Sustainability criteria: Compensation preferences and WTP to avoid future oil spills in Spain

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‘‘a far-seeing statesman will feel a greater responsibility to
future generations when legislating as to land than as to other forms of
wealth; and that, from the economic and from the ethical point of view,
land must everywhere and always be classed as a thing by itself,” (Marshall, 1920)

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Thank you…

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Declaration

I certify that the thesis I have presented for examination for the MPhil/PhD degree of the London School of Economics and Political Science is solely my own work other than where I have clearly indicated that it is the work of others (in which case the extent of any work carried out jointly by me and any other person is clearly identified in it).

I warrant that this authorization does not, to the best of my belief, infringe the rights of any third party.

Abstract

This thesis explores the theoretical debate regarding the pursuit of weak versus strong sustainability (SS). It is argued that the choice between these paradigms needs better scientific information plus knowledge of citizen preferences in order to be resolved.

The novelty of this research lies in providing an empirical test of Aldred (2002) and Turner (2007) who claim that investment in social capital such as schools and hospitals may be an adequate compensation measure when environmental damages occur. Following Pearce *et al.* (2006) and Atkinson *et al.* (1997) the benefits of preserving natural capital are also analysed through a contingent valuation (CV) study in which environmental damages of different sizes and consequences are depicted.

The main research questions are: Are the views of elites and citizens as regards sustainability similar? Do citizens exhibit strong sustainability preferences with regards to compensation schemes? Can the use of CV help substantiate the case for strong sustainability? These research questions are answered undertaking a mixed methodological approach. Elite interviews, focus groups and a survey explore expert and non-expert views on sustainability.

Statistical analyses confirm Aldred's (2002) and Turner's (2007) claim. However, a significant number of respondents choose natural capital as the preferred compensation option. Multinomial logit models used show the main characteristics that determine the likelihood of choosing a given compensation option. Answers to the compensation question leads to the expectation that respondents to the valuation question will pay significantly more to avoid larger environmental damages. This expectation is confirmed by the statistical analyses undertaken. Interval data models provide information on the variables that determine willingness to pay. The results are encouraging as they signal scope sensitivity but doubts remain over whether CV can adequately capture preferences when evaluating environmental losses as willingness to pay amounts are not proportional to the damages described.

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CHAPTER 1. INTRODUCTION

1.1 Motivation

The publication of the report 'Our Common Future' (WCED, 1987) not only put development and environmental concerns on the international policy agenda, it also provided the most often cited, and arguably vague, definition of sustainable development as the development that 'meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED, 1987: 43). This broad definition and the myriad of existing interpretations (Pezzey and Toman, 2002) lend the term a widespread popularity among policy-makers at various governance levels, although implementation of the concept was, and still is, in need of further theoretical developments and empirical implementation and testing.

Two broad paradigms emerged within the sustainability literature, weak and strong sustainability (henceforth WS and SS respectively). Pearce *et al.* (1989) provided the conceptual divide between these two paradigms. The intersection of these paradigms lies in that they both strive for lasting development. They differ however in the assumptions about the substitutability of different types of capital and thus about the need to preserve any specific form of wealth for future generations.

Adherence to any of these two paradigms is largely dependent on better understanding of the environment and better understanding of the demands for (and acceptance of) sustainable development policies by citizens. Thus, asking whether specific forms of capital should be preserved and whether compensation in the form of natural capital or other forms of capital would be acceptable when environmental damages occur, may help advance the debate regarding sustainability. It may also provide relevant policy indications of the socially acceptable sustainability paths. The scarce amount of empirical papers on sustainability (Pezzey and Toman, 2002) provides the rationale for an applied inquiry into sustainability preferences.

Sustainability is, in its broad sense, a supra-national endeavour that is influenced by national actions. Within nations, sustainability will be influenced by what happens to the different sectors and products (Pezzey, 1992). At project and portfolio levels of analysis, valuation procedures such as those offered by contingent valuation (hereinafter CV) can be used as a tool for analysing citizen willingness to pay for prevention measures to protect natural capital (Pearce *et al.* 2006) and explore the

benefits of sustainable development (SD) policies (Atkinson *et al.* 1997). The remainder of this section will analyse the field of enquiry chosen to advance the understanding of preferences towards sustainable development.

Approximately 71% of the earth is comprised of oceans and large seas. Direct and indirect environmental services and functions provided by marine and coastal areas include, among others: food production, biodiversity, climate regulation, disease control, waste absorption, flood protection and cultural and recreational services (Hassan *et al.* 2005). Marine and coastal areas are linked through the use that species and humans make of these ecosystems. The Millennium Ecosystem Assessment (2005) acknowledges that there is neither a regional nor a global management framework to guide the inevitable trade-offs between competing activities that may affect coastal areas. One such activity is oil exploration and its related hydrocarbon transport. Accidental oil spills such as the one cause by the explosion of the *Deepwater Horizon* platform off the Gulf of Mexico in April 2010 or the *Prestige* oil spill off the Spanish coast in November 2002 are recent examples of the conflicts between environmental protection and economic development.

The Millennium Ecosystem Assessment report expects oil spills to have a moderate impact on maritime areas by 2025. Certain oil spills such as the *Exxon Valdez,* the Prestige and (presumably) the Deepwater Horizon, however, cause long term damages to marine and coastal ecosystems, especially if the areas affected are vulnerable or are already degraded. Accidental oil spills may not be the most serious threat to the marine environment but they are visible incidents that trigger policy action at various administrative and geographical levels, widespread media attention and civil society alarm.

Furthermore, major transport routes such as the Fisterra maritime corridor are oil spill 'hot spots'. In fact, five out of eleven major spills in EU waters have taken place in Galicia (Spain) in the last three decades (Loureiro *et al.* 2006). Although accidental oil spills worldwide have decreased in recent decades, the European Atlantic that includes the area of Galicia does not show a clear reduction in the number of spills (Vieites *et al.* 2004). According to Loureiro *et al.* (2006) and Vázquez *et al.* (2004: 28) 'the coast of Galicia has received more than ten percent of the world's maritime oil spills'.

According to the Ministry of Environment[1] Spain has 7,880 Km of coast. Approximately 44% of Spain's population lives in coastal municipalities that represent 7% of the available land (MMAMRM, 2007). Urbanization, land use planning, climate change and economic activities as important as tourism[2] and maritime transport[3] have resulted in increasing pressures on the marine and coastal environment.

In Spain, 85% of imports and 70% of exports are carried by sea. The EU is the largest oil recipient amounting to '27% of the world oil-related trade, compared to 25% by the US. The largest share of this transport takes place either in the Atlantic coasts or in the North Sea. This means that between 1,500 and 2,000 oil tankers navigate EU waters each year'[4]. Hydrocarbon shipping is therefore an important economic activity for fossil fuel dependent economies. This activity can threaten the global commons; adding one ship implies a direct benefit for the firms that exchange goods but the costs, in the form of increased risks of accidents, are borne by society that may or may not have benefited directly from those goods. The 'tragedy' comes from the 'remorseless working of things' (Whitehead, 1948 in Hardin, 1968: 1244) in the form of environmental damages.

EU's integrated maritime policy and Spain's coastal sustainability strategy both point to increased relevance of environmental resources. They both call for sustainability but fail to explicitly state what paradigm of sustainability they refer to or whether this quest is backed by citizens.

In order to analyse sustainable development the *Prestige* spill (to date the most recent large scale accidental oil spill Spain has suffered) is studied as the baseline scenario from which to build compensation and valuation scenarios. It had long term consequences for the economy, the environment and Spanish society. It triggered an unprecedented amount of voluntary work in cleaning-up activities. It also resulted in a 'regulatory thrill' (Tan, 2006) at various administrative levels. Citizen response plus

[1] *Ministerio de Medio Ambiente, Medio Rural y Marino*
[2] 10.3% of Spain's GDP in 2009 came from the tourist sector according to the National Statistics Institute. See: http://www.expansion.com/2010/02/18/empresas/1266495717.html
[3] The European Maritime Safety Agency stated that maritime transport carries 80% of world trade, 90% of EU's external trade and 40% of trade among EU members. Three million people in the EU work in the maritime sector.
[4]http://www.mma.es/portal/secciones/acm/aguas_marinas_litoral/prot_medio_marino/contaminacion_marina/trafico_maritimo.htm (author's translation)

policies enacted in the aftermath of the spill led to enquiring into sustainability preferences in this context.

1.2 Research questions

The understanding of complex environmental problems such as those caused by oil spills benefits from the knowledge and inputs of both experts and non-experts (Dürrenberger *et al.* 1999) to successfully design and implement feasible and socially acceptable policies. Existing maritime policies call for public participation and expert inputs as well as for sustainable development. Routine integration of expert and non-expert knowledge plus the engagement in sustainability is nevertheless missing in the implementation of marine and maritime policies in Spain[5]. As is the case in other policy areas (see McVittie, Moran and Elston, 2010), to the researcher's knowledge there has been no analysis of whether policy goals and public preferences 'match' in the area of marine resource management and accidental oil spills. In order to help improve the integration of expert and non-expert knowledge the first research question explores whether experts and citizens view sustainability in the same way in the context of oil spill prevention, management and compensation.

When faced with environmental losses derived from excessive pollution, increases in (any type of) capital may offset these environmental losses if we adhere to the weak sustainability paradigm. That is, increased material welfare can compensate for environmental degradation (Hartwick, 1977). Aldred (2002) and Turner (2007) present an arguably modified Hartwick-type compensation criterion whereby social capital (henceforth defined as investments in schools, hospitals or other community services) could potentially compensate for environmental losses. On the other hand, strong sustainability proponents (it its weakest sense) would argue that certain types of capital (i.e. natural capital in the form of 'any stock provided by nature' (Pezzey, 1992: 322)) overall cannot be substituted by increased consumption, although some form of substitution via increased levels of natural capital could compensate for environmental losses (*substitution of like-for-like)*.

Adherence to any particular sustainability paradigm depends, to a certain extent, on what path society chooses to take. This choice will be shaped by a country's development level, preferences and needs, among others. Hence, the second research

[5] Calls for integrating expert and non-expert knowledge are made in existing strategies despite the fact that potential inconsistency problems can emerge between experts and non-experts whereby non-experts are concerned with environmental problems that are not considered to be very important by experts (Atkinson *et al.* 1997).

question explores whether a Hartwick-type rule or stronger forms of SD (replacing *like-for-like*) can be valid in terms of compensation for environmental damages suffered. This question will be addressed by asking the type of compensation that citizens in two Spanish cities (a coastal one, La Coruña, and an inland one, Madrid) would prefer if they were faced with three future spills of different sizes and consequences. This research also analyses the characteristics that best determine the probability of choosing one compensation option over another.

Criticisms regarding the usefulness of sustainability and its application have spurred research into what sustainability is and how it can be practically used in policy-making in order to leave a bequest to future generations. One of the possible ways of doing this is combining sustainability and valuation (Pearce, Atkinson and Mourato, 2006). Additionally, as Atkinson *et al.* (1997) claim, SD proponents have so far paid little attention to the costs and benefits of sustainability. The final research question will therefore ask whether valuation in the form of a Contingent Valuation (CV) experiment, can help substantiate strong sustainability. That is, whether respondents are willing to pay to preserve natural capital and if so, how much.

In the context of accidental oil spills, the *Prestige* gave rise to public outcry and demonstrations, an unprecedented amount of volunteers that went to clean-up the spill and a significant public investment effort in recovering the economy of the affected areas. The context specific question addressed is, given these reactions, can we say there is a shift in citizen preferences towards protection of natural capital manifested through significantly higher WTP to avoid potentially irreversible damages? This is analysed through the willingness to pay (WTP) for prevention schemes to protect the marine environment. A further question that will be asked is whether WTP is proportional to the hypothetical damages described. Finally, socio-economic characteristics that best explain respondents' willingness to pay to avoid a future spill are explored.

1.3 Contribution to the field

When technology and human mediated risks happen, there is increased 'concern over the relationship between citizens, science and technology' (Irwin, 1995: 9). According to Bonnes *et al.* (2007) there is a burgeoning literature of experts versus 'lay' analysis of environmental risks and some of the scholars in the field conclude that participatory approaches will facilitate sustainable outcomes (*ibid.)*. They furthermore conclude that expert and 'lay' knowledge can be complementary as lay knowledge may add local understanding of environmental phenomena (to expert understanding) that can ground expert analysis in locally acceptable policies. As Bäckstrand (2003: 37) states, 'In the quest for sustainability, ''universal'' knowledge must be connected to place-based knowledge' that is traditionally held by non-expert citizens. In addition to this and in the context of oil spills, Leschine (2002) calls for the joint analysis of the social, political and environmental impacts and recognises the all too frequent lack of social input in the analysis and perceptions of environmental damages. Additionally, Moyano *et al*. (2009) acknowledge the scarce analysis of the perceptions of citizens as regards environmental problems and public policy. It is these theoretical gaps that the analysis of experts versus citizen views as regards sustainability aims to bridge.

Hence, experts and citizens understanding of sustainable development in oil spill settings will add some insight into the ongoing paradigmatic debate between weak sustainability and strong sustainability from two perspectives: that of the policy-makers, civil servants, businessmen associations and NGO's, who have specialised knowledge and input into decision-making processes, *versus* that of citizens who have place-based knowledge and who are to accept policies for them to be successful. It also provides insights of how civic science[6] can be applied to oil spill management.

Economic interpretations of welfare assume losses can generally be offset by increasing the *amount of other goods or money*. Resources are hence largely substitutable and compensation either in monetary terms or in alternative goods can make individuals 'whole'. If there are losses for which there is no possible substitution with other goods, compensation would have to be infinite and the economic

[6] 'Civic science has been defined as the efforts by scientists to reach out to the public, communicate scientific results and contribute to scientific literacy' (Bäckstrand, 2003: 28). The use of 'civic science' is said to be able to tackle two of the main on-going problems that undermine scientific knowledge: lack of trust by the public and increase in the democratization of science (*ibid.*)

framework is not well suited to analyse the 'adequacy or fairness of compensation' (Ozdemiroglu *et al.* 2009: 16). Recently developed project restoration approaches are based on the above economic interpretations and analyse the *amount of resources* required to offset environmental damages. These approaches do not engage in the *type* of resources that would offset environmental damages or their relationship to the sustainability paradigms. This thesis aims to explore this gap. Hence, citizen views are integrated with expert knowledge to produce a set of compensation and valuation scenarios. Additionally, the attempt to include a wealth of agents in the development of compensation and prevention scenarios is to the researcher's knowledge, a new applied contribution, especially when analysing compensation preferences.

The empirical contribution when analysing survey respondents' preferences for different type of compensation packages is to provide a test for Aldred (2002) and Turner's (2007) claim. In their papers, the authors theorise that money may not be an adequate compensation measure when faced with environmental damage but investment in social capital such as schools and hospitals may be socially preferred. Linking this claim with the sustainability framework (as described by Pearce *et al.* (1989) and analysed by Neumayer (1999), Atkinson *et al.* (1997), Dietz and Neumayer (2007), Pezzey and Toman (2002) among others) answers the question of whether respondents' compensation preferences point towards a SS compensation rule rather than a Hartwick-type compensation criterion that assumes there is perfect substitutability between different forms of capital.

The main contribution of the CV experiment is to advance the understanding regarding valuation and strong sustainability following Pearce *et al.* (2006) and Atkinson *et al.* (1997). One way of attempting this is assuming, as the above authors do, that as we approach the critical amount of an asset, individuals will experience large welfare losses. If the welfare loss is very large, adherence to strong sustainability may be socially desirable. Yet this will require adequate information on the relevance of the resource and its loss as well as on 'good measures of willingness to pay for the resource' (Pearce *et al.* 2006: 246). The contributions to project appraisal and strong sustainability are overall conceptual. There is therefore scope for empirically testing the suitability of project appraisal as a tool to go deeply into strong sustainability. This thesis aims at doing this.

In the context analysed, it is hypothesised that social and policy responses in the aftermath of the last large scale spill in Spain may be indicative of a shift towards strong sustainability. The results from chapter four of the thesis (on compensation) indicate that over a third of survey respondents would prefer natural capital (replacing like-for-like) if a future spill happened. This helps strengthen the case for a possible shift to a strong sustainability paradigm by survey respondents. In order to test this interviewees are asked about whether they would be willing to pay to prevent future spills (one of the three scenarios had large, potentially irreversible consequences) and if so, how much. This approach builds on past CV studies on oil spill management, taking up the recommendations by Arrow *et al.* (1993) concerning the usefulness of building a body of knowledge regarding WTP for spills of different sizes and consequences. In addition, this chapter contributes to the debate on protest responses and on scope sensitivity (by conducting both an external and an internal scope test in an oil spill situation). Some of the most relevant literature on oil spills does not report *external scope tests* (see for example Carson *et al.* (2003) and Loureiro *et al.* (2007, 2009) and Bonnieux and Rainelli, (2003)). In the present thesis testing for external scope sensitivity implies using a split-sample design so that half of the sample is asked about their WTP to avoid a small and medium size spill and the other half of the sample is asked about their WTP to avoid a medium and a large size spill.

Finally, the valuation question furthers existing knowledge regarding protest responses. This is done by analysing differences in WTP estimates using two alternative classifications of protests (Bateman *et al.* 2002 and Brouwer *et al.* 2008) as few CV studies report the classification of protest responses used or whether WTP estimates would differ significantly if alternative classifications were used.

1.4 Methodology: qualitative and quantitative methods

Both qualitative and quantitative methods are used to answer the research questions put forward above. Theoretical and topic-related motives favoured undertaking a multi-method approach to explore the pursuit of weak and strong sustainability policies. Markandya and Pedroso-Galinato (2007: 297) claim that 'one of the recurrent themes in the sustainability literature has been the extent to which a loss of natural capital can be made up for in welfare terms by increases in other forms of capital. This issue was raised early on in the debate on sustainability by Pearce and has never really been resolved'. These authors tackle the issue empirically as regards production functions finding a fair degree of substitutability but to my knowledge there is no empirical analysis of citizen preferences as regards the type of capital that would be preferred when faced with environmental damages such as hypothetical spills of different sizes and consequences. As this is a relatively novel area of enquiry, exploratory analysis in the form of qualitative methods was a logical starting point to understand the range of feasible policy options, the policy drivers of these options, the understanding and the acceptance of potential policies by focus group participants. The information obtained from both qualitative research methods used (semi-structured elite interviews and focus groups) was then funnelled into the development of the compensation and the valuation exercises that were the core elements of the quantitative analysis (the survey) (see Shipman, 1997). The rationale for this mixed approach can be summarised as 'a mixture of quantitative and qualitative evidence can ensure that numbers are related to complex social situations from which indicators have been extracted'. (Shipman, 1997: 27).

Qualitative methods

Qualitative research is one of the available methods for obtaining data that focuses on systematic interpretation of behaviours, organisational functioning and cultural values. This information is obtained and interpreted through methods that differ from statistical analysis of quantitative data. Interpretation entails categorising focal concepts, establishing relationships between categories and subcategories and finally integrating them into a theoretical framework (Strauss and Corbin, 1998).

Advantages, beyond being able to explore in greater depth the reasons for taking action, lie in the fact that qualitative interviews allow greater flexibility and do not

force respondents to 'fit' their answers into what the researcher sets as options. In this sense, interviews aim at exploring the complexity and details of the selected topic, revealing different options for action, rather than directly categorising responses. This type of research provides further insight into the motivations of human actions which complements the information provided by quantitative research.

Limitations of this type of approach are as follows. When developing qualitative research, the interviews are *not* conducted by using a representative sample of the population. Thus, the results obtained from this type of approach cannot be generalized to the population. Conclusions drawn from qualitative research are therefore considered logical conclusions and not statistical conclusions. Interviews are also thought to be less replicable than questionnaires as they do not have a fixed set of questions to ask repeatedly but a number of 'open' topics to be discussed.

The complex nature of the topic analysed, the importance of establishing personal contact with interviewees in 'privileged' positions of knowledge and the length required to fully answer the questions also favoured a qualitative engagement with elites. Additionally, the results and analysis of the qualitative research undertaken were expected to help explain the findings of the quantitative research (Saunders, Lewis and Thornhill, 2007; Wass and Wells, 1994; Shipman, 1997).

Although a quantitative approach to the information held by elites was theoretically feasible (i.e. designing a questionnaire of the key issues: compensation schemes, prevention programs, definition of SD used, inter and intra-generational equity, etc.) it was hypothesised that given the sensitive nature of the topic, given the on-going policy developments, given the intricate characteristics of oil spills and their management, face-to-face interaction with 'elites' would provide useful information on what was happening and why that would have not been fully retrieved from a survey.

Elite interviews provided an in-depth overview of compensation schemes, prevention schemes, the understanding of SD and questions about equity beyond those that might have been offered through a questionnaire. Semi-structured interviews allowed to build rapport with the interviewees and are thought to have facilitated fruitful discussion and interaction that would have been constrained by a quantitative exchange with elites.

In the aftermath of the *Prestige* oil spill a myriad of policy developments (such as the design of contingency plans, compensation legislation or clean-up activities among others) were taking place (Tan, 2006). According to elite interviewees these developments were the result of the ongoing interaction among a number of stakeholders and were being implemented by policy-makers and civil servants with specialized knowledge. The evolving nature of the decisions made, the contextual information held by elites, the reasons for actions taken or feasible changes in future compensation and prevention policies were not readily available in publicly available documents. This information was thought to be essential for the development of feasible and credible compensation and prevention scenarios. Elite interviews were hypothesized to be able to provide this information.

The second qualitative research method used in the thesis, focus groups, was chosen due to its hallmark characteristic of being able to produce information through the interaction of group members that would be impossible to obtain without this guided exchange of ideas. This group interaction is argued to be particularly fruitful when the topic analysed has not been explored in depth (Morgan, 1997; Strauss and Corbin, 1998), as was the case when analysing for example preferences for different types of capital in the compensation exercise. Similarly to elite interviews, developing understandable compensation and valuation scenarios was hypothesised to benefit from the input of the socially constructed interaction among FG participants who would provide information on the local language and understanding of the topics analysed (Gaskell, 2005).

In the thesis the focus groups served a double purpose. The first role of the FG was to be a source of information in order to compare and contrast the views of elites and the views of non-expert citizens as regards sustainability. The second role of the FG was to provide data to develop and refine the compensation question and the valuation question in the survey. Other disciplines such as marketing have also successfully used focus groups in this second role of providing information for survey development (McQuarrie, 1996). The faster implementation and the lower cost of focus groups (compared to additional one-on-one semi-structured interviews with non-experts) was a further reason to explore citizen views using this research method (Morgan, 1997).

Quantitative method: Survey

A survey can be defined as the 'research strategy that involves the structured collection of data from a sizeable population' (Saunders, Lewis and Thornhill, 2007: 612)

Surveys are the most often used technique for obtaining primary data in social science research. According to Burton (2000), survey information can be divided into the following categories: physical condition of interviewees, socio-economic variables, behaviour, attitudes and intentions. Within survey research we find two broad categories, descriptive research, that is considered less sophisticated, and explanatory research that is more complex and aims not only at describing but also at uncovering the causal explanation for the answers obtained.

Within the different types of explanatory research designs[7], cross-sectional design is used whereby people with different characteristics (age, gender, education, socio-economic situation, etc.) are interviewed once. The main advantage of cross sectional design over longitudinal design is that fewer resources (in time and money) are needed to obtain and analyse data.

The main advantage of quantitative methods over qualitative methods is that the former allow the researcher to collect large amounts of information at a 'low' cost. These techniques have a long tradition in aiding policy-makers and thus are well tested and widely accepted. As questionnaires do not change throughout the interview process[8] they can be replicated and results checked and then validated or discarded. Procedures for developing and implementing questionnaires are controlled and standardised.

On the other hand, disadvantages include the fact that researchers' assumptions and limitations are reflected in the questions asked. This distorts reality. Models and assumptions are simplified representations of the phenomena studied and different researchers may disagree on whether the assumptions made and the focus and intention of the questions asked are the most appropriate. Surveys may not be able to help establish causal explanations due to lack of social contextualisation. Surveys are

[7] Classical experimental design, quasi-experimental design, cross-sectional design and longitudinal designs (see Burton, 2000, Chapter 20, for a description of the characteristics of each)

[8] Although face-to-face interviews with different interviewers may of course suffer from some degree of interviewer bias and thus alter questions to a certain extent.

also said to neglect human will in actions and thus purport an image of a respondent who is always pre-determined by external forces. Surveys have been criticised as overly applied and thus adding little to theoretical advances. Technically, measurements made and analyses conducted can be flawed, biased or wrong. Besides, response rates might not reach the required level to be considered representative. In order to try to minimise potential problems good practice guidelines have been followed, peer review has been sought and piloting was used to test the questionnaire.

Table 1.4.1 below provides a summary of the different methods used, the number of interviews and their main purpose.

Table 1.4.1 Methods used, quantity and purpose

Method	Quantity	Purpose
Elite interviews	18	Analyse expert (elite) views and sunderstanding of sustainable development Inform the survey development process
Focus groups	8	Analyse citizen (non-expert) views and understanding of sustainable development Inform the survey development process
Pilot	25	Test questionnaire
Survey	720	Analyse respondent preferences for compensation Analyse respondent willingness to pay to prevent environmental damage

1.5 Policy relevance

The Deepwater Horizon oil spill off the Gulf of Mexico and its global repercussions for the US, BP, and indirectly the UK, inevitably highlight the recurrent policy relevance of oil spills. Up-to-date analysis of crisis management, damage mitigation, compensation preferences and willingness to fund prevention policies can be of interest to policy-makers facing oil spills and perhaps in other crisis situations.

EU and Spanish policy requires, at a theoretical level, engagement with sustainable development and public participation. The analysis of existing policy strategies highlights the largely unexplored relationship between oil spill management and sustainable development in Spain. The analysis undertaken in this thesis is framed within the current multi-level and multi-agent governance structure. This can arguably help unveil areas that can be improved in the ongoing process of oil spill preparedness and operational response in the light of the Spanish Coastal Sustainability Strategy and the EU's Integrated Maritime Policy.

The policy relevance of analysing elite interviews and focus groups with regards to sustainable development is three-fold. First, were this type of research be included as part of the policy-making process, it might help to project an image of transparency that could help build trust and appease citizens in future oil spills. Second, listening to voters' preferences could help politicians to be re-elected. Finally, increasing stakeholder participation enhances the spirit of the European Integrated Maritime Policy.

The usefulness of analysing citizens' preferences as regards compensation is two-fold. Firstly, the research is intended to help policy-makers understand taxpayers' preferences in terms of compensation packages if and when a new spill occurs. Secondly, this thesis aims at facilitating the analysis of the adequacy of existing compensation options given the limited coverage of international compensation mechanisms.

Analysing citizens' willingness to pay to prevent future spills is relevant for policy-making for two reasons. First, it may allow decision-makers to compare oil spill

prevention budgets with voters' willingness to pay for these[9]. Second, the results obtained could help reduce the expense of commissioning new CV studies as this will allow the possibility of conducting benefit transfer (BT).

[9] One should however bear in mind the limited sample size and the semi-probability sampling process followed

1.6 Structure of the thesis

Chapter 2 presents the literature review focusing on sustainable development and the two main paradigms of sustainability: weak and strong sustainability. Key issues on the measurement of sustainable development are also discussed. Sustainable development policies in Spain and the institutional context in which they develop are analysed. *Chapter 3* shows the similarities and differences that arise from experts' views and from public preferences in the sustainability debate. This is framed within the context of oil spills. *Chapter 4* provides a test of Aldred (2002) and Turner's (2007) assertion on acceptance of social capital (schools, hospitals, etc) as the preferred compensation option versus the weak and strong sustainability compensation options. *Chapter 5* analyses respondents' willingness to pay to prevent future spills of different sizes and consequences. The last chapter (*chapter 6*) discusses the key findings of the thesis. This is followed by the policy recommendations. The chapter concludes with a brief reference to future research that could help test the reliability and robustness of the results obtained. It also briefly reflects on the possible contribution of neuroeconomics to stated preference methods.

CHAPTER 2. LITERATURE REVIEW

2.1 Introduction

Sustainability, as we saw in the introductory chapter, is concerned about long rung intra and intergenerational welfare. The key concepts within the sustainability debate refer to the limits of the environment, society and technology and the needs of present and future generations (Atkinson *et al.* 1997). These needs can only be accounted for by the actions and omissions of the current generation that will impact on the availability of different types of capital.

Preserving capital stocks as a whole or assigning special protection status to certain forms of capital (e.g. natural capital) leads us to distinguish among different sustainability paradigms. Deciding on which sustainability path to choose will depend on the development stage, stocks of capital available and preferences of different nations, among other factors. Despite the global nature of the quest for sustainability, national, sector and project-based efforts are all part of the sustainability web (Pezzey, 1992).

An economic enquiry into sustainability brings the analysis into the realm of compensation. As Barbier, Markandya and Pearce (1990: 1260) claim, economic efficiency and equity are joint concerns addressed by sustainability and they will require 'actual compensations of future generations by the present generation…via a transfer of capital assets…no less than the current capital stock'. Weak and strong sustainability paradigms will diverge in the type of compensation needed. Weak sustainability abides by the Hartwick-Solow rule that states that the total stock of man-made and natural capital has to be maintained through reinvesting in any form of capital when there has been depletion of any form of capital. Strong sustainability is a 'broad church' but overall it will require maintaining natural capital by adding natural capital when it is depleted (or ensuring the functions of critical natural capital are maintained). The extent to which these compensation efforts are feasible and acceptable is subject to debate (Dietz and Nuemayer, 2007; Humphrey, 2001).

Regardless of the sustainability path taken, it is argued that valuation can be a useful tool to inform about the consequences of different and often competing development options. This assumption does not imply neglecting the limitations of valuation as an information tool regarding efficiency. Rather, it entails being aware of these limitations and being mindful of the complementarities of other disciplines and other ethical

theories. The role of valuation is hence circumscribed to providing one of many possible inputs to decisions.

As regards the context chosen for an enquiry into sustainable development it can be said that the sea provides humans with a myriad of goods and services. It performs complex ecosystem functions that make life possible. Threats to the marine environment come from a wide variety of agents and activities. One them is oil transport. Economic activities have historically taken precedence over environmental protection. This is still the case in many places around the world as there is no overarching marine protection framework. The recent explosion of the *Deepwater* Horizon oil rig and the gushing of oil for approximately three months have highlighted the environmental, social, economic and political relevance of preventing and managing oil spills.

The existing legislation and institutions in charge of oil spill management in the context analysed call for the preservation of capital, both man-made and natural capital. At a theoretical level this implies acknowledging some form of sustainable development. The emphasis has been traditionally placed on preserving and compensating for losses in man-made capital, hence shying away from the strong sustainability paradigm.

This is partly due to the private nature of man-made capital lost coupled with civil liability conventions that have traditionally focused on economic losses. Historical emphasis on compensation via man-made capital can also be a consequence of the relatively recent importance assigned to natural capital in the policy agenda. Additionally, valuing non-market losses is difficult. Furthermore, quantitative and qualitative limitations in compensation according to the IMO, the EU Environmental Liability Directive and the Spanish legislation lead to the (at best) partial compensation of environmental losses when oil spills happen.

The remainder of the chapter is structured as follows. Section 2.2 provides a definition of sustainability and its weak and strong paradigms. It also provides insights from other fields of knowledge that can complement economic analyses relative to intentions, attitudes and behaviours. Section 2.3 discusses how to measure sustainability. Section 2.4 briefly outlines the main gaps in the literature in theoretical an empirical terms. It also provides explanations regarding the way in which this thesis aims to explore these gaps. The remainder of the chapter zooms into the specific context in which the

research is developed. Section 2.5 explores sustainable development strategies in Spain. Section 2.6 provides the rationale for analysing oil spills in Spain. Section 2.7 discusses the key institutions, regulations and policies involved in oil spill management in Spain as well as the property rights enshrined in the use and management of the marine space. Section 2.8 discuses the main issues analysed and their link to the remainder of the thesis.

2.2 Sustainability: Definitions, paradigms and broader issues

Economics has been concerned about how long resources would last since, at least, the 18th century with the work of Malthus (1798) on the limited availability of land and growing population, the work of Jevons (1865) on the limited availability of coal and Britain's rising energy demand and the work John Stuart Mill who analysed the existence of a stationary state with constant population and capital (Pezzey and Toman, 2002; Pearce, 2002).

An economic definition of sustainability will strive for enduring wellbeing or utility of individuals derived from increased consumption, the availability of amenities provided by renewable resources and (reductions in) pollution (Neumayer, 1999). The working definitions that will be used throughout the thesis claim that development[10] is sustainable if it provides

> *'Non-declining per capita utility - because of its self-evident appeal as a criterion for intergenerational equity'* (Pezzey, 1989: 11) or,
>
> *'Non-declining utility of a representative member of society for millennia into the future'* (Pezzey, 1992: 323)

The elements ensuring capacity to provide non-declining wellbeing are different types of capital defined as 'any economically useful stock' (Pezzey, 1992: 322). The types of capital that will be referred to throughout the thesis are: *natural capital* which comprises nature in a broad sense (plants, animals, renewable and non-renewable resources, biodiversity, ecosystems, etc.). *Man-made capital* (also called physical capital or just capital) includes buildings, machinery, infrastructures, etc. *Social capital* defined as community facilities such as schools and hospitals (Turner, 2007) that provide the capacity to provide health and educational services, among others. The last type of capital is *human capital* (also called *intellectual capital*) which includes ingenuity, intelligence, knowledge and skills.

As claimed by Pearce *et al.* (1989: 179-180), the conditions to achieve sustainable development (SD) are: '(a) development subject to a set of constraints which set resource harvest rates at levels no higher than managed or natural regeneration rates; and (b) use of the environment as a 'waste sink' on the basis that waste disposal rates

[10] Following the distinction between development and growth provided by Daly (1990: 1) 'growth is quantitative increase in physical scale, while development is qualitative improvement or unfolding of potentialities'.

should not exceed rates of (natural or managed) assimilation by the counterpart ecosystems'. Additionally these authors claim there is some degree of substitutability between 'renewables and exhaustibles'.

Limitations to the SD concept arise from its definition as there is no consensus regarding what sustainability objectives or standards are (Pezzey and Toman, 2002). Despite the seemingly clear 'rules' for achieving SD a myriad of variables blur the implementation of strategies to abide by these rules. The Governance for Sustainable Development report (2003) acknowledges the existence of four dimensions of sustainable development: the ecological, the economic, the institutional and the social dimension which are all interconnected. The multiple dimensions of sustainability plus issues such as the lack of scientific information, the political bargaining process that tends to shape the scientific mandates, etc. make abiding by the above stated conditions to achieve SD a complex endeavour. As Farrell *et al.* (2005: 143) claim SD is 'a political concept replete with governance questions' for which there are no definitive guidelines (in Jordan, 2008).

The main reasons given in the literature for adherence to sustainable development are: first, individuals care about the welfare of their descendants and thus, they would potentially be willing to save some of their resources for their descendants; second, as time is unidirectional, the present generation bears the burden of deciding implicitly or explicitly (through their actions) for those yet unborn. Finally, there is also a moral argument for caring about future consequences of today's decisions, that it is 'right' to do so (Neumayer, 1999).

Within the sustainability discourse two 'paradigms' have been differentiated: weak sustainability and strong sustainability (Pearce *et al.* 1989). They both advocate for development that is prolonged into the future, but they differ in what the necessary conditions are for this durable development. Underlying assumptions regarding substitution between the different forms of capital and regarding compensation also differ among these paradigms. Their views on the capacity of the environment to produce goods and services, its resilience, the uniqueness and essential life support features of certain environmental assets are the main points of disagreement between these two approaches.

Weak sustainability (hereinafter WS) assumes: firstly, substitutability among the different forms of capital. According to Solow, 'the current generation does not especially owe to its successors a share of this or that particular resource. If it owes anything, it owes generalized productive capacity or, even more generally, access to a certain standard of living or level of consumption' (Solow, 1986: 142); secondly, resources are super-abundant or that elasticity of substituting man-made capital for natural capital is greater than or equal to one or that technological progress will be able to overcome any resource constraint (Neumayer, 1999: 24). WS also assumes there are well functioning price mechanisms (Azqueta, 2002 and Beckerman, 1995). Prices are assumed to be able to signal scarcity and thus spur substitution of cheaper assets for relative expensive (scarce) assets. The result of this process can imply advances in technological progress that increase the worth of reserves of non-renewable products.

The requirements from a WS perspective to achieve SD imply maintaining total net investment in man-made and natural capital greater than or equal to zero, known as the Hartwick rule (Hartwick, 1977). This rule implies reinvesting the rents obtained from exploiting natural capital in reproducible capital that will be inherited by generations to come. However, if different forms of capital are assumed to be substitutable, any form of capital could be depleted if enough investment is made in other forms of capital. It should be noted however that as the resource base (stock) is depleted towards a given threshold, its price would rise, thus making conservation an increasingly attractive option for policy-makers, provided the market mechanism is able to adequately reflect scarcity, i.e. there are complete markets.

A modified form of WS could come from Aldred's (2002) and Turner's (2007) proposal that states that when individuals are faced with environmental losses, some forms of compensation, say money, may not be appropriate whereas others, say schools or hospitals, may be accepted as adequate compensation. As Aldred (2002: 38 - 39) explains 'large environmental losses may not be commensurable with money... It is often supposed that if no amount of money can compensate for a loss, nothing else can serve as adequate compensation either. But since no assumption has been made that the loss has infinite value, this need not be so. Rather, the agent might accept the loss if, say, a new local hospital is built as compensation'. There could therefore be

some substitutability (and acceptable compensation projects) or no substitutability but an acceptance of certain types of compensation (Humphrey, 2001) and there is a possibility that money is not the adequate measuring rod when asking individuals about certain losses (Aldred, 2002; Turner, 2007; O'Neill and Spash, 2000; Frey and Oberholzer-Gee, 1997).

Proponents of strong sustainability (henceforth SS) call for stronger constraints on development strategies in order to ensure lasting development. The reasons for demanding a greater protection of the environment rest on the fact that there is lack of scientific knowledge and uncertainty regarding the consequences of natural capital depletion. The possibility exists of irreversible consequences of depleting natural capital (e.g. species becoming extinct). There are environmental assets that provide life-support functions. Lastly SS claims that there are environmental losses for which individuals cannot be compensated even though in some cases compensation may mitigate damages. As Spash (1993: 127 - 128) claims 'the transfer of a set of ''goods'' may be unacceptable as an attempt to correct for loss or injury due to the violation of rights…in terms of economic compensation…(when) rights that ought not to be violated have been violated … compensation is undertaken to mitigate the wrong'.

Different proponents support different versions of SS, and it is hard to pinpoint the requirements of SS (Neumayer, 1999). Here are however two main camps within SS:

1. SS (in its 'softer' version) will require maintaining the value of total capital and natural capital at least constant. This version of SS allows for depletion of non-renewable resources (such as oil) if the proceeds from depleted assets are reinvested in renewable alternatives (e.g. solar energy development projects). This would allow for substitution between different forms of natural capital. It would also allow compensation in natural capital. As Aldred (2002: 43) states 'perhaps in some cases only 'in-kind' compensation – environmental goods to replace environmental losses – will suffice'. There remain doubts that this in-kind compensation will be adequate for all kinds of environmental losses (Neumayer, 1999; Dietz and Neumayer, 2007).

2. SS (in its more 'stringent' version) will require maintaining the value of total capital plus maintaining the physical stock of natural resources that are

considered critical natural capital (CNC), in other words, non-substitutable (vital) natural assets. These resources can be used within the regenerative capacity of the environment, but their functions must be maintained. Identifying what critical natural capital is and what is worth has been difficult (Pearce, Atkinson and Mourato, 2006) although recent work on ecosystems valuation, climate change and managing catastrophic impacts can be said to be analysing environmental change in ways relevant to the identification and management of critical natural capital.

Both paradigms of SD suffer from diffuse definitions (Pezzey and Toman, 2002) that have helped broaden the scope of the concept but have made the implementation through policy measures elusive and complex (Cowell, 1997). Besides, the boundaries between WS and SS are not clearly specified (Azqueta, 2002). SD as a concept has been criticised ever since it reached the public debate. Little and Mirrlees (1994) and Beckerman (1995) among others criticise SD saying that it is more of a 'buzzword' (what Ann Markusen (1999) would call a 'fuzzy' concept) than a substantial contribution to environmental economics or policy-making. A further critique to the concept stems from the idea that SD will entail reducing or eliminating certain economic activities such as mining (Little and Mirrlees, 1994).

This last critique would not hold however if the approach to sustainability was that of WS requiring that total net investment should be greater than or equal to zero. It would also be possible to deplete non-renewable resources if the 'softer' version of SS was followed as it allows depletion of resources as long as the proceeds are reinvested in renewable alternatives. If SS in its more 'stringent' version was followed, economic activities could continue provided the functions of critical natural capital are maintained.

As with many of the academic debates whose classifications come across as eschewed towards the extreme propositions, SD seems to divide academia and policy-makers[11] into WS supporters and SS advocates. Reality may however be less clear-cut and for good reasons too. SS may be seen as WS with extra sustainability requirements. However WS may, theoretically at least, allow for 'optimal' depletion of all natural

[11] Although policy-makers would more realistically pursue WS at best, leaving SS for the rhetorical political discourse, except for initiatives such as the EU Environmental Liability Directive for example.

capital provided enough capital (man-made, human or social) is built in exchange. The above stated reasons (i.e. irreversibility, loss aversion and uncertainty[12]) may lead to pursue more stringent SD requirements demanded by SS.

Depending on the environmental problem analysed it may be possible to substitute say man-made capital for natural capital and increase well-being. Conversely, before certain thresholds are reached it may be advisable to refrain from resource use in order to avoid irreversible losses of critical natural capital. The vast array of situations and the complexity of environment-economy-social relationships could therefore signal towards the need for tailor-made SD approaches that take into account politically feasible and socially desirable options.

Broader issues: Plurality and cross-fertilization in valuing environmental damage

Neoclassical welfare economic theory is underpinned by the following assumptions (see box 2.2.1 below):

Box 2.2.1 Assumptions of neoclassical welfare economics

'Agents' values are expressions of their preferences Their preferences are ordered and have a certain structure – they are transitive, reflexive, complete and continuous The strength of agents' preferences for marginal changes in a bundle of goods is expressed in their willingness to pay for their satisfaction. Agents have subjective probabilities about the likelihood of different possible outcomes. Agents are instrumentally rational. They act so as to realise the greatest expected satisfaction of preferences, given budget constraints and assignments of probabilities to different possible states of the world. Preferences are exogenously determined, stable, context independent and ethically unchallengeable'.

O'Neill and Spash (2000: 522 – 523)

Gowdy (2004) highlights the problems and caveats of neoclassical welfare economics precepts when choosing between policy options and concludes that value judgements will inevitably inform policy recommendations. Understanding the values, ethical categories and preferences and providing an explicit account of these in valuation exercises may be useful to understand sustainability paths. Neoclassical economics regards all goods as tradable, assumes a lack of pure altruism in individual choices, sees processes as irrelevant and believes preferences are exogenous. In contrast to this, empirical observations may be in accordance with alternative ethical theories.

[12] Irreversibility/irreversibilities can be defined as 'changes that are physically impossible to reverse or prohibitely expensive to reverse' (Turner, Pearce and Bateman, 1994: 57). Loss aversion 'is equivalent to a utility function which is steeper for losses than for gains' (Kahneman and Trevsky, 1979 in Schmidt and Zank, 2005:158). Uncertainty can be defined as 'a situation where the probability distribution over a set of possible states of the world and the resulting payoffs cannot be known objectively , but individuals have subjective beliefs about the distribution and the payoffs' (Neumayer, 1999: 100)

These may show the existence of lexicographic preferences[13], loss aversion, altruism and a significant role of context and processes in the outcomes of valuation.

In addition to the limitations of the above assumptions (e.g. due to the existence of bounded rationality of individuals, limitations of WTP estimates, altruistic motives for actions, etc.) it has been argued that environmental goods can be considered, at least by some individuals in society, a special type of goods. This may entail social construction of preferences, the possibility of changing preferences through deliberation with significant others or through public processes. Furthermore contextual issues can also be seen to have a significant weight in decisions (Roberts, 2004).

Different ethical theories[14] have therefore helped shed light to the way choices are made in the environmental realm. According to Randall (2000) there is an emerging consensus among philosophers that no ethical theory is likely to reign. Pluralism seems to be one way forward to guide decisions. In this sense, and from an ethical perspective it will be argued that 'some questions in life are best resolved by reference to moral imperatives, some as matters of respect for rights, and for the remainder it is reasonable to go about maximizing value, perhaps even focusing on consequences and evaluating them in terms of their impact on the level of preference satisfaction' (*ibid.*: 255). What people actually choose and their motives could illustrate how pluralism is related (or unrelated) to sustainable development.

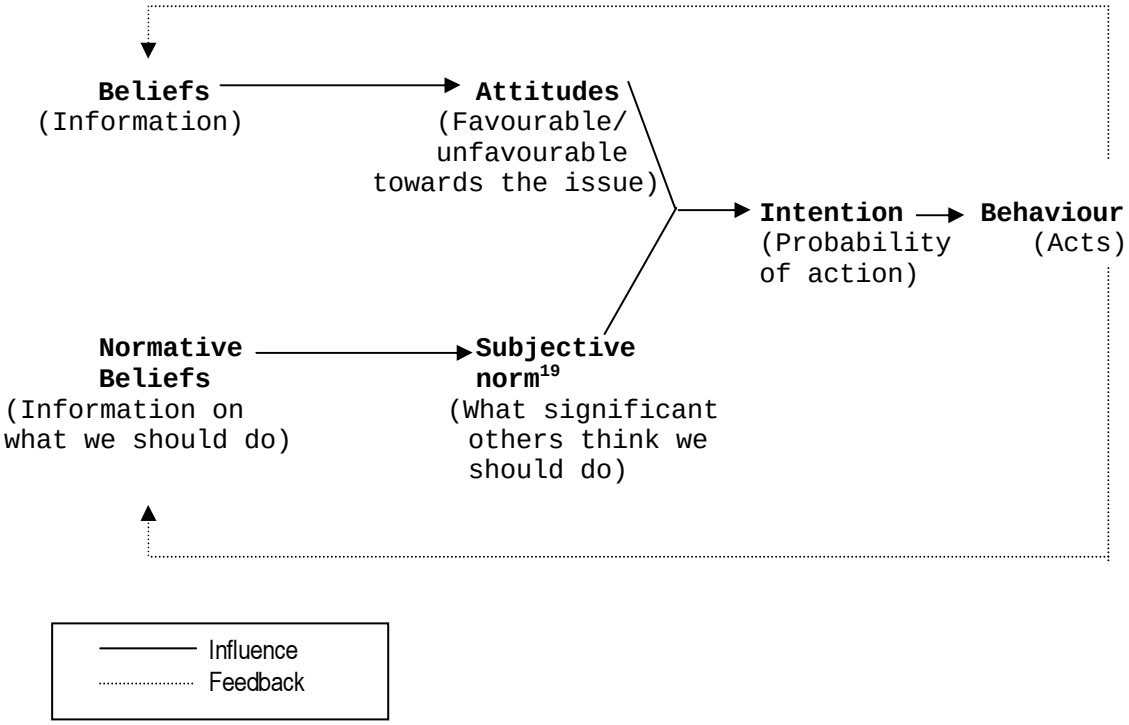
In addition to the input of ethical pluralism to the field of environmental valuation, cross-fertilization from sociology and psychology has also been seen in the inputs to valuation instruments. In this sense, economists have 'borrowed' attitude-behaviour models from these fields. The most often quoted model in the stated preference literature is Fishbein and Ajzen's theory of reasoned action (1975). This theory explains behaviour as a result of the joint influence of various factors that result in a framework

[13] Gowdy (2004: 247) describes lexicographic preferences as a situation in which 'people may place absolute values on environmental preservation and refuse to make trade-offs between environmental features and money'.

[14] According to Randall (2000: 253) philosophers identify two main ethics. First, axiology according to which 'goodness is a matter of value'. Welfarism, which is one type of consequentialism, is part of axiology (here, good action is whatever produces good consequences and consequences are evaluated according to their contribution to welfare). Second, deontology where 'goodness is whatever emerges from right action'. Within this, we can find two types of deontological ethics: Kantianism according to which right action is 'that which is obedient to moral duties derived ultimately from a set of universal moral principles'. The second type of deontology, useful from an economic perspective, is contractianism that claims 'right action respects the rights of individuals' (*ibid.*)

for action. These factors are: *beliefs*[15] about the consequences of certain behaviour, *normative beliefs* about the studied behaviour, *attitudes*[16] towards behaviour, *subjective norms* regarding behaviour and *intentions*[17] to perform a given behaviour. All these will shape behavioural[18] outcomes. An adaptation of this idea is given by Fishbein and Ajzen (1975: 16):

Figure 2.2.1 Diagram of Fishbein's and Ajzen's theory of reasoned action



Source: Fishbein and Ajzen (1975)

When there is no observable behaviour, Fishbein and Ajzen state that intentions may be considered good predictors of behaviour. This will occur if both intentions and behaviour are analysed with the same level of specificity, if the lapse of time between the question regarding intentions and the actual behaviour is short and if there are no external factors that may disrupt the link between intentions and behaviour. In addition, Bateman *et al.* (2002) state that monetary valuation will be a more powerful predictor of behaviour than attitudes. Finally, familiarity with the described scenarios

[15] Belief is defined by Fishbein and Ajzen (1975) as the information an individual has about any aspect of the person's environment.
[16] Attitude is a favourable or unfavourable evaluation of the analysed issue. Fishbein and Ajzen (1975).
[17] Intention is defined as the subjective probability that an individual will effectively pursue a given course of action. Fishbein and Ajzen (1975).
[18] Behaviour is defined as 'observable acts' of individuals. Fishbein and Ajzen (1975).
[19] Subjective norm is defined as what 'significant others' think with regards to a given behaviour.

may enable better predictions in the intention-behaviour relationship than when the situation to be valued is unfamiliar.

As has been argued SD will depend, to a certain extent, on what citizens' want. As a significant proportion of environmental goods and services are not traded in the market, despite their potentially high values, information on the beliefs, attitudes, intentions, etc. of citizens are of essence in understanding citizen preferences as regards sustainability.

This section has focused on the requirement to maintaining capital (*in toto* or maintaining total capital plus natural capital) for the future in order to meet sustainability requirements. The additional inputs from other disciplines described in the last part of this section are thought to be able to provide a broader and more complete framing that may help engage in the enquiry regarding the pursuit of sustainable development.

We agree that 'any policy regime must be capable of being monitored, if the success or failures of the policies are to be judged. Ultimately, this means data concerning the environment, the economy and society must be collected, analysed and made usable to policy-makers' (Atkinson *et al.* 1997: 20). The following section will analyse how sustainability can be measured for the two paradigms, WS and SS, at the portfolio levels of analysis.

2.3 Measuring sustainability: is there a role for valuation?

Although there is wide ranging literature on sustainable development there has been arguably less focus on 'identifying essential elements of sustainable development to not only guide the formulation of goals and the indicators selected to measure them but to enhance learning about how to progress towards sustainable development' (Becker, 2005: 88). Additionally, various authors have acknowledged the myriad of attempts to make sustainability indicators operational (Dietz and Neumayer, 2007) as well as the limitations and preliminary nature of the existing indicators Rigby *et al.* (2000) in Becker (2005). This section will mainly focus on the micro-level approaches to measuring SD and its relationship to valuation.

When analysing WS at a project level, economic efficiency will be pursued. Although pursuing efficiency is known to be insufficient to achieve sustainability, the fact that natural resources are normally underpriced and overexploited means that moves towards efficiency may be regarded as positive steps towards sustainability. The relationship between WS and CBA is mainly based on the following issues (Pearce, Atkinson and Mourato, 2006):

1. Public projects, which should arguably bear in mind future consequences, embody similar characteristics to private investment projects. The reason for this is that they require up-front investments, yielding benefits in the future. They can contribute to (or hinder the achievement of) sustainability if they result in accumulation (or loss) of capital.
2. Investment decisions, when made following CBA requirements, may not only yield net increases in wealth but may also contribute to the goal of sustainability, if savings are effectively allocated to the best alternative available.
3. WS is concerned with saving enough for the future. CBA by definition will require having net benefits from the projects undertaken.
4. WS theoretical framework and requirements (i.e. the Hartwick rule) 'give rise to CBA rules' (*ibid.:* 243). This implies all projects yielding net benefits should be undertaken. It will however require that compensation is actually paid. The calculations of net present value will include, as a separate item, the net effects of the project on the environment (Turner, Pearce and Bateman, 1994).

The functions[20] performed by natural capital, its limits in terms of productive capacity and waste assimilation capacity, the limited knowledge we have regarding these capacities and the threats to which natural capital is exposed can provide the rationale for considering it a special type of capital worthy of protection. In order to link the economy with the environment, the concept of Total Economic Value (TEV) emerged as a useful heuristic.

TEV presents us with the monetary valuation of environmental assets. It is calculated as the sum of all relevant WTP or WTA of individuals with standing in the valuation process. One of the main concerns regarding TEV is that it is a partial account of the entire value provided by the environment. The environment, as a system in which life occurs, can be said to have some prior value related to its life support capacity (primary value), which is not captured by TEV. Total economic value only accounts for secondary value of environmental assets that are use and non-use values (Turner, Pearce and Bateman, 1994).

Use values imply *utilization* or consumption of goods and services at present, *actual use,* and the possibility of using goods and services in the future, *option value.* Actual use can, in turn, be divided into direct use (e.g. fishing) and indirect use (e.g. carbon storage in forests). Direct use values leave a behavioural trail in the sense that they refer to values of using goods and services that are directly or indirectly traded in the market. Their market prices are related to these values.

TEV also encompasses *non-use values* (also called *passive use values*) defined as the utility an individual derives from a good even though *no direct use* is experienced now or in the future. Non-use values leave no behavioural trail. To elicit these values individuals affected by a project will have to be asked about their WTP. There are several motivations. For example *altruism* will refer to the value an individual derives from the existence of an asset due to the fact that other people from the present generation might enjoy it. *Bequest value* refers to the value individuals assign to the asset for its enjoyment by generations to come. Lastly, *existence value* is the WTP an individual would offer for preserving a good even though he does not plan to use it and does not foresee its use by others (Atkinson *et al.* 1997). *Existence value*

[20] The provision of life support functions such as weather regulation, provision of raw materials, enabling waste assimilation and supplying amenities.

motivations may include concern for the good itself, or feeling responsible for preserving the good (also called *stewardship motivation).*

Non-use values are related to the ecological functions that the environment performs. Within the ecological functions, the waste absorption capacity and the provision of biodiversity are seen by ecologists as 'assets' for which there are no substitutes (Norton and Toman, 1997). In this sense, strong sustainability advocates believe the way to ensure sustainability is through preservation of stocks of natural capital.

Focusing on the micro-level, adherence to the Safe Minimum Standard (SMS) is one possible approach to SS that links CBA rules to preservation of natural capital. SMS implies maintaining critical flows of resources so that it will be possible to rebuild the stock in the future. The objective of this standard is to minimise maximum possible loses (Bishop and Ready, 1991) and it will imply that 'policy-makers follow standard cost-benefit rules unless there is a compelling reason not to' (Pearce *et al.* 2006: 246).

This decision rule received the input of Ciriacy –Wantrup (1952) and was first applied to game theory by Bishop (1978). The rationale behind this rule is that 'there is evidence that individuals consider regret when making decisions under uncertainty rather than maximising expected utility (Loomes and Sudgen, 1982 in Ready an Bishop, 1991: 311). The criticisms to the SMS approach are, however, numerous. This decision criterion will favour prevention of environmental damage unless the costs of doing so are intolerably high and although it is an intellectually appealing concept it has not been embedded in a theoretical model of social choice (Ready and Bishop, 1991 and Hohl and Tisdell, 1993). Crowards (1998) points out the existence of both an unclear definition of what safe minimum standard entails and the different interpretations given by different authors of the costs of applying SMS and how these costs should be measured. Furthermore, in order to set environmental standards, there is a need for complete scientific information regarding system's capacities and limits. According to Hohl and Tisdell (1993) this information is still unsatisfactory. The SMS rule is also criticised for being pessimistic and eschewed towards environmental preservation.

Some authors have argued (see Pearce *et al.* 2006) that monetisation could, in principle, help in deciding preservation (or otherwise) of natural resource. Despite the limitations of this approach it will be assumed that this may be the case and that valuing environmental preservation will help in advancing the knowledge of the costs

and benefits of sustainability (Atkinson *et al.* 1997). In order to analyse the value of critical assets it is assumed that the price of the asset will tend to infinity as the amount of asset tends to the critical amount of the asset. It follows that, the closer we get to the threshold amount of the asset, the larger the welfare loss (reflected in higher WTP). This is hypothesised to require a good measure of WTP for critical resources and, it would also require (harder to find) accurate economic and scientific information regarding the importance and characteristics of the resource. The last empirical chapter attempts to capture survey respondent's WTP to prevent environmental damages of varying degrees, including a scenario in which irreversible damages occur and thresholds are trespassed.

2.4 Motivating the analysis: exploring existing gaps

As Robèrt *et al.* (1997: 79) claim 'environmental problems have multiplied and changed character during the past decades: from local to global, from distinct to diffuse, from short time delay between cause and effect to long time delay, and from relatively low complexity to high complexity [Holmberg & Karlsson 1992 mm]. This enlargement of complexity and effects has increased the need for a compass to point us in the direction of sustainability'.

Previous sections in this chapter have shown many advances in the understanding of sustainable development. There are however areas where further research is called for. These areas are related to both theoretical and empirical contributions, Pezzey and Toman (2002).

It has been argued that the analysis of whether policy goals and public preferences 'match' is missing in the analysis of sustainability, as is the case in other research areas (see McVittie, Moran and Elston, 2010). This research area is approached in the remainder of this thesis by means of comparing and contrasting the views of elites and focus group participants on sustainable development.

Monetary compensation and in-kind compensation are assumed to be able to provide restoration when faced with welfare losses due to (some) environmental damages. Neoclassical welfare economics as well as more recent proposals such as those related to resource equivalency analysis focus on the amount of compensation that would offset environmental damages. For other environmental losses and depending on the type of preferences of individuals, it may be the case that no amount of compensation and no type of compensation will restore pre-damage levels of welfare. Theoretically this can be linked to weak and strong sustainability paradigms. Testing whether individuals would prefer one type of capital (say infrastructures) or another (say schools or natural parks) can be a matter of empirical enquiry that could further the analysis of sustainability. The main contribution offered in this area is to explore the *type* of compensation preferred when faced with environmental damages and its relationship to SD paradigms.

In order to meet this research endeavour respondents to an in-person questionnaire were given information about three hypothetical spills of different sizes and

consequences and were asked whether they would accept compensation. Respondents who accepted compensation were asked to choose among three types of compensation projects. These compensation projects are modelled to emulate three possible sustainability stances in the weak-to-strong sustainability continuum. Investments in man-made capital (à la Hartwick), investments in social capital (à la Aldred (2002) and Turner (2007)) and investments in natural capital (in line with the 'softer version' of the strong sustainability paradigm) form the basis of the compensation exercise.

Despite advances in the theory regarding sustainable development, the analysis of the costs and benefits of sustainability, and in particular in the area of water pollution have been under-researched (Atkinson *et al.* 1997). This thesis aims to bridge this gap by assessing the benefits of preventing future environmental damages (caused by hypothetical oil spills) that would reduce natural capital in the medium to long term.

It has been argued that at the micro-level, in order to unveil the value of the critical amount of natural capital, the price of the asset will tend to infinity as the amount of asset tends to the critical amount. It follows that, the closer we get to the threshold amount of the asset, the larger the welfare loss (reflected in higher WTP). This however would require a good measure of WTP for critical resources and accurate economic and scientific information regarding the importance and characteristics of the resource that is harder to find. This is done through the analysis of the answers to the in-person questionnaire that presents respondents with three hypothetical spills of different sizes and consequences and asks interviewees about their willingness to pay to prevent future environmental damage (and hence to preserve natural capital). The remainder of the chapter presents the context in which these research areas will be explored.

2.5 Sustainable development strategies in Spain and in Galicia

The Rio de Janeiro Earth Summit in 1992 called for the development of SD strategies. At the OECD level this goal had been largely met with the exceptions of Belgium, Canada, Hungary, Mexico and Spain that still lacked such strategies in 2006 (Jiménez Herrero, 2006). After the EU's renewed SD strategy in 2006 Spain presented its sustainable development strategy in November 2007[21] as well as its Coastal Sustainability Strategy. According to the OECD (2007: 9) 'Achieving the goals of sustainable development depends to a large extent on governance practices, particularly the effective implementation of national sustainable development strategies (NSDS)'.This section will briefly analyse the main features of the Spanish and the Galician sustainable development strategies with special emphasis on maritime resource and pollution management.

The *Spanish Sustainable Development Strategy (SSDS)* is based on overarching principles that include inter and intragenerational equity, the precautionary principle and the polluter pays principle (PPP). No explicit reference is made regarding the sustainability paradigm the government seeks to achieve.

There is however an optimistic view of the role of economic growth as a facilitator of environmental protection. The SSDS does not mention limits, irreversibility or limits to substitution between different types of capital. Increasing public and stakeholder participation is seen as a goal in the development of SD. Analysing costs and benefits of actions is mentioned as a desirable goal, thus opening the door to CBA-type analyses and hence echoing the Atkinson *et al.* (1997) in their call for this data.

The SD strategy lacks specific requirements to achieve lasting development, except for the reduction in energy consumption of 2% per annum that is proposed (without providing any rationale for that figure). Although some references are made regarding the environment's absorptive capacity, the emphasis throughout the document is on resource use.

With regards to marine areas the SD strategy falls short of providing any specific guidance. On the one hand it acknowledges that there is an overarching lack of data

[21] http://www.la-moncloa.es/NR/rdonlyres/B73920C0-8F78-4EFE-83D8-A570345ADBA4/0/EEDS.pdf

regarding the state of marine resources[22]. It also recognises the lack of marine protection and the need to reduce the risk of accidental oil spills. On the other hand maritime transport is hailed as a competitive option (*vs.* road transport), thus implicitly accepting the increase in the risk of accidents without providing guidance regarding additional prevention, compensation or allocation of funds, equipment or personnel that this would entail.

The first indicators regarding the evolution of environmental quality in Spain were drawn up by the Ministry of Environment since its creation in 1996[23]. The analysis of the state and evolution of the different indicators of sustainability is additionally undertaken each year since 2005 by the OSE (*Observatorio de la Sostenibilidad en España*). Regarding marine protection OSE's 2009 analysis indicates that there are plans to develop an inventory of marine Natura 2000 Network areas in the 10 Marine Protected Areas (MPA's) to be officially designated. Although there is still considerable lack of data in order to tailor protection for these areas, this could be considered as a step in the right direction. Oil spills are only mentioned in passing when referring to the disruptions they cause for birds. No measures are mentioned on prevention or management of oil spills.

Spain's *Coastal Sustainability Strategy*[24] was also released in 2007. Intergenerational equity concerns and the environment's carrying capacity are mentioned in the strategy although no specific actions to address these concerns or indicators on which to take actions are mentioned. The strategy however acknowledges the lack of data and states the Ministry's goal to obtain baseline data on the state of coastal areas.

The strategy describes the geographical characteristics of the Spanish coastline with a larger focus on the Mediterranean region and the islands. Few references to the Atlantic region are found. The strategy acknowledges the strategic nature of Spain's coast in economic, environmental and social terms. Tourism and maritime transport are the two economic activities that are recognised as the most relevant ones in terms of the challenges to achieve an Integrated Coastal Management (ICM) as advocated by

[22] In this sense the SSDS calls for the development of a map of Marine Protected Areas (MPA's).

[23] http://www.mma.es/portal/secciones/calidad_contaminacion/indicadores_ambientales/banco_publico_ia/#4

[24] http://www.mma.es/secciones/medios_comunicacion/prensa/noticias/pdf/ESTRATEGiACOSTA05102007PresCONSEJOMINISTROS.pdf

the EU. The strategy dwells on the need to manage urban planning in coastal areas and leaves the management of maritime transport largely unexplored.

The only measures to be taken by the Ministry of Environment to ensure sustainability are: the drawing up of a document to know the baseline scenario of the coast and the active regional authorities' engagement with different agents to develop future actions. Future developments of this strategy are supposed to provide more specific goals.

The *SD Strategy for Galicia* (SDSG)[25] sets four main fields on which to focus in order to achieve sustainable development. They are: economic competitiveness, demographic equilibrium, social cohesion, environmental quality and urban and 'heritage' planning (Xunta de Galicia, 2005a). The main purpose of analysing this document was to gain understanding of the theoretical underpinning of SD in Galicia focusing on the oil spill management field. In order to analyse environmental quality in Galicia the SDSG concentrates on water, biodiversity, atmosphere, noise, waste and land. It defines SD as a dynamic process providing indicators to measure sustainability and objectives to be reached. These indicators however leave many aspects of the environment out of the analysis and the goals set are unrelated to physical limits in terms of resource use or pollution absorption capacity of the environment.

The SDSG states that the best strategy to achieve sustainability would be through the establishment of voluntary agreements. The industry would have to agree on the efforts needed to achieve SD. A more restrictive statement in terms of access to sensitive areas is made when the document deals with sustainable tourism. The means to achieve sustainability in tourism implies restricting access to environmentally sensitive areas. Although this seems to point towards a stricter approach (banning the use of certain natural assets) the document does not provide any information regarding which areas would fall under the 'sensitive category' or which activities would be considered damaging. The lack of specification provides shallow guidance for policy-makers. This may result in heterogeneous responses that fall short of SD requirements.

The SDSG is however more specific when it describes drinking water quality as it establishes limits and goals in order to ensure health and safety of water consumption.

[25] It was published in 2005 and is currently being updated.

As regards bathing waters, the characteristics of different bathing water qualities (0, 1 or 2 depending on the characteristics of the water analysed) are also more narrowly defined. So, in those issues related to health (water consumption and bathing water quality) there is stricter guidance and limits compared to other areas of the environment.

With regards to biodiversity, the SDSG acknowledges the existence of valuable environmental resources and areas that are protected under international agreements and national legislation (Ramsar wetlands in Galicia, Natura 2000 Network sites[26], Spanish legislation such as the law 4/1989 on conservation of open spaces[27], wild flora and fauna). The SDSG states that those areas should be monitored in order to obtain information regarding the state of conservation, the regulatory measures implemented and the limits on the use of these areas. The indicator used in order to measure sustainability is equal to the area protected by any environmental protection instrument divided by the total protected area. The indicator is not critically analysed. The benchmark set for this indicator is Spain's average biodiversity protection. This again is unrelated to whether protection will enable durable development of Galician biodiversity in terms of maintaining environmental functions.

Finally, as regards public participation, the SDSG strategy supports the idea of having as much civil society participation as possible. The indicator used is the number of people receiving training and education on sustainability. The goal is to increase this population every year. This indicator does not imply that civil society's opinions and SD preferences would be considered in decision-making processes.

The above SD strategies analysed in this thesis do not deal with irreversible effects, uncertainty or system's limits. The indicators presented are not explained nor critically analysed. The goals set do not seem to follow any specific sustainability rationale. They only aim at reaching EU's mean figures, or Spain's or increasing or decreasing the magnitudes in the variables analysed. This could be seen as an overall strategy to follow rather than a SD strategy. The political appeal of the term 'sustainable' can however imply that having a 'SD strategy' is profitable in terms of votes. This may be

[26] Spain being the EU country that includes a wider area in this network due to exceptional characteristics in terms of habitats and species according to the SDSG.
[27] Open spaces are areas in which elements or natural systems of particular value, interest or singularity can be found' (Xunta de Galicia, 2005 a: 271)

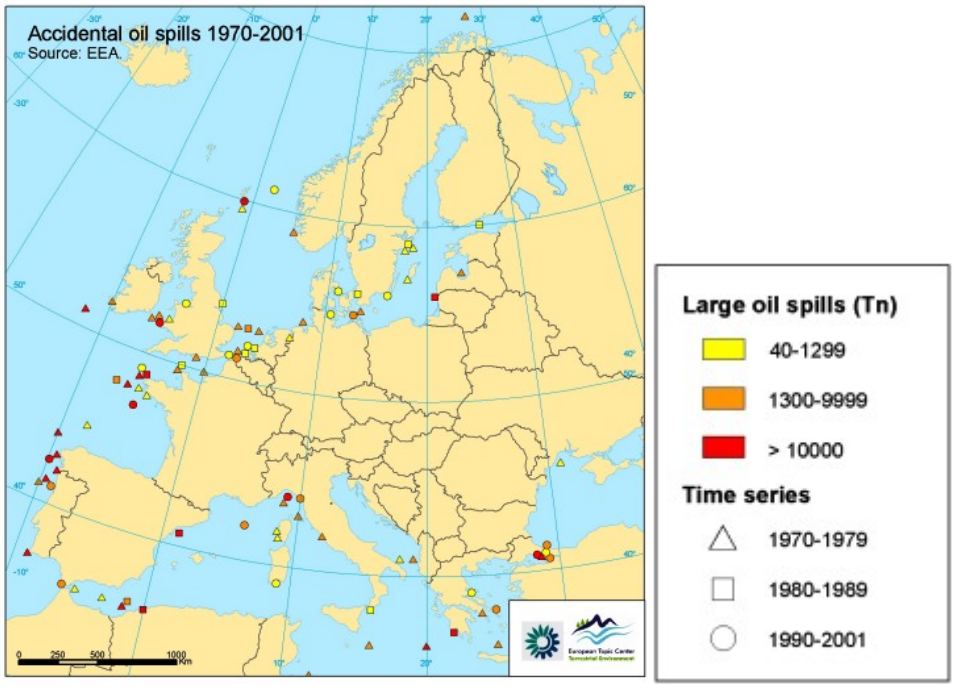
so even if the underlying assumptions of the SD strategy to be followed are not explained and system limits are largely ignored. Finally no cost analysis is provided regarding what it would mean in monetary terms to reach the established goals; nor does it say whether these strategies are demanded or even accepted by citizens. The above analysis of SD strategies has highlighted that there is scope for further empirical enquiry into the views of experts and citizens regarding sustainable development strategies. The following chapter strives to fill this gap exploring the views of elites and focus groups regarding sustainability.

2.6 Rationale for analysing oil spills in Spain

The Fisterra maritime corridor bears 70% of hydrocarbon traffic travelling to central and northern Europe (Vázquez, Varela and Prada, 2004). The Spanish region of Galicia[28] has received over 10% of the world's oil spills. Approximately 45,000 boats navigate close to its coasts annually, of which more than 13,000 carry potentially dangerous substances. This means 36 boats carrying dangerous goods sail in Galician waters every day (García Negro *et al.* 2007). Additionally, until 2017 maritime transport is expected to be increasing. This will mean increasing the risk of oil spills by 25% (Vieites *et al.* 2004). Potential damages of oil spills can affect 'key ecosystems and species (that) may be permanently damaged regardless of the size of the spill and indirect long term effects cannot be excluded' (*Ibid.*: 537). The areas that are more likely to be affected within Europe are the English Channel and Galician waters.

Map 2.6.1 below shows the main accidental spills that have taken place in EU waters from 1970 to 2001.

Map 2.6.1 Accidental oil spills in the EU (1970 – 2001)



Qualitative and quantitative limitations under the international compensation system that is applicable in the EU (CLC and IOPC-funds) imply that there are damages derived from oil spills that are borne by governments and therefore by society, making oil spills

[28] See map in Annex A.1.1.

a ‘cheap’ occurrence for the maritime business. Compensation only includes direct damages such as those affecting fishing tackles or infrastructures, reasonable preventive measures that are determined on a case by case basis, cleaning operations, revenue losses and the cost of studies to assess the damages. Ecological damages (non-use values) are excluded from the compensation system (Mason, 2005).

Additionally the EU Environmental Liability Directive (2004/35/CE) (that provides the framework for implementing the polluter pays principle, preventing and remedying environmental damage) excludes oil spills from its reach. Article 4.2 states ‘This Directive shall not apply to environmental damage or to any imminent threat of such damage arising from an incident in respect of which liability or compensation falls within the scope of any of the International Conventions listed in Annex IV, including any future amendments thereof, which is in force in the Member State concerned’ (L 143/59). The Spanish Law that transposes the EU Directive (*Ley 26/2007*) in its article 3.5 follows the EU spirit in that it excludes damages that are ‘covered’ by international agreements.

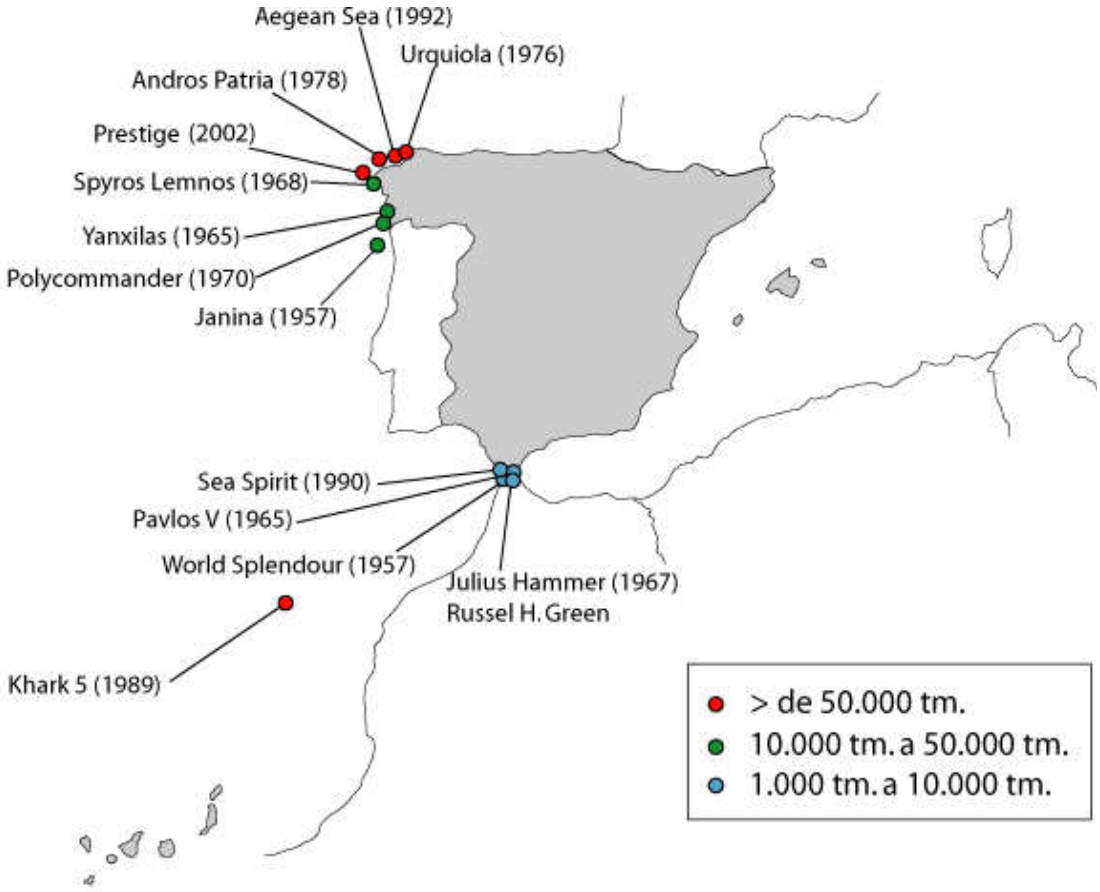
International compensation payments were limited to approximately 171M€ at the time of the Prestige spill (García Negro *et al.* 2007), which was insufficient to cover the damages caused by the Prestige spill. Thus, the Spanish government and its citizens had to cope with the payment of all the damages not covered by the compensation instruments available. In order to boost the economy *additional* investment expenditure as a policy response to the Prestige oil spill included 5,200M€ from the state and 882.33M€ from the Autonomous Community (regional government).

Prevention and management of spills were also in progress at the time the Prestige occurred. There was a known lack of oil spill fighting means (equipment and personnel). There was also a very general National Contingency Plan without a Regional or Territorial Contingency Plan for Galicia that was only published in 2007. Coordination and cooperation problems that were repeatedly voiced in the aftermath of the Prestige are still a cause for concern according to the institutions in charge of oil spill preparedness and management.

The frequency of spills in Spain (see map 2.6.2 below), the economic, environmental and social damages caused, and the limited prevention, management and compensation framework at all institutional levels provide the rationale for studying oil

spills in Spain. The Prestige oil spill has been used as the *status quo* situation in the thesis as it is the more recent large scale spill occurred in Spain.

Map 2.6.2 Main accidental oil spills in Spain (> 1,000 tons)



Source: CEPRECO (2008)

2.7 Oil spills in Spain: key institutions, regulations and policies

Maritime transport is a lucrative activity that implies many boats navigate EU waters. Safety concerns are therefore expected among EU citizens due to the large amount of vessels and past spills[29]. In order to improve safety in the maritime transport sector, international, EU and national legislations and policies have developed through time, mainly as a reaction to accidents. The institutions that deal with oil spills affecting Spain (and the EU) include the International Maritime Organisation (IMO), the United Nations Environmental Program (UNEP) the European Maritime Safety Agency (EMSA) and national bodies that will be described below. Key features of the most relevant policies at the national level will be analysed in this section. The Galician case will be discussed as an example of regional policy-making. The relationship between the existing legislation and sustainable development will also be highlighted.

Article 45 of the Spanish Constitution states that, 'all individuals have the right to enjoy an adequate environment that enables their appropriate development as well as the duty to preserve it. The authorities will watch over the rational use of all natural resources in order to protect and improve the quality of life and protect and restore the environment, supported by the indispensable collective solidarity' (López Guerra, 1994: 55)[30]. Institutionally, the Central Government is responsible for this constitutional mandate regarding maritime protection at a national level. The Ministry of Public Works and within it the State Merchant Navy Office is competent to legislate on issues related to the merchant navy. According to law 27/1992, the State Merchant Navy Office is in charge of marine environmental protection. In order to respond to maritime pollution SASEMAR (salvage and maritime safety society) was created under the auspices of the State Merchant Navy Office. It is SASEMAR who has the equipment, personnel and know-how to respond to oil spills at the national level. At the regional level, autonomous communities are also responsible for environmental protection. At the local level, the city council is in charge of keeping beaches and public spaces clean. To complicate things further, if an oil spill is large enough, other institutions such as

[29] Note that although 80% of oil spilled comes from operational spills (i.e. voluntary discharges), it is accidental spills the ones that attract widespread media and public attention putting pressure on policy-makers to react to these events.
[30] Author's translation.

civil defence services, the Home Office, the Ministry of Environment or the Ministry of Defence or even other countries can intervene.

According to the former Centre for Maritime and Coastal Pollution Prevention (CEPRECO)[31], jurisdiction in marine protection was dispersed and thus the CEPRECO was created in the aftermath of the *Prestige* spill to coordinate oil spill prevention and management. The CEPRECO had limited resources and hence its power to effectively coordinate other institutions (that have more means and personnel) was restricted. It was furthermore re-structured just over four years after its creation and relocated into the State Sea and Coastal Sustainability Office in Madrid.

The key government policies to prevent, manage and compensate for oil spills in the aftermath of the Prestige with a special focus on the region of Galicia are analysed below.

The *National Salvage Plan* (NSP) is a document that analyses the actions and investment plans for 2006-2009 in the field of maritime human salvage activities and pollution fighting (Ministerio de Fomento, 2006). With regards to 'singular geographical locations and activities' the plan states that special attention should be paid and actions taken should be guided towards protection of sensitive areas. The plan is vague as it does not give any guidance regarding the specific actions that would meet the protection requirements of the NSP. The NSP also describes a wealth of institutional agents involved in maritime salvage and pollution fighting activities and seeks greater coordination among the different bodies. The main institutions are described in table 2.7.1 below:

Table 2.7.1 Institutions involved in oil spill management

INSTITUTION	DESCRIPTION
Coastal Autonomous (regional) Communities	Basque Country, Galicia, Cantabria, Andalusia, Asturias, Murcia, C. Valencia, Catalonia, Balearic Islands, Canary Islands, Ceuta and Melilla
Institutions in the Central Government	Prime Minister's Office (CEPRECO, DISSC), Ministry of Agriculture, Fishing and Food, Ministry of Economy, Ministry of Defence, Home Office Ministry (Civil Guard, Civil Defence Services and Emergency Services) Ministry of Environment (State Coastal Office, State Biodiversity Office, State Environmental Evaluation and quality Office, National Meteorology Office), Ministry of Labour and Social Services, Ports and port Authorities
Other entities	Spanish Red Cross, potential polluting firms, industrial associations
Other countries	Neighbour countries: France, Portugal and Morocco

Source: Ministerio de Fomento (2006: 39)

[31] Regulated by the Royal Decree 2182/2004

The NSP in its final section describes the main investment items that amount to over 1,000M€ in pollution fighting equipment, operating and management costs for 2006-2009. The valuation section fails to analyse the reasons to allocate specific funds to the different items. No detailed description of the specific actions appears in the plan (e.g. allocating equipment to most sensitive areas within pollution fighting activities).

The *National Contingency Plan* (NCP) is an operational document intended to provide policy-makers and civil servants with hands-on advice in oil spill management situations. The document clarifies the broad steps to be taken and agents involved in oil spill management as well as the activation of contingency plans as a response to oil spills (Ministerio de Fomento, 2001). In relation to the protection of environmental and economic resources it lacks specific information regarding for example which are the characteristics that define sensitive areas, which protection actions are to take place and how are these protection actions funded. The reason for this lack of specificity is related to the fact that many areas of competence (such as regional response to oil spills) are transferred to regional governments; invading those areas would be illegal. Delays in the development and implementation of regional contingency plans have hindered a coordinated response to oil spills.

In any case, the National Contingency Plan requires access to information regarding sensitive areas, important resources, information regarding the areas that should be assigned a high priority for protection and information regarding the best means available to protect these areas. Thus, it would seem, on paper at least, that according to the NCP, there are priorities given and protection measures ensured for areas of special environmental, economic and social importance or vulnerability.

The *Regional Contingency Plan for Galicia* (RCPG) aims to protect the marine environment through prevention and management strategies. According to Xunta de Galicia (2007) (regional government) the plan was developed following the mandate of the NCP and taking into account other territorial plans thus striving to develop a homogeneous response to oil spills in Spain. The fact that a myriad of institutions are still involved in oil spill management signals the potential coordination problem that may arise again in a future spill. In fact a civil servant consulted stated that as of March 2010, they were working on reducing the number of institutions involved in oil spill management activities. In addition to this, there is an 'operational coordinator' for the

plan in the Civil Defence department. The fact that the equipment, personnel and funds largely belong to other (central) government institutions (i.e. the State Merchant Navy Office), again casts doubts on the effectiveness of such coordination capacity.

Other key aspects of this plan are: first, it includes the mandate to use GIS[32] to determine vulnerable areas but fails to inform about whether sacrifice areas[33] or refuge areas[34] are determined. It also lacks guidance on the equipment, skills and personnel needed to provide adequate preparedness, mitigation and recovery to priority protection areas. Additionally, integration of research knowledge and institutions at national and international levels is contemplated. An example of this is the use of Environmental Sensitivity Indicator (mirroring the NOAA[35] indicator) which is included in the plan alongside risk assessments. These result in classifying risks into unacceptable, tolerable and acceptable. For the former category the plan allows banning activities independently of the costs of doing so. Doubts remain regarding the politically feasible scenarios in which this mandate would take effect. Finally, no mandate is given in the plan to manage volunteers, should they be allowed to intervene again in future oil spills.

The shock and public outrage caused by the Prestige oil spill plus the limited compensation paid by the international funds available (CLC and IOPC Funds) were coupled with the development of *economic recovery plans* by policy-makers at a regional and national level. These were the *Plan Galicia 2003* (state level) and Plan de Dinamización Económica de Galicia – *Plan Galicia* (regional level). Society's demand for prompt and effective response on the part of the Spanish authorities was exacerbated by the region's economic divergence compared with Spanish development and GDP per capita[36], its lack of infrastructures and its economic dependency on the industries (mainly fishing and tourism) that were more severely affected by the oil spill. Both plans, as will be shown below are largely directed towards investments in

[32] GIS is the acronym for Geographical Information Systems.
[33] Sacrifice areas are those that are selected to direct pollution in case of an oil spill, should this be technically and politically feasible.
[34] Refuge areas are those where vessels can be directed and moored so that they are not exposed to rough weather conditions. Any port or estuary, provided it has enough depth of water, can be considered a refuge area.
[35] National Oceanographic and Atmospheric Administration
[36] According to the Spanish National Statistics institute Spain's GDP per capita in 2003 was 18,328€ and Galicia's GDP per capita in 2003 was 14,496€.

infrastructures (man-made capital) and economic incentives to boost Galicia's economy. The objectives of the two plans can be summarised in table 2.7.2 below:

Table 2.7.2 State and autonomous community objectives for economic policy plans

STATE LEVEL PLAN (Plan Galicia 2003)	REGIONAL PLAN (2003-2006) (Plan de Dinamización Económica de Galicia – Plan Galicia)
Environmental regeneration	Territorial cohesion to reach 90% of Spain's mean GDP by 2015.
Territorial cohesion	Economic diversification and modernisation
Promotion of private investment in Galicia	Recovery of economic dynamism experienced since the late 90's
Economic diversification in Galicia	Increase added value of Galician products and improve working conditions for employees of affected economic sectors
Promotion of Galician's image	

Sources: González Laxe (2003), Xunta de Galicia (2004a) and Xunta de Galicia (2004b)

According to González Laxe (2003) out of the 12,459M€ invested in the *state level plan* (Plan Galicia 2003) 5,200M€ were new investments to accomplish the above stated objectives in order to mitigate the effects of the Prestige oil spill. The rest of the programmed investment was pending from other initiatives to boost the economy of the area. The investment is distributed as shown in table 2.7.3 below:

Table 2.7.3 State level Plan (Plan Galicia 2003)

PROPOSED ACTIONS	QUANTITY (M€)	PERIOD
Environmental recovery	1,000	Not specified
Economic aid for affected people	Not specified	Not specified
Transport infrastructure plan	**6,481**	2000 - 2007
New infrastructures (Motorways and high speed trains, AVE)	**3,622**	Not specified
National Hydrology Plan in Galicia	481	2003 – 2008
Spanish Forestry Plan in Galicia	290	2003 – 2008
Financial aid	126.5*	Not specified
Incentives to private investment	75*	2003 – 2006
Technology	34.6	2003 – 2005
Education	8*	Not specified
Galician product promotion	10	Not specified
Fishing sector aid	38.4*	Not specified
Ship building aid	6*	2003 – 2004
Tourist sector promotion	39.6*	Not specified

Sources: González Laxe (2003), Xunta de Galicia (2004a,b).
* Note these categories include some qualitative concepts.

The following table (2.7.4) will present the *regional economic recovery plan*. In the following breakdown the first column indicates the different items to which the funds

are allocated. The second column indicates the total amount spent on each different items and the third column the additional 'effort' (new investment) made after the Prestige oil spill to improve the situation in Galicia.

Table 2.7.4 Regional plan (Plan de Dinamización Económica de Galicia 2003-2006)

PROPOSED ACTIONS	TOTAL INVESTMENT (M€)	ADDITIONAL EFFORT DUE TO PRESTIGE ACCIDENT (M€)
Infrastructures	**1,033.75**	648.88
Roads (2003 – 2008)	783	510.33
Ports	42.39	42.39
Industrial land	190.43	85
Electrification	11.63	4.85
Gasification	6.30	6.30
Fishing sector	**320.65**	155.53
Off-shore fishing	87.02	49.29
Aquiculture	15	15
Transformation industry	178.43	59.48
Port equipment	27	18.57
Recovery of unproductive areas	5	5
Education	7	7
Technology centres	1.20	1.20
R+D	**43.10**	43.10
Tourism	**39.41**	9.57
Commerce	**57.77**	3.75
Arts and crafts	**2.56**	1.74
Education	**98.53**	-
Incentives for employment	**42.26**	-
Incentives for investment	**24.89**	19.77
Total	**1,662.91**	**882.33**

Sources: González Laxe (2003) and Xunta de Galicia (2004b)

The lack of unlimited liability for oil carriers and non-existent regional contingency plans[37] plus increasing hydrocarbon traffic made pollution an increasingly likely and cheap option (in any spill in which the damage caused were larger than the 171M€ that were covered by the CLC[38] and IOPC[39] funds)[40]. The breakdown of both plans shows that investment is mainly directed towards building infrastructures (man-made capital)[41]. This meant a weak sustainability response (if viewed from the capital approach in the sustainability parlance).

[37] until 2007 in the case of Galicia
[38] CLC is the acronym for Civil Liability Convention
[39] IOPC is the acronym for International Oil Pollution Compensation funds
[40] This compensation quantity was raised to approximately 1,000M€ via a supplementary fund but the rationale is still applicable.
[41] See figures in bold in tables 2.7.3 and 2.7.4

The follow-up of the investments publicised in the economic recovery plans (Plan Galicia) led to the analysis of a later document called the Strategic Plan for Transport and Infrastructures (PEIT 2005 - 2020 in its Spanish acronym). The PEIT took over the investments planned in the economic recovery plan but the document does not analyse in any detail what was finally invested nor the specific actions that were developed within the different items examined in the economic recovery plans. The PEIT states that one of the strategies that would be pursued implies the recognition of the Canary Islands and Galician waters as especially sensitive marine areas. The document does not analyse what this means, whether funds, personal and technical means would be allocated to monitor and protect those waters, nor does it analyse whether this would only imply that the existing means would be allocated to these areas first, or whether other initiatives would be developed.

Property rights and the marine space and who owes compensation to whom?

The International Encyclopedia of the Social and Behavioural Sciences defines property rights as 'the right to use a particular item of property in a particular way. An item of property can be used in more than one way, as long as those different uses do not exclude each other. Therefore, there can be more than one property right attached to one item of property' (12206 – 12206). In fact, Schlager and Ostrom (1992) and Ostrom (2003) classify property rights in the following five categories:

1. Access: Right to enter a given area
2. Withdrawal: Right to extract resources
3. Management: Right to determine the rules of use
4. Exclusion: Right to allow or restrict access
5. Alienation: Right to sell

Ostrom (2003) further stresses that property rights inform about actions that can be taken as regards 'things'. Property rights provide the owner(s) of a resource with the power to use it and to exclude others from use. According to Ogus (2004: 16) 'institutions within a society are given the authority to define the extent of an individual's power of exclusion and to enforce that power against intruders, ultimately by threatening physical compulsion'. In terms of management and withdrawal rights Bromley and Cochrane (1994: 9) state 'property … is a right to a benefit stream that is only as secure as the duty of others to respect the conditions that protect that stream'.

The types of goods that are subject to the above rights and ownership are routinely classified as private goods (easy to exclude and rival in nature), common-pool resources (difficult to exclude and rival in nature), club and toll goods (non-rival in nature and easy to exclude) and public goods (non-rival and non-excludable) (Prakash and Kollman, 2004). All these can be affected by accidental oil spills, as was clear in the *Prestige* spill given the widespread damage caused.

Davidse *et al.* (1999) present a typology of ownership to which property rights accrue. These are summarised in the table 2.7.5 below.

Table 2.7.5 Types of ownership of property

Ownership of property	Characteristics
State	Managing agencies (national, regional or local) determine use and access. Individuals have to abide by the established rules.
Private	Individuals or firms have socially acceptable use rights and duties. Society has to respect these rights.
Common	Shared resource where there are socially acceptable rules of use and maintenance.
Non-Property	The resource is open for all individuals to use. Rules governing use are restricted to how individuals should behave in society. Navigational regulations would be an example of the constraints that relate to this type of ownership.

Source: Davidse (1999: 538)

The ownership of rights is relevant to determine whether to use WTP or WTA. Pearce (2002) provides the rules of thumb according to which WTP should be used for quantity increases if survey respondents do not have the right to the improved situation. Alternatively, if those with standing in the valuation exercise have the right to an improved environment (or to a no-change situation) and they are faced with a reduction in environmental quantity (or quality) then WTA should be used. In practice however, WTP tends to be used (as we will see below), leading to what can be seen as a systematic undervaluation of environmental losses that may lead to suboptimal environmental policies.

Property rights in relation to the marine space have evolved through time and are argued to involve all of the above types of goods, ownership and rights. The complex nature of the marine environment and the ill-protection that threatens marine resources (Hassan *et al*. 2005) make the analysis of rights, liability and compensation schemes of the essence in the development of credible compensation scenarios in chapter 4 of this thesis. The property rights applicable to the marine space have been traditionally characterised as non-property regarding their ownership. This view of the

sea as an open access resource resulted, among other factors, from the economic importance of maritime trade but this right has been transformed through time. Hence, free navigation has been increasingly restricted by requirements to protect the sea (see Tan, 2006)

As argued by Clapp and Dauvergne (2005: 70) a state has, since the signature of the Treaty of Westfalia in 1648, 'supreme authority to act within its territory'. The nature of transnational environmental problems, such as oil spills, and the emergence of international institutions such as the International Maritime Organisation (IMO) have displaced some of the power (from states to international institutions) to enact rules. As argued by Wu (2002) it was not until 1969, in the aftermath of the *Torrey Canyon* spill that international law, under the IMO, regulated compensation for oil pollution damage. Compensation was by the end of the 60's paid through the Civil Liability Convention (CLC69) were the ship owner was strictly liable (no guilt had to be proven by victims to receive compensation although victims had to demonstrate the damage suffered). In 1971, the International Fund for the Compensation for Oil pollution damage (IOPC fund) was created as an additional compensation tier that complemented the CLC and that was financed by oil companies. So, ship owners and oil companies (loosely speaking, the polluter) provide since the late 60's compensation for the damages caused by oil spills although this *compensation is limited in quantity and in the type of damages covered. This leaves ample scope for governments to step in and compensate for those damages not covered by international compensation mechanisms.*

Ever increasing damages caused by accidental oil spills such as the *Amocco Cadiz and* the *Tanio,* among others, exposed the limits of existing compensation mechanisms as the available funds were not enough to compensate for the damages caused (Wu, 2002; González Laxe, 2005). This led to the 1984 protocols that increased compensation amounts. In 1989, the *Exxon Valdez* was a turning point in US legislation that gave rise to a schism in international oil spill legislation and compensation rules. Since then, the US is subject to the 1990 Oil Pollution Act (stricter and with higher compensation requirements that have been revised after the BP spill). *Limited liability and compensation* under IMO rules (which apply to the EU) has remained entrenched in international compensation systems and it continues to be the case to date. In fact, according to the IOPC fund as regards the *Prestige*:

'The maximum amount available for compensation under the 1992 Civil Liability Convention and the 1992 Fund Convention in respect of the Prestige incident is €171.5 million (£148.7 million). The figures given in May 2003 by the Governments of the three States affected by the incident, Spain, France and Portugal, as to the damage caused indicated that the total amount of the damage could be as high as €1 050 million (£910.1 million). Under the 1992 Conventions, the Fund has to give all claimants equal treatment. The Executive Committee therefore decided in May 2003 that the 1992 Fund's payments should be for the time being limited to 15% of the loss or damage actually suffered by each individual claimant as assessed by the 1992 Fund's experts. The Committee reconsidered the payment level several times but decided, as late as in June 2005, that the level of 15% should be maintained'.
Source: http://www.iopcfund.org/prestige.htm

Although as of March 2005 the compensation amount was raised to 750 million special drawing rights (under 1,000 million Euros), this is clearly insufficient to compensate for the damages caused by large scale accidental oil spills. The lack of retroactivity implied that this higher compensation limit did not apply to the damages caused by the *Prestige* spill.

Damages that are larger than the maximum amount that can be compensated or different in type (e.g. non-use values lost), damages occurring outside territorial waters or the exclusive economic zone (EEZ) and interim damages are borne by governments and by society. What is covered by the compensation mechanism, classified as 'damage', includes: preventive measures, 'reasonable' measures of reinstatement, property loss, consequential loss and pure economic loss.

According to the above analysis polluters 'owe' compensation to directly affected parties according to IMO applicable rules. But this compensation is limited in type and quantity. Even though at the EU level the Environmental Liability Directive (2004/35/CE) could have potentially implied filling the gap of international compensation mechanisms, the EU Environmental Liability Directive (that provides the framework for implementing the polluter pays principle, preventing and remedying environmental damage) excludes oil spills from its reach. Article 4.2 states 'This Directive shall not apply to environmental damage or to any imminent threat of such damage arising from an incident in respect of which liability or compensation falls within the scope of any of the International Conventions listed in Annex IV, including any future amendments thereof, which is in force in the Member State concerned' (L 143/59). The international conventions referred to in annex IV include the following[42]:

[42] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:143:0056:0075:EN:PDF

Box 2.7.1 Annex IV. EU Environmental Liability Directive (2004/35/CE). Exclusions

(a) The International Convention of 27 November 1992 on Civil Liability for Oil Pollution Damage;
(b) The International Convention of 27 November 1992 on the Establishment of an International Fund for Compensation for Oil Pollution Damage;
(c) The International Convention of 23 March 2001 on Civil Liability for Bunker Oil Pollution Damage;
(d) The International Convention of 3 May 1996 on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea;
(e) The Convention of 10 October 1989 on Civil Liability for Damage Caused during Carriage of Dangerous Goods by Road, Rail and Inland Navigation Vessels.

The Spanish Law that transposes the EU Directive (*Ley 26/2007*) in its article 3.5 follows the EU spirit in that it excludes damages that are 'covered' by international agreements.

In Spain, Article 45 of the Constitution states that, 'all individuals have the right to enjoy an adequate environment that enables their appropriate development as well as the duty to preserve it. The authorities will watch over the rational use of all natural resources in order to protect and improve the quality of life and protect and restore the environment, supported by the indispensable collective solidarity' (López Guerra, 1994: 55)[43]. There is hence a constitutional mandate for the Spanish government to protect and restore the environment. Governments, as argued above, can step in to compensate society for the damages caused by oil spill. As no pre-established regulations exist for this government intervention and given the fact that society funds through their tax payments additional compensation, it seems reasonable to ask what type of compensation society wants. This is the core subject discussed in chapter 4.

Expectations of compensation and compensation exercise

In Spain laws and royal decrees have been passed *after* major spills to regulate compensation[44]. The vast majority of claimants after the *Prestige* spill received money from the Spanish government. Then the government claimed before the IOPC Funds[45]. Claimants in Spain forfeited their right to future compensations when they accepted the governments' funds. This is an interesting feature of the way compensation is claimed which is different from that of other European countries such as France for example where affected parties did not receive compensation from their government

[43] Author's translation.
[44] The legislation passed after the Prestige included the *Real Decreto Ley 4/2003 de 20 de junio and Real Decreto Ley 4/2004 de 2 de julio*
[45] http://www.iopcfund-docs.org/ds/pdf/92exc32-4-1_s.pdf

and claimed compensation directly from the international funds available under the CLC 92 and the IOPCF when the *Erika* spill happened.

The existing compensation process means that Spanish citizens, through their tax payments, end up funding compensation that is not paid for by the international instruments at hand. Hence, compensation for damages over and above the existing compensation limits and compensation for non-use values lost is not included in existing international compensation schemes. This is illustrated by one of the elite interviewees involved in the coordination of prevention and management plans who stated *'the issue is that the IOPCF compensated for 15% to 30% of the damages suffered and the Spanish Government paid compensation for 100% of the damages'*.

Given the above information and striving to replicate credible, understandable and feasible compensation scenarios, survey respondents were told that the government would provide *additional* compensation (in the form of man-made capital, social capital and natural capital). Compensation exercises in future research could tell respondents that compensation would be provided by different institutions (other than the government) in order to test whether the compensation provider has a bearing on the choice of the preferred compensation option. Changing the compensation provider would detract from the reality of current compensation schemes (and perhaps from the credibility of the exercise) but it would allow testing the effect of different compensation providers over the compensation preferences.

To conclude, the policies and plans analysed in this section make repeated references to environmental protection. They contemplate the use of tools such as bans to protect the environment. But overall no clear protection goals are set. There is a lack of detailed monitoring, verification and protection instruments to ensure sustainable management of environmental resources. Compensation is provided *ad hoc* after spills, and government investments to boost the economy emphasise investments in man-made capital without providing the rationale for this choice. Authorities' engagement with citizen preferences in these situations was nowhere to be seen. These gaps are explored in the remaining chapters of this thesis.

2.8 Final remarks

Economics has been concerned with scarcity of resources for centuries. The beginning of the XXI century with a crowded world and ever increasing demand for resources and for waste absorptive capacity has broadened the reach of that traditional concern. The analysis of sustainability (i.e. concerned about enduring development), has produced a vast amount of literature which has not been matched by empirical analysis. This is so especially in areas such as water pollution.

Weak and strong sustainability paradigms emerged by the end of the 80's as a framework that could encompass most views regarding economic development and the use of environmental sources and sinks. Pursuing weak or strong sustainability has however very different implications regarding the environment. Weak sustainability assumes a modified neoclassical welfare economic framework of unlimited substitution, trade-offs, rational individuals and actual compensation for welfare losses. Strong sustainability limits substitution, acknowledges the existence of a special type of capital (natural capital) to be preserved, accommodates better the idea of lexicographic preferences and hence is osmotic to the possibility of limited compensation for certain environmental losses.

Strong sustainability has nevertheless made its way to a certain extent both to the empirical academic research arena and to the regulatory realm. The existence of the Environmental Liability Directive is one such example. Academic analysis of the applications of Habitat and Resource Equivalency analysis such as those undertaken by Ozdemiroglu *et al.* (2009) provide an enquiry into *how much* natural capital is enough to compensate for an environmental loss.

The analysis of *what type of capital* would be adequate to compensate for an environmental loss is however missing from the academic empirical analysis. This is one of the theoretical contributions of this thesis. It explores whether compensation is seen as adequate and desirable when environmental damages occur and if so, the *types of capital* preferred as compensation (and hence preferences for weak or strong sustainability). Given the exploratory nature of this enquiry, in addition to the contributions from the literature, a specific context is used to ground the analysis, that of water pollution due to oil spills. This is done by comparing and contrasting the views of elites and citizens through a multi-method approach that combines qualitative data

from elite interviews and focus groups with quantitative data from an in-person survey.

Existing literature acknowledges the scant analysis of the costs and benefits of sustainability (Atkinson *et al.* 1997). The non-marketed nature of non-use values provides scope for fruitful cross-fertilization of sustainability and valuation via stated preference techniques. The contingent valuation study used in the last part of the empirical analysis in this thesis will strive to explore the benefits of preserving natural capital at risk of oil spills of different sizes and consequences, including a situation in which irreversible losses may occur.

CHAPTER 3. EXPERT AND PUBLIC PREFERENCES IN THE SUSTAINABILITY DEBATE.

3.1 Introduction

The literature review chapter highlighted the relevance of multiple agents in the pursuit of sustainability. It also stressed the need for better scientific information as well as the need for inputs from citizens in order to choose socially acceptable sustainability paths. Additionally, a lack of data on whether elites' and citizens' views on sustainability coincided was discussed.

In order to explore the above issues, this chapter will analyse the similarities and differences between experts' views and those of citizens as regards sustainability. This will entail looking into issues related to substitutability of natural resources, compensation, limits, thresholds, irreversible losses and preservation of natural capital. This will be done by using qualitative methods. Elite interviews and focus groups (FG) of citizens were conducted to engage in this analysis.

The combination of expert knowledge and public knowledge has been advocated by researchers on a variety of settings. According to Yearly (2000: 105) 'In case after case, it has been suggested that "expert" accounts of physical reality have conflicted with local people's knowledge and that rather than local knowledge being routinely inferior and defective, it has commonly proven more sensitive to local 'realities''. Additionally, (Bäckstrand, 2003) claims that a balance between expert knowledge and public participation in the context of sustainable development is called for when dealing with global environmental issues. Although the scope of this thesis is mainly national, the consequences of oil spills are known to sometimes affect various countries. There are furthermore clear links between national oil spill management and international environmental management as maritime transport is global in nature.

Elite interviews and focus group discussions are hypothesised to be able to shed light on the policy paradigm that was applicable in Spain in the aftermath of the *Prestige*. The results from these methods were also expected to aid in understanding whether the myriad of plans, policies and regulations that emerged after the *Prestige* could signal towards the uptake of a particular sustainability paradigm in the context of oil spill management.

This chapter will therefore compare the inputs of experts (with specialised knowledge) to the views of FG participants (as 'lay citizens' with local knowledge whose

acceptance and engagement with the behavioural requirements of sustainable development are indispensable). As acknowledged by Macnaghten and Jacobs (1997: 5) 'public support or identification is important if sustainable development is to have a significant effect on policy'.

The value of this research can be summarised in three areas. It can enrich the ongoing paradigmatic debate between weak sustainability and strong sustainability by exploring citizen perceptions of public policies as well as elites' analysis of public policies. It can also provide a practical example of how civic science[46] can be implemented as regards oil spill management. In the present thesis citizen views have been integrated with expert knowledge to produce a set of policy options from which a representative sample chose their preferred management options. This top-down[47] *plus* bottom-up[48] approach, if included in future decision-making processes, could increase participation and thus could arguably help democratise decision-making in this area. This approach tests what citizens want in terms of compensation and prevention when environmental damages (in this case an oil spill) happen, taking into account the politically feasible policy scenarios set by elites. The main applied contribution of this chapter is the attempt to include a wealth of actors and representatives in the analysis and design of compensation 'packages' and prevention strategies (in order to preserve natural capital), comparing and contrasting their views.

The structure of the chapter is as follows. Section 3.2 provides a brief overview of the policy-making process as a framework for understanding the management of environmental damages. It also reflects on how different agents involved in (or affecting) the policy process have perceived past environmental damages. Section 3.3 introduces the main content of the elite interview and focus groups analysis and discusses the process followed to conduct first the elite interviews, and, later on, the focus groups. Section 3.4 presents and critically analyses the similarities and differences between elite interviews and focus groups with regards to sustainable development. The analysis is undertaken by using the framework that Roberts (2004)

[46] 'Civic science has been defined as the efforts by scientists to reach out to the public, communicate scientific results and contribute to scientific literacy' (Bäckstrand, 2003: 28). The use of 'civic science' is said to be able to tackle two of the main on-going problems that undermine scientific knowledge, lack of trust by the public and increase in the democratization of science (*ibid.*)

[47] Which can be seen as responding to a 'deficit' model in which the public is seen as lacking the scientific 'facts'

[48] Which entails a 'democratic' model establishing a more fruitful exchange between experts and citizens.

uses as a heuristic device to present the workings of policies. Section 3.5 concludes with a brief discussion of the main findings.

3.2 Regulation, the policy process and environmentalism: a framework for understanding oil spills

Regulation is a steering activity (Ogus, 2004 and Eisner, 2007). It is multi-faceted and context-dependent. It may entail public and private intervention at various administrative and institutional levels. Regulation in the environmental realm is directed to managing sources and sinks through policies. This section will analyse regulation, the main policy paradigms relevant to the thesis and the policy cycle as a framework for understanding oil spill management. The section will also briefly hint to the social and political nature of environmental damage assessment, within the policy environment, as a basis for understanding the contributions of elites and focus groups in the pursuit of sustainable development.

A variety of reasons explain why societies enact policies to steer activities. These reasons include wanting to act in the 'public interest' by means of keeping private interests in check (Eisner, 2007). Another driver of regulation is the existence of private interests with powerful groups (mainly economic and social elites) that have access to and influence on decision-making processes. Baldwin and Cave (1999) additionally acknowledge the existence of 'shared ideas' regarding what should be done as the basis for regulation. Institutional theories argue that existing institutions[49] structure interactions and behaviours subject to their hard to change (path-dependent) rules. From an economic perspective the reasons for regulating activities such as maritime transport can be based on the existence of market failures that lead to inefficient outcomes. Regulation would thus try to produce efficient outcomes by facilitating or imposing the internalisation of externalities, providing information, securing and enforcing property rights, etc.

Two policy paradigms are relevant to this thesis: the traditional policy paradigm and an alternative paradigm, sustainable development. The *traditional policy paradigm* has been more concerned about economic growth than about environmental problems. Environmental policy has therefore been reactive in nature (Viñas, 2009). This policy paradigm has largely provided end-of-pipe solutions rather than proactive responses.

[49] Understood as 'prescriptions that humans use to organise all forms of repetitive and structured interactions including those within families, neighbourhoods, markets, firms, sports leagues, churches, private associations and governments at all scales' (Ostrom, 2005: 3)

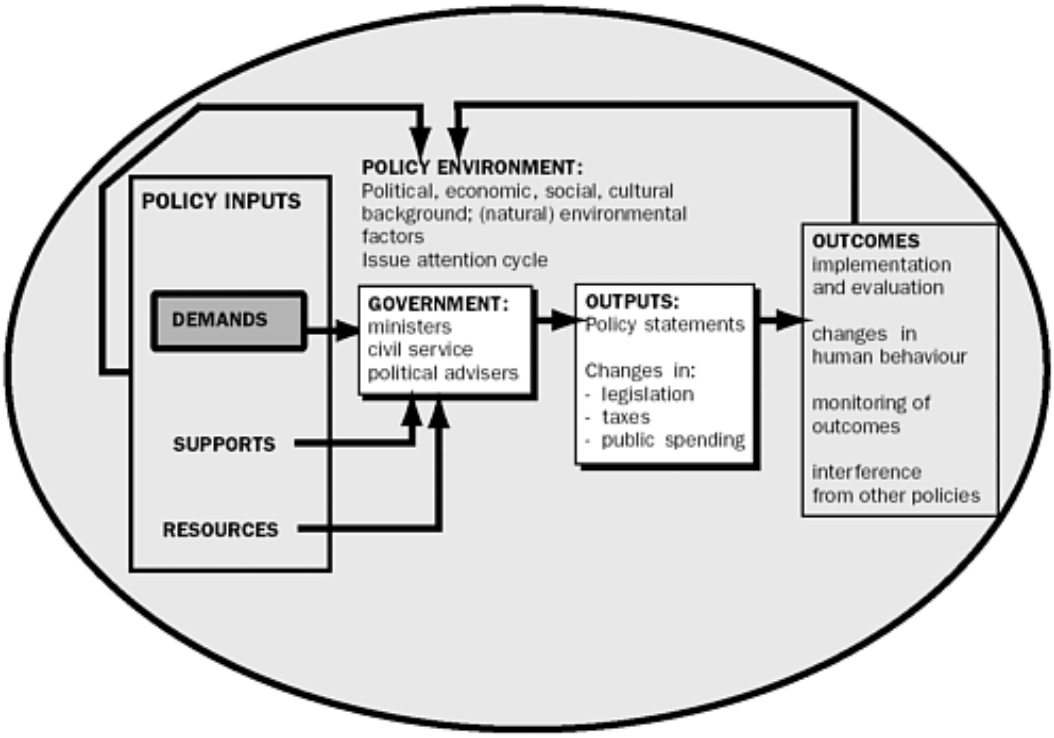
This paradigm has also suffered from a policy implementation deficit whereby policies have been enacted but delays in implementation and lack of action have occurred. Current environmental problems and threats have shown the limitations of the traditional policy paradigm. In the past decades it became increasingly clear that this traditional policy paradigm was 'unfit' to deal with complex environmental problems.

According to Carter (2007) an alternative paradigm, *sustainable development*, emerged, at least in theory, to reconcile, through regulation and policies, activities that foster economic growth and environmental protection. The characteristics of this alternative paradigm include an anticipatory or proactive response to environmental problems, a holistic (system-wide) response, the strategic framing of solutions and increased efforts to ensure full implementation of polices. The extent to which there has been an effective shift in the dominant policy paradigm is debatable although some progress has been seen (e.g. the EU Environmental Liability Directive).

It is well known that environmental policies develop in 'predictable and messy cycles' that involve various steps. The first step is setting policy agendas. This implies socially constructing what will be considered important and worthy of policy action. This is done through the framing of environmental problems by agents and institutions that have unequal access and weight in the policy-making process. The second step entails formulating and adopting policies. The third step implies implementing policies. The final stage evaluates and reformulates policies.

In order to analyse the results of elite interviews and focus groups in a systematic way, the policy process heuristic by Roberts (2004) is used. This is reproduced in figure 3.2.1 below and briefly explained because it will be used in this chapter to explain and compare the results obtained from elite interviews with the results obtained from the focus groups in the analysis of sustainable development.

Figure 3.2.1 The Policy-making process at the government level



Source: Roberts (2004: 140)

The above figure shows in a stylised format the core elements of the policy-making cycle. On the left hand side, *policy inputs* influence the outcomes of the process. These inputs include the *demands* from interest groups. Interest groups may be either '*sectional'* (which represent a set of economic interests or a 'class' of people such as lobbies) or '*cause'* groups (which promote for example environmental ideas which are beyond self-interested motives). The former tend to be more powerful, more cohesive in defending their interests and have greater access and influence on decision-making processes. The next *input* is labelled *supports*. The core idea is that policies and governments are dependent on the support of their citizens to be able to implement and maintain policies. The final input is labelled *resources*. Under this broad heading personnel, technical resources and skills are acknowledged to be the core elements of any successful policy.

On the upper part of figure 3.2.1 we find the policy environment. This refers to the context in which policies arise. The political situation (e.g. pre-election time or budgetary allocation periods), the economic context (e.g. crises or growth periods), cultural factors or environmental crises (e.g. an oil spill) shape the policy agenda. The way in which issues come in and wane away in the policy realm can be explained with

reference to Downs' Issue Attention Cycle (Downs, 1972). The stages in the issue attention cycle are five:

1. *Pre-problem stage*. There is data on a given problem (say oil spills) but neither the public nor the media or policy makers are paying attention to it. Other groups such as environmental NGO's or scientists may be concerned.

2. *Alarmed discovery and euphoric enthusiasm*. In the aftermath of an environmental crisis for example, the media, the public and policy makers tend to become aware and show, in most cases, short-lived concern about an issue. This concern is coupled with the confidence in the existing capability to solve the problem. Programs are designed, policies enacted and institutions created to deal with the problem at hand.

3. *Realising the cost of significant progress*. Complex problems tend to call for multi-dimensional and costly solutions rather than 'off the shelf' technical fixes. Agents in the policy cycle realise this during the third stage.

4. *Gradual decline of intense public interest*. The realisation that the problem is difficult to solve implies a reduction in the interest shown by society that may take the form of being bored with the issue, being too scared to act or feeling they cannot do anything meaningful to solve the problem.

5. *The post-problem stage*. The issue is not permanently 'in people's minds' anymore but certain institutions and programs may stay. These will serve as an existing institutional setting for future occurrences in which the problem is propelled again into the policy agenda.

According to Downs, his depiction is valid when the issue under scrutiny affects a low percentage of the population directly, when the issue is the result of a pre-existing social arrangement that benefits a powerful minority and when there are other concerns competing for public and policy attention. These three pre-conditions hold when analysing environmental damages such as those caused by oil spills.

Crisis management literature within the analysis of public policy claims that 'problems do not exist objectively as much as they do in perception' (Birkland and Lawrence, 2002: 17). This idea of the relevance of public perceptions plus the above reflections on the relevance of the policy environment and the issue attention cycle provide the

rationale for considering agents' perceptions in crisis situations (such as the natural disasters and industrial accidents) as relevant variables in understanding policies such as those that relate to compensation and prevention.

Natural disasters and industrial accidents[50] such as accidental oil spills can be seen as sudden, uncommon, harmful events that affect a given area or interest group. These events are known simultaneously to policy-makers and to the public (Birkland, 1998: 54). The analysis of crisis events such as the ones caused by inappropriate product management, chemical leaks that caused for example the Bhopal disaster in India, the Chernobyl nuclear accident, or the *Exxon Valdez* accidental oil spill in Alaska are relevant to this thesis as they present common features that can help understand public perceptions of these events.

As argued by Birkland (1998), if we focus on oil spills, these are visible incidents that are presented to the public through 'compelling' pictures of oiled animals, dirty beaches or lost infrastructures. The media propels these images into the public sphere facilitating greater attention is paid to the issue. In fact, Parker and Deane (1997) revealed that man-made disasters, natural disasters and military interventions are the 'stories' that people follow the most. The *Exxon Valdez* oil spill for example was one of the top 20 stories most followed in the news of the decade analysed by the above authors[51]. This in turn leads to negative assessments of the existing preparedness and management policies (Baumgartner and Jones, 1993 in Brikland, 1998). Whether this was also the case in the aftermath of the *Prestige* oil spill was explored in the elite interviews and in the focus groups.

Some of the key factors that help shape perceptions regarding a given problem include: how the media presents the issue i.e. the information received by civil society, how the rest of the industry backs (or fails to back) the explanation of the event, the reaction and credibility of the perceived 'culprit' or the reactions by other agents (NGO's, the government, etc.) among other factors. In any case, if an identifiable

[50] Named focusing events by some public policy scholars due to their capacity to change issues in the policy agenda and to the mobilisation of interest groups (Birkland, 1998)

[51] It may occur however that such an emphasis in the media on the visible consequences leaves less room to explore proximate causes of environmental damage such as polluters liability being capped and hence failing to provide incentives for greater safety measures. Broader debates regarding oil dependency and fuel switching also appear but with less force, arguably due to the issue being purposefully left out of the agenda by powerful agents. These issue may however be discussed by elites and by focus groups, as was the case in this thesis.

polluter exists, it is likely that it will face lasting public opposition (Silva, 1995 in Birkland and Nath, 2000).

Negative assessment and public opposition are acknowledged to be drivers of policy demands and these demands can be facilitators of policy changes (Birkland, 1998). A recent example of this would be the increases in operational safety measures recommended by the US Department of the Interior (Home Office) in the aftermath of the Deepwater Horizon spill[52]. The extent to which environmental damages spur effective changes will however depend on several factors among which the consequences of the damage and their visibility can play a significant role. This was the case in the aftermath of the *Exxon Valdez oil spill* with the passing of the Oil Pollution Act (OPA) 1990 and in the case of the *Prestige* with the implementation of new safety regulations for hydrocarbon shipping[53].

In the Spanish context, there exists a limited amount of research on public opinion and perceptions regarding environmental problems and policies to arrest these problems (Moyano *et al.* 2009). In this sense, in order to understand civil society perceptions of environmental damages and of the policies implemented to mitigate them it can be useful to briefly portray the development of the environmental movement in Spain. This information will help contextualise and understand the views of citizens and elites regarding SD.

In Spain, new social movements such as environmentalism emerged later than in other countries due to the transition from a dictatorial regime to a democracy (Jiménez, 2007). This historical context also made the movement somewhat different from that of other countries in that initially, in the late 70's, Spanish environmentalism was hardly interconnected to other environmental movements and it was by and large less violent (*ibid.*).

Environmentalism in Spain initially focused its attention on local environmental problems such as nuclear power plant locations or the preservation of local habitats or charismatic species. Political parties were at this stage detached from the environmental movement and hence the assessment of the public management of

[52] See http://www.doi.gov/deepwaterhorizon/loader.cfm?csModule=security/getfile&PageID=33598
[53] http://ec.europa.eu/transport/maritime/safety/doc/2007_03_memo_maritime_safety_en.pdf
http://ec.europa.eu/transport/maritime/safety/third_maritime_safety_package_en.htm

environmental problems was characterised by open opposition and criticism towards for example energy policy decisions. In fact, a significant number of environmental organisations even avoided receiving funding from the government or from international institutions such as the EU or from private firms due to opposition to their environmental policies.

Later, in the 90's, the environmental movement allied with the trade unions (*Comisiones Obreras*) as well as with left wing parties (*Izquierda Unida*). During this decade the Spanish environmental movement broadened its scope in terms of the issues covered and the channels through which they would seek to influence policy-making. In this sense, the environmental movement started using both institutional channels and the media to voice their claims. It is also argued that environmental policy-making has been permeable to the demands of the environmental movement in part due to the increased capacity of the latter to organise protests (see Jiménez, 2003). These protests have been significant in issues such as industrial waste and water management policies.

In the early part of the 2000's, prominent protests with high participation in demonstrations included those organised against the management of the *Prestige* oil spill. These demonstrations that took place in various cities in Spain can be contextualised as part of civil society's disapproval of the governing party's general policies (Jiménez, 2007). This overview is relevant in order to understand both the design and implementation of compensation and prevention programs after the *Prestige* and citizens' perceptions as regards these compensation and prevention programs.

Coming back to the explanation of the policy-making process both *policy inputs* and *policy environment* influence governments. As for the government, the role of ministers, civil servants and advisors will be relevant in determining what type of actions or outputs result from decision-making processes. This implied, in this thesis, the need to interview policy-makers and civil servants at different administrative levels from different departments. *Policy outputs* will imply enacting programs and policies, passing new legislation, mandating the use of policy tools, etc.

Although, in theory, decisions can be made '*rationally and in a comprehensive fashion'* (i.e. setting goals and analysing all the avenues by which they can be met), this is not

normally the case, partly due to the limited time and resources. Rather, an *incremental* approach whereby small changes in policies (outputs and outcomes) tend to take place. In this incremental approach, starting from the status quo, only those alternatives that are feasible and would achieve consensus are considered. An additional model is analysed by Roberts (2004), the *mixed scanning decision-making*. The consequences of different courses of action are considered in order to act. Both radical changes and incremental changes can happen under this model.

Despite the existence of well known obstacles to change in the policy realm (e.g. strong economic interests or administrative fragmentation) there are factors that facilitate change. These include, among others, the existence of crises or the surge of new environmental problems that have no known solutions.

Importance of citizen input into oil spill policy

From a *theoretical perspective*, and following the policy-making heuristic used in the thesis, citizen support is seen as one of the many variables that have a bearing on the ability of governments to implement and maintain policies. This is so as active or at least passive acceptance by the citizens is seen as essential in supporting policies (Roberts, 2004; Connelly and Smith, 2003). Additionally, Macnaghten (1997: 5) claims that 'public support or identification is important if sustainable development is to have a significant effect in policy'. Citizen input is also built in the agenda setting stage of the policy-making process as public attention is known to drive some actions (mainly reactive) of policy-makers, as was discussed by elite interviewees. As regards Downs' (1972) Issue Attention Cycle, phase two (in which there is 'alarmed discovery and euphoric enthusiasm' about a given environmental problem and its solution) is driven by the (often short-lived) concern of the media, the public and policy-makers.

Busenberg (2000) analyses the relevance of citizens (and in particular of the financial resources these agents have) in the outcomes of environmental policies to protect the marine space from accidental oil spills in the US. In his paper Busenberg describes how citizens were integrated into the Regional Citizens Advisory Council (RCAC) that was created in the aftermath of the *Exxon Valdez* spill off the coast of Prince William in Alaska in 1989. Through the analysis of five different case studies the above mentioned

author concludes that the input of citizens in successful policy outcomes depends not only on the resources of citizens (known as the *resource hypothesis*) but also on the support for the proposed oil spill prevention and management policies by other influential groups such as policy-makers, the oil industry or environmental protection agencies.

Citizen support is therefore only one of the many inputs in decision-making processes. Demands for environmental policies by various groups in society plus the availability of resources (manpower, skills, technology and funds) are further policy inputs that affect government decisions. The role of other stakeholders such as powerful business associations, the political, economic and social background, the role of civil servants and policy-makers all shape the outputs and the outcomes of policies (Roberts, 2004).

In terms of the influence of various groups, several theories explain the weight of different actors in shaping policy. Connelly and Smith (2003) argue that unequal power and influence will determine success in policy-making. The most powerful and influential agents will have a disproportionate weight in the outcomes of policy-making processes. Additionally, public opinion is seen as fickle and fragmented, hence exercising only punctuated pressure upon governments to react. As González (2001: 1) claims environmental policies 'are regarded as evidence that science and public action can triumph over corporate power and vested economic interests…(but) the imperatives of capitalism, and the preferences of the dominant elites within it, overshadow science and the general public in the formation and implementation of even environmental policies'.

González (2001) summarises existing competing models that analyse policy formulation in terms of the power of different interest groups, the coordinated or fragmented behaviour of business, the determination of policy-making and the policy outcomes. Table 3.2.1 below presents the current competing models of policy-making.

Table 3.2.1 Competing policy-making models

Policy-formulation model	Loci of Political Power	Business Political Behaviour	Description of Policy Formulation Process	Policy Outcomes
Pluralism	Numerous interest groups and elected officials	Fragmented	Interest groups, rooted in different segments of society, competing vigorously	Shaped by competing interests groups and elected officials
Plural elite	Various interest groups	Coordinated to limited extent through trade associations	Different interest groups, especially business groups, dominating different policy areas	Special interests determine the content of narrowly constructed policies
State autonomy/Issue networks	State officials supported by issue networks	Fragmented	State officials draw ideas, plans and support from issue networks to develop policies	Appointed and elected officials determine the content of policies
Economic elite	Individuals of wealth and corporate decision-makers	Largely coordinated through policy-planning networks and other social business institutions	Economic elites, operating through policy-planning networks, dominate the policy formulation process	The policy preferences of economic elites pre-dominate

Source: González (2001: 19)

The *results obtained from the analysis of elite interviews* in the thesis are in accordance with the expectations set out above by scholars such as Connelly and Smith (2003) and González (2001). Hence, the economic elites are capable of shaping environmental policies. In this sense, elite interviewees did not seem to demand participatory approaches to decide which policies to adopt to respond to oil spills. Experts did however recognise the relevance of communication with non-experts (civic science as defined by Bäckstrand, 2003) as well as the fact that pressure by civil society has forced government action in the aftermath of oil spills such as the *Prestige*.

The limited amount of elite interviews conducted precludes any overarching conclusion stating that citizen input has been 'important' in policy-making. What could, at best, be argued in the light of demonstrations, voluntary work, institutions set up in the aftermath of the spill and investment plans to reinvigorate the economy, is that citizen input was one of many variables shaping policy.

The policy-making process described above will be used as a broad framework for understanding and analysing sustainable development in the context of oil spill preparedness and management as seen by elites and by focus group participants. Before presenting the key results, the next section will briefly discuss the methods used.

3.3 Qualitative methods

This section will introduce the qualitative research methods used in the present thesis and it will explore the process followed to conduct elite interviews and focus groups.

Elite interviews

Dexter (1970: 5-6) defines elite interviews as 'an interview with any interviewee who in terms of the current purpose of the interviewer is given special, non-standardized treatment... the investigator is willing, and often eager to let the interviewee teach him what the problem, the question, the situation is. These elites are normally considered influential, prominent or well informed'.

The basic advantage of qualitative interviews is the wealth of details and topics that may be addressed in this type of interviews. A further advantage according to Dexter (1970: 50) is that the 'interviewer can adapt his comments and questions to the unfolding interaction between himself and the interviewee'. It is a flexible exploratory tool which allows respondents to answer in their preferred manner without forcing them to adhere to any set of fixed answers. It also allows seeking further clarifications and nuances to responses when interviewees provide partial or unfocused answers. Reasons for taking action can also be uncovered by qualitative interviews (Burton, 2000).

The limitations of this approach derive from the lack of representative samples in qualitative interviews and the consequential lack of explanatory power in terms of the entire population. The conclusions that will be discussed in the present chapter will therefore be logical conclusions drawn from the interviews. Another limitation of the method lies in the fact that questionnaires cover a similar number of topics in the majority of cases, but each respondent has been chosen due to his/her specific expertise, knowledge or involvement in the decision-making and / or implementation process. This means there may be questions and answers that are only relevant to a particular interviewee and are not replicable (*ibid.*).

Oil spill prevention, management and compensation schemes are largely shaped by political elites and are implemented under the supervision of policy-makers and civil servants. Additionally, decision-making is an evolving process especially in oil spill

management given the 'regulatory momentum' spurred by the Prestige (Tan, 2006). This means reports are not always available and / or public. It therefore seemed reasonable to assume that direct contact with policy makers involved in oil spill management plans would provide otherwise hard to access or unavailable data. For these reasons, qualitative elite interviews were chosen as the research method to unveil the current decision-making process, actions and shortcomings in oil spill management plans as well as the recommendations for future spills.

The main purpose of the interviews is to obtain data relevant to the analysis of sustainable development in the context of oil spill management, organise this information in a systematic way, analyse the salient issues and integrate these issues into the SD theoretical framework. This could arguably help future decision-making processes. Thus, interviews will be used as the 'basis for generating the framework for further research' (Gaskell, 2005: 39). This further research consists of the focus groups, the pilots and the survey. The mixed methodological approach aims to provide useful and accessible data to determine the socially preferred response to oil spills and its relationship to sustainable development.

Focus groups

Focus groups (FG) can be defined as qualitative research (Morgan, 1997) in which an interaction among a reduced number of people is maintained. During this interaction various topics are debated for a limited amount of time, typically between one and two hours. A moderator facilitates the discussion and probes respondents in order to explore participants' views on the research topics of interest. The interaction among group members enables the researcher to explore attitudes, behaviours, thoughts, agreements and disagreements. Focus groups were conducted primarily to understand citizens' views on sustainability in oil spill settings. General issues of concern and hypothetical situations can be explored through focus groups. The use of focus groups enables the researcher to understand and get acquainted with the 'local language' used by participants to talk about a given issue (Gaskell, 2005). All these features of FG help understand the knowledge, attitudes and intentions of citizens as regards sustainable development.

Focus groups can be used in isolation as a method to gather data or in combination to supplement or add to information that has been collected through other methods

(Morgan, 1996, 1997). In the present thesis focus groups have been used as a supplementary tool to elite interviews and as a previous step to the design of the survey. The use of both focus groups and surveys is one of the 'most practical ways of bringing together qualitative and quantitative methods' (Morgan, 1996: 136). This methodological approach is especially appealing when analysing complex situations such as the ones created by oil spills and their management, as it will allows interpreting and contextualizing responses to surveys.

The main advantages of using focus groups are, according to Gaskell (2005), firstly, the potential of focus groups to provide creative ideas about the topic discussed given the fact that participants are asked to provide their thoughts and opinions in conjunction with other people with whom they interact, explaining their ideas and responding to questions. Focus groups are also faster and cheaper to implement compared to individual in-depth interviews, especially when there are travelling expenses involved. Focus groups also allow the researcher, theoretically at least, to explore any topic that may be of interest (Morgan, 1997).

On the snags of focus groups the first and probably the most problematic is the fact that individuals who decide to attend a focus group session tend to self-select themselves. This may result in too much (or too little) relevance awarded to a certain opinion being discussed and thus it could provide a distorted picture of the socially constructed topics analysed. In order to counteract this, an economic incentive was offered to FG participants. Although the possibility of self-selection bias cannot be ruled out *per se*, the fact that some participants stated they attended because the researcher was paying them is somewhat reassuring in the sense that not only environmentally aware individuals turned up to the focus group sessions. The second caveat is that certain individuals (e.g. better educated with well-paid jobs, family and little time to spare) are generally harder to access.

A further word of caution that can be applied to qualitative research in general is the researcher's influence on the focus of the research and the degree of researcher involvement in conducting research (*ibid.*). With regards to the influence of the researcher on the issue studied and the interpretation of the results obtained the only defence is to be explicit about the choices made. One should also try to include as broad a set of opinions as possible in a balanced manner that strives to accurately

represent the phenomenon studied. Although this will not avoid researcher bias it will hopefully expose the choices made and the rationale followed throughout so that criticism helps improve future research. The use of quantitative techniques as an additional research tool can also help check whether the logical conclusions reached after the interpretation of the qualitative data are in line with the conclusions drawn after the statistical analysis of the survey results. In any case, no amount of checks and explanations are likely to prevent researcher bias in social sciences.

The final caveat of focus groups is the counterpart to its cost efficiency merit, namely its broad reach *versus* its depth. According to Morgan (1996: 138) 'each focus group participant produced only 60% to 70% as many ideas as they would have in an individual interview'. With only one to two hours per focus group each participant has less time to explore their views and interact compared to the depth interviews in which the researcher can explore interviewee attitudes, behaviours and actions for the entire duration of the interview. Logistic and cost issues as well as the possibility of gathering socially perceived views of complex situations were all factored in and the choice of focus groups was favoured over in-depth interviews in order to gather citizens' opinions on sustainable development.

The process

Qualitative methods are a laborious endeavour with various interlinked steps that interact with one another providing continuous information that helps improve the process. The steps are summarised in table 3.3.1 below:

Table 3.3.1 Steps in the elite interview process and in the focus groups

Steps	Elite interviews	Focus groups
Design	Topic guide	Topic guide
Interviewees	Decide interviewees	Design FG
Preparation	Background research on interviees bios Technical issues	FG facilities and materials Technical issues
Execution	Conducting elite interviews	Conducting focus groups
Data gathering	Recording, translation and transcription	
Analysis	Deductive apporach: From theory to data analysis Explanation building	

Source: Adapted from Bauer and Gaskell (2005)

The main features of the above outlined steps will be discussed in the remainder of this section.

Design

The topic guides exhibit the order in which the questions were raised. The rationale behind this order was based on the advice given by the main methodology texts consulted as well as the expert advice received[54]. Tables 3.3.2 and 3.3.3 present the basic sections of the elite interviews and the focus groups, the description of each section and the purpose.

Table 3.3.2 Elite interview topic guide

Section	Description	Purpose
Introduction	Reminder of topic to be discussed Brief introduction of each interviewee	Warm-up
General questions	Marine resources Theats to marine resources Monitoring mechanisms Benchmarks and goals Analysis of management strategies	Obtain data on interviewees 'expert' knowledge
Case study specific questions	Causes and consequences of the Prestige spill Commonalities & differences with other spills Key variables in management decisions Information in oil spills Benchmarks Thresholds Equipment and personnel needs to: Mitigate Regenerate Prevent Existing and alternative oil spill preparedness and management strategies	Analyse the *status quo*
Context in oil spill management	Political, economic and social considerations in oil spill management	Discuss broader issues that may affect oil spill policies
Sustainability	Definition used Implications (substitutability, compensation, prevention, etc.) Actions	Explicitly discuss the term & its related actions
Other	Other issues of interest for interviewees	Allow interviewees to explore other issues of interest

Source: Elite interviews, Dexter (1970), Matilde Fernández-Cid (pers. Comm.)

[54]I am indebted and most grateful to Matilde Fernández-Cid for her help in refining the questionnaires and improving the researcher's qualitative interviewing skills.

The rationale for the above questions responds to the need to draw a broad and accurate picture of the world of those interviewed. Context, institutional arrangements and decision-making in complex emergency situations are the building blocks of the framework in which sustainable development strategies may be adopted or ignored. As stated by Hertz & Imber (1995: 56) 'it is in the situation of crisis that the structures and processes of social organization most vividly manifest themselves'. Answers to indirect and direct questions about sustainability, compensation and irreversible losses[55] illustrate what is happening in the different areas and whether sustainable development is a current concern. Lastly, in order to make recommendations for improvement in oil spill management, it is interesting to know what is actually happening, what is in the make and how far different actors are willing to go.

The research questions to be answered, the literature review process and the results obtained from the elite interview process, gave rise to the set of topics to be covered by the focus groups. The aim of the focus groups was to analyse participants' knowledge, attitudes and intentions regarding sustainability in oil spill settings. In order to fulfil this purpose questions on the information and experience of participants (their beliefs) were asked. Their attitudes regarding oil spills were also discussed as well as their preferences towards different possible actions that could be taken both by individuals and institutions when managing oil spills. Participants were also asked to state their intentions (their willingness to pay) to prevent future spills and their willingness to accept compensation that would provide them with different types of capital if a new spill happened.

Table 3.3.3 below presents the focus group topic guide.

[55] for various papers in this topic see for example Ledoux and Turner, (2002); Markandya *et al*, (2006); Berrens *et al.* (1999); Walker and Meyers, (2004); Rosenberg *et al.* (2001); Spash, (2001); Muradian, (2001); Arrow *et al.* (1995); Kotchen and Reiling, (2000), Haines Young, (2006), Stevens *et al.* (1991); Garza-Gil *et al.* (2006), Ekins, (2003); Kontoleon and Swanson, (2003) and Loureiro (undated).

Table 3.3.3 Focus group topic guide

Section	Description	Purpose of discussion
Introduction	Researcher presentation Thanking participants Explaining FG dynamic	Welcome Warm-up Provide clear instructions
Opening questions	Participants introduce themselves	Ice-breaker
Beliefs	Information and experience with oil spills Ranking different consequences of spills	Obtain data on participant knowledge & experience on the topic
Provision of information	Additionally to participant information baseline information on the basic consequences of spills was provided	Ensure minimum knowledge of all participants for later discussion
Attitudes	Feelings and worries Importance on a 1-10 scale of different size & consequence spills	Favourable or unfavourable comments regarding oil spills Scope testing
Thresholds	Beliefs and attitudes towards potential ecosystem threshold trespassing	Explore the credibility of threshold trespassing scenarios Explore intentions of participants faced with threshold trespassing
Valuation	Comensation exercise WTP exercise	Analyse participants' intentions when faced with different spill situations in which threshold trespassing is included
Wrap-up	Thanking participants Asking for further ideas/comments	Providing closure Providing the opportunity to comment on the FG or issues that were not discussed

Source: Focus groups

Selecting Interviewees

The goal in the final elite interview schedule was to have at least one representative from each institution involved in oil spill management, one representative from each major political party, environmental experts, economic experts, legal experts and the main NGO that was involved both in the recovery of the affected environment and in the public demonstrations.

The final layout of the interviews conducted is shown in table 3.3.4 below:

Table 3.3.4 Elite interviews conducted

Interviewee code	Area(s) of expertise	Position(s)	Political tendency	Access
GL26C01F	Applied Economics & Maritime studies	Professor	Socialist	Conference
ML27C01R	Policy	Former mayor	Nationalist	Summer course
FM09M02A	Policy	Politician	Conservative	Personal
NR&MTC21C03X	Policy	Civil servants	No information available (NIA)	Conference & Snowballing
AQL&GA23C03J	Private firms	Ship agents	Conservative	Personal
NJFMG10M04C	Lawyer	Civil servant	NIA	Personal
TA25C04O	Policy & Sociology	Politician	Socialist	Personal
P25C04E	Lawyer	Civil servant. Civil defence	NIA	Snowballing
U25C04J	Engineer (agriculture)	Civil servant. Civil defence	NIA	Snowballing
LD26SC04B	Maritime issues	NGO & Politician	Nationalist	Mail
NL27SC04A	Policy	Civil servant Coastguard, maritime salvage & pollution prevention	NIA	Mail
SG27SC04S	Private firms	Businessmen representation	Conservative	Personal
PM09M05J	Oceanography	Civil servant	NIA	Snowballing
SLLG14M07F	Maritime safety and pollution fighting	Civil servant	Socialist	Snowballing
VS26M07J	Maritime pollution fighting	Civil servant	NIA	Snowballing
FD01SC08R	Open spaces and biodiversity	Civil servant	NIA	Mail & telephone

Source: Elite interviews

As the first interviews were conducted and factual data were filled in by interviewees new ideas came up which shaped following interviews as well as the people to be contacted. As reflected by Dexter (1970: 43) 'the decision as to whom to see depends largely upon one's on-going reflection about the issues, upon new data and hypotheses that come to one's attention, from whatever source – often from earlier interviews'.

There are no guidelines carved in stone regarding the optimal *focus group* design but Morgan (1997) describes the rules of thumb that are common practice in conducting qualitative analyses through the use of focus groups. These rules include: organising groups to include previously unacquainted individuals of similar characteristics to facilitate group interaction; it also implies using structured interviews where the moderator is actively involved; the number of participants normally should be between 6 and 10 participants *per* group; and finally, each project normally consists of three to five focus groups.

The selection of FG participants could be made either according to socio-demographic characteristics (age, gender, education, geographical location, etc.) or selecting

'natural' groups. Natural groups are formed by people who share some common characteristic of interest such as belonging to an NGO, being policy makers, widows, etc. According to Gaskell (2005) there is no one right way to select respondents. Thus the choice of one form of participants' selection over another will depend on the research questions and aims. For the present thesis socio-demographic variables were considered when grouping participants together. The reason for this choice was that the focus groups were intended as the first step in the development of a questionnaire that was distributed to a sample of the population according to their socio-demographic characteristics. Additionally this selection criterion is recommended when all individuals may be affected by the issue under discussion (*ibid.*) which would be the case when analysing future implementation of oil spill management strategies in Spain. Table 3.3.5 below presents the final layout and characteristics of the focus groups:

Table 3.3.5 Focus groups conducted

Focus group number	City	Age range	Higher education	Number of attendants
FG1	Madrid	18-40	Yes	7
FG2	Madrid	18-40	No	8
FG3	Madrid	>41	Yes	6
FG4	Madrid	>41	No	5
FG5	La Coruña	18-40	Yes	7
FG6	La Coruña	18-40	No	8
FG7	La Coruña	>41	Yes	3
FG8	La Coruña	>41	No	6

Access

There are a variety of means to gain access to interviewees. Following Keating (2005) the process of negotiating access to the interviewees used regular mail, e-mail and telephone conversations. Besides these, attendance to summer courses and seminars where the elites were expected to gather was also useful in order to gain access, establish the first contact with the potential interviewees and have updated information related to oil spill management strategies. All these were useful strategies in order to gain access and conduct interviews.

Focus group participants were approached in places where people gather and have spare time. These places were chosen too due to proximity to the places where the FG

would take place. Additionally an advert was posted in a higher education website[56] in Madrid. A similar action was undertaken in Galicia as the University of Coruña through its student services centre offered the researcher the possibility of sending the announcement of the project and the request for FG participants to over 2,000 students (both undergraduates and post-graduates) through their weekly newsletter distributed via e-mail.

Additional locations used to recruit FG participants both in Galicia and in Madrid were local unemployment offices[57] where permission was requested to speak to people in queues and around the premises. Other institutions such as the CICE (IT vocational centre) in Madrid and the Pablo Picasso Arts Vocational Centre in Coruña also granted the researcher access and advertisements were posted on these centres' information boards. As people in Galicia did seem to take longer than expected to respond, other locations such as municipal libraries, parks, bars and kiosks were approached and information on the project and the FG process was posted in their establishments and distributed in person to people in the street.

Execution

According to Gaskell (2005: 46) 'Essentially in the successful depth interview the personal worldview of the interviewee is explored in detail'. Elite interviews were conducted mainly in the workplace of interviewees. The power dynamics expected in the sense that the interviewee would largely lead the interview (see Keating, 2005) was mostly noted when interviewing politicians and maritime interests' representatives. In the remainder of the interviews, especially with civil servants, the interaction was established on a more level playing field although (understandably) some interviewees avoided giving their opinions on sensitive issues or disclosing any internal or non-published information.

At the beginning of the interview respondents were reminded of the research topic in order to provide an initial reference of the questions that would be discussed. A brief explanation of the main sections of the interview was also given. The average duration of the interviews was over two hours.

[56] http://www.emes.es/Actualidad/Foro/tabid/408/type/foro/Default.aspx?postid=181
[57] INEM (*Instituto Nacional de Empleo* or its new denomination since 2003, *Servicio Público de Empleo Estata*l) in its Spanish acronym which stands for National Employment Institute.

Assuring confidentiality was also useful in most interviews although some explanations and examples were offered by interviewees only if the digital recorder was turned off. When this happened, notes were made on confidential issues discussed as soon as the interview ended in order to retain the information shared, which offered insights that linked focal concepts[58].

The FG locations were selected both in Madrid and Coruña attending primarily to efficiency criteria. Four locations were used to conduct the FG. Two of these settings were 'formal', a university college (*Colegio Universitario Cardenal Cisneros*) and a cultural foundation (*Fundación Pedro Barrié de la Maza*). These two selected locations were both near the city centre thus being easily accessible for participants; they were well known institutions that provided confidence, encouraging individuals to take part in the FG process, and they were both offered to the researcher free of charge. The informal settings included the researcher's home in Madrid and a meeting room in a hotel (*Hotel Maycar*) near the centre of La Coruña (Galicia).

The basic organisation of the focus groups entailed various tasks. The premises where the FG's were to be conducted were visited in order to arrange tables, chairs, food and drinks for participants. Photocopies of the different exercises were provided for participants. Once all the material and the room was prepared, FG participants were met by the researcher at the entrance of the premises where they were welcomed. A sticker with each participant's name was distributed so group participants could address each other by name facilitating interaction and familiarity. Once in the room participants were asked to take a seat and permission was requested to record the session as a memory aid for the researcher, ensuring anonymity. As expected, anonymity was not an issue with FG participants as they were not asked to speak on behalf of any institution or as the 'professional *persona*' they exhibited in their work place (a significant difference to the elite interview process in which anonymity was an issue of concern).

[58] This was the case when interviewing one businessmen representative. The interviewee analysed the pressure exercised by the industrial lobby over both the regional government and the central government in order to assign funds to railway infrastructures within the economic recovery plan (Plan Galicia). This pressure was a response of the car industry to the turbulent political moment and the EU structural fund negotiation process that would leave Spain and thus Galicia without funding to modernise obsolete and insufficient transport infrastructures in the region.

Data gathering

As recognised by various authors (see Dexter 1970, Burton 2000, Keating 2005 and Gaskell, 2005 among others) transcribing is a time consuming activity. The accuracy of the transcriptions depends on the research aims. For the present thesis in which analysing context, processes and decision-making is the aim, extensive notes with frequent *verbatim* quote were used.

The time devoted for transcribing and checking every hour recorded was approximately 8 hours for each focus group and 9 hours[59] for each elite interview. The fact that the interviews were conducted in Spanish and the transcripts were done in English increased the hours spent in this activity. Within the transcriptions, reference to the time in which responses were offered was also recorded in order to provide a quick reference in case doubts arose regarding the transcribed information. Colour codes were used in order to distinguish questions from answers and researcher's codes.

[59] Note that Dexter (1970) allows, for the transcription and checking process, approximately 9 hours for every hour of interview recorded. Saunders, Lewis and Thornhill (2007) state that it can take up to 10 hours to transcribe every hour recorded. Other authors, Keating (2005), state that the transcription process can take as little as 4 hours for every hour recorded.

3.4 Results

The analytical approach taken is primarily a deductive one in which a pre-existing theoretical framework helps enunciate the research questions, permeates the data collection effort and aids the initial analyses. The main advantage of using this approach is the 'safety net' provided by the use of a standing theoretical framework that guides the research effort. This approach has been loosely applied to ensure permeability to new concepts and findings that emerged during the course of the elite interviews and the focus groups (Saunders, Lewis and Thornhill, 2007).

The analytical strategy followed both in the elite interviews' analysis and in the focus groups analysis can be labelled as 'explanation building' according to Yin (2003) in Saunders, Lewis and Thornhill (2007). This implies unveiling an explanation for the phenomenon studied (e.g. whether elites and focus groups participants understand SD in the same way). The analysis entailed establishing different themes (topics), determining underlying categories and sub-categories and then exploring the more concrete concepts expressed by interviewees and focus group participants. Once this was done, interrelationships among concepts and categories helped build the framework in which research questions could be answered and further research planned.

There is little agreement among different methodology texts regarding the best way to present results obtained from qualitative analysis. Where Burton (2000) would leave the decision of whether to quote abundantly or not to the researcher, Gaskell and Bauer (2005) and Alvermann, O'Brien and Dillon (1996) recommend abundant use of *verbatim* as interviewees' statements are, according to Gaskell and Bauer (2005), confidence makers. Confidentiality concerns voiced by various interviewees, the sensitive nature of the issue analysed and the highly politicised treatment of the *Prestige* oil spill by political parties, the media and civil society (Tan, 2006) called for a relatively restricted use of *verbatim* quotes. These quotes are used where necessary in order to support the main ideas and interrelations presented in this section.

Framework

The analysis was undertaken with the aid of an information matrix where the concepts, categories and topics were analysed for each elite interviewee and each FG (Saunders, Lewis and Thornhill, 2007). The process of breaking up the information provided by respondents and then grouping it together aided in the systematic analysis of the different concepts and ideas raised in the interviews.

The main findings from elite interviews and focus groups are briefly summarised before presenting a more detailed analysis (in the remainder of this section).

As regards the *understanding of the term sustainable development* neither elite interviewees nor focus group respondents (non-experts) provided an academic definition according to which different sustainability paradigms were identified. In addition to this, only elite interviewees whose work was directly related to natural resource management were able to provide a definition of the term. Support for the general concept of SD was voiced but no in-depth reflection of what this meant in terms of protecting for example natural capital as a special type of capital was recognised.

Non-experts (focus group participants), in contrast to elites, were overall more concerned about lasting development as this was acknowledged to affect the welfare of their descendants. They offered, in accordance with the literature reviewed (Bonnes *et al.* 2007), place-based knowledge and practical examples of efforts to achieve sustainability (via daily practices to protect natural capital). They were also aware of potential trade-offs between economic growth and environmental protection. Elites, arguably more worried about re-election, were overall silent as regards their concern for future generations.

According to Jordan and Lenschow (2008) the pre-requisite for achieving sustainable development is integrating environmental policies across different government departments. In the context of accidental oil spill prevention and management (most) elite interviewees and focus group respondents repeatedly referred to the lack of integration of such policies and the lack of coordination among different government levels and departments.

When analysing *compensation*, two main issues were discussed both by elite interviewees and focus group participants: money and compensation (investment) packages. Elites and FG participants largely coincided in their view of monetary compensation. Experts and non-experts agreed that monetary compensation was needed for those who had had been directly affected by the spill (e.g. fishermen, net menders, hotels, restaurants, etc.). There was (as expected due to the more technical nature of the concept) little discussion about monetary compensation for non-use values lost. There was also coincidence in the perceptions of elite interviewees and focus group participants regarding the fact that monetary compensation was 'used' by the government to appease citizens.

As regards *'in-kind' compensation* in the form of different 'compensation packages' (that resulted from the design of the *Plan Galicia* and the *Plan de Dinamización Económica de Galicia*, see section 2.7 in the thesis for further explanation) and possible alternatives for these packages elites and FG participants showed wide-ranging opinions. Elite interviewees largely answered in line with their 'professional persona' in their support for (or their criticism of) past compensation packages that devoted a large percentage of the funds to infrastructures.

In fact, conservative party representatives strongly supported investments in man-made capital whereas nationalists and elites in the field of oil spill management suggested alternative investment packages that would focus on replacing damaged natural capital with like natural capital. Focus group participants overwhelmingly demanded natural capital to be built in compensation if a new spill happened. The self-selection bias inherent in FG participants and the non-probability sampling followed in the qualitative part of the research precluded any generalisation of the findings as regards compensation preferences but helped define the range of compensation packages that could be credibly included in the survey.

Finally, concerning the willingness to pay to prevent future spills the role of experts and non-experts differed. Experts were asked to provide information on the building blocks of prevention schemes that would protect natural capital. This information was summarised and then funnelled into the prevention programs presented in the focus groups and in the survey. The key features of these prevention mechanisms included more control of maritime traffic, better communication between agents in the

maritime sector, further R&D efforts and international cooperation. See Table 3.4.3 for further detail.

Focus group participants expressed a generalised belief that prevention and effectiveness were largely missing in government response to oil spills (in accordance with theoretical predictions discussed by Birkland, 1998; Birkland and Nath, 2000; Birkland and Lawrence 2002). Preventing oil spills was seen as a worthy investment with some respondents from FG2 stating that it was cheaper and more desirable to prevent spills rather than having to manage their consequences. One of the FG's (FG1) argued that citizens were both responsible and able to prevent environmental damage. FG participants reiterated the acknowledgement of the impossibility to eliminate the risk of oil spills but continued demanding all efforts should be made to minimise the risk of these accidents. One of the participants in FG5 broadened the framing of the issue and proposed a cost benefit analysis of maritime transport of oil as a decision-making tool to regulate (by limiting) vessel traffic. The main demands regarding prevention and management are summarised in box 3.4.1.

When (non-expert) FG respondents were asked whether they would be willing to pay to prevent future spills most FG respondents answered affirmatively (80% said they would be wiling to pay), some seemed to favour SS (14% were WTP the maximum amount and were very concerned about future spills). In addition to this few respondents did not want to pay for protest reasons (e.g. others should pay, the polluter should pay). Comments and clarifications sought by non-experts respondents to the valuation scenarios discussed in the focus groups helped refine the final version of the valuation exercise in the final survey.

The remainder of this section will analyse the outcomes of the elite interviews and focus groups in a detailed manner. Similarities and differences between elite interviewees' responses and focus group responses will be highlighted. Table 3.4.1 presents the topics analysed:

Table 3.4.1 Topics, categories and concepts: Elite Interviews & Focus Groups

Topics (themes)	Categories	Sub-categories	Concepts
I. Sustainable development	A) Oil spills	1. Definition	Understanding and use of the term SD
		2. Resources	i. Control Information, Inspections, Technical and personal means ii. Cooperation & coordination Institutions: National, International, Companies R&D centres
		3. Outputs	i. Prevention and management strategies ii. Compensation strategies
		4. Substitutability	Special protection areas, recovery and replacement strategies
		5. Limits and irreversibility	Biodiversity Cultural heritage Image
		6. Equity	Intergenerational and intragenerational equity
	B) Other factors	1. Environment as source/sink	Natural Resource Use: Overexploitation, Habitat destruction Pollution: Operational discharge, pollution from urban areas, accidental spills
II.Context	A)Policy inputs & environment	1. Agents	Civil society, voluntary workers, fishermen, lobbies, political parties, the media
		2. Resources	Relevance of natural resources

Source: Elite interviews and FG. Classification of categories and concepts adapted from Roberts (2004)

I. Sustainable development: A) Oil spills: 1. Definition

According to the EU Integrated Maritime policy (2007:4):

> *'Increasing competition for marine space and the cumulative impact of human activities on marine ecosystems render the current fragmented decision-making in maritime affairs inadequate, and demand a more collaborative and integrated approach. For too long policies on, for instance, maritime transport, fisheries, energy, surveillance and policing of the seas, tourism, the marine*

environment, and marine research have developed on separate tracks, at times leading to inefficiencies, incoherencies and conflicts of use.[60]

The above quote is a faithful reflection of the views most elite interviewees held regarding oil spill management in Spain.

The most salient finding as regards the definition of SD is the vague, partial and at times shallow understanding of the term sustainable development by elites, especially when non-academic interviewees or interviewees that were not directly involved in natural resource management were asked about SD. This contrasts with the views of both academic interviewees and civil servants or politicians that work in nature conservation related areas. Answers obtained from elite interviews suggest the existence of a lack of horizontal integration among different departments in natural resource management. Sustainable development is generally perceived to be an issue to be dealt with by environment departments alone. The main comments from elites are summarised in the table 3.4.2 below:

[60] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0575:FIN:EN:PDF: (pp.4)

Table 3.4.2 Elite interviewees' comments on sustainable development

Interviewee	Definition & Comments
NL27SC04A	In the oil spill pollution area sustainable development implies enacting mitigation and prevention schemes. No detailed analysis beyond this general statement was offered
FM09M02A	First reference made solely to economic sustainability. 'Objectives and plans' cited as needed to achieve sustainability. No precise information provided regarding what the objectives or plans should entail.
LD26SC04B	Marine resource management is perceived to be short sighted and short term. Acknowledgement of a turning point for fishermen after the Prestige whereby limiting activities was considered one possible solution to have enduring fishing activities
NJFMG10M04C	The term is not used in the CEPRECO. The competence is seen as lying with the Ministry of Environment and the Ministry of Economy rather than being a horizontal guiding principle in natural resource management strategies
GL26C01F	The sustainable development indicators being developed are more an academic endeavour rather than a policy strategy. There are no funds devoted to using these indicators
VS26M07J	The State's Merchant Navy's Office said they cooperate with other departments in SD issues but no concrete data was provided.
PM09M05J	Sustainable development strategies are routinely included in the reports produced by the Spanish Oceanographic Institute. This implies not only looking into environmental sustainability but also into economic criteria that may lead to increases in consumption of certain species. They even consider an ecosystem's approach in which all organisms and the use they make of the environment are considered. The difficulty of this approach is the very large amount of variables that have to be fed into the models. The workable solution for the Spanish Oceanography Institute is the development of indicator species that will allow the implementation of management strategies with the goal of having 'sustainable stocks within healthy ecosystems'.
AQL&GA23C03J	References made to reducing unnecessary resource use based on economic efficiency grounds rather than on sustainable development criteria.
TA25C04O P25C04E U25C04J	Civil defence services interviewees do not consider the environment or the concept of sustainable development as one of their priorities. No horizontal integration of natural resource management in their plans.
ML27C01R	Acknowledges the theoretical relevance of the sustainable development concept and the lack of implementation of SD strategies alluding to lack of long term strategies.
FD01SC08R	A clear idea of limits, critical natural capital and developing within system limits permeated the answers of this interviewee who works within the natural areas and biodiversity regional government in Galicia. Urban and territorial planning schemes are seen as the basic policy instruments to achieve this. The process followed: Identify habitats, identify activities that can affect those habitats, analyse the interaction between habitats and activities. This approach could provide a guide for encouraging beneficial activities whilst prohibiting damaging activities.
SG27SC04S	From a business perspective sustainable development issues are dealt with only by big firms. Demands for voluntary measures and incentives were voiced
NR&MTC21C03X	General statements about prevention and mitigation were said to be the strategies to ensure sustainable development was pursued by the CEPRECO. The career of the interviewee (in the field of environmental issues) is said to be the reason for taking into account sustainability issues. No further data was provided.

Source: Elite interviews

The composition of the *focus groups* (i.e. citizens of all walks of life) plus the expected limited amount of data generated by focus groups, compared to elite in-depth interviews, resulted in less detailed information regarding theoretical concepts. Although no focus group discussed the definition of sustainable development spontaneously, indirect references to the concept were made by three of the eight focus groups. These references included the notions of long lasting development which was to be balanced with economic development. Humans were seen as responsible for the preservation (and able to preserve) environmental resources.

The common features among elites and FG participants regarding the definition and use of SD highlight the virtually non existent knowledge of the term in an academic sense. That is, no distinction was made when defining sustainable development among different sustainability paradigms, the possibility of substituting different forms of capital or compensation issues. This was so for elite interviewees who were not directly involved in marine resource management or nature conservation initiatives, and for FG participants.

Within elite interviewees who dealt with maritime resource management (PM09M05J) or who dealt with nature conservation initiatives (FD01SC08R), the definition and requirements for achieving sustainable development were clear. Limits, indicators and influence of political wrangling and human activities were all acknowledged to be important in SD. In addition to this, the academic perspective regarding the fact that sustainability indicators were being developed but were not being used added a further insight into the difficulties in the uptake of this type of indicators.

FG participants provided broad and arguably less detailed information of sustainable development (SD). They nevertheless recognised some of the main building blocks of the term. References to system limits, human induced threats, the need to balance economic development and preservation of resources were voiced. These ideas were complemented with references to the wellbeing of both present and future generations.

I. Sustainable development: A) Oil spills: 2 Resources

Mitigation and prevention strategies are seen, by elite interviewees working in oil spill management, as the core elements to arrive at sustainable development. According to

elite interviewees the resources that facilitate the design and implementation of oil spill management strategies include two main concepts: *control and cooperation*. The concept of *control* encompasses *information and inspection* (physical control). Cooperation refers to *national* and *international* cooperation as well as cooperation with private firms and R&D centres.

I. Sustainable development: A) Oil spills: 2 Resources i. Control

Within *information* requirements, interviewees asked for the development, update and diffusion of baseline data on maritime assets at risk of oil spills. Additional information needed on spills would entail deploying ongoing air and satellite[61] surveillance of maritime corridors. Strategies to determine whether it is best to bring vessels into ports or to send them off into high seas are needed (TA25C04O, P25C0406E, U25C04J). Data was also demanded on the sensitivity of environmental assets exposed and thresholds in order to establish protection priorities. Risk and sensitivity maps were seen as a useful tool (in theory) to manage future spills. In practical terms however these maps were seen as little more than an academic exercise when they interfere with economic activities that would reduce local and regional government funding. The challenge in this area is to ensure this information is effectively used by policy makers[62]. This information should be coupled with real time and 24h available data on tides, water temperature and information protocols (GL26C01F). This information should be understandable and easily accessible to decision-makers.

Data on available pollution fighting means, suppliers, delivery times and replacement needs in a continuously updated database was also seen as essential in guiding planning and response efforts in future spills. According to PM09M0506J, P25C04E and U25C04J, it is important to continuously check there are enough means available to respond to 'daily emergencies' (P25C04E)[63]. Providing effective communication

[61] Please note that the EU's CleanSeaNet satellite surveillance was set up by the EMSA in 2007 (http://www.emsa.europa.eu/)

[62] INTECMAR which is the Spanish acronym for *Instituto Tecnológico del Mar* through its RADIALES project and the analysis of the consequences of the Prestige spill on Plankton is said to be equipped to undertake this information task. A further project developed along these lines is the ESEOOS. Its aim is to create a Spanish Operational Oceanography System to be used in oil spills and location of drifting objects. Experts from Universities and decision-makers are involved. (NR&MTC21C03X).

[63] Note that by daily emergencies the interviewee meant crisis situations contained within the geographical boundaries of the autonomous community (region), the response to which could be dealt with by existing regional emergency services.

channels to ensure any incident is swiftly known by all potentially affected parties is also seen as a potential action driver in future oil spill management situations. This could be articulated by improving radio communication systems to provide 24h coverage via 16VHF channel[64].

Information strategies enacted by the government and media communication are seen as vital in future oil spill management. Contradictory information provided by the government, media and other countries research centres was seen by interviewees as driving outraged responses and demonstrations. The importance of providing credible, updated and continuous information that is adjusted to what citizens could contrast with alternative information sources seemed clear from the answers obtained. Although interviewees criticised (GL26C01F, ML27C01R, TA25C04O, P25C04E, LD26SC04B and U25C04J) or alternatively were supportive of the information strategy followed (FM09M02A), they all assigned *communication a high value in crisis management*. This could signal towards the need for planned, coordinated and homogenised *information protocols* in crisis management situations. According to NJFMG10M04C communication protocols were being developed.

Physical control through inspections was seen as the second, although equally important, tier within the 'control' concept. Increasing the amount of on-site vessel inspection was said to be essential in reducing the risk of spills. According to interviewees these inspections were to be coupled with an increase in the number of tug and patrol boats and with lager number of ship inspectors. According to LD26SC04B there were only 149 coastguards for over 1,000 Km of coastline at the time of the interview, which significantly limits the vessel inspection capacity of Galicia.

An added control measure requested is the monitoring and revision of management strategies through for example full scale oil spill management drills involving all government departments and administrative levels. According to NL27SC04A, partial drills (i.e. response in land or response in high seas but not all responses combined) are executed. Whether the coordination problem has been resolved (often quoted by interviewees) will not be known until oil spill response plans are fully tested or, a future spill occurs.

[64] According to LD26SC04B this is the emergency and salvage channel used by vessels and seafarers.

Throughout the focus groups participants repeatedly stated there was a *lack of information* regarding oil spills on which to base policy decisions. Some focus group participants regarded this information gap as a driver of reactive policy-making (FG3). The demands voiced by focus groups included investing in increasing the data available regarding oil spills (FG1). Additionally, the sharing of this information with communities affected by oil spills was another request to enhance oil spill management by involving government and citizens.

Inspections were also seen as a significant element in the oil spill control process by FG participants. There were calls for inspections as well as concerns regarding the trustworthiness of the civil servants that conduct these inspections. Participants in FG1 stated that these inspectors could be bribed to overlook lack of safety in vessels. Another focus group (FG4) however saw the inspection system as a trust builder that would increase their willingness to pay for oil spill prevention. On site (on board) inspections as well as satellite surveillance was demanded by FG participants. A further demand revolved around the need for an international effort to coordinate and homogenise inspections to ensure risk of oil spills is minimised. The risk of oil spills was acknowledged as 'inevitable' due to current demand for hydrocarbons but FG participants demanded 'all efforts' to reduce the risk as well as increased awareness and alert by the government.

Focus groups overall had a negative attitude towards government actions when referring to the *technical means* available for oil spill preventions and management. This attitude was expressed as concerns regarding a lack of equipment (tug boats, surveillance material and equipment for volunteers such as masks and suits). Additionally the government was seen as unaware of this lack of oil spill response equipment and slow in responding to oil spills (FG7). The demands made therefore included an increase in surveillance and pollution fighting equipment for civil servants as well as for volunteers.

Lack of personnel was also perceived as a shortcoming in the government's response to oil spills. Focus group participants therefore thought an increase in the number of ship inspectors was needed. Trust issues arose when discussing the need for further ship inspectors. The suspicion voiced regarding the possibility of inspectors receiving

bribes was only seen in FG1 and therefore seems overall of marginal relevance for other participants.

When comparing elite interviews with focus groups in the analysis of *control, baseline information* that was requested by elite interviews as background for policy decisions was acknowledged to be important by FG participants who requested expert input to 'improve everything'. In addition to the importance of data, FG participants in La Coruña demanded information on the desirable management actions to be shared with citizens pointing towards a demand for specialised information to reach affected communities (i.e. civic science in its weaker sense, see Bäckstrand, 2003 for a depiction of 'thin' civic science). This information sharing was perceived as important by elites too. Elites viewed communication with citizens more as a way to build trust and foster transparency, thus reducing outrage, rather than as a participatory tool for social action.

Elites doubted whether risk and sensitivity maps would be used to determine priority protection and sacrifice areas. These doubts were motivated by the fact that risk and sensitivity maps could limit economically beneficial activities (e.g. building infrastructures that raise local government's revenues, in flood prone areas). FG participants on the other hand believed these tools were good and did not perceive the conflict between the use of these maps and revenue raising activities.

Inspections were seen as primordial by FG and elites. The former group expressed some suspicions on the possibility to bribe inspectors whereas elites voiced no concerns regarding the professional integrity of those civil servants.

Regarding the need *for further oil fighting equipment* such as tug boats and barriers, both elites and FG participants agreed on the need for further investments. FG participants perceived the government to be unaware of the lack of means and did not acknowledge any improvements in the aftermath of the Prestige.

I. Sustainable development: A) Oil spills: 2 Resources ii. Cooperation

According to elites, national and international cooperation and coordination are further resources by which oil spill management action can be facilitated. The main issues within international cooperation are: the existence of *International*

Environmental Agreements (IEA's) and *legislation*, cooperation among *private international firms* and sharing *international research findings* among countries.

A polycentric policy system makes unified decision-making in oil spill management in Spain a complex task. This is arguably one of the reasons for the ongoing competence delimitation and cooperation problems among institutions and government departments that were stated by all elite interviewees except for the conservative party representative[65] interviewed. Fear of losing control and power over resources and decisions was acknowledged by elites to hinder daily cooperation among different departments. Leadership and personal relationships across departments are seen as key drivers to smooth cooperation and coordination according to SLLG14M07F and VS26M07J. Training and simulation exercises were acknowledged to hold the potential to improve cooperation (TA25C04O, P25C04E, U25C04J). In fact, all oil spill drills from 2005 onwards stress the need for coordination among different institutions[66]. Surprisingly however, some interviewees admitted that cooperation and coordination among departments was easier in crisis situations (TA25C04O, P25C04E, U25C04J).

At the institutional level, competences in oil spill management are clearer while the spill is in the sea as it is the State Merchant Navy Office that is in charge. Once the spill reaches the coast the local government would react but there may be instances in which the State Coastal Office or the Ministry of Environment have to take action. This creates a complex institutional structure (SLLG14M07F). Despite the 'paper-based' requirements for coordination in contingency plans, this is an unresolved issue for interviewees. Fostering cooperation could come from either expanding civil defence services scope for action including oil spills in their competences[67] or creating a National Crisis Management Agency with regional and local agreements to ensure cooperation that is sensitive to local realities and knowledge (NJFMG10M04C, SLLG14M07F, VS26M07J and FM09M02A). Political leadership is seen as key in fostering coordination and communication strategies.

The international dimension of hydrocarbon transport was also acknowledged by elite interviewees. This resulted in demanding further international cooperation and

[65] Then in power.
[66] http://www.salvamentomaritimo.es/index.asp?lan=SP&acc=no&menu=B6
[67] As of the 13th of January 2010, civil defence is awaiting the passing of legislation that may expand its competences in the area.

regulations regarding inspections, maritime traffic control, homogenised paperwork (e.g. ship dispatch data), technical means, liability regimes (NR&MTC21C03X) and R&D initiatives (FD01SC08R). These demands result from the acknowledgement of the limited effectiveness of a single country's oil spill prevention strategies (ML27C01R, SLLG14M07F and VS26M07J). Research efforts undertaken by international institutions are also seen as paramount in implementing adequate management strategies for species recovery FD01SC08R. This was coupled with the need for cooperation with privately owned multinationals such as Repsol that extracted hydrocarbon from the *Prestige* and sealed the leaks of the vessel that was 3,800 metres deep.

Focus group participants exhibited overall a negative attitude towards what is seen as a complex myriad of institutions operating within national borders in oil spill situations. These institutions are perceived to lack coordination and cooperation among them. Additionally FG5 acknowledged a lack of competence delimitation parallel to that voiced by some of the elite interviewees. The normative belief put forth was the need for an institution in charge of coordinating all agencies involved. This demand is also similar in nature to those voiced by a significant number of elite interviewees.

Comments and demands from focus groups when discussing *cooperation and coordination at an international level* also showed a negative perception of EU and world wide level of cooperation regarding oil spill management (FG1, FG5). The main concerns were the lack of EU action as well as the need for further competence delimitation stating there was a 'legal mess' after the Prestige (FG5). Focus group participants thought there was a need to strengthen control of oil tankers at an EU and world wide level. FG participants also expressed their doubts on the trustworthiness of other governments to effectively exercise control over vessels. This statement indirectly referred to countries that licence vessels under unsafe conditions (the so called flags of convenience[68]).

In contrast to elite interviewees, no focus group discussed the potential cooperative role of *private firms* in oil spill management. On the other hand, comments regarding the cooperation by research institutions and organisations (overall referred to as 'the

[68] According to Osieke (1979) the concept of 'Flags of Convenience' was coined in the aftermath of the First World War. It refers to countries that registered non-national ships in order to reap the economic benefits of these registries without exercising due control over the safety conditions of the vessels.

experts') were put forth. The main normative beliefs discussed included the idea that a myriad of experts should be involved in oil spill management (FG7). The demands regarding the role of experts were multi-faceted including knowledge generation, making policy recommendations, aiding in solving problems, sharing their findings and making recommendations on how citizens should manage these spills. Regarding the production of knowledge in the area of oil spill management scientists were called to 'improve everything' (FG8) indirectly assigning a prescriptive role to science in line with the overall call for expert decision-making in oil spill management voiced by elite interviewees. Additionally, experts were expected to reach out to civil society, informing potentially affected citizens of what to do in future oil spill situations.

Comparing elite interviewees and FG participants views on cooperation it is clear that they voiced similar concerns and demands. The complex institutional structure that entails moving towards governance (in the government – governance policy continuum) is seen as a barrier to effective oil spill management. Additionally, both elites and FG participants coincided on demanding a single institution with power and resources to coordinate all emergency situations.

Both elite interviewees and FG participants acknowledged the relevance of international coordination. FG participants demanded coordination regarding vessel safety requirements, expanding liability and on defining competences when talking to FG participants. Elite interviewees added more technical and operational matters to their requests pointing towards the desirability of homogenising all ship dispatch paperwork. Again, some FG participants were more sceptical than elites regarding the effectiveness of governments in achieving this coordination.

Where cooperation between governments and private firms in oil spill management was seen as fundamental by elites, focus groups failed to mention this potential partnership. Finally cooperation among scientists and governments was seen as beneficial for oil spill management as long as expert-led decision-making is not interfered with by political interests.

I. Sustainable development: A) Oil spills: 3.Outputs

Following Roberts' (2004) framework explaining policy *outputs*, the interaction among resources, context, support and demands of stakeholders have resulted in: *Prevention*

and management plans and compensation strategies. Elite Interviewees' overall assessment of these outputs could be summed up in what Richardson (1982, in Viñas, 2009) calls a reactive-consensual response whereby a crisis spurs government reaction. This reaction is then shaped by the consensus and pressure exercised by the main agents involved in the crisis.

Examples of reactive behaviour in oil spill management are analysed by Xunta de Galicia (2005b) where the Green Book on Maritime Policy states there was a new organisational impulse *after* the Prestige. At an institutional level, the CEPRECO[69] was the institution created to coordinate pollution fighting, foster legislative homogeneity and encourage R&D in oil spill management; its birth 2 years after the spill also illustrates the reactive nature of policy-making. A further example of this reactive behaviour is the development of the basic legal framework for the later development of regional contingency plans in Galicia (decree 438/2003). Another example of reactive policy in oil spill management in Spain is illustrated by monetary compensation schemes that are developed *ad hoc* after spills take place (see for example the Royal Decree 4/2003 that regulates compensation schemes to be paid after the Prestige). No strategy exists regarding compensation schemes before spills occur according to SG27SC04S and even though the specific cases and particularities may be legislated when the spill takes place, a general agreement would be desirable before hand according to NJFMG10M04C and NL27SC04A .

This reactive behaviour however is not unique to Spanish oil spill management strategies. At a European level the adoption of the Erika packages to increase maritime safety is a further example of reactive policy-making in the oil spill management field. According to the EU '*following the Erika accident*, in March and December 2000 the Commission presented two sets of measures intended to improve maritime safety'[70]. At an international level and going back to the *Exxon Valdez* oil spill the US government enacted the OPA 1990 which 'was signed into law in August 1990, *largely in response to rising public concern following the Exxon Valdez incident*'[71].

[69] The 12th of November 2004 by the Royal Decree 2182/2004 (*almost 2 years after the spill*)
[70] http://europa.eu/rapid/pressReleasesAction.do?reference=PRES/01/353&format=HTML&aged=1&language=EN&guiLanguage=en (emphasis added)
[71] http://www.epa.gov/oilspill/opaover.htm (emphasis added)

These include the National Salvage Plan (*Plan Nacional de Salvamento*) and the Contingency Plans (*Planes de Contingencias*). The main goal of the plans was to improve pollution management and prevention of oil spills. More specifically, the *National Salvage Plan 2006-2009* (henceforth NSP) focused on two areas. First, the prevention of maritime emergencies and pollution mainly via increased inspections and training. Second, the management of maritime emergencies multiplying by six the government investment (reaching 1,022M€ at the end of the plan). These funds were essentially assigned to acquiring technical means such as boats and helicopters and reducing response times. The increase in resources brought about by the NSP was overall acknowledged by all elite interviewees who saw this as a significant improvement compared with the previously available pollution fighting means. Further demands in terms of prevention were nevertheless voiced. These demands (see table 3.4.3 below) included increased control, improvement in communications and increasing R&D to account for economically or environmentally sensitive areas.

Table 3.4.3 Elite Interviewees' demands on prevention of oil spills

Concept	Demand
Control	Increase the number of ship inspections over and above what is required by international agreements and by the Spanish law
	Expand satellite and aerial coverage to increase vessel control
	Further personnel to ensure 24hour ship dispatch along the coast to prevent self-dispatch of sub-standard vessels
Communications	24 hour coverage through channel 16 VHF is needed
	Improve training in English via international and national agreements and regulations to ensure all maritime personnel can communicate in case of emergency
R&D	Redesign maritime corridors to take into account potential damage to economic activities and natural resources
	Define tailor-made protection for areas of special economic relevance and environmental sensitivity that are to be integrated horizontally across policy areas and institutions (maritime salvage, economics, environmental protection, etc).
	Provide cost estimates for prevention and management efforts but take into account 'other' (social) criteria to make decisions
International cooperation	Agreements to share available means are essential to ensure adequate monitoring and response to spills in light of the expected increases in maritime traffic
	Increase liability and compensations

Source. Elite interviews

Oil spill prevention strategies are complemented by *Contingency Plans.* These plans work at various institutional levels and are interconnected. Their main goal is to

prevent and manage maritime pollution. Their scope and activation are succinctly summarised in table 3.4.4 below.

Table 3.4.4 Oil spill management plans

Plan	Scope	Activation
International Contingency Plan	International	When two or more countries are affected and the National Contingency Plan is insufficient to deal with the spill
National Contingency Plan	National. Applicable to territorial seas and exclusive economic zone of a country	When the spill takes place at the sea or when the consequences of a spill cannot be managed by the territorial or interior contingency plan
Territorial Contingency Plan	Regional. Autonomous Communities	Pollution affects the coastline and cannot be managed with the means available for the Interior Contingency Plan
Interior Contingency Plan	Harbour or port installations	Pollution affects the port/harbour installation

Source: Ministerio de Fomento (2001)

Although international cooperation was mentioned as vital in oil spill prevention and management strategies, only one elite interviewee made reference to International Contingency Plans and to specific international agreements that inspired the National Contingency Plan (the OPRC[72]). At a national level, the main goals of the National Contingency Plan, Ministerio de Fomento (2001), are the development of operational guidelines for oil spill management, which would define the criteria for the development of regional and interior contingency plans and develop coordination across institutions[73]. The most salient comments from interviewees include coordination concerns, demands for further specification in contingency plans and demands for assigning priority protection to economically relevant areas.

Coordination among institutions began in earnest in 2006 according to some elite interviewees. This coordination refers to institutional integration of decision-making processes. All interviewees demanded a single National Emergency Agency à *la* Spanish civil defence services that dealt with all emergencies. This would imply having local and regional plans including risk and sensitivity maps. These plans would be integrated into the national plans so that a compatible and homogeneous operational response could be offered. Similarly, a CEDRE[74] type centre was called for by some

[72] The Protocol on preparedness, response and coordination to pollution incidents by Hazardous and Noxious substances.
[73] http://www.cedre.fr/project/erocips/wp4/sp/orga/plan_nacional_de_contingencias.ppt
[74] The CEDRE is the French centre for research and analyses of accidental water pollution. It is the reference R&D centre for oil spill analyses in the EU.

elite interviewees in order to ensure continuous monitoring and swift operational decision-making (GL26C01F). Experts detached from political pressures are called for as decision-makers by some interviewees as well as by international institutions such as the CEDRE (GL26C01F). Other interviewees limit the role of experts to an advisory one (FM09M02A). In any case, the role of experts in providing information in oil spill prevention and management is overall seen as very important.

Priority protection to sensitive areas was firstly assigned according to economic criteria (e.g. fishing areas and tourist areas). The environmental concerns (e.g. damage to natural parks) are taken into account after economic concerns are considered. Priority protection entailed fundamentally sending more boats and barriers. There is no tailor-made approach (i.e. analysing what means would be the most appropriate for a given sensitive area in order to ensure its specific protection requirements are met (FM09M02A)). One of the interviewees even stated that 'No one knows in sensitive areas what they have to do in these cases' (GL26C01F). The territorial contingency plan was not developed in Galicia at the time of the interviews. Interviewees' assessment of the existing contingency plans at the time of the interviews will be presented in table 3.4.5 below and compared to the later approved regional Contingency Plan for Galicia.

Table 3.4.5 Elite interviewees' demands on contingency plans

Concept	Interviewees' demands pre-territorial contingency plan	Territorial Contingency Plan	Remaining concerns
Institutions	Define competent bodies	Competences defined	The amount of institutions may make coordination difficult
	Create a National Emergencies Agency	National Emergency Agency has not been created	
Resources	Increase technical means	National salvage Plan has increased available means significantly	Given the expected increase in maritime traffic, will the available means be enough to control traffic and respond to emergency situations?
	Increase personnel		
	Ensure decision-makers can request additional means		
Policy Instruments	Legal requirements should be developed to ensure regional contingency plans are developed	The Territorial Contingency Plan for Galicia was finally presented in 2007 five years after the spill.	EU & Spanish legislation leave to international (voluntary) agreements compensation and restoration. Damages not covered by these are borne by citizens.
	As a second best option the civil defence plan was used		Limited liability regimes hinder precautionary approaches. Pollution is 'cheap'
Information	Data on available means and deployment times should be available and updated.	Risk and sensitivity maps were starting to be developed	Will risk and sensitivity maps be used?
	Cost data on contingency plans should be available		Will this mean not only more but also better protection?
	Data on sensitivity and risks is needed to reduce uncertainty of decision-makers		
Competences	Clarification should be provided regarding who should develop regional contingency plans	The regional government developed the territorial plan through its fisheries and maritime department	Are all competence intricacies sufficiently clear?
Coordination	Needs to improve	CECOP (Centre for operational coordination) was created	A myriad of institutions is still involved and there has been no full scale drill. Coordination problems may persist

Sources: Elite interviewees and Xunta de Galicia.

Focus group participants expressed a generalised belief that prevention and effectiveness were largely missing in government response to oil spills (in accordance with theoretical predictions discussed above by Birkland, 1998; Birkland and Nath, 2000; Birkland and Lawrence 2002). Preventing oil spills was seen as a worthy investment with some respondents from FG2 stating that it was cheaper and more desirable to prevent spills rather than having to manage their consequences. One of FG's (FG1) argued that citizens were both responsible and able to prevent environmental damage. FG participants reiterated the acknowledgement of the impossibility to eliminate the risk of oil spills but continued demanding all efforts should be made to minimise the risk of these accidents. One of the participants in FG5 broadened the framing of the issue and proposed a cost benefit analysis of maritime transport of oil as a decision-making tool to regulate (by limiting) vessel traffic. The main demands regarding prevention and management are summarised in box 3.4.1:

Box 3.4.1 Focus groups' demands on oil spill prevention and management

1. R&D on oil spills, areas that may be affected by spills and citizen actions. This R&D was to be integrated into interdisciplinary team of experts that was expected to include local institutions.

2. The establishment of sacrifice areas was overall seen as a desirable option along with the proposal of using previously degraded areas for this purpose.

3. Investments in oil pollution fighting equipment such as tug boats, safety measures for volunteers, barriers and aerial surveillance.
4. More personnel to inspect and control vessel traffic.
5. Additional involvement of other civil servants such as trained personnel from the army to respond to major oil spills.

Source: Focus groups

In order to further analyse prevention and to help bridge the gap in the literature as regards the analysis of the benefits of sustainability (e.g. analysing WTP to preserve natural capital) as stated by Atkinson *et al.* (1997), focus groups were asked about their WTP to prevent future spills. The analysis of the responses to the valuation question is divided into three parts: clarifications requested by participants, choices made and determinants of WTP. *Clarifications* sought by FG participants underlined the relevance of *payment specifications*. Questions formulated included whether the payment vehicle would be *coercive or voluntary* despite the fact that FG participants were told that they would pay for improved oil spill management through taxes. As

expected, there were participants who opposed an increase in taxation stating '*I would not pay extra taxes as I believe I pay enough for the government to do what it is supposed to do'* or '*I would not be willing to pay because I don't know exactly where the money will go to'* whereas others were less concerned about the payment vehicle '*I would pay both via taxes or donations*'. Some participants demanded an *environmental fund* that would serve to manage a bundle of environmental problems rather than funding a specific problem such as oil spills, signalling the possibility of finding biased answers in the final questionnaire.

With few exceptions, *voluntary payments* did not raise opposition and one of the participants stated his higher WTP subject to a voluntary payment. Doubts remain on whether voluntary payments would be effectively made as free-rider behaviour has been observed (Bateman *et al.* 2002). Despite the fact that the scenario stated everyone would pay, focus group participants asked whether everyone would pay or only some citizens and whether payments would be progressive (i.e. higher taxes would be paid by wealthier citizens). They were also concerned about the timing of the payments, whether these would take place before the spill or after and whether the payment would be done in one go or in small instalments. The payment frequency (whether it would be a one-off payment or a repeated contribution) was also asked during the FG session. In the development of the survey these concerns were taken into account and a fully specified payment vehicle was presented (see annex A.3.1).

The second concern regarding the WTP scenario was related to how the money would be spent. That is, greater specification than that initially offered in the exercise was demanded regarding which investment options would be included in the prevention and management plans, whether these would include prevention and safety measures, which mitigation measures would be pursued, whether compensation would be paid and what would happen to an annual payment if there were no accidents in a given year. These issues were addressed in the survey and tests of the main options were undertaken in the pilot.

A further *question regarding the purpose* of the exercise voiced by FG5 in the following statements ('***Sula*** *- I didn't understand what you want;* ***Sus*** *- Neither did I*) pointed towards the need to stress the rationale of the whole exercise. These comments signalled the need for further work on the valuation question as it was clear from the

discussion in the focus groups that there were problems in understanding the purpose of the exercise as well as its relevance. The researcher explained the purpose of the exercise FG participants answered the valuation question.

The majority of FG participants (80%) were willing to pay to prevent medium and large spills[75]. The main reasons to pay were that investment in prevention and management plans would avoid future spills, that the effort was not unreasonable or that they were concerned about these spills. Demands for control and law abidance were repeated for example in FG3. The remaining 20% stated they would not pay. The reasons given for not being willing to pay were either the lack of resources, that others should pay or that they already paid enough taxes.

The percentage of protest bids in this exercise was 12%. This figure is lower compared to protest responses reported in the CV literature (see for example Brouwer *et al.* 2008, Atkinson *et al.* 2008, Jorgensen *et al.* 1999, Halstead *et al.* 1992, Strazzera *et al.* 2003). A possible reason for this lower protest rate can be the limited number of FG respondents, the fact that FG participants self-selected themselves and hence may be more willing to engage in valuation-type exercises or the fact that the valuation question was placed near the end of the FG session and hence respondents may have been influenced by the information received.

Protest answers were excluded from the calculations (Bateman *et al.* 2002). Answers were considered as protests if their WTP was zero plus participants stated as a motivation not to pay that others should pay (either vessel owners or the government) or they ranked consequences to the environment first in the sort card exercise (showing a high concern for the environment). As FG results cannot be generalised no broader conclusions can be drawn at this stage although the following chapters will analyse the issue in greater detail.

Regarding the amounts respondents were willing to pay 59% stated they would pay 50€ per year and 9 participants (18%) stated they would be WTP 400€ to manage future spills. Out of the 9 participants who stated they would be willing to pay 400€, seven (14% of the total amount of participants) chose a strong sustainability scenario in the compensation exercise and awarded very high or maximum concern to oil spills in the 1-10 concern scale explained below. These participants could be considered as

[75] Compared to a lower percentage of survey respondents (just above 54%) were willing to pay.

exhibiting strong sustainability preferences. The fact that these participants were not a representative sample means these results were only indicative of what may have been found when the final survey was administered. The main motivations of FG respondents' answers on the willingness to pay question are summarised in table 3.4.6 below:

Table 3.4.6 Reasons for FG respondents' answers to the willingness to pay question

Variable	Comment
Income	Higher disposable income was acknowledged to be positively related to WTP answers by FG participants
Communication strategies	The greater the payment effort requested from participants, the greater demands for explanations on how the funds would be allocated. To illustrate, one FG participant said 'I think we have to do something about the spills but there has to be information about where the money is invested and we have to see results'
Trust	FG participants were overall concerned with politicians' trustworthiness when managing public funds. One of the participants stated 'I don't trust politicians to be honest and use the money appropriately. Once the money is paid we could find someone could steal the money and say there is no more money to manage the spill'. Providing information on who is spending the money and how the money is allocated and controlled were concluded to be confidence builders
Law enforcement and abiding	Participants were willing to pay for accidental oil spills provided law had been abided by agents in the maritime business. One FG participant illustrated this by saying: 'I would be happy to pay if it is an accident but not if regulations have been ignored'
Payment and payment vehicle	As expected taxes were opposed by some of the interviewees. Interestingly other interviewees were supportive of earmarked taxation to manage spills yet others were indifferent regarding the payment vehicle. Questions regarding the duration of payment and the possibility of paying in small instalments were also raised. As is the case in income taxation in Spain progressive taxation was demanded by FG participants
Convenience	Some interviewees stated their WTP was subject to convenience and this payment is seen as satisfying the will to 'do something' about the issue
Decay effect	Time decay and geographical distance were acknowledged to reduce WTP of FG participants

Source: Focus groups

In sum, the elite interviews and the focus groups were conducted in the midst of the regulatory development of oil spill management. This means that some operational and legislative initiatives such as the National Contingency Plan (NCP) and the salvage plans were in place whereas others (such as the Regional Contingency Plan, RCP) were still in the making. Elite interviewees and FG participants coincided on their demand for further R&D efforts as well as on their requests for further control.

Elites' demands highlighted their expertise regarding the ongoing prevention and management strategies. Thus theirs alone is the demand for improvements in communication channels as well as demands for training seafarers and other technical personnel to be able to communicate in English. Elites also demanded international cooperation in sharing pollution fighting equipment and the development of continuously updated databases to keep track of available equipment and deployment times. FG participants on the other hand explicitly mentioned the need for interdisciplinary teams of experts that would include local authorities to manage oil spills.

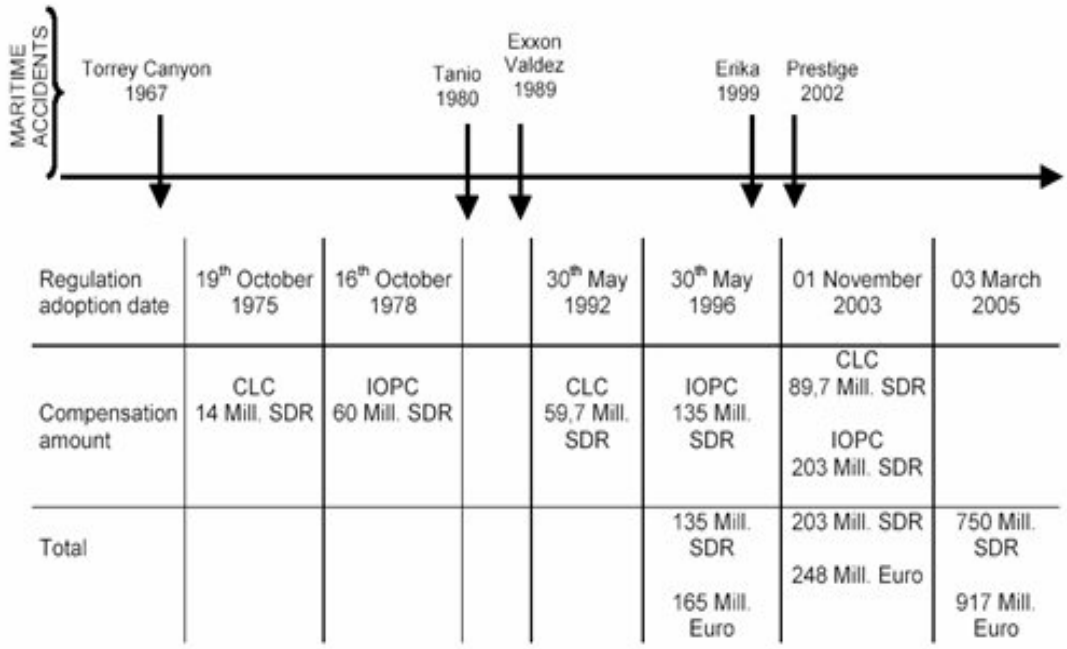
I. Sustainable development: A) Oil spills: 3.Outputs ii. Compensation strategies

Two main concepts were discussed regarding compensation. First, the monetary compensation strategies and second the recovery strategies (*Plan Galicia and Plan de Dinamización Economica de Galicia*). International compensation mechanisms under the IMO[76] limit the amount and the concepts for which any agent or institution can receive compensation (Mason, 2003). As Théaud *et al.* (undated: 2) state 'a significant part of the estimated costs may not be internalized via the liability system under which the compensation of damages is carried out'. According to these authors two factors have traditionally limited compensation. First, the difficulty in calculating global cost estimates of spills. The second factor is the asymmetric power of maritime agents who behave strategically. Beyond limits in compensation and following a strong sustainability paradigm, there might be losses that cannot be compensated (Spash, 1993).

A schematic representation of compensation amounts along with a timeline of different spills is provided in figure 3.4.1 below.

[76] The international framework applicable for compensation in Spain (Olmo García and Pintos Ager, 2003)

Figure 3.4.1 Evolution of the Compensation Limits under CLC and IOPC[77] Funds



Source: González Laxe (2005)

In Spain laws and royal decrees have been passed *after* major spills to regulate compensation[78]. The vast majority of claimants after the Prestige spill received money from the Spanish government. Then the government claimed before the IOPC Funds[79]. Claimants in Spain forfeited their right to future compensations when they accepted the governments' funds. This is an interesting feature of the way compensation is claimed which is different from that of other European countries such as France for example where affected parties did not receive compensation from their government and claimed compensation directly from the international funds available under the CLC 92 and the IOPCF when the *Erika* spill happened.

The existing compensation process means that Spanish citizens, through their tax payments end up funding compensation that is not paid for by the international instruments at hand. Hence, compensation for non-use values lost is not included in compensation schemes. This is illustrated by one of the elite interviewees involved in the coordination of prevention and management plans who stated *'the issue is that the IOPCF compensated for 15 to 30% of the damages suffered and the Spanish Government paid compensation for 100% of the damages'*. It therefore seems

[77] CLC is the acronym for Civil Liability Claim and IOPC is the acronym for International Oil Pollution Compensation

[78] The legislation passed alter the Prestige included the *Real Decreto Ley 4/2003 de 20 de junio and Real Decreto Ley 4/2004 de 2 de julio*

[79] http://www.iopcfund-docs.org/ds/pdf/92exc32-4-1_s.pdf

reasonable from a policy perspective to ask citizens whether they would want compensation and if so what type of compensation they would want.

Elite interviewees all agreed that monetary compensation when an oil spill happened was a vital policy outcome. The speed in distributing these funds among affected parties was seen as both a political move to appease citizens (ML27C01R) and as a significant improvement compared to previous compensation paid in earlier spills. In contrast to what happened after the Prestige, agents affected by the *Aegean Sea* spill waited for over 10 years to receive compensation (FM09M02A, NL27SC04A). In any case, some environmental losses such as biodiversity losses could not be compensated according to (ML27C01R).

Elite interviewees voiced concerns over the lack of a clear institutional framework that determines how oil spill compensation should work in future spills and raised the question of which Ministry (perhaps the Ministry of Economy) should channel this compensation. The recommendation in this area would be to have some sort of National Compensation Strategy that is an overarching compensation framework. This framework would be further specified and developed as plans or specific strategies once a spill takes place.

The *economic recovery plans* (*Plan Galicia and Plan de Dinamización Económica de Galicia*) developed after the Prestige oil spill were also discussed in the elite interviews. These plans were modified and diluted with the change of government after general elections and regional elections[80] (ML27C01R and SG27SC04S). Again the views of the conservative government representative *versus* political opponents and other stakeholders were divergent. The main argument voiced by the conservative party representative was the adequate analysis of the needs of Galicia after the spill. He claimed that this resulted in investments by the government according to ministries requirements. The Plan Galicia was in his view a 'well thought out plan in which the budget entries (headings) corresponded to the demands made by each ministry' (*ibid.)*. This statement is backed by the information obtained from a regional civil servant in the pollution fighting area (NL27SC04A) who confirmed he was asked about his needs before the Plan Galicia was approved. Neither of these representatives were however

[80] See for example the testimonial reference made in the PEIT with regards to the *Plan Galicia.*

able to provide any factual data or internal memos that explained the decision-making process with regards to the economic recovery plans.

Industry representatives, although showing a positive attitude towards the economic recovery plans, did highlight the political nature of these plans subject to lobby pressure, subject also to an international situation (that of the renegotiation of EU's structural funds) that could halt infrastructure investment in Galicia, a less developed region in Spain according to the industry representative interviewed. 'It was seen as the opportunity to incorporate Galicia to Spain's development path. The goal of the Plan Galicia was to pay the 'historical debt' by the state (that includes among other an infrastructure deficit) and provide funds before the EU considered the adhesion of new member states and thus the structural fund flow to Spain ceased' (SG27SC04S). These factors shaped, according to this industry representative, the outcome of the economic recovery plans. Critical views regarding the economic recovery plans (voiced by GL26C01F, NR&MTC21C03X, ML27C01R and NJFMG10M04C) state that these plans were only a political marketing strategy. Furthermore, according to NL27SC04A, GL26C01F and NR&MTC21C03X, investments that were planned and approved before the Prestige oil spill were 'repackaged and relabelled' as the Plan Galicia. This statement is backed by González Laxe's (2003) analysis of the economic recovery plans.

The overwhelmingly higher investment in the economic recovery plans compared to the damage claims presented to the IOPC fund suggest there were additional (mainly political) reasons for these plans other than the damages that could be valued in monetary terms. Investing in inland infrastructure more than half of the National Plan when the spill occurred on the coast did not make sense according to GL26C01F, ML27C01R, TA25C04O and LD26SC04B. The most representative statement of this line of argument was given by LD26SC04B who stated that 'after analysing the Plan Galicia we concluded it was the first black tide that had no environmental consequences'. This surprise regarding the scant references and actions (of the *Plan Galicia* and the *Plan de Dinamización Económica de Galicia)* to invest in environmental projects could point towards demands for stronger version of sustainable development compared to that exhibited by industry representatives or politicians interviewed.

The businessmen representative interviewed (SG27SC04S) as well as maritime businessmen representatives (AQL&GA23C03J) welcomed the investment, possibly exhibiting a weak sustainability approach to the solution given by the government. The absence of economic and environmental analysis and the lack of data explaining why the money was allocated the way it was also pointed towards the political nature of the response. A summary table of the main findings is provided below in table 3.4.6.

Table 3.4.6 Economic recovery plans: main comments according to elite interviewees

Largely backing the economic recovery plans: Conservative party representative, businessmen representative & ship agent		Opposed/partially opposed to the economic recovery plans: Political opponents (nationalist and socialist party representatives), civil servants and NGO's
Conservative party	Well thought out plan. Not improvised	Political response to the spill
	Investment planned according to ministries requirements	Previous investment 'repackaged' as Plan Galicia without economic or environmental analysis
Industry representatives	'Investments are good although they are the result of a Historical debt'	Government response to historical infrastructure deficit in Galicia (known as the 'historical debt') thus not solving the damage or reducing the risk
	Investments are good although there are no execution dates (they lack specificity)	Investment was much greater than damages caused and scant funds were allocated to worst affected areas (only 0.7% of the budget was allocated to these areas). No explanation was offered regarding how the funds were allocated.
	Investments are good but infrastructure investment responded to industrial lobby pressure and threat to take business from Galicia if railway infrastructures were not built	Investments in infrastructures and unrelated marine activities. 'After analysing the Plan Galicia we concluded it was the first black tide that had no environmental consequences'LD26SC04B
		The economic recovery plans were a tool used to counteract the bad communication strategy of the government. Thus 'everything was Plan Galicia' TA25C04O
	Historical debt + Prestige + EU structural fund renegotiation + lobby pressure = Plan Galicia	Funds coming from National Budget and only partially recovered by recourse to IOPC funds.

Source: Elite interviews

Two broad issues were discussed when analysing *compensation strategies in FG sessions.* Initially, monetary compensation paid to directly affected parties was discussed. Later on, FG participants were briefed about how compensation schemes work. Finally, the hypothetical compensation packages were presented for participants to choose from.

The main comments regarding monetary compensation paid to directly affected agents (e.g. fishermen) was greeted by FG participants with positive attitudes as they were seen as an effective mitigation measure for economic losses (FG4). Some FG participants however judged payments as excessive compared to the money recipients would have made in the absence of a spill (FG5, FG6). There was nevertheless a

generalised feeling that this money had also been used to '*calm people down'*. This comment coincides with some of the elite interviewees' assessments of compensatory payments provided by the government in the aftermath of the Prestige spill. In addition, trust issues were voiced regarding the allocation of compensation funds with participants in FG1 stating that they would not trust the government to provide compensation in future spills.

During the FG sessions participants were asked to choose their preferred compensation 'package'. The compensation exercise presented three hypothetical compensation options, one in which after the spill the government would invest in infrastructures (assuming man-made capital could substitute natural capital), another one in which there would be a replacement of natural capital for lost natural capital (replacing like-for-like) and finally a scenario in which preventive measures to protect certain areas is ensured (surveillance and vessel transport limits are set to protect especially valuable areas).

The compensation options included in the FG protocol were believed to be theoretically feasible scenarios given the fact that the plans for investment in infrastructures in fact took place in the aftermath of the Prestige[81], replacement strategies were suggested by elite interviewees as well as by experts from the ITOPF[82], and that the third compensation package (that of prevention through surveillance, establishment of sacrifice areas and push for unlimited liability) was also suggested by experts consulted in the elite interview process and move towards satellite vigilance has been advanced by the EMSA[83].

Focus group participants overwhelmingly preferred the strong sustainability compensation options. Replacing like-for-like or preserving natural capital through prevention programs were chosen over receiving compensation in the form of investments in man-made capital. FG participants even suggested getting rid of this

[81] *Plan Galicia* and *Plan de Dinamización Económica de Galicia.* The national and regional economic recovery investment plans approved in the aftermath of the Prestige.
[82] http://www.itopf.com/environ.pdf
[83] EMSA is the acronym for European Maritime Safety Agency. It should be noted however that in the final survey this last preventive option was taken out of the compensation scenarios and replaced by the theoretically driven proposal by Aldred (2002) and Turner (2007) who proposed that when faced with environmental losses, monetary compensation may not be adequate but compensation in say schools or hospitals may be more appropriate. Focus group comments as well as the pilot interviews conducted for this thesis backed the change in compensation scenarios. The information on prevention was nevertheless used in the final questionnaire to build the WTP exercise in stating the provision of prevention to respondents.

policy option (investment in man-made capital) or the possibility of allocating all investment funds to prevention or restoration programs. FG participants did however state that they would have preferred that the exercise had allowed them to choose 'a bit of everything' rather than forcing them to choose just one compensation option.

The main reasons given for choosing each option are as follows. For the few FG participants that chose investments in man-made capital as the preferred compensation option, the main reason was that the economy was the most 'important thing'.

When choosing replacing like-for-like FG participants stated that the investments in restoring and replacing the damaged environment would help minimise the damage caused by the spill. Restoration was said by some participants to be the most important initiative once a spill has taken place, '*I would choose restoration in both cases as I think the most important thing to do once a spill has happened is to restore first and then, in the medium term, to prevent*'.

The main reasons for choosing the third compensation option (i.e. investments in safety and prevention) included that it was the cheapest option, it would save money (in terms of not having to manage future spills) and it was seen as an effective tool to prevent further oil spills. The prevention option was also seen as an efficient 'insurance policy', '*I would choose option 3 in both cases because advances on safety measures for boats should entail fewer accidents and the government would not have to invest so much in these accidents'*. Additionally, the consequences of a large spill with potentially irreversible losses and the consideration of the environment as the basis for all other activities (primary value) were also mentioned by some of the FG participants when asked about the reasons for their choice. One of the FG participants said '*I would choose option 3 in both scenarios as I believe it's the basis of everything. I think we could have a little bit less 'modernity' of these things* (infrastructures) *that are so expensive in order to help other things to which we assign little importance such as flora, fauna, the sea'*.

It must be highlighted that in order to avoid further politicization over past government investment initiatives, FG participants were not told that the compensation option that entailed investing in infrastructures largely corresponded to the bulk of the investment plans approved by the Spanish regional and national

governments in the aftermath of the *Prestige* spill. The technical nature of budget entries and the fact that the spill happened in 2002 and the FG took place in 2007 makes it unlikely that FG participants would link the policy option that implied investment in infrastructures to past government investment initiatives. In fact no one in the FG's was aware of the budget passed by the government. Thus the possibility of dismissing policy option 1 (investments in infrastructures) by respondents due to outrage or opposition of the previous government could be discarded. That policy option was retained in the final survey as the *status quo* compensation package.

Both elites and FG participants viewed monetary compensation as a needed and positive response by the Spanish government in the aftermath of a spill. The positive outlook was qualified by elites and FG participants as they acknowledged the political move to appease citizens, which was partially engineered through these payments.

Budget entries for the economic recovery plans were analysed by elites and then used in the FG sessions as one of the compensation packages offered. Elite interviewees answered in line with either their political or professional *persona*. Support for the economic recovery plans was voiced by the conservative representative, business representative and civil servant in the regional fisheries department. Opposition and criticisms to the recovery plans were expressed by academics, nationalists, civil servants in the regional civil defence service department and the NGO representative.

FG participants' answers showed that most respondents preferred either the compensation scenario in which there was replacement of natural assets for damaged natural assets or the compensation package that was devoted to prevention. Investment in infrastructures was preferred by a fifth of FG participants in the first two FGs and by none of the remaining FG participants.

I. Sustainable development: A) Oil spills: *4. Substitutability*

> *'substitution is a matter of individual's subjective preferences…if people belief in some principle such as avoiding the loss of a resource, then it would be wrong for experts to assume that one resource is a perfectly good substitute for another'* (Bateman *et al.* 2002: 75)

Among elite interviewees a clear divide was shown with regards to the possibility of substituting man-made capital for damaged natural capital. Nationalist party and civil

society representatives favoured a strong sustainability stance. They stated either the limited substitution possibilities or the impossibility of substituting certain resources. In this sense, they questioned economic recovery plans that assumed substitutability across different types of capital and compensation in the form of man-made capital.

Hence, nationalists, civil society representatives and the civil servant working in biodiversity and natural spaces management argued that biodiversity losses for example could not be substituted but that the loss of certain commercial species (i.e. fish and shell-fish) could be substituted through the restocking of species. This statement encouraged the possibility of exploring the substitution of 'like' natural capital for lost natural capital in the compensation question in the FG (and later in the survey). An additional asset that could not be substituted and for which no adequate compensation existed was cultural heritage according to elites.

Other elite interviewees, including the businessmen representative, the civil servant working in the fisheries regional government and the conservative representative signalled a weak sustainability approach to environmental losses. They showed support for the economic recovery plans (that implicitly assumed substitutability among different types of capital) and they said compensation packages were adequate.

The reasons for their support for the economic recovery (compensation) plans included the existence of a 'historical debt' in terms of a GDP and infrastructure development gap between Galicia and the rest of Spain. This was coupled with the re-negotiation of EU structural funds that were expected to reduce the amount of EU infrastructure money received by Spain. In addition, a powerful lobby in Galicia (the automobile industry) threatened the government to relocate part of its business elsewhere if infrastructures were not included in the economic recovery plans. These findings plus the analysis of the economic recovery plans provided the rationale for testing a weak sustainability compensation scenario in the FGs as well as in the final survey.

The focus groups explored the issue of substitutability of different types of capital through both the follow-up questions in the compensation exercise and as the general comments made throughout the focus group session.

A wide range of opinions were expressed regarding the substitutability of different forms of capital. Some respondents did not understand the rationale behind having roads and railways built as compensation for an environmental loss, '*But what does this have to do with an oil spill? If we have a spill in the sea what the hell do I want a motorway for?. O*ther respondents stated that all compensation packages were good, on different grounds, and therefore having a bit of everything seemed as an attractive option. Half of the FGs mentioned that money could compensate for economic losses but that other losses (flora and fauna) could not be made up for with money (FG3). *This opinion pointed towards the existence of intra-category substitutability (i.e. substitution within, say, man-made capital) but to a lack of inter-category substitutability (i.e. no or limited substitution between different forms of capital).* In addition, there was explicit recognition by participants in two of the focus groups of the economy being a subsystem of the environment, stating that economic activities depended on flora and fauna which were the '*important things'* (FG2, FG8).

Elite interviewees as well as FG participants showed a wide range of views regarding the possibility of substituting different types of capital. Pro economic growth respondents thought substitution of man-made capital for natural capital was desirable as boosting the economy would bring much needed economic growth and would bridge the development gap between Galicia and the rest of Spain. On the other hand some respondents both from the elite group and from the FG sessions did not understand and were opposed to the weak sustainability assumption made by the economic recovery plans. Within the respondents who opposed the man-made capital compensation package some of them considered replacing damaged natural assets with like natural assets thus walking the path of the softer version of the strong sustainability paradigm. This broad array of views among both elites and FG participants encouraged a further analysis of compensation options and attitudes towards substitutability in the survey.

I. Sustainable development: A) Oil spills: *5.Limits and thresholds*

As was stated in the literature review chapter, sustainability entails development subject to nature's limits both as a source and as a sink (Pearce *et al.* 1989). The use of natural resources beyond these limits can lead to situations in which there are irreversible losses. In order to manage marine resources in a sustainable manner these

limits would have to be respected. Elite interviewees were asked about natural resource management in order to develop within system's limits and about irreversible losses that may affect marine resources.

According to elite interviewees specialised in maritime *resource management initiatives* the divide between *commercially relevant environmental goods* and non-market goods is notable. With international agreements in the background of management initiatives[84], fishing activities have clearly established management guidelines that use the TAC[85] system. This system is based on limiting the quantity of fish caught based on scientific research with the goal of maintaining non-diminishing fish stocks. Thus, following the guidelines of the International Council for the Exploration of the Sea (ICES), precautionary biomass (Bpa) levels are established. These limits ensure the resources are not at risk even considering natural fluctuations. The ICES also establishes a limit reproductive biomass (Blim) below which the resource is in grave danger of having diminishing stocks. Between the precautionary biomass and the limit biomass the risk of having diminishing resources increases exponentially. There is also an equilibrium biomass (Beq) that provides information on fluctuations with regards to a reference year (which is normally the previous year). 'This data provides information for decision-makers regarding the possible consequences of altering the fishing effort' (PM09M05J).

The problems related to fishing management initiatives are varied. Once scientists have determined these levels (Bpa, Blim and Beq) and once they have produced their reports and recommendations, the TAC system undergoes a *political bargaining process*. This process results in consideration of economic and social factors that lead to increases in the final catch which can lead to overexploitation according to GL26C01F and PM09M05J.

Non-market environmental goods, including sensitive and environmentally relevant areas such as National parks, exhibit less concrete and less known *management policies* in Galicia with little or non-existent *specific* protection against oil spills according to GL26C01F, ML27C01R and FD01SC08R. The recommended approach towards especially sensitive areas would depend both on the characteristics of the

[84] See for example OSPAR agreements (http://www.ospar.org/eng/html/welcome.html) and ICES guidelines (http://www.ices.dk/indexfla.asp)
[85] Note TAC is the acronym for Total Allowable Catch.

environment and the activities to be carried out in the area according to FD01SC08R. Thus, physical planning of these especially sensitive areas should entail firstly identifying habitats to be protected and the elements within them; secondly, identifying those activities that are expected to take place within the given areas or activities that may affect these areas (i.e. maritime traffic). Thirdly, physical planning should require the determination of the level of compatibility between the habitat and the activities. The final task will require designing territory planning according to compatibility criteria.

According to elite interviewees and (WWF, 2010) the problem (in Galicia as well as in other coastal areas) is that environmental protection is very recent and marine areas are not effectively protected even if protection has been granted on paper. In fact there were no marine protected areas in Galicia when the elite interviews took place[86]. Protection of the sea as a public good is seen as the great challenge by FD01SC08R. On a more positive outlook, the implementation of Natura 2000 Network is expected (*ibid.*) to bring greater protection to environmentally relevant non-commercial species and areas.

Furthermore, the Spanish Oceanographic Institute is currently working on ecosystem indicators although no further information was provided by PM09M05J, regarding those indicators. The aim of their ongoing research is to find 'sustainable stocks in healthy ecosystems' (PM09M05J) and find parameters in which to base management decisions. This, according to PM09M05J, is in line with the EU Water Directive and with the forthcoming maritime strategy which will consider salinity, ichtyoplankton, phytoplankton,[87] the presence of invertebrates and biodiversity of marine areas as marine indicators.

The above information highlighted the fact that *protection is closely linked to economic importance of assets at risk*. International Environmental Agreements (IEA's), national laws and urban planning initiatives provide the legal framework for protecting non-

[86] Proposals to designate marine protected areas (MPA) in the area of 'Cachucho' and 'Banco de Galicia' were being developed by NGO's as well as by the Spanish Oceanographic Institute. As of February 2010 only the former has been designated MPA.

[87] Ichtyoplankton are fish eggs and larvae (http://csrd.lau.edu.lb)
Phytoplankton. 'These are tiny organisms with the ability to convert sunlight, warmth, water and minerals into protein, carbohydrates, vitamins and amino acids which marked the beginning of life. Phytoplankton, the single-cell plants are the basis of all other life forms on planet earth, they are the 'vegetation' of the ocean. Phytoplankton are responsible for making up to 90% of Earth's oxygen. Phytoplankton are the food utilized by the worlds largest and longest living animals and fish'. (http://www.whyplankton.com/)

market environmental goods. Growing citizen environmental awareness and government acknowledgement of this awareness bring conservation initiatives higher up in the policy agenda. The regulatory 'thrill' derived from the Prestige oil spill (Tan, 2006) seems to suggest a future of increased protection and awareness. The speed and depth of policy-making and policy implementation will however depend on the pressing issues local, regional and central government institutions have to deal with. The fact that policy-making is reactive in Spain in this area (Viñas, 2009) even if spills are recurrent, suggests caution as regards environmental protection expectations in this area.

The ideas of system's limits to withstand shocks and the idea of thresholds and irreversible losses were analysed in FG's explicitly through an exercise depicting a large oil spill that would imply trespassing system thresholds so that the 'environment collapsed'. FG participants were asked to discuss how the threshold situation presented would affect them, if at all, and what they would do about it (if anything). The goal was to understand whether respondents were familiar with the idea of thresholds, limits and irreversible losses. By presenting a situation in which limits could be trespassed and irreversible losses could happen, the credibility of such a situation was to be gauged as well as FG participants' beliefs, attitudes and intentions.

As expected, there was a wide variety of responses and issues raised in this exercise. Some respondents stated that they expected a situation such as the one described to arise sometime in the future (FG3, FG7). Other respondents were more sceptical about the scenario presented and affirmed flora and fauna were resilient, especially in a dynamic environment such as the sea. As one of the FG4 participants stated '*the spill would have to be huge to affect species'*. Broader issues regarding lifestyle choices were mentioned by participants in FG3 as the real danger in terms of reaching thresholds rather than a single spill causing irreversible losses. Overall, FG participants regarded the hypothetical threshold and irreversibility situation as a plausible one either as a consequence of repeated spills or as a consequence of 'other' threats.

Concern (worry) about environmental losses was shaped by the direct use FG participants made of the damaged environment, time and distance decay effect, biodiversity losses, economic consequences, governments' actions and the repeated

nature of the spills. The determinants of FG participants' concern in threshold situations are depicted in table 3.4.7 below:

Table 3.4.7 Concern drivers in threshold situations

Variable	Comment
Use	Direct use and contact with the affected environment increases concern regarding the threshold situation
Trust	FG participants stated that trust issues had a bearing on their concern. As was the case in elite interviews, information and transparency as well as the possibility of verifying what was happening and control over allocation of funds were seen as elements that would affect their concern
Decay effects	Both time and distance from the event reduce the concern expressed by FG participants
Biodiversity losses	Range of views. Some participants were highly concerned about biodiversity loss, mentioning the insurance value of biodiversity whereas others acknowledge biodiversity loss as a 'natural and ongoing process'
Economic losses	Following a pro economic growth rationale some FG participants were mostly concerned about economic losses (that would mean fewer resources would be available to protect the environment). Other participants were however less concerned about economic losses
Government actions	Government response if a situation such as the one described happened was said to increase FG participants' concern (i.e. if the government was seen to be actively engaging in the management of the spill, citizens would be more worried). However, participants were sceptical about the government's ability to provide an adequate response to such a spill.
Repeated spills	Previous spills were acknowledged to have increased awareness and concern of participants

Source: Focus groups

If a spill such as the one described happened participants' intentions included seeking information from the media, volunteering subject to convenience, donating money, changing consumption habits and even migrating. Changes in consumption habits were discussed by participants from some of the FG's without a university degree (FG3 and FG6). These groups discussed both the possibility of exploring alternative energy sources to reduce oil transport and the personal sacrifices they would be willing to undertake in terms of reducing their energy use. On this last point participants in FG3 acknowledged that their behaviour would be contingent on the behaviours of others, indirectly referring to the 'subjective norm' and actions of others as drivers for their own actions.

The demands expressed by FG participants in a threshold type situation included planning, prevention and mitigation strategies which were also the building blocks of part of the sustainability strategies voiced by elite interviewees. FG participants requested sufficient equipment and expert advice to respond to a potentially large spill

with irreversible consequences. Punitive and legal measures were also called for in order to ensure polluters were held responsible for the damage caused.

Comparing elites and FG views on limits and thresholds we saw the expected expert versus non-expert knowledge divide. Elite interviewees working in the field of environmental protection and natural resource management provided a technical explanation on the framework for analysing and observing environmental limits. Analysis of limits is clearly linked to the commercial value of the species. The protection of non-commercial species and areas in the sea is acknowledged to be very recent and patchy (in the policy development front). Environmental indicators are being developed to analyse the state of ecosystems but work in this area is in its infancy in Spain. The basic threats to system limits were said to be related primarily with overexploitation of resources, habitat destruction and pollution. Oil spills were seen as a threat although recovery from oil spills such as the Prestige was expected to take about 15 years (GL26C01F).

FG respondents overall had no problem in grasping the idea of system limits and even referred to the possibility of reaching these limits either as a consequence of repeated spills or as a result of other human induced threats (that largely coincide with the threats mentioned by elites). Other respondents were more sceptical about the idea of system limits being reached arguing that the environment, and especially the marine environment in Galicia, was dynamic, resilient and showed a remarkable recovery capacity.

I. Sustainable development: A) Oil spills: *6. Equity*

Intragenerational equity concerns were repeatedly voiced by most elite interviewees who overall assigned great importance to people directly affected by oil spills. They called for compensation to directly affected parties, particularly fishermen, and saw monetary compensation as a priority in case a new spill happened (NL27SC04A, FM09M02A, LD26SC04B, TA25C04O and GL26C01F).

Elite interviewees were overall more concerned about the immediate consequences of the spill than about the long term consequences (NJFMG10M04C, ML27C01R) although there were calls for more future oriented policy-making (ML27C01R). Some references to future generations were made when answering the last question of the

elite interview on sustainable development. The nationalist party and the NGO representative stated that concern about present generations was greater that concern about future generations although they qualified this by stating that after the *Prestige* some fishermen had started demanding measures to preserve certain maritime areas to ensure fishing resources for future generations.

Most focus groups expressed a positive attitude about both people that might be affected in the present generation (e.g. fishermen) and by generations to come (e.g. their children and grandchildren). Bequest values, insurance values and existence values were mentioned as reasons to be concerned about present and future environmental losses derived from oil spills. In addition to this, there were broader claims to act at an individual level 'for the common good' (FG6), clearly signalling that some FG participants were stepping into the shoes of their 'social persona' when thinking about their intentions regarding environmental goods and services.

Not all participants were concerned about others and future generations though. In fact one of the participants in FG2 was adamant about solving present problems and immediate damages rather than devoting any resources to future occurrences. Normative beliefs, regarding what had to be done regarding equity, included the need for monetary compensation to directly affected parties as well as a change in education and a more 'environmentally friendly' way of life for future generations.

Elite interviewees and FG participants coincide in the high priority assigned to people within the present generation that were affected by the spill. Political responsibilities and the constraint of re-election may explain these concerns. FGs concern may be explained by the fact that the FG setting encouraged respondents to think about a broad range of consequences thus tapping into the social behaviour of participants.

FG participants were more explicit about their intergenerational equity concerns compared with elites. FG participants repeatedly referred to their descendants and to the future when analysing oil spills and their consequences. Additionally, they expressed the worth on non-market environmental goods and services referring to their insurance and bequest value. This was interesting as none of the elite interviewees explicitly mentioned the relevance of these values for decision-making.

I. Sustainable development: B) Other factors affecting sustainability

Accidental oil spills are visible, media-frenzy occurrences and policy accelerators. They raise environmental management in the policy agenda but they are not the only issue to consider when analysing sustainability of marine resources. Overexploitation of resources, habitat destruction, operational oil discharges, climate change and pollution dumped in the sea from urban areas threaten the coast. Elite interviewees were asked about these threats. The background and training of interviewees influenced, as was expected, the perception of what the main *threats* to marine natural resources were.

With regards to *oil pollution as a threat* to natural resources, interviewees with experience in oil pollution management as well as nationalists, socialists and NGO's that would include GL26C01F, ML27C01R, NR&MTC21C03X, LD26SC04B, SG27SC04S and NL27SC04A) said *oil pollution* as the main threat for Galicia[88]. Other interviewees acknowledged the fact that *oil pollution* was a recurrent threat in Galicia but its consequences were not perceived as irreversible, except for the loss of biodiversity (LD26SC04B), the loss of *santiaguiños* and guillemot (ML27C01R), or the decline in octopus and Dublin Bay Prawn as well as the country's image loss (SG27SC04S). One of the interviewees with experience in oceanography (PM09M05J), stated however that pollution in Galicia's waters is not a concern and that the situation had stabilised with regards to the water quality before the Prestige oil spill. This interviewee recommends caution however in the interpretation of data as only a limited amount of time had gone by since the spill and effects derived from the oil slick could still affect the marine environment.

O*verexploitation* of fishing resources was seen as a serious threat by academics (GL26C01F), nature conservation experts (PM09M05J and FD01SC08R) and one of the nationalist representative (ML27C01R). On the other hand, when asked about overexploitation one of the civil servants interviewed with experience in oil pollution management (NL27SC04A) suggested that bans and adequate management were the solution to overexploitation given the outcrop phenomenon and great regenerative capacity of the sea in Galicia.

[88] Note that on average since 1970 every 6 or 7 years Galicia experiences a major oil spill on its coasts. It is thus a 'hotspot' for accidental as well as operational oil spills. According to Tan (2006) spills may be accidental (non-intentional) such as the Prestige oil spill, and operational (intentional) that would include bilge cleansing activities or ballast water disposal.

Further factors that were mentioned to varying degrees of intensity as threats to Galicia's marine environment were climate change according to PM09M05J and FD01SC08R, municipal urban waste disposal onto the estuaries according to NL27SC04A and habitat destruction[89] according to PM09M05J.

In addition to accidental oil spills, and largely coinciding with the main ideas voiced by elite interviewees, FG participants mentioned the following threats to maritime sustainability, in addition to accidental spills. These include:

- Operational discharges from vessels
- Overexploitation of fishing resources through the use of trawling boats
- Urban pollution that may end up in the sea such as 'cooking oil'
- Other accidental spills (e.g. fertilizers that are transported by sea)

The fact that both elite interviewees and FG participants mentioned similar threats was relevant to the design of the valuation question as it provided background information and (hopefully) a credible setting to frame the willingness to pay question.

In sum, elite interviewees and FG participants' views on the threats to marine resources were very similar. In addition to accidental oil spills, operational spills, overexploitation of resources and urban pollution were mentioned by both elites and FG participants. Elite interviewees mentioned climate change, which was not mentioned in FG discussions. FG participants on the other hand provided more practical and individual examples to illustrate their beliefs and demands regarding these threats.

II. Context: A) Policy inputs & Environment

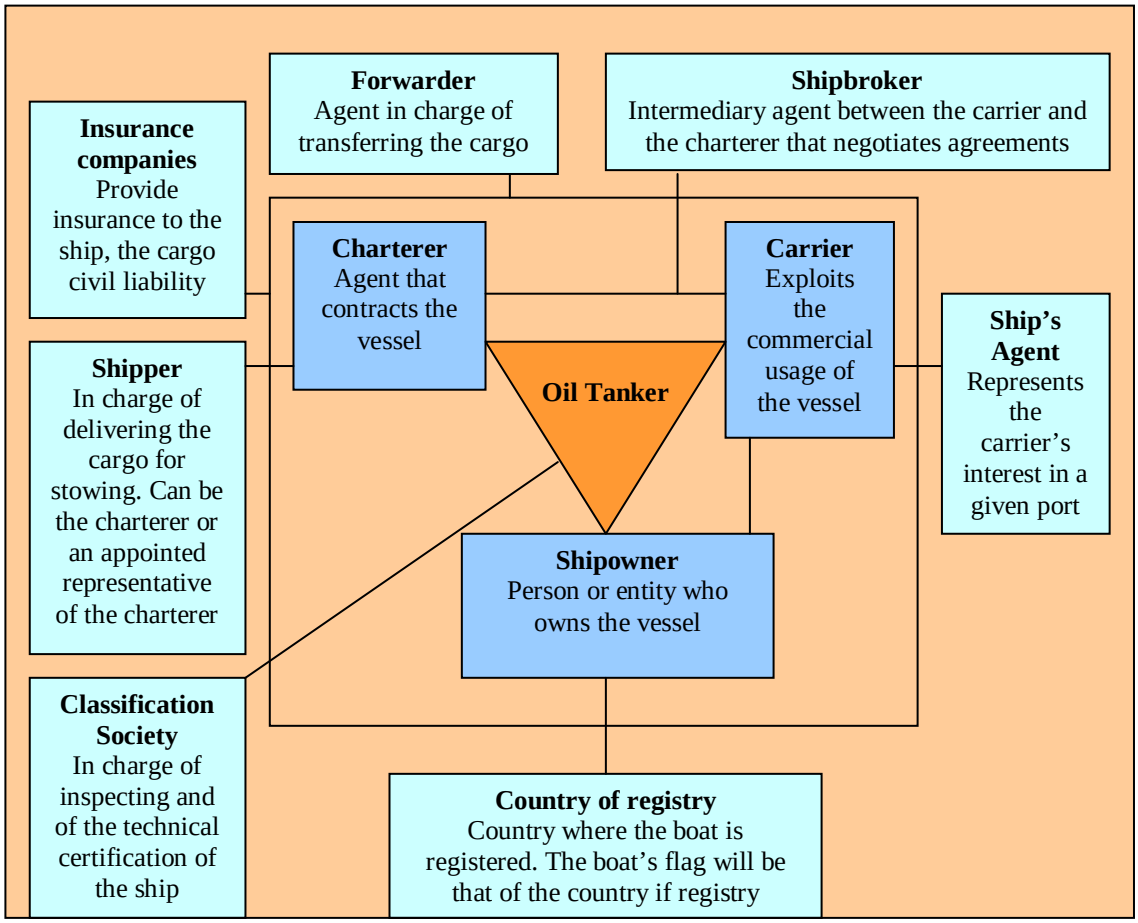
Aprioku (2003: 99) argues that 'oil-spill hazards are more than isolated engineering malfunctions. They can be alternatively understood as reflections of the social, economic and political contexts in which they occur'. Other scholars, Roberts (2004), reflect the same idea in a broader policy context as we have seen in section 3.2 above. Thus, the context in which oil spills take place was analysed in the elite interviews due to its policy relevance and the usefulness of contextual features in the development of credible valuation scenarios.

[89] Habitat destruction caused by economic development of activities such as mussel production and its derived organic waste.

II. Context: A) Policy inputs & Environment 1. Agents

The context in which the maritime business develops is acknowledged to be a complex one by elite interviewees (GL26C01F and AQL&GA23C03J). In addition to this complexity in the maritime business we have to remember the polycentric, multi-level and multi-agent policy environment discussed above with regards to oil pollution prevention, management and compensation in Spain. The EU renegotiation of structural funds in the aftermath of the Prestige, also discussed earlier, provides the last element of the context within which policy-making takes place. To complement the institutional governance structure presented above a simplified illustration of the oil transport business is provided in figure 3.4.2 below:

Figure 3.4.2 Agents in the Maritime Business

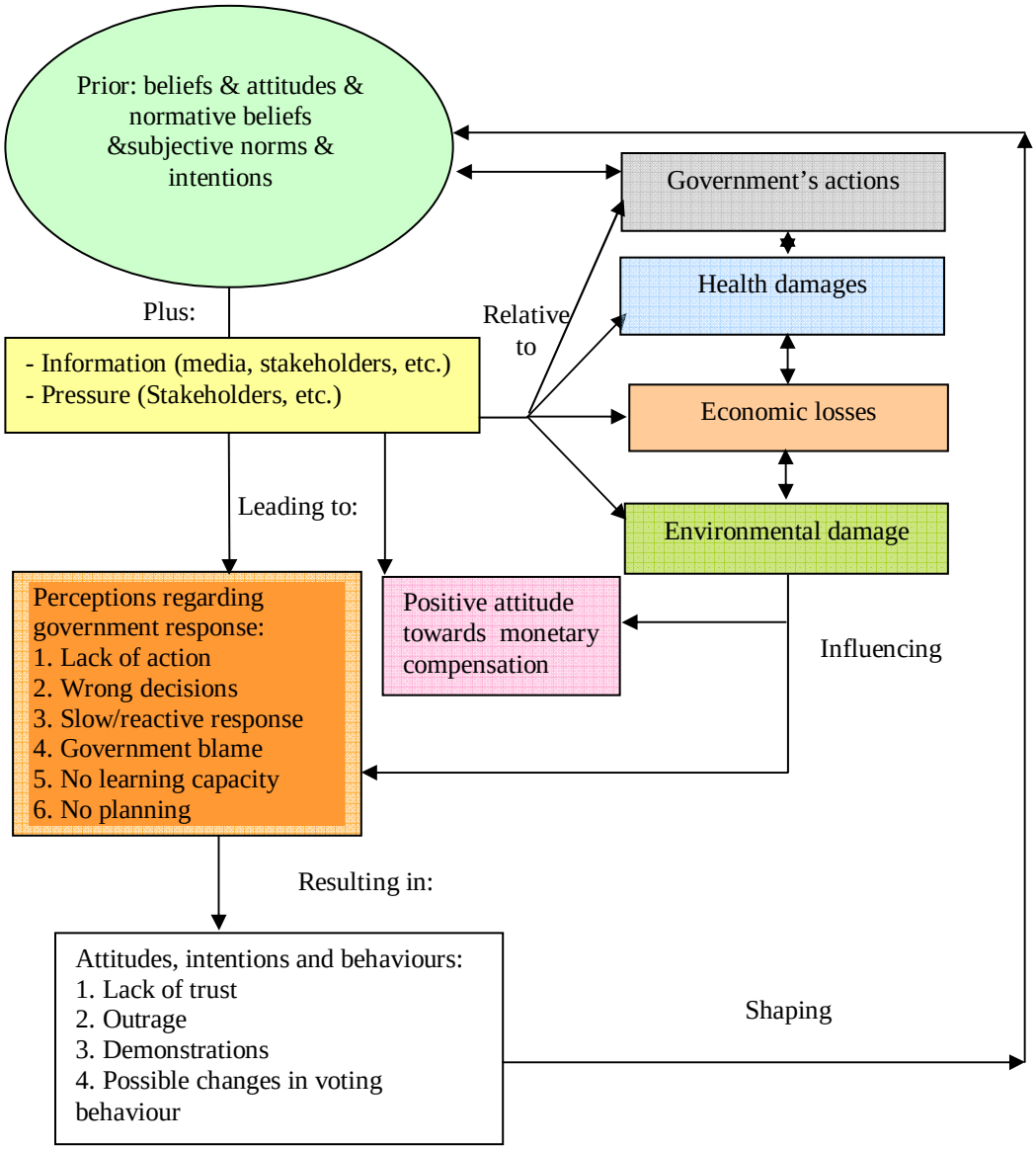


Source: González Laxe (2005)

The perceptions of FG participants regarding government actions (e.g. prevention, management and compensation) in past oil spills was overall negative. These negative attitudes about the government included perceptions of an overly complex and inefficient institutional framework, lack of preparedness, slow response, insufficient

means, in terms of both, equipment and personnel, political rather than expert-led decision-making process, etc. A positive perception was expressed however when analysing monetary compensation paid to directly affected parties acknowledging these payments had helped minimise economic losses. Graphically, these attitudes are presented in figure 3.4.3

Figure 3.4.3 FG views on government actions regarding past spills



Source: Based on Fishbein and Ajzen (1975), Birklan and Lawrence (2002), Birkland (1998) and on information obtained in focus groups.

On the other hand FG participants thought there should be changes in the behaviours of agents involved in oil spills. These changes are summarised in table 3.4.8 below:

Table 3.4.8 FG participants' views on the main agents involved in oil spills

FG	Agent	Statement
1,2,3,4,5,6,7,8	Spanish Government	Is the institution that should manage spills rather than rely heavily on volunteers but if volunteers help out, the government should be prepared to provide equipment, training and accommodation for them
		Is expected to 'make tough choices' regarding for example sacrifice areas and design compensation mechanisms for these areas
		Is seen as responsible for the protection of citizens
		Expenditure in R&D, education, safety measures and more generally prevention should increase
		Is expected to engage in a learning process after spills have happened
		One governmental institution should coordinate all means and responses
		Suspected of mismanagement of funds by some and trusted by other participants
		Is purported as a reactive institution still unaware of its lack of means to respond to oil spills
		Is accused of being 'shut off' to citizens
		Expected to provide truthful information to citizens
		All governmental levels from local to national are expected to be involved in planning
	Army	Should be properly trained if they are to respond to oil spills
	Media	Is expected to have a significant impact on civil society as well as on reactive policy making (see Downs, 1972)
		Another main role is as information provider although suspicions of political bias are mentioned
2,3,4,5,8	Volunteers	Convenience and time available are expected to affect the willingness to volunteer
		Some FG participants were against volunteering as they thought the government should have enough means to manage spills
	Polluters	Demands for the polluter pays principle to be established were expressed
		Should insure their vessels (this is a legal requirement so the demand reflects the lack of specialised knowledge of FG participants regarding legal requirements)
		Penal sanctions are requested over and above administrative sanctions and fines
	Citizens	Attitudes are influenced by the severity and proximity of the spill as well as by governments' response to the spill
		There is a 'growing concern regarding environmental issues'
		Co-responsible for environmental protection based on environmental resources that have been passed on from past generations
3, 6	Other governments	Reactive policy making is also perceived at the EU level
	International institutions	Other countries are expected to be informed about future spills as was the case in the past
6, 8	Experts	Interdisciplinary teams of experts are expected to provide information and answers in oil spill situations

Source: Focus groups

These attitudes and demands were voiced throughout the FG sessions and were not explicitly sought by any single exercise.

Contextual factors affecting sustainable development were hence discussed by both elites and FG participants. Both groups coincided on demanding better oil spill management, increased coordination and a unified decision-making institution, further expert-led de-politicised decision-making, investments in R&D to increase the information on the baseline state and evolution of the environment and more

technical and personal means to fight oil spills. Tougher sanctions were also requested by both groups with elites calling for increased liability and FG participants requesting penal sanctions to be established.

A more permeable, transparent and bi-directional flow of information was also seen as vital in future spills by elites and FG participants alike. There is a more or less tacit acknowledgement of a growing pro-ecological worldview which is expected (by elites) to put some pressure on policy-makers. This is so despite the recognition that citizens' behavioural changes were seen as partial and subject to convenience by FG participants.

Elites and FG participants saw the international policy-making framework as a reactive one. The nationalist party representative called for a self-sufficient response independent of the aid (means) of other countries. This contrasts with the international agreements signed that consider calling on other countries in the events where Spanish oil spill management means are not sufficient to deal with the damage of an accidental spill.

II. Context: A) Policy inputs & Environment 2. Resources

The *importance* of fishing, shell-fishing and aquaculture was stated as the main relevant feature of natural resources. The economic relevance of these activities largely explains this consensus statement voiced by GL26C01F, ML27C01R, FM09M02A, NJFMG10M04C, SG27SC04S, NL27SC04A, LD26SC04B, PM09M05J and NR&MTC21C03X. The factual data provided to support this idea included: the percentage of Galicia's GDP these activities yield, the number of people directly and indirectly employed by the fishing sector, the high percentage of Galicia's private firms' turnover provided by the firms located in littoral areas provide, the amount of population living near the coast and the weight of these activities in the international arena. The relevance of tourism activities was also mentioned although no factual data was provided.

Environmentally trained interviewees (PM09M05J and FD01SC08R) as well as nationalists and NGO representatives (LD26SC04B and ML27C01R) stated other relevant features of natural resources in Galicia. These include the outcrop

phenomenon[90] of Galicia's continental shelf, the biodiversity contained in Galicia's coastal waters, as well as the special areas (designated Natura 2000 Network, areas of special protection for birds species, areas of European interest, National Parks, etc). One of the interviewees (LD26SC04B) also mentioned the fact that Galicia was the most important area in terms of marine mammals in the EU. Socially relevant issues were also mentioned by some interviewees (LD26SC04B and ML27C01R) although the emphasis, without a doubt, in all the elite interviews was linked to fishing and related activities, their economic importance and dependence of these activities.

The data provided by elite interviewees on the relevance of natural resources in Galicia is summarised in table 3.4.9 below:

Table 3.4.9 Relevance of natural resources in Galicia

Concept	Data provided by interviewees
Economic relevance of fishing and related activities	Provides 3% of Galicia's GDP
	Fishing and related activities are the 2nd most important after the car industry in Galicia
	There are 3,552 mussel punts (located mostly in the Southern estuaries)
	Galicia is the 2nd world wide mussel producer (after China) and the first EU mussel producer
	13,000 jobs are provided in Galicia by the mussel industry
	150,000 People are employed (directly and indirectly) by the fishing sector
	Galicia provides 10% of EU jobs arising from fishing and related activities
	84% of private firms' income come from firms located on the coast
	50,000 vessels cross Galicia's waters every year
	Institution created: Regional fisheries and Marine Council
Environmental relevance	1,700 km of coastline
	Outcrop phenomenon (nutrient and water temperatures increase the productivity of Galicia's continental shelf)
	Home to rare and endangered species such as the tridactile seagull or the guillemot
	Natural parks and open spaces (i.e. The Atlantic Isles Natural Park)
	Richest marine mammal area of the EU
Social relevance	50% of the population in Galicia is located in the littoral
	There are cultural heritage locations highly valued by the population in Galicia

Source: Elite interviews

FG participants provided information on the beliefs and attitudes held towards the environment. These views largely coincided with those of elite interviewees. FG participants did not however provide any data on how the different environmental resources are monitored or the specific contribution of these resources to regional or national economic growth. Overall, the environment is portrayed as the source of life

[90] The outcrop phenomenon is defined as the 'vertical and ascendant movement in masses of water that transport sediments from the seabed to higher layers of water. These sediments serve as mineral nutrients that will, through photosynthesis, transform in primary productivity'.
http://tarwi.lamolina.edu.pe/licochea/masas.html

and provider of the necessary goods and services in order to develop economic activities (with repeated references to fishing and tourism activities). Anthropogenic threats such as oil spills are recognised to be derived from economic activities such as oil transport and consumption. This in turn illustrates the trade-off between economic development and environmental preservation in a context in which the environment is known to be able to provide goods and services but which can exhibit limits. Going beyond these limits may lead to irreversible losses, with a FG participant stating '*there will come a time when the planet cannot cope anymore'* or *'there will come a point when these species disappear and we will suffer this' or 'if we have a Prestige every so often we can reach a 'saturation point'…and this is dangerous for living organisms and for the fishing activity which is relevant in Galicia both for shell-fishing and for employment too'.*

Elites and FG participants saw natural resources and in particular marine resources as providing valuable goods and services. Elites also acknowledged the importance of biodiversity but the greatest detail and explanations were related to the relevance of natural resources as an input into the economic activity and as a driver for development.

Thus, the view presented by elites is a more economically framed and policy-oriented one whereas FG participants discussed more broadly their beliefs, normative beliefs and (generally) positive attitudes towards natural resources.

3.5 DISCUSSION AND CONCLUSIONS

This first empirical chapter has presented the beliefs, attitudes and intentions of elites and FG participants with regards to sustainable development in the context of oil spills. The rationale of the theory of reasoned action (Fishbein and Ajzen, 1975), the adapted policy-making process heuristic by Roberts (2004) and the social context as regards environmental policies in Spain according to Jiménez (2007) have been presented as a framework for understanding the views of elites and FG participants relative to SD.

As regards the question of whether experts and citizens view *sustainability* in the same way, the basic findings show that even though experts (either in the academic field or in nature conservation) offer greater technical knowledge and a broader, policy-aware (policy-feasible) perspective, the main topics mentioned by elites and FG participants as regards the definition of SD coincided to a certain extent. The latter explored equity concerns with more in-depth references to inter-generational equity (compared with elites). FG participants also acknowledged the existence of system limits as well as the resilience and restoration capacity of the environment. They were furthermore concerned about the need to establish trade-offs between economic development and environmental preservation.

Neither elites nor focus groups explicitly distinguished between *weak and strong sustainability* in their definition of SD. Implicit references as regards the substitutability of different types of capital were made by both elites and FG participants. Elites' beliefs about the substitutability of resources largely coincide with the political tendency of respondents. This finding was expected as reflected in Jiménez (2007) that shows left wing parties are known to have allied in certain circumstances with the environmental movement since the 90's. FG participants also indirectly reflected on the substitutability of different types of capital although no direct relationship to their political tendency could be analysed as FG respondents were not asked about their ideology.

Three distinct positions were drawn from respondents' answers as regards the *substitutability* of different types of capital. There were elite interviewees and focus group respondents who implicitly accepted substitution between different forms of capital (hence accepting weak sustainability). Other elite interviewees stated that

losses in natural capital could be replaced by natural capital built in exchange. Finally, some elite interviewees and some FG participants stated there were some types of natural capital (e.g. biodiversity loss) that could not be substituted by other forms of natural capital (see Neumayer, 1999 or Spash, 1993, for example).

As regards *system limits and thresholds* in the context of managing marine resources, both elites and FG participants were aware of these concepts. Elites provided detailed information on managing commercial resources according to 'expert-determined' criteria. Elite interviewees also acknowledge the still developing nature of non-commercial marine resources protection, in line with Hassan *et al.* (2005) and WWF (2010). Focus groups explored, through an exercise, the issue of limits, irreversible losses and thresholds. The answers obtained show a wide range of views and opinions regarding these issues. The possibility of reaching systems' limits and being faced with irreversible losses was overall credible for FG participants and was thus retained and refined in order to design the valuation scenarios that are presented in the next two chapters of the thesis.

When analysing *compensation*, elites and FG participants expressed the need for monetary compensation that would help mitigate the economic losses of individuals and firms directly affected by the spill. Both groups of interviewees acknowledged the 'political' nature of these payments. Some elite interviewees and some focus group members claimed that monetary compensation was swiftly and generously paid to appease citizens. The context in which the spill happened (close to pre-election time and during the second term in power of the conservative party) could be seen as one of the drivers of the monetary compensation as contemplated in the policy-making process heuristic used (Roberts, 2004).

Additional compensation in the form of investment 'packages' was analysed both with reference to the economic recovery plans that were *de facto* implemented after the last large spill (*Plan Galicia and Plan de Dinamización Económica de Galicia*) and with reference to the compensation options that were suggested by elite interviewees. Elite interviewees' perceptions of the compensation packages were very much in line with their political tendencies and professional *persona* (Jiménez, 2007). Thus conservative representatives and business representatives favoured past actions that fundamentally entailed a weak sustainability response, largely investing in man-made capital

(infrastructures). On the other hand, nationalists and the NGO representative showed discontent with those investments (that were largely geared towards building infrastructures) and advocated for replacement of damaged natural capital with 'like' natural capital.

FG participants showed a wide range of opinions regarding the preferred compensation option and none of the respondents protested against these compensations or failed to answer the compensation exercise. The acceptance of additional compensation can be indicative of the theoretical 'compensatability' of the environmental losses depicted (Humphrey 2001). Overall, however, FG participants preferred either replacing damaged natural capital with similar natural capital to be built in exchange (intra-capital substitutability) or a compensation package designed to strengthen the prevention mechanisms. For FG participants however there seemed to be no or limited possibilities of substituting man-made capital (infrastructures) for damaged or lost natural capital. These findings on compensation encouraged further exploring this issue in the survey as a way to explore preferences for either weak or strong sustainability.

Oil spill *prevention strategies* intended to preserve natural capital (in line with stronger versions of sustainability) were also analysed. Elites and FG participants demanded further R&D and control efforts to ensure that the risk of future oil spills was minimised. Again the expertise of elites led to more detailed and technical demands on equipment and training compared with the demands of FG counterparts. FG participants voiced demands for interdisciplinary teams of scientists and experts to provide tools and solutions. They also referred to the need to include local institutions in the training and decision-making process. All this shows a demand for further participatory approaches favouring civic science, at least in its weakest sense, (Bäckstrand, 2003).

According to Kates *et al.* (2000: 641) 'In a world put at risk by unintended consequences of scientific progress, participatory procedures involving scientists, stakeholders, advocates, active citizens and users of knowledge are critically needed'. One of the potential benefits from the use of economic valuation techniques (that are preceded by elite interviews, focus groups and pilot interviews) could be engaging in a reflexive and participatory interchange of information. The combined use of these

methods could also help to understand attitudes and to respond to the demands of citizens within the realm of what is politically feasible and scientifically advisable. In this sense, Chilton and Hutchinson (1999: 466) claim that 'good CVM should combine quantitative and qualitative insight if it is to be utilised to its full potential'.

This chapter has presented the qualitative part of the fieldwork conducted to hopefully present a reasonable CV in which sustainability criteria in oil spill management are tested. The next two chapters will present the survey and the analysis of the main results.

CHAPTER 4. AN EMPIRICAL TEST OF SUSTAINABILITY PREFERENCES: COMPENSATION

4.1 INTRODUCTION

The previous chapter analysed whether elites and citizens who participated in FG discussions view sustainability similarly. Their views on monetary and project-based compensation were compared. It was argued that the results obtained from the previous analysis could provide logical conclusions and feasible compensation 'packages' but they could not ensure results would be representative of what citizens at large would want when faced with environmental losses. This chapter will further explore the issue of compensation when environmental damages of varying severity occur and its link to the sustainability debate. This will be done by analysing the results obtained from the survey.

While there remains debate about what sustainable development is and the standards against which the concept can be measured (Pezzey and Toman, 2002), a substantive proposition is that a sustainable path is one where wealth does not decline (see, for example, Hamilton and Atkinson, 2007; Mäler, 2007). This, in turn, has led to a focus on ensuring that asset values are maintained. That said, there is uncertainty about whether this involves keeping total wealth constant or whether there are certain assets that must be passed on in some form. In large part, removing this uncertainty must entail better scientific understanding of, for example, how much of nature must be conserved. However, there is also a need to better understand the preferences of individuals for different combinations of the assets that comprise the wealth of say a nation. For example, both Aldred (2002) and Turner (2007) speculate that individuals may not view money as compensating for certain environmental losses whereas investments in social assets such as schools may offer a more acceptable compensation option for these same individuals. If so, this would appear to circumscribe in some way 'Hartwick-like' rules for reinvesting in the face of the loss of certain environmental assets.

The main contribution of this chapter is to provide an empirical test of Aldred (2002) and Turner (2007), linking this with the sustainability framework as described by Pearce *et al*. (1989) and analysed by Atkinson *et al.* (1997) or Pezzey and Toman (2002) among others. This chapter provides a test of this by using the data obtained from the

questionnaire[91] in which different compensation options are offered to a sample of people from two Spanish cities (Madrid and La Coruña) faced with hypothetical future oil spills. The first option offers investments in man-made capital as compensation for the environmental damages caused by the spill. The second option presents a set of social investments (hospitals, education and so on). The third option offers restoration of like-for like, that is, investing in natural capital.

It should be noted that the first compensation scenario (also called package or option) was designed with reference to official investment plans in the aftermath of the *Prestige* oil spill. Such plans largely followed a standard 'Hartwick-rule' policy response involving significant investment in man-made capital, especially in infrastructure projects. The highly politicised nature of past oil spills in Spain created a reactive and piece-meal set of *ad hoc* investment plans to boost the economy of the affected area. Those plans were heavily criticised by government opponents, NGO's and civil society, as was discussed in the previous chapter. Furthermore, the policy plans contrasted with an unprecedented 'white tide' of volunteers who invested over 327,000 days of their time in cleaning-up the oil slick. This altruistic behaviour plus the demonstrations demanding more prevention and protection against oil spills is at the very least suggestive of a shift towards stronger forms of SD in citizens' demands regarding oil spill management that is not reflected in official plans.

The rest of this chapter is structured as follows: Section 4.2 briefly presents an economic analysis of compensation as well as the more recent resource equivalency approach to compensation. It also analyses the basic features of the compensation exercise based on the information obtained from the elite interviews, focus groups and pilots. Section 4.3 critically discusses the results obtained. Summary statistics and parametric analyses (using a multinomial logit model) are presented in this section. Section 4.4 concludes.

[91] See annexes A.3.1 and A.3.2 at the end of the chapter in which the questionnaire and the documentation distributed among survey respondents are presented.

4.2. COMPENSATION: THEORY AND DESIGN BASED ON SALIENT FINDINGS

4.2.1 Compensation: Economic and broader interpretations

As was argued in the introductory chapter, economic interpretations of welfare assume that losses can generally be offset by increasing the amount of other goods or money. Resources are assumed to be substitutable[92] and compensation either in monetary terms or in alternative goods can make individuals return to their initial (no damage) level of utility or wellbeing. Project restoration approaches[93] (that have been applied among others in the context of US natural resource damage assessments or EU's Environmental Liability Directive), are based on the above economic interpretation and analyse *the amount of resources required to offset environmental damages*.

This choice of compensation in-kind has been criticised on theoretical grounds as potentially inconsistent with welfare economics due to the fact that restoration projects may generate losers and/or gainers as a consequence of the public good nature of the restoration (compensatory) projects, Flores and Thacher (2002).

For welfare economics-consistent measures of compensation, as Flores and Thacher (2002: 172) state 'willingness to accept (compensating variation) by definition exactly satisfies the requirement that an individual can be returned to their preinjury level of utility'. Money will, from this perspective, be essential for ensuring damage assessment adheres to the principles of welfare economics. Empirical work has however found that in certain contexts the introduction of money in compensation scenarios reduces public acceptance of policies (Frey and Oberholzer-Gee, 1997 and O'Neill and Spash, 2000). These findings highlight the relevance of issues that transcend neoclassical welfare economic foundations when valuing costs and benefits of different compensation options.

[92] Humphrey (2001: 146) highlights the divide between substitutability 'as a functional concept' and 'compensatability as a welfare concept'. The author conveys the relationship between lack of substitutability and hence lack of compensatability for basic goods (e.g. no amount of water will compensate for a lack of food). Conversely, for non-basic goods non-substitutability does not mean that their loss cannot be compensated and hence individual's welfare restored (say by increasing the availability of other goods). This argument would probably be accepted by weak sustainability supporters but not by (all) strong sustainability advocates.

[93] Compensation in the form of restoration projects is defined according to Cowell (2000: 690) as 'the provision of positive environmental measures to correct, balance or otherwise atone for the loss of environmental resources'.

Returning to the economic interpretations of welfare[94], if we assume that there are only two types of goods (market goods (x) and non-market – environmental – goods (q)) their relationship can be expressed through the depiction of indifference curves that assume substitutability of these goods (figure 4.2.1). The analysis of a project compensatory approach (in line with the 'softer' version of SS that allows the substitution of like-for-like) would present two types of environmental goods. In this case environmental damage remediating projects (q_1) are seen as good substitutes of damaged environmental assets (q_2), see figure 4.2.2. This assumption about substitution between environmental goods could however be rejected due to environmental or ethical reasons and indifference curves may be completely inelastic (or inelastic beyond a certain environmental threshold).

Figure 4.2.1 Individual indifference curves

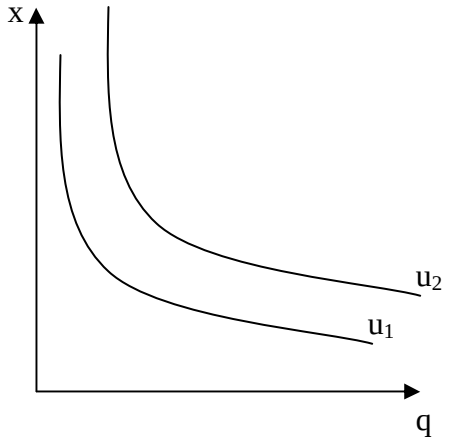
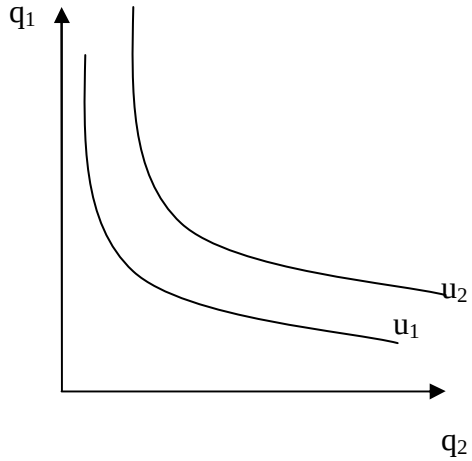


Figure 4.2.2 Social indifference curves



Source: Ozdemiroglu *et al.* (2009: 14-15)

When faced with environmental damages and when analysing the compensation required, welfare economics provides the framework for analysing how to measure losses and compensation. If we assume individuals hold the right to an unpolluted environment (as does the public trust doctrine and constitutional requirements in some countries such as Spain), then the compensation required to 'make the public whole', returning them to their initial utility level, will be given by the compensating variation in the form of other private goods or money. Additionally, compensation can also take place in the form of additional public goods (like-for-like), The appropriate

[94] Based on (Ozdemiroglu *et al.* 2009)

amount of compensation is obtained by asking individuals how much resource they would need to return to their pre-damage level.

Despite the intuitive appeal of compensation (in the form of environmentally restorative projects) in terms of meeting sustainable development requirements a number of questions have been raised regarding the acceptability and adequacy of this compensation (restoration) approach to environmental damage (Spash, 2000, O'Neill and Spash, 2000, Dietz and Neumayer, 2007). On a broader level Cowell (1997) has argued that compensation may devalue and capitalize nature without a widespread reflection on more substantive issues such as the scale of environmental degradation.

The 'traditional' economic approach and the project restoration approaches explained above ask about the *amount* of compensation but fail to analyse the *type* of remediation that would make individuals whole, which would be of interest for furthering the sustainability debate. This chapter explores this empirically through the results obtained from the compensation question.

4.2.2 Developing the compensation question: Elites, focus groups, pilot and expert opinions

This subsection presents the main ideas, relevant to designing the compensation exercise, discussed in the elite interviews, the focus groups, the pilot questionnaires and offered by experts. Sustainable development was described as a popular yet much criticised concept in the literature review chapter. The idea of being able to keep on growing and preserve resources was hypothesised to be well accepted by decision-makers. Practical difficulties in deciding where WS ends and SS starts (Azqueta, 2002) were also highlighted.

As we have seen, proponents of WS assume all types of capital are perfectly substitutable as long as total capital remains at least constant. This means we could potentially compensate for losses in natural capital by investing in any type of capital. Aldred (2002) and Turner (2007) however state that there may be losses for which certain types of compensation, say money or flowers, will not be appropriate but other types of compensation such as investing in social capital assets (e.g. schools and hospitals) will. Yet, if we ask proponents of SS, in its weakest sense, natural capital would have to be preserved and replacement of like-for-like, through shadow or

compensating projects, would be the way forward to ensure sustainability at a project and portfolio level.

Previous chapters presented the issue of compensation that took place in the aftermath of the Prestige oil spill. The regulatory momentum spurred by the Prestige (Tan, 2006) was considered to be a policy relevant issue to analyse, both in terms of government funded compensation[95] and government funded oil spill prevention and management plans. To sum up, compensation included on one hand cash payments (monetary compensation) paid by the Spanish government to directly affected parties (e.g. fishermen); on the other hand we have additional compensation packages ('economic recovery plans') that the Spanish government presented in the aftermath of the spill (*Plan Galicia* and *Plan de Dinamización económica de Galicia*).

These were investments, mainly devoted to building infrastructures that were designed to boost the economy of the areas affected by the spills. An additional reason for these investments was argued to be the historical debt argument (the region of Galicia has traditionally suffered from a lack of infrastructures and a gap between its GDP and Spain's mean GDP, thus Spain 'owes' Galicia). The EU structural funds were being renegotiated in the aftermath of the Prestige oil spill. This renegotiation would reduce the money available for future infrastructure projects. Finally, the industrial lobby exercised a significant pressure on the government to promote infrastructures that would improve the connexion between Galicia and the rest of Spain. All these pressures led to significant investment in man-made capital, which is argued to be a reflection of a WS stance towards compensation.

The *status quo* option that had been promoted by the government was included in the compensation exercise in the survey as the first compensation option. The main design features of this first (WS) compensation option were shaped along the research project and the final version included investments in man-made capital (i.e. roads, railways and marketing campaigns to promote the area affected by the spill). Throughout the elite interviews, focus groups and the pilots, this option was well understood and thus it was expected that this would continue to be the case in the survey. The final version of the compensation question can be seen in annexes A.3.1 and A.3.2.

[95] This compensation packages were additional to the compensation paid by insurers and by the IOPC Funds.

The second compensation option from which respondents could choose implied that government investments would be devoted to social capital (investments in education, health and R&D programs). The reasons for including this compensation option include the following. Firstly, empirically testing Aldred (2002) and Turner's (2007) proposition partially motivated the inclusion of this compensation option. Secondly, the need for R&D mentioned by elite interviewees to fill in the knowledge gaps and develop practical oil spill management strategies provided additional reasons for having this compensation option. Finally, the follow-up questions in the pilot interviews revealed that respondents also thought about other possible investment options[96] (e.g. in technology or other socially desirable goods) that would improve the wellbeing and the health of Spanish citizens.

The third compensation option in the survey presented respondents with investments in shadow projects that would replace damaged natural capital with similar capital (like-for-like). This option was initially explored in the literature review chapter. The analysis of the elite interviews confirmed the attractiveness of including this option in future compensation plans as some of the interviewees suggested this possibility. Focus groups were faced with this compensation option and there seemed to be no credibility issues or problems in understanding this option. It was furthermore chosen as the preferred compensation option by a significant number of FG participants. The pilots conducted also included this possibility and again no major problems arose with this option[97].

Advice from CV experts[98] plus meetings with the market research company hired to do the fieldwork resulted in the final versions of the questionnaires that are presented in annexes A.3.1 and A.3.2.

The main changes made to the final questionnaire are summarised in table 4.2.1 below:

[96] In addition to the initially offered ones of monetary compensation, infrastructures or replacement of damaged natural assets for like natural assets.

[97] It should additionally be noted that in the final version of the compensation question, the questionnaire did not include a possible cash payment for respondents. Cash payments were included in the pilot as a possible compensation option but interviewees stated this was morally repugnant and they did not deserve payment given the fact that their livelihoods had not been directly affected by an oil spill. The do-nothing option (i.e. no extra compensation action aside from the cash compensation paid to directly affected parties) was retained although in a different format in the final version of the compensation question. See annexes A.3.1 and A.3.2.

[98] I am most grateful to Susana Mourato and Maria Loureiro for their help in the revision of the questionnaire.

Table 4.2.1 Changes made to the final questionnaire

Suggestion	Result
Shorten length of questionnaire	Implementation time: 15 minutes
Simplify explanations & questions	Less information included in the exercises
Include question on socio-economic problems at the start	Inclusion of warm-up question. Socio-economic concern as possible determinant of compensation option chosen
Change the order of the two core exercises (first compensate and then ask for willingness to pay to prevent future spills)	Compensation question prior to valuation question. Rationale: the government compensates and would like your views on how to allocate this compensation among competing ends. In the future it would be better to avoid spills and in order to do this further investments will be needed. These will only happen if citizens are willing to pay for them.
Eliminate economic consequences from the compensation and the valuation scenarios	Markets capture these losses. These have been fully compensated via cash payments by the Spanish government and IOPC funds
Inclusion of the social capital compensation option	Literature reviews, the analysis of the elite interviews, suggestions made by the FG and pilot interviewees and peers led to including an additional compensation option to empirically test Aldred (2002) and Turner(2007) hypotheses.
Swap close-ended follow-up questions for open-ended ones	This follow-up question format allowed respondents to explore the reasons for their answers rather than force them to choose from pre-determined categories decided by the researcher

4.2.3 The compensation question in the survey

The *compensation exercise* asked respondents whether they would want compensation (in addition to expected government & international clean-up and payments to directly affected people) and if so, the type of investment program they would prefer. These questions were complemented with an exercise in which respondents were asked to allocate hypothetical amounts (of different sizes according to the size of the spill) to the different compensation options thus expressing the strength of their preferences for the different compensation packages. Follow-up questions were included to understand the motivations for respondents' answers.

The initial background information that respondents were provided with in the compensation exercise is shown in box 4.2.1 below (see annex A.3.1 and A.3.2 for a full account of the entire exercise):

Box 4.2.1 Initial background information on the compensation exercise

In Spain we have had various oil spills (respondents were shown map C in annex A.3.2).
After an oil spill the government always cleans up affected areas and provides monetary compensation for those people who are out of work
The government is analysing the possibility of investing in other projects **additionally to the cleaning-up and compensation activities.** As we all know money is limited and if we choose these additional investments there will be other things we won't be able to do.
The additional investment options include: 1. Investing in things such as roads and railways 2. Investing in things such as schools and hospitals 3. Investing in things such as restocking and creating natural parks

Respondents were then asked whether they would want compensation and the reasons for their answer. Following this, for those respondents who did want compensation, additional information was provided. This is shown in box 4.2.2 below.

Box 4.2.2 Additional background information on the compensation exercise

As the funds for these investments come from our taxes I would like to know how you would like this money to be spent.
Focusing on the environmental and health effects I am going to show you three spills with very different consequences and I would like you to tell me how you would like the government to spend the money.
Remember there are other areas in Spain and elsewhere that will not be affected by these spills.

The main features of the compensation exercise are shown in table 4.2.2 below.

Table 4.2.2 Summary of the main features in the compensation exercise

Section	Elements	Question/information provided
Compensation	Clean-up & compensation	In the past: Cash always received by affected parties after a spill
		In the future: Compensation is expected to continue
		Additional compensation packages are planned
	Agents	*Compensarion provider* : central government and regional government *Beneficiaries* : affected areas and directly affected people (monetary compensation) All citizens in Spain (project compensation)
	Opportunity cost reminder	If we undertake these investments there will be others we can't undertake
	Substitutes reminder	Other areas in Spain and elsewhere will not be affected
	Compensation options	Man-made capital (infrastructures)
		Social capital (schools and hospitals)
		Natural capital (restocking, create natural parks)
	Allocation exercise	Allocate X€ to the different compensation options according to what you prefer if e.g. a small spill happened
	Preferred option	Which is your preferred option?
	Follow-up questions	Can you tell me why?

4.3. ANALYSIS OF RESULTS

This section will analyse the main results obtained from the analysis of the data that are relevant to the analysis of the compensation question. The first subsection (4.3.1) will present the summary statistics of questions that are relevant to the compensation topic. The second subsection (4.3.2) will present the parametric analysis of the compensation exercise.

4.3.1 Sampling and Summary statistics

Sampling: process and sample characteristics

A superior semi-probability sampling process[99] was followed to select questionnaire respondents. This entailed a multi-stage approach in which initial random selection of postcodes in the city of Madrid and in the city of La Coruña was followed by the interviewer discretionary selection of respondents according to income, age and gender quotas. The sample size was calculated according to simple random sampling formulae under the assumptions of similarities of quota sampling and stratified random sampling with proportional allocation, and the equivalence of the latter to simple random sampling formulae. The final number of usable interviews amounted to 663. This number of usable responses is reasonable for this type of studies according to the literature reviewed and the experts consulted.

Age and gender quotas were reasonably well met in the sample and thus population characteristics and sample characteristics are close. The income quota was the most problematic one[100]. This meant both in the city of Madrid and in the city of La Coruña the percentage of respondents with lower income was higher that the population figure. Higher income groups are therefore under-represented in the sample.

The population with lower educational level (no education at all or primary education) in the sample is under-represented. The sample also over-represents higher educational levels (secondary education and high school graduate). The sample and the population characteristics are reasonably close in the representation of respondents with university degrees or above (MSc of PhD) [101] for the Madrid sample.

[99] Please see annex A.3.3.3 for a more detailed explanation of the sampling process.
[100] Please refer to annex A.3.3.4 for a more detailed explanation of the implementation issues faced.
[101] Please note that according to the statistics institute of the City Council of La Coruña data on education is known to grossly over estimate the percentage of people with lower educational levels. This is so for two reasons: the census data is outdated and people are known to underreport their highest educational

Higher educational level is over-represented in the La Coruña sample although the degree of over-representation is unknown due to the lack of precision of the educational attainment data in La Coruña.

Table 4.3.1 below presents the sample characteristics in comparison to population characteristics.

Table 4.3.1 Sample and population characteristics

Socio-economic characteristics	Range of values or categories	Madrid		La Coruña	
		Sample (N=405) Frequency & (%)	Population (%)	Sample (N=258) Frequency & (%)	Population (%)
Age	18-34	136 (34%)	36%	85 (33%)	32%
	35-49	120 (30%)	26%	74 (29%)	27%
	50-64	97 (24%)	20%	58 (23%)	24%
	65-79	52 (13%)	18%	40 (16%)	17%
Income	0-24,000	135 (34%)	25%	145 (57%)	40%
	24,001-36,000	195 (49%)	55%	86 (34%)	48%
	≥ 36,001	66 (17%)	21%	25 (10%)	12%
Gender	Female	211(52%)	53%	136 (53%)	53%
	Male	194 (48%)	47%	122 (47%)	47%
Education	Primary education	22 (5%)	24%	21 (8%)	51%
	Secondary education	103(25%)	18%	53 (21%)	18%
	High school graduate	137(34%)	23%	77 (30%)	16%
	Higher education	143 (35%)	34%	104 (41%)	15%

Sources: Institute for Fiscal Studies (IEF, 2008), 2001 census for Madrid, http://www.feccoo-madrid.org/servlets/VerFichero?id=4031, 2007 Census data for the city of La Coruña provided by the City Council of La Coruña. Please note these figures have been rounded up and do not add up to exactly 100%.

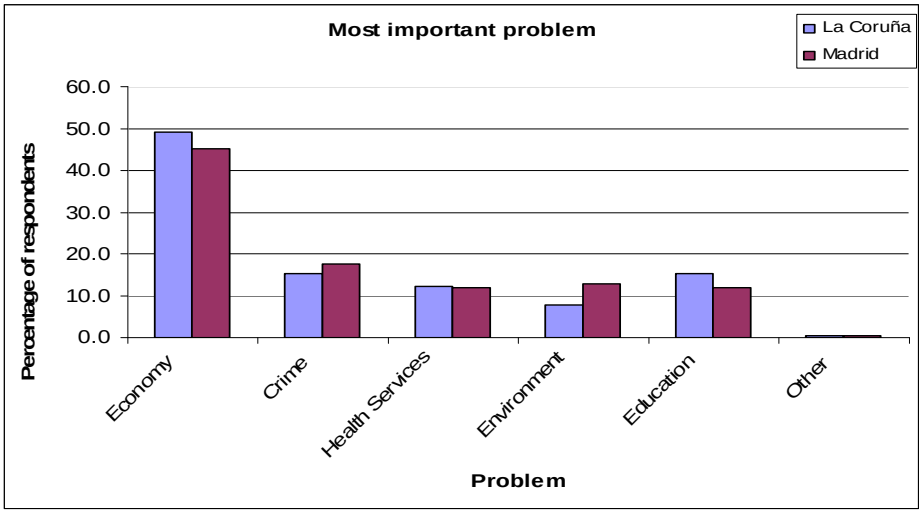
Summary statistics

This subsection presents the summary statistics for the significant independent variables that were later used in the multinomial logit models. Following the initial questions on basic socio-economic characteristics, interviewees were presented with a set of common socio-economic problems and they were asked to state the most important problem for them.

The results are presented in graph 4.3.1:

level because people with higher educational attainment are more frequently selected for citizen duties such as monitoring polling stations on elections.

Graph 4.3.1 Respondents' perception of socio-economic problems



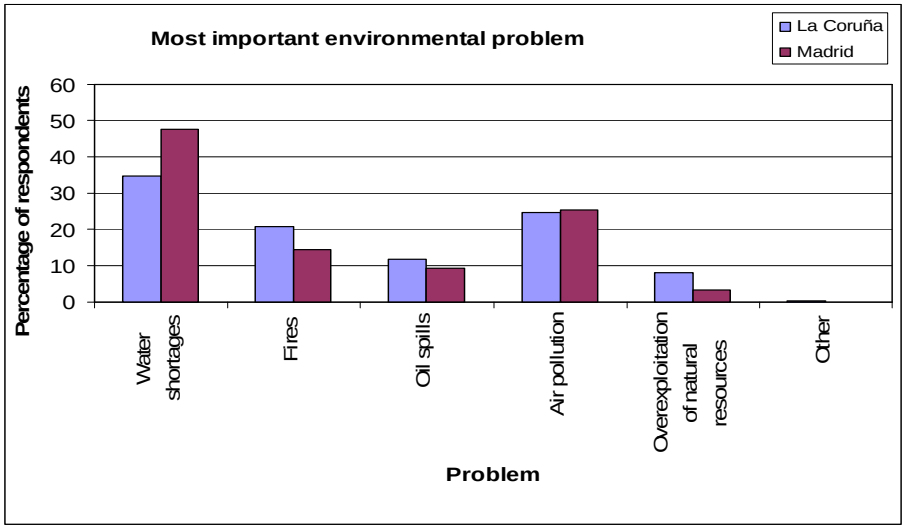
Just under half of the respondents stated the state of the economy was *the most important problem* for them. This was followed at a fair distance by the number of respondents who stated other problems (crime, education, the state of health services and finally the state of the environment) were their main concern. Interestingly for the interpretation of the model results, more people from Madrid thought environmental problems were the most important problem (12.8%) compared to respondents in La Coruña (7.8%). These results over-represent the environmental concern of Spanish citizens as only 1.6% of people interviewed by the CIS (Spain's Centre for Sociological Research) stated the environment was the first or the second most important problem in Spain[102] (CIS, 2008).

Following these questions, respondents were asked about their concern about various environmental problems. They were asked to state which of the environmental problems were the most important for them.

The results are presented in graph 4.3.2 below.

[102] http://www.cis.es/cis/opencms/-Archivos/Marginales/2700_2719/2705/e270500.html

Graph 4.3.2 Respondents' perception of environmental problems



Under 50% of respondents in Madrid and over 30% of respondents in La Coruña stated water scarcity was *the most important environmental problem*. Spain's geographical location with repeated droughts in recent years can help explain this perception. This was followed by approximately 25% of respondents in both cities stating air pollution was the most important environmental problem. The concern about air pollution can arguably be attributed to the inclusion of climate change in the issue attention cycle, see Downs (1972), Roberts (2004), Carter (2007) or Connelly and Smith (2003), among other. According to Noya (Pers. Comm.) air pollution and climate change more specifically have been in 'society's mind' in Spain since both the IPCC and Al Gore received the Nobel Prize. A further 20% of respondents in La Coruña (vs. 14% in Madrid) stated wild fires were the most important environmental problem. The many wild fires suffered each year in Spain[103] during the summer months are a likely cause for this answer. Oil spills were chosen as the most important environmental problem by only approximately 10% of respondents in both cities. Finally, over-exploitation of resources (e.g. over-fishing) was chosen as the most important environmental problem by 8% of respondents in La Coruña and only 3% of respondents in Madrid.

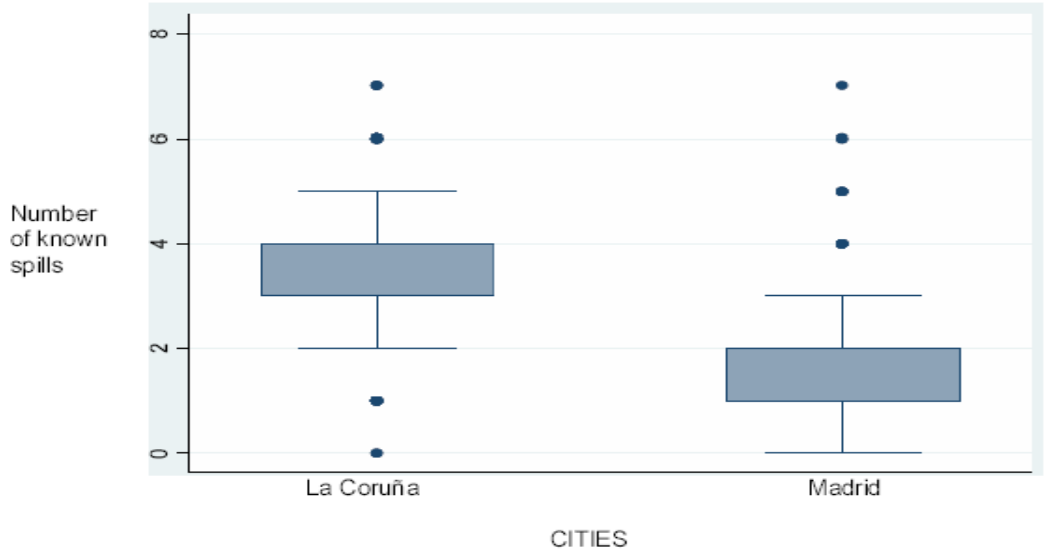
Whether people thought oil spills were the most important environmental problem was not significant in the compensation exercise and therefore it was not included in the multinomial logit model that will be presented and analysed below. The

[103] More so in Galicia than in Madrid. See http://assets.wwfspain.panda.org/downloads/incendiometro_09_informe.pdf

information provided by respondents' answers to this question is nevertheless interesting as it informs about the relatively low relevance of oil spills compared with other environmental problems.

The number of oil spills known by respondents is not significant in determining the choice of compensation option but if this variable is transformed into a dummy variable (people who know about oil spills *vs.* people who don't) then the variable becomes significant in the choice of preferred compensation option. It is nevertheless interesting to analyse the mean differences in knowledge among the two survey locations. The box plot representation of this information is provided below in graph 4.3.3.

Graph 4.3.3 Number of known spills: survey results



As was expected, the mean knowledge regarding oil spills of people in the city of La Coruña is over three spills whereas this figure goes down to under two spills on average for respondents from Madrid. There is therefore a 'distance decay effect' in the average number of known oil spills.

The next question that is relevant in our analysis is respondents' pro-ecological worldview as captured by the aggregate New Ecological Paradigm Scale (NEP). This attitudinal exercise provided respondents with the 15 statements that make up the revised NEP scale (see Dunlap, 2000). The use of the NEP scale is based on the idea that this multi-attribute scale provides a better indication of pro-ecological world view of respondents compared with single attribute questions (Kotchen and Reiling, 2000).

This scale fits well with the theory of reasoned action (Fishbein and Ajzen, 1975) in which attitudes, among other variables, influence intentions which can be good predictors of behaviour under certain circumstances. The statements included in the questionnaire and answers are provided in table 4.3.2 below.

Table 4.3.2 Summary statistics of the percentage distributions for the NEP

Number	Statement	STA[a]	A	U	D	STD
1	We are approaching the limit in the number of people the earth can support	10.86	34.09	15.84	28.51	7.69
2	Humans have the right to modify the environment to suit their needs	8.01	23.41	10.12	37.31	20.39
3	When we interfere with nature it often produces disastrous consequences	32.22	57.64	5.75	3.16	0.3
4	Our ingenuity will ensure we do not make the earth unliveable	15.02	41.12	15.93	21.4	5.77
5	We are severely abusing the environment	51.96	43.05	1.96	2.11	0.91
6	The earth has plenty of natural resources if we just learn how to use them	28.81	53.24	7.39	8.9	1.36
7	Plants, animals and humans have the same right to exist	44.19	44.19	6.49	4.68	0.45
8	Nature is strong enough to resist impacts of humans	3.79	18.18	14.7	45.61	17.27
9	Despite our abilities we are still subject to the laws of nature	28.85	58.61	5.89	5.44	0.91
10	Environmental problems have been greatly exaggerated	4.68	15.23	12.37	46.3	20.36
11	The earth has very limited space and resources	13.16	42.21	16.94	22.39	4.08
12	Humans were meant to rule over the rest of nature	6.18	23.83	14.63	39.52	14.63
13	Nature's balance is very fragile and it can be easily upset	18	61.27	6.96	10.74	1.36
14	We will eventually learn enough about how nature works to be able to control it	4.68	32.28	19.31	32.58	9.65
15	If things continue as they are we will soon face a large scale ecological crisis	41.48	47.06	4.52	5.28	1.06

[a] STA stands for strongly agree, A means agree, U means unsure, D means disagree and STD means strongly disagree. Figures have been rounded up and thus may not add up to 100%[104].

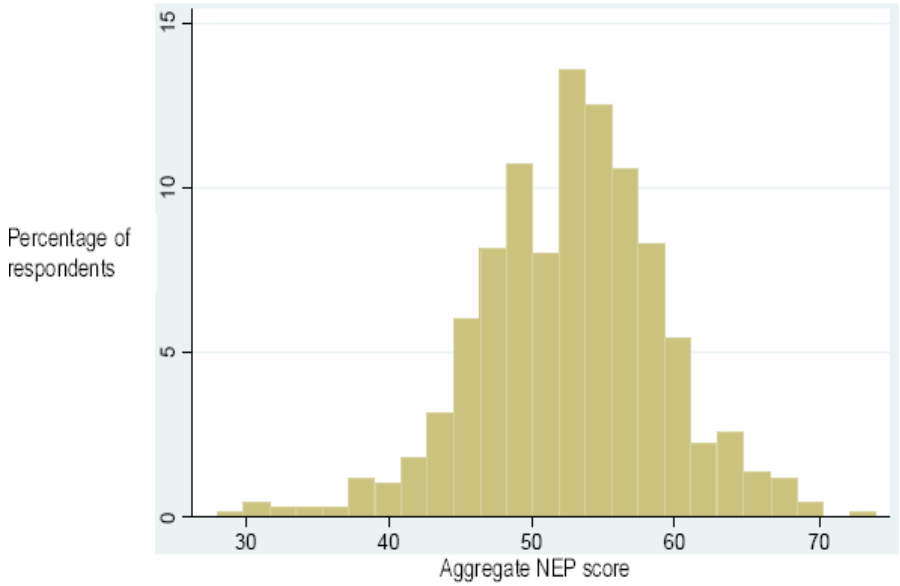
In order to reduce the number of variables to be included in the parametric estimates of the compensation choices, Dunlap's (2000) instructions were followed. The nominal categories (strongly agree, agree, etc.) were assigned a number in a five point likert scale where agreement or strong agreement with statements numbered 1, 3, 5, 7, 9, 11, 13 and 15 and disagreement with statements numbered 2, 4, 6, 8, 10, 12 and 14 showed a pro-ecological worldview. An aggregate score was then used as an independent variable in both the compensation question and in the valuation question.

[104] Please note the wording of the statements was adapted to clarify the statements' meanings following the pilot. This was done to ensure interviewees understood the statements.

Once the scores were obtained Cronbach's alpha (α[105]), which is a measure of the ability of a set of questions/statements (variables) to measure a given construct (i.e. the pro-ecological worldview[106]), was computed. It is generally stated that for social science studies an acceptable value is α ≥ 0.7. Values between 0.6 and 0.7 are also accepted; see for example Sturmey *et al.* (2005), Moss *et al.* (1998) Nixon and Saphores (2007) even though they provide less conclusive evidence in terms of single construct measurement. The α obtained for the present study is 0.63 and therefore within the acceptable range in terms of using the aggregated NEP score to measure the pro-ecological worldview of respondents.

The representation of respondents' aggregate NEP scores is shown in graph 4.3.4 below:

Graph 4.3.4 Aggregate NEP Scores



The last independent variable used in the analysis of compensation preferences is ideology. This variable was introduced by a question on nation-wide right wing and nation-wide left wing newspapers read by respondents as there is evidence that newspapers read can be a good proxy of ideology (Gentzkow and Shapiro, 2010). The summary statistics of the newspapers read by survey respondents is presented in the following table. The data is then compared to the last municipal election results in order to see whether respondents' ideology is related to population characteristics.

[105] Calculated as: $\alpha = \frac{N \cdot \bar{c}}{\bar{v} + (N-1) \cdot \bar{c}}$ where N is the number of items (15 in our case), c-bar is the mean inter-item covariance and v-bar is the mean variance (http://www.ats.ucla.edu/stat/spss/faq/alpha.html)

[106] That can be formed by different dimensions (Loureiro and Ojea, 2007)

Graph 4.3.5 and table 4.3.3, present the percentage of respondents who read right and left wing newspapers as well as the population's ideology according to the latest municipal elections. The data is disaggregated by cities.

Graph 4.3.5 Right and left-wing newspapers read by survey respondents

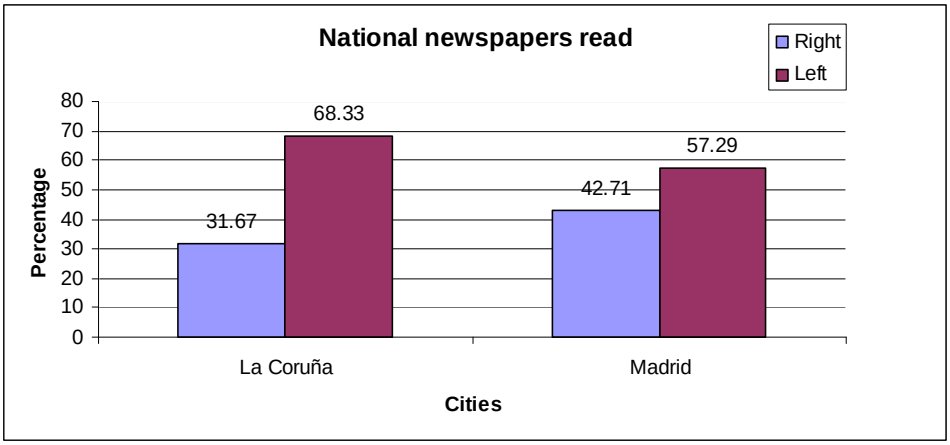


Table 4.3.3 Population characteristics according to the last municipal elections

	Main Right political party (PP) voters in %	Main left political party (PSOE) voters in %
La Coruña	30.09%	44.70%
Madrid	55.50%	30.80%

In Madrid the data in the tables above clearly shows that the sample contained a higher proportion of left wing respondents compared with population characteristics, assuming that the newspapers read are a good proxy political orientation of respondents. In Coruña expected right wing voters within the sample are only marginally over-represented by the sample compared with population characteristics but left wing voters are grossly over-represented. So, there is an overall over-representation of left wing respondents in the sample.

The dependent variable in the compensation exercise was respondents' choice of compensation option when faced with spills of different sizes and consequences. The first question asked was whether respondents wanted additional compensation (i.e. over and above the compensation paid). Respondents were reminded of the opportunity cost of receiving compensation in terms of public projects forgone as well as of the existence of unspoilt substitute sites. The results from this question are shown in the table 4.3.4 below.

Table 4.3.4 Respondents' willingness to accept compensation if a new spill happened

	Frequency	Percentage
Not willing to accept additional compensation	55	8.30
Willing to accept additional compensation	608	91.70
Total	663	100.00

So, the vast majority of respondents were willing to accept additional compensation. As regards those respondents who did not want additional compensation, the main reasons given in the follow-up questions were primarily that these spills should be prevented, rather than compensated for. This explanation could be indicative of a demand for preservation of natural capital and a potential move towards strong sustainability preferences. It could theoretically signal a limit in the type of damages can be compensated (Humphrey, 2001; Neumayer, 1999; Spash, 1993) and it could help explore further issues of compensatability, Humphrey (2001). The small number of respondents not willing to accept compensation implies any conclusions should be treated as preliminary and in need of further studies to test this idea in empirical terms.

Other respondents who did not want compensation stated the reason for their answer was that there were other more important problems. Over 20% of those who didn't want compensation said others should pay, arguably acknowledging the opportunity cost of additional compensation. This answer could also signal that respondents are protesting, in line with valuation classifications of protest answers (Bateman *et al.* 2002) in contingent valuation exercises. The following chapter further explores protest responses in a CV setting.

Interviewees who did want additional compensation in case a new spill happened were shown the three spills (small, medium and large) with their consequences and they were asked to allocate a hypothetical amount of money among the three compensation options (investments in man-made capital, investments in social capital and investments in natural capital). This amount was equal to 100€ per person for the small spill, 500€ for the medium spill and 1,000€ per person for the large spill.

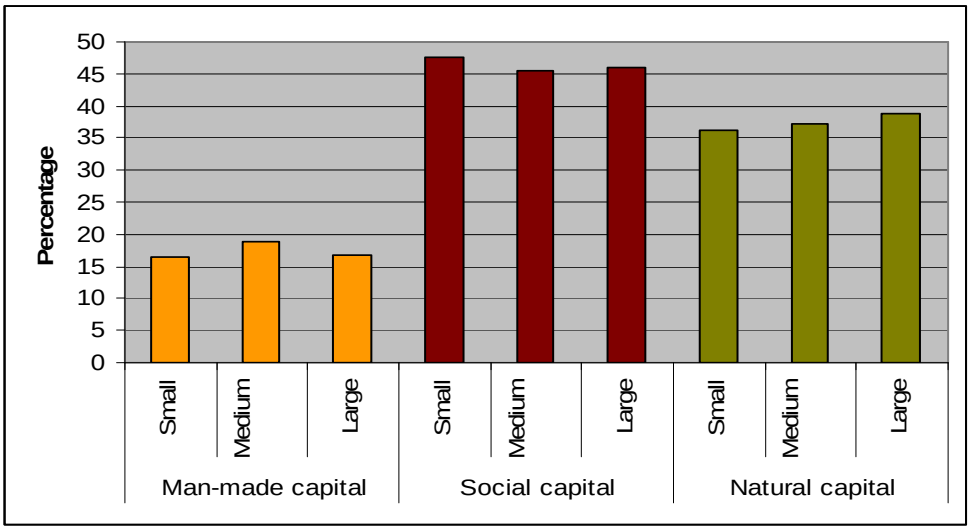
The results are shown in table 4.3.5 below.

Table 4.3.5 Summary of additional compensation allocation preferences[107]

Spill / quantity to be distributed among the investment programs	Investment program	Mean	%
Small / 100€	Man-made capital	16.57	16.57
	Social capital	47.49	47.49
	Natural capital	36.09	36.09
Medium / 500€	Man-made capital	94.85	18.97
	Social capital	227.19	45.43
	Natural capital	186.55	37.31
Large / 1,000€	Man-made capital	166.83	16.68
	Social capital	459.05	45.9
	Natural capital	389.05	38.9

Overall, respondents allocated more investment to social capital. This was so across the three spills. Respondents to the questionnaire show that, on average, they would allocate between 16.5% and 18.9% of additional compensation investment funds to man-made capital. They would allocate between 45.4% and 47.4% to social capital. Finally, they would allocate between 36% and 38.9% of compensation investment funds to natural capital. Graph 4.3.6 below illustrated this:

Graph 4.3.6 Compensation funds assigned to different types of capital across spills



In order to test whether there were statistically significant differences between the quantities allocated to the different compensation options across the three different spills a repeated measures ANOVA test was undertaken. The dependent variable was the compensation amount assigned in percentage. The two factors, or independent variables, were the type of capital and the size of the spill. These factors or

[107] Note figures may not add up to 100% due to rounding up.

independent variables had three levels each (small, medium and large for the spill; man-made capital, social capital and natural capital for the type of capital).

The results obtained indicated there are statistically significant differences according to the type of capital (Pillai's trace = 0.599; p-value < 0.001) with a very large size effect (Cohen's d = 2.44). Equally, the percentage of compensation allocated to each type of capital varies significantly according to the size of the spill (Pillai's trace =0.071; p-value<0.001) with a medium size effect (Cohen's d=0.55). The output is presented in table 4.3.6 below:

Tale 4.3.6 Multivariate contrasts: Spill, type of capital and spill*type of capital

Effect		Value	F	P-value
Spill	Pillai's trace	0.005	1.518	0.220
Capital	Pillai's trace	0.599	412.249	0.000
Spill * Capital	Pillai's trace	0.071	10.52	0.000

The results for the pairwise comparisons for the type of capital are as presented in table 4.3.7 below:

Table 4.3.7 Pairwise comparisons: Type of capital

(I) Capital	(J) Capital	Mean differences (I-J)	SE	P-value(a)
Man-made	Social	-28.475(*)	1.17	0.000
	Natural	-19.363(*)	1.158	0.000
Social	Man-made	28.475(*)	1.17	0.000
	Natural	9.112(*)	1.595	0.000
Natural	Man-made	19.363(*)	1.158	0.000
	Social	-9.112(*)	1.595	0.000

* Mean difference is significant at the 0, 05 level.
(a) Bonferroni adjustment for multiple comparisons

The results show that we reject all the null hypotheses tested in table 4.3.7 above. This means that we reject that the mean amount assigned to man-made capital is equal to the mean amount assigned to social capital. We also reject that the mean amount assigned to social capital is equal to the mean amount assigned to natural capital. Finally, we reject that the mean amount allocated to man-made capital is equal to the mean amount allocated to natural capital.

Interactions among the two independent variables (i.e. whether one factor had a bearing on the other, in our case whether the size of spill led to a different amount of

say natural capital demanded as compensation) were analysed using graphical representation of the data. According to (Hinton, 1995: 155) 'a significant interaction occurs when the effect of one factor is different at the different conditions of the other factor'. When the lines are not parallel, we can say there is an interaction effect (*ibid.*). In our project, a small yet significant interaction occurs when the allocation of compensation to one type of capital (say natural) is different (higher or lower) when the other factor (size of spill) changes (say from small to medium).

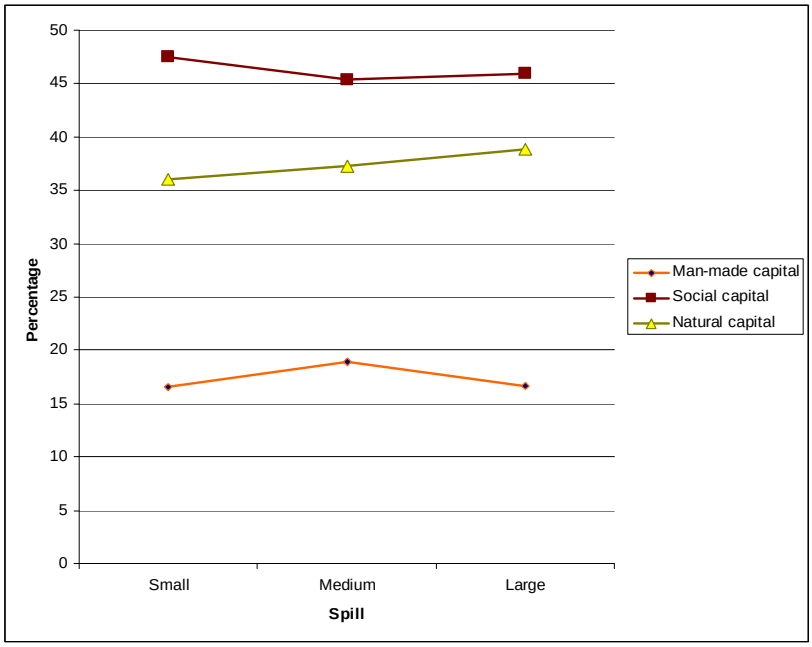
More specifically, looking at graph 4.3.7 below we see that even though the allocation of compensation funds to social capital is higher across the three spills, indicating a significant main effect of social capital (red line), less compensation is allocated to social capital as the spill sizes changes from small to medium. When the spill size changes from medium to large, there is a slight increase in the amount of compensation funds allocated to social capital[108].

The second most 'popular' compensation option is natural capital (green line). We see that as the spill size changes from small to medium and from medium to large there is an increase in the amount of compensation allocated to natural capital. This means that as the environmental damages increase, more natural capital is demanded as compensation despite the fact that compensation in social capital is the option to which overall more resources would be allocated.

Man-made capital is the compensation option to which fewer resources were allocated. The slight 'hump' in the orange line indicates that we find interactions. As the spill size changes from small to medium there is an increase in the amount of compensation allocated to man-made capital. When the spill size changes from medium to large, there is a reduction in the amount allocated to man-made capital. Graph 4.3.7 below is a representation of the moderate interaction effects:

[108] The help of David Arribas Águila is greatfully acknowledged.

Graph 4.3.7 Interaction of factors in the analysis of variance



Finally, respondents were asked to choose their preferred compensation option (investment in infrastructures, in social capital or in natural capital). The analysis of the data using a multinomial logit required having information on the preferred option. The summary table 4.3.8 below presents these results:

Table 4.3.8 Frequency & percentage of respondents choosing compensation options

Spill	Compensation option	Frequency	Percentage
Small	man-made capital	48	8.08
	Social capital	354	59.6
	Natural capital	192	32.32
Medium	man-made capital	49	8.19
	Social capital	348	58.19
	Natural capital	201	33.61
Large	man-made capital	39	6.77
	Social capital	325	56.42
	Natural capital	212	36.81

As table 4.3.8 shows, the majority of respondents chose investment in social capital as their preferred compensation option. More specifically, between 56.42% and 59.6% of respondents chose social capital as their preferred compensation option. Between 32.32% and 36.81% of respondents chose natural capital and finally between 6.77% and 8.08 % of respondents chose man-made capital as their preferred compensation option.

A possible reason for the high percentage of respondents preferring social capital may be that respondents were told that the government was the provider of additional compensation[109] and questionnaire respondents may think that, irrespective of the problem analysed, the government should be investing in social capital. Future studies could test whether the provider of the compensation package has a significant effect on the choice of compensation option using a split sample design whereby different groups of respondents are presented with different institutions (the government, the oil transport sector, NGO's, etc.) as providers of compensation.

The questionnaire contained open-ended follow-up questions to help understand the motivations behind respondents' compensation choices. The reasons for choosing each type of capital are presented below.

The main *reasons for choosing man-made capital* as the preferred compensation option are presented in table 4.3.9:

Table 4.3.9 Main reasons for choosing man-made capital as compensation

Spill	**Small spill**	**Medium spill**	**Large spill**
I choose this option because:	%	%	%
it is the most important	39.58	26.53	25
it is a good substitute	18.75	8.16	5
it is beneficial for others	0	4.08	5
it will prevent spills	0	8.16	10
it mitigates the damages	12.50	16.33	12.5
of the consequences of the spill	0	2.04	2.5
of the economic consequences	4.17	10.20	5
I am concerned about future generations	4.17	0	0
of normative criteria (we should, it is our responsibility)	6.25	6.12	0

According to respondents, the core reason for choosing infrastructures was that this option was the most important, the most logical or the best. Prevention or mitigation of the damages were both seen as other important reasons for choosing man-made capital as the preferred compensation option. A further reason given was that these infrastructures benefit others or that they may constitute a good substitute for the damaged or lost natural capital. This last statement could arguably back the Hartwick rule regarding perfect substitutability of different types of capital, although the fact

[109] The government has provided compensation in past spills (e.g. the Prestige) and it is expected to continue to be the case in the future given current quantitative and qualitative limitations in international compensation mechanisms.

that this reason was decreasingly mentioned as the spill size and consequences worsen could signal limits to this substitutability as environmental thresholds are trespassed.

The fact that a very small number of respondents chose infrastructures and an even smaller number mentioned the substitutability of infrastructures for damaged natural capital could caution policy-makers against assuming substitutability for the population at large. Further studies may benefit from larger sample sizes to be able to generalise these results to the population.

The *reasons for choosing social capital* are presented in table 4.3.10 below:

Table 4.3.10 Main reasons for choosing social capital as compensation

Spill	Small spill	Medium spill	Large spill
I choose this option because:	%	%	%
it is the most important	32.59	26	24.03
it is a good substitute	0.56	0.28	0.59
it is beneficial for others	3.06	1.43	3.56
it will prevent spills	10.58	6.86	4.15
it mitigates the damages	11.42	12.28	21.06
of the consequences of the spill	1.11	2	3.26
of the economic consequences	0.28	0.57	0.59
I am concerned about future generations	3.06	1.72	2.37
the damages are permanent/irreversible	0	0	0
of its use values (food, recreation, etc.)	0.28	0.29	0
of normative criteria (we should, it is our responsibility)	2.22	2.87	1.48
of education	25.62	22.28	13.64
of research	5.57	5.71	5.04
of hospitals	0.83	0	0

In table 4.3.10 we can see that once again, respondents stated that the compensation option chosen was the best or the most logical/important one. The belief that this compensation option would help mitigate the damages or would even help prevent them in the future (arguably through the R&D programs) followed in popularity as the reason provided by respondents for choosing social capital as the preferred compensation option. Very few respondents stated investment in social capital would be a good substitute for lost natural capital hence shying away from the Hartwick-type assumption of perfect substitutability.

The *reasons for choosing natural capital* as the preferred compensation option are presented in table 4.3.11 below:

Table 4.3.11 Main reasons for choosing natural capital as compensation

Spill	Small spill	Medium spill	Large spill
I choose this option because …	%	%	%
it is the most important	14.07	15.31	13.77
it is a good substitute	1.51	0	0
it is beneficial for others	0	0.47	1.33
it will prevent spills	0.5	0.47	1.33
it mitigates the damages	55.27	39.23	40
of the consequences of the spill	3.01	7.65	8
of the economic consequences	0.5	0.95	0
I am concerned about future generations	1.50	0.47	0
the damages are permanent/irreversible	2.51	3.34	2.66
of its use values (food, recreation, etc.)	1	0.95	2.22
of normative criteria (we should, it is our responsibility)	14.07	10.04	9.33

The main reasons for choosing natural capital are: the belief that this type of compensatory projects will help reduce the damages caused by spills; the fact that the natural capital compensation package is perceived by respondents as the most important; finally, respondents stated it was their responsibility or their duty to invest in natural capital when future spills take place. If we compare tables 4.3.9, 4.3.10 and 4.3.11 we can see that explanations differ. A larger proportion of respondents who chose natural capital as the preferred compensation option stated something different to 'it is the most important' option. Very few respondents explicitly stated that investments in natural capital were a good substitute for the lost natural capital. This precludes any conclusion as regards intra-capital substitutability, in contrast with the information obtained from the FG sessions. The fact that over a third of respondents chose natural capital as the preferred compensation option is suggestive of a potential demand for strong sustainability.

4.3.2 Compensation exercise[110]

Model

As we have seen in the previous section, respondents were asked to choose between three different compensation options in case a new spill (small, medium or large) happened. The aim of this exercise was two-fold. First, to test whether weak sustainability (either in its traditional Hartwick-type approach or in the modified Aldred

[110] The main results presented in this section were presented in a preliminary state of the analysis at the UKNEE the 20th of March 2009 (see http://www.eftec.co.uk/UKNEE/envecon/2009_documents/envecon2009_POLICY_INSTRUMENTS_Lazaro-Touza_presentation.pdf). Questions and comments from attendants to this conference are gratefully acknowledged.

(2002) and Turner (2007) proposal) or strong sustainability (in the form of replacement of like-for like) is preferred in terms of compensation when a new spill happens. Second, to analyse the characteristics that determine the compensation choice of respondents. The present section focuses on this latter goal through the parametric analysis conducted via the use of multinomial logit models[111].

When faced with these types of questions, the analysis of the characteristics that determine the choice of one option over another is done through multiple choice models. The polychotomous categorical variables with no pre-established order plus the fact that the covariates (regressors or explanatory variables) refer to individual characteristics, led us to choose a MNL model[112].

These models are based on the assumption of rational agents that will choose the option that yields higher utility. In our compensation exercise, we have three alternatives and ten individual characteristics and we assume that the utility functions are linear. We would therefore have[113]:

$$U_{i1} = \alpha_1 + X'_i\beta_1 + \varepsilon_{i1} \quad (1)$$

$$U_{i2} = \alpha_2 + X'_i\beta_2 + \varepsilon_{i2} \quad (2)$$

$$U_{i3} = \alpha_3 + X'_i\beta_3 + \varepsilon_{i3} \quad (3)$$

[111] The help, insight and knowledge of Mercedes Gracia Díez (Professor in Econometrics at Universidad Complutense de Madrid) is gratefully acknowledged.

[112] Although the multinomial probit was also considered, computational ease and the theoretical similarities between logit and probit estimations led us to choose the MNL model (see Cabrer Borrás *et al*. 2001). Additionally, the MNL had a larger (less negative) log pseudo likelihood value than the multinomial probit for the medium and the large spills.

Given the nature of the questions asked (i.e. all respondents answered three compensation questions) a multivariate probit model was also considered. This was due to the possibility that respondents' choices could be closely related and according to Giraud, Loomis and Johnson (1999) this could lead to correlations between the statistical disturbances of the responses. A probit for the compensation exercise was run to compare the results of the two. As of 2003, 'accurate functions for the evaluation of trivariate and higher-dimensional normal distributions do not exist in Stata' (Cappellari, 2003: 278) so the compensation answers were transformed into dichotomous type responses for each type of capital for the comparison of the multivariate probit and the multinomial probit results. The outputs of these analyses showed that the results of these two models were very similar. The reason for this similarity according to Rubinfeld and Pindyck (1981), Zellner (1963) and Judge *et al.* (1988) is that if we have three equations to estimate and these equations all have the same regressors then the estimator that takes into consideration the possible correlation is the same as the OLS estimator. The above-mentioned authors demonstrate this for a linear model and analysing the results when trying out the multivariate probit and the multinomial probit led us to assume this was also the case in non-linear models. We therefore used the multinomial logit model for the analysis of the compensation exercise data.

[113] This explanation is adapted from Cabrer Borrás (2001).

Where:	
Y_i	: Choice
U_{i1}, U_{i2}, U_{i3}	: Utilities of each alternative for respondent i
α_1, α_2, α_3	: Constant
X'_i	: Row vector of regressors or explanatory variables for respondent i
β_1, β_2, β_3	: Column vector of coefficients
ε_{i1}, ε_{i2}, ε_{i3}	: Error terms

And therefore, each respondent will choose according to the following logic:

Y_i= 1(man-made capital) if $U_{i1} > U_{i2}, U_{i3}$ (4)

Y_i = 2 (social capital) if $U_{i2} > U_{i1}, U_{i3}$ (5)

Y_i = 3 (natural capital) if $U_{i3} > U_{i1}, U_{i2}$ (6)

The expected value of choosing a given option is quantified through the probability:

$$P(Y_i = j) = \frac{e^{X'ij\beta}}{\sum_{j=o}^{J} e^{X'ij\beta}} \quad (8)$$

Where:	
j	= Index for each alternative for respondent i
X'_{ij}	= Row vector of regressors or explanatory variables for respondent i
β	= Column vector of coefficients

If the regressors (X_{ij} in general notation as it includes respondent characteristics (i) and characteristics of the alternatives (j)) refer to respondent's characteristics, which is the case in the present research project, then the Multinomial Logit Model should be used. The specification for this model is as follows[114]:

$$P(Y_i = j) = P_{ij} = \frac{e^{X'i\,\beta j}}{\sum_{j=0}^{J-1} e^{X'i\beta j}} \quad (9)$$

Where:	
P_{ij}	= Probability that respondent i will choose alternative j
j	= Index for each alternative which include J-1 alternatives
X'_i	= Row vector of regressors or explanatory variables for respondent i
β_j	= Column vector of coefficients for the alternative being analysed ($_j$)

[114] Medina (2003:22)

Given the existing indetermination of the MNL when estimating the parameters, the model is standardised assuming that the coefficients of the baseline alternative are equal to zero ($\beta_0=0$)[115]:

$$P(Y_i = 0) = \frac{1}{1 + \sum_{j=1}^{J-1} e^{X'_i \beta_j}} \quad \text{for } j = 0 \qquad (10)$$

Where:	
j	= Index for the alternative being analysed (= 0 or base outcome in this case)
X'_i	= Row vector of regressors or explanatory variables for respondent i
β_j	= Column vector of coefficients for the alternative being analysed ($_j$)

$$P(Y_i = j) = \frac{e^{X'_i \beta_j}}{1 + \sum_{j=0}^{J-1} e^{X'_i \beta_j}} \quad \text{for } j = 1, 2, \ldots, (J-1) \qquad (11)$$

Where:	
j	= Index for each alternative which include J-1 alternatives
X'_i	= Row vector of regressors or explanatory variables for respondent i
β_j	= Column vector of coefficients for the alternative being analysed ($_j$)

In our case, in which we have three alternatives from which respondents were asked to choose, the probability of choosing each option would be[116]:

$$Pi_0 = \frac{1}{1 + \sum e^{X'i\beta j}} \quad \text{for } j = 0 \qquad (12)$$

$$Pi_1 = \frac{e^{X'_i \beta_j}}{1 + \sum e^{X'i\beta j}} \quad \text{for } j = 1 \qquad (13)$$

$$Pi_2 = \frac{e^{X'_i \beta_j}}{1 + \sum e^{X'i\beta j}} \quad \text{for } j = 2 \qquad (14)$$

Subject to $Pi_0 + Pi_1 + Pi_2 = 1$

[115] *ibid.*
[116] Adapted from Medina (2003) when there are more that one explanatory variable.

Regresors

The independent variables that were to be included in the model were selected following the literature review, analysing the information obtained during elite interviews and focus groups and and studying the cross tabulation data. The theory of reasoned action (Fishbein and Ajzen, 1975) that is described in chapter 2 was (loosely) used as a model to understand behavioural intentions in the compensation and in the valuation exercises. Stated preference techniques literature and manuals were also used to determine the independent variables that were to be used in the models (see Bateman*. et al.* 2002). Socio-economic variables, variables related to beliefs and attitudes related to the environment (e.g. the aggregate NEP score) were therefore included in the MNL model. A summary table of the independent variables is presented in table 4.3.12 below:

Table 4.3.12 Independent variables. Compensation exercise, multinomial logit model

Independent variable	Possible values
City	0= if resident of La Coruña 1= if resident of Madrid
Age	18-79
Income	Midpoint of the income band
Education	= 1if illiterate = 2 if no education but can read = 3 if Nursery school = 4 if Primary education = 5 if High school or equivalent (up to 14 years of age) = 6 if Secondary school certificate (up to 18 years of age) = 7 if Graduate = 8 if Postgraduate
Concerned about the economy	0= if No 1= if Yes
Concerned about the environment	0= if No 1= if Yes
Known spills	0= if none 1= if one or more
Aggregated NEP score	15 – 75[117]
Number of right wing newspapers read	= 0 if none = 1 if one = 2 if two = 3 if three
Number of left wing newspapers	= 0 if none = 1 if one = 2 if two

[117] Although 74 was the maximum aggregate NEP score obtained by any respondent

There are, to my knowledge, no previous studies of the choice between different compensation options in terms of the *type* of capital preferred when faced with oil spills of varying severity in order to test respondent preferences in terms of weak and strong sustainability. This means that the expectations as regards the signs of the variables were exploratory and guided by other scales (e.g. the NEP) that unveil the pro-ecological worldview. Expectations were also guided by other valuation studies as it was hypothesised that there might be some similarities among the independent variables and expected signs in the compensation question and the valuation question. For example, people who have a more pro-ecological worldview (higher aggregate NEP score) might be more likely to choose natural capital when faced with environmental losses and might also be willing to make extra sacrifices in terms of higher WTP to prevent future oil spills. Contextual information obtained from elite interviews and from the focus group discussion additionally shaped the expectations regarding the signs of the independent variables chosen (see discussion in chapter 3).

The sign of the city variable was unclear as, in principle, the distance decay effect according to which 'benefit values are inversely related to the distance from a site' (Georgiou *et al*. 2000:3) may in principle have also been applicable to the compensation exercise and it was hypothesised that this may have led respondents in La Coruña to prefer social capital or natural capital over the status quo (infrastructures). The fact that some elite interviewees and some focus group respondents mentioned the lack of infrastructures in Galicia as a reason for supporting investment in infrastructures in the additional compensation packages designed in the aftermath of the *Prestige*, put that expectation on hold.

There were little *a priori* expectations regarding the sign of age in the choice of compensation option (social capital or natural capital over infrastructures). According to Olofsson and Öhman (2006) younger people tend to show more pro-environmental attitudes compared to older people, but it is older people (up to retirement age) who, on average, will have more financial resources and hence will be able to make commitments to protect the environment. In the compensation exercise, where income does not *a priori* limit the compensation received, it may be expected that younger interviewees show a more pro-environmental attitude and perhaps choose

natural capital as their preferred compensation option. Older people however tend to be more risk averse. If this risk aversion is translated into environmental damages caused by spills, older respondents will be expected to want to avoid loosing natural capital and hence they may choose natural capital over the status quo (man-made capital). Hence, it was not clear whether age would be significant in determining the preferred compensation option. In fact, the results from the compensation exercise show that age does not discriminate in the choice of social capital or natural capital over infrastructures.

As regards income, although the general expectation from an economic growth optimist perspective is that richer people care more about the environment (Pearce, 1980, Beckerman, 1974), there is a counter argument that claims that low income individuals can value the environment highly (Neumayer, 1999; Kriström and Riera, 1996). Additionally, losses such as those depicted in the compensation exercise could also be less significant for people who are better off as they can be argued to have greater substitution possibilities. So, income could in principle be expected to be either positive or negative. Regression results show that the sign is negative in the compensation exercise, indicating that individuals who are worse off have higher probability of choosing social capital or natural capital over infrastructures.

Regarding education, Dunlap *et al.* (2000) and Markandya and Perrings (1991) claim better education makes individuals more aware of environmental damage and allows them to voice their demands for environmental quality. Hence, education is expected to have a positive sign in the choice of natural capital over infrastructures. The same reasoning applies to the variable 'information about previous oil spills' that was expected to be significant and positive in determining the choice of natural capital over infrastructures.

Concern about socioeconomic problems (such as the state of the economy or the state of the environment) was included as contextual information in the form of warm-up questions at the outset of the questionnaire. Belief-attitude-behaviour models could point to the possibility of having individuals who are more concerned about the environment being more likely to choose natural capital as their preferred

compensation option. Additionally, the analysis of the information obtained from elite interviewees led to the hypothesis that individuals who were more concerned about the state of the economy would prefer man-made capital to social or to natural capital. This was so as man-made capital was seen by some elite interviewees and focus group respondents as boosting the economy (i.e. infrastructure projects tend to require substantial labour force which in turn drives the demand for goods and services in the surrounding areas).

Higher aggregate NEP scores (that indicate a more pro-ecological worldview, Dunlap *et al.* 2000) were hypothesised to lead to higher likelihood of selecting natural capital over infrastructures. Finally, as regards political orientation the above mentioned authors state that there is evidence that more progressive people (characterised in the thesis as reading more left wing newspapers) would have a more ecological worldview and this in turn may me related to a greater probability of choosing either social capital or natural capital over infrastructures.

Results

This subsection presents the output of the multinomial logit model used to analyse the characteristics that have a significant impact in the compensation choices of respondents. These results will then be critically discussed.

The model simultaneously estimates the choice of social capital and natural capital over infrastructures. The STATA outputs are however divided into two tables in the present chapter to improve clarity in the presentation of results. Thus, table 4.3.13 a) presents the first part of the MNL output in which the significance of regressors and their sign are described in the choice of social capital over man-made capital. Table 4.3.13 b) presents the second part of the MNL output in which the significance of regressors and their sign are depicted in the choice of natural capital over man-made capital. The base outcome is chosen to be infrastructures as this option was the one to which a largest amount of funds were devoted in the aftermath of the *Prestige*. The STATA outputs show that the model is significant overall as the Wald Chi squared of 78.63 for the small spill, 90.04 for the medium spill and 89.92 for the large spill all have a p-value of 0.0000 which means that the model proposed has a better fit than an

empty model (which would mean that all coefficients would be simultaneously equal to zero, the null hypothesis tested).

Table 4.3.13a Multinomial logit. Compensation exercise

a) Social capital over man-made capital

Variables	Small	Medium	Large
Constant	-2.485	-0.471	1.529
	(2.11)	(2.09)	(2.29)
City	1.451***	1.371***	1.695***
	(0.42)	(0.42)	(0.49)
Age	0.003	-0.0001	-0.007
	(0.11)	(0.01)	(0.01)
Income	-0.00002**	-5.65e-06	-0.00001
	(0.00001)	(0.00001)	(0.00001)
Education	0.192	-0.030	-0.140
	(0.15)	(0.15)	(0.18)
Concerned about the Economy	-0.973***	-0.353	-0.681
	(0.41)	(0.38)	(0.43)
Concerned about the Environment	-0.507	0.124	-0.012
	(0.39)	(0.42)	(0.46)
Konwn spills	0.953	0.856	1.448*
	(0.86)	(0.84)	(0.89)
Aggregate NEP score	0.053*	0.033	0.009
	(0.02)	(0.02)	(0.03)
Right	-0.518	-0.875***	-1.004***
	(0.33)	(0.30)	(0.35)
Left	0.969**	0.976**	1.419***
	(0.43)	(0.42)	(0.56)
Pseudo R^2	0.0775	0.0821	0.0882

Where : Standard error in parentheses

* =The coefficient is significantly different from zero at a 90% confidence level

** =The coefficient is significantly different from zero at a 95% confidence level

***=The coefficient is significantly different from zero at a 99% confidence level

Key findings:

Across the three spills, age, the educational level of respondents and being concerned about the environment *do not* discriminate between choosing social capital and man-made capital.

If responses came from people interviewed in Madrid the probability of choosing social capital over man-made capital increased across the three spills. When elite interviews were conducted the 'historical debt argument', whereby Galicia had comparatively less infrastructures to the rest of Spain, was repeatedly mentioned as an underlying reason for investments in man-made capital. It seems as though this is also reflected in the compensation choices preferred by respondents.

Income is significant when analysing the small spill but for the medium and the large spills income does not discriminate between choosing social capital and infrastructures. The sign is negative, meaning that the higher the income the less likely to choose social capital over infrastructures. This may be due to the greater access wealthier people have to alternative education and healthcare that may be provided privately. The existence of substitution possibilities for these goods may therefore make them less desirable than the availability of infrastructures that tend to be publicly provided.

Concern for the economy is only significant when analysing the compensation choices for the small spill. For the medium and large spill, the concern for the state of the economy does not discriminate when choosing between social capital and infrastructures. For the small spill, also as expected, respondents who stated they were concerned about the economy were less likely to choose social capital over infrastructures. One possible explanation for this, mentioned in the focus group discussions, is that investments in infrastructures are seen as boosting the economy.

Whether or not respondents had prior knowledge about oil spills was only significant in determining the choice of social capital over infrastructures in the large spill. The sign is positive meaning that knowledge increases the probability of choosing social capital over infrastructures.

The aggregate NEP score is only significant for the small spill. For the medium and large spill, the NEP score does not discriminate between social capital and infrastructures. In the small spill, higher NEP scores increase the probability of choosing social capital over infrastructures. There were no prior expectations regarding the sign of this variable as there is no direct relationship between a more pro-ecological worldview and a preference for social capital. Concern for other species and for the environment may nevertheless be related to social capital investment which could further help confirm Aldred (2002) and Turner's (2007) theoretical proposal that when an environmental damage is suffered investment in schools and hospitals may be appropriate as compensation.

The political inclination is overall significant when determining the choice of social capital over infrastructures. With the exception made of the small spill, reading more right wing newspapers has a significant and negative effect on the probability of

choosing social capital over infrastructures. Conversely, reading more left wing newspapers has a significant and positive impact on choosing social capital over infrastructures for all spills. That is, an increase in the number of left wing newspapers read increases the probability of choosing social capital over infrastructures. This was also expected due to the traditional left wing ideological underpinnings in Spain that tend to advocate for government investment in public goods such as health care, education and, although maybe to a lesser extent, R&D programs.

Overall the variables chosen are significant and they have the expected signs. This is a sign of theoretical validity which is defined as results that 'conform to the predictions of economic theory' (Pearce *et al.* 2006: 119).

The coefficients, sign and significance in the choice of natural capital over infrastructures is presented in table 4.3.13 b) below:

Table 4.3.13b Multinomial logit. Compensation exercise

b) Natural capital over man-made capital

Variables	Small	Medium	Large
Constant	-3.890*	-2.415	-1.103
	(2.19)	(2.18)	(2.36)
City	1.187***	0.859**	1.350***
	(0.44)	(0.43)	(0.50)
Age	-0.008	-0.018	-0.017
	(0.01)	(0.01)	(0.01)
Income	-0.00003***	-0.00001	-0.00002**
	(0.00001)	(0.00001)	(0.00001)
Education	0.258	0.085	0.122
	(0.16)	(0.16)	(0.18)
Concerned about the Economy	-0.424	0.091	0.014
	(0.42)	(0.39)	(0.44)
Concerned about the Environment	0.015	0.723*	0.353
	(0.40)	(0.43)	(0.46)
Known spills	1.093	0.938	1.677*
	(0.92)	(0.91)	(0.95)
Aggregate NEP score	0.071**	0.059**	0.024
	(0.03)	(0.02)	(0.03)
Right	-0.760**	-0.908***	-1.33***
	(0.36)	(0.33)	(0.37)
Left	0.564	0.647	1.18**
	(0.44)	(0.43)	(0.57)
Pseudo R2	0.0775	0.0821	0.0882

Where : Standard error in parentheses
* =The coefficient is significantly different from zero at a 90% confidence level
** =The coefficient is significantly different from zero at a 95% confidence level
***=The coefficient is significantly different from zero at a 99% confidence level

Key findings:

Neither concern for the state of the economy nor the age of respondents, nor the educational level discriminate when choosing between natural capital over infrastructures. This is so across the three spills. Whether respondents are concerned about the environment as one of the main socio-economic problems is only significant, with an expected positive sign, in choosing natural capital over infrastructures for the medium sized spill.

The variable city is significant with a positive sign across the three spills. Respondents in Madrid are more likely to choose natural capital over infrastructures. The reasons for this may be two-fold. First, respondents in Madrid are not expected to perceive a lack in infrastructures. Second, respondents in Madrid have less access to coastal areas. Thus the choice of natural capital over infrastructures seems logical. Moreover as mentioned previously, there is a 'historical debt' argument and a lack of infrastructures acknowledged by elites and by FG respondents in La Coruña.

Income is significant in the in the small and the large spill. The negative sign indicates that higher income reduces the probability of choosing natural capital over infrastructures. Two reasons may help explain this. First, people with higher income are less dependent on specific natural resources for either their livelihoods or their enjoyment (they tend to be employed in the tertiary sector (services) and they may choose alternative holiday destinations). This could provide support to the growth pessimists' arguments that state that lower income people may be more concerned about environmental degradation than wealthier people as they are more dependent on natural resources for their livelihoods or their wellbeing (Neumayer, 1999). As this is a somewhat unexpected finding that may contradict optimist views on economic growth and the environment, future research could test this further to ensure this finding is robust across different environmental problems and compensation options.

Previous knowledge of oil spills is significant and increases the probabilities of choosing natural capital over infrastructures for the large spill. Again resorting to the precepts of the theory of reasoned action more information and therefore understanding of an event (*descriptive beliefs* in Fishbein's and Ajzen's parlance, 1975: 132) will influence attitudes and these in turn will affect intentions under certain circumstances.

The aggregate NEP score which has long been used as a good predictor of pro-ecological world view, (Dunlap, 2000; Dunlap and Xiao, 2007 and Kotchen and Reiling, 2000) is significant for the small and medium spill. It also has the expected positive sign. Thus, the higher the NEP scores, the higher the probability of choosing natural capital over infrastructures. People who have a more pro-ecological worldview are expected to prefer natural capital over infrastructures.

The right wing ideology of respondents, inferred through answers to the newspapers read, is significant across the three spills. The sign is negative, indicating that the more right wing newspapers read, the less likely the respondent will be to choose natural capital over infrastructures. This finding is also in accordance with prior expectations (Jiménez, 2007).

Reading left wing newspapers does not discriminate in the choice of natural capital over infrastructures in the small spill or in the medium spill. It is however significant when we look at compensation choices in the large spill. The sign for the large spill is positive. So, the more left wing newspapers read, the larger the likelihood of choosing natural capital over infrastructures. It should be noted however that these ideological variables may only be reflecting what respondents would expect the government to invest their money in, irrespective of the issue being analysed. Future research could test whether this is the case.

Except for the *a priori* counter-intuitive finding as regards income in the choice of natural capital over man-made capital (explained and nuanced above), the remainder of the independent variables are overall significant and have the expected signs.

4.4 DISCUSSION AND CONCLUSIONS

This chapter has analysed the compensation exercise in the questionnaire. The main findings and their relationship to sustainability are discussed below.

Firstly, the most important problem for respondents was the state of the economy followed by crime. Within environmental problems water shortages were seen as the most pressing problem followed by air pollution and wild fires. Oil spills only came fourth (out of the five main environmental problems). So, there is still a low concern for environmental issues as well as for oil spills when other socio-economic problems and other environmental problems are presented to respondents. This finding coincides with the barometer conducted by the Spanish Centre for Sociological Research in June 2008 where only 1.6% of respondents stated that the environment was the first, second or third most important problem (CIS, 2008)[118].

Survey respondents had heard of, on average, two oil spills. In Galicia, as expected, this knowledge was higher than in Madrid, arguably due to distance decay effects (i.e. knowledge and concern is higher, the closer we are to the event).

The majority of survey respondents would want additional compensation over and above the pre-existing clean-up and compensation funds traditionally paid through existing compensation schemes. This is so despite reminders of the opportunity cost of accepting compensation (i.e. other government-funded projects would no longer go ahead) and despite reminders of the existence of unaffected substitute sites.

A small number of survey respondents did not want additional compensation. The main reasons given for rejecting compensation were that these spills should be prevented (arguably calling for preservation of natural capital and hence for stronger versions of the sustainability paradigm) or that others should pay (perhaps acknowledging the opportunity cost of additional compensation packages).

Overall, the compensation option chosen by respondents who did want additional compensation does not change across spills, signalling stable preferences in terms of compensation for environmental losses. The hypothetical nature of the exercise plus the fact that the government was purported as the provider of additional compensation may have influenced the choice of compensation options, reflecting

[118] http://www.cis.es/cis/opencms/-Archivos/Marginales/2760_2779/2766/e276600.html

what respondent would want the government to invest in irrespective of the issue analysed. Future research using split sample designs and various compensation providers could also test this matter.

The most popular compensation option is the investment package in social capital (i.e. building schools, hospitals and undertaking R&D) thus providing empirical support for Aldred (2002) and Turner (2007). Roughly a third of respondents would choose natural capital as their preferred compensation option and less than 9% of respondents would choose investments in infrastructure projects. The fact that over 80% of the funds would be allocated to social capital plus natural capital compensation packages could arguably signal towards either a modified Hartwick –type rule or a stronger SD approach. Future oil spill analyses could explicitly test this.

The main reason given by those who chose man-made capital as well as by those who chose investments in social capital was that their option was the 'best' or 'the most logical one'. Interestingly, some respondents who chose man-made capital as their preferred compensation option also stated that investments in man-made capital would be a good substitute for losses in natural capital, pointing towards a Hartwick-type reasoning as regards substitutability.

The main reasons given by those who chose natural capital were the mitigation effects of this compensation package. Additionally, these respondents also stated that it was their responsibility to choose natural capital (i.e. there was a moral obligation to replace damage or lost natural capital with similar natural capital). Very few, if any, respondents who chose either social capital or natural capital stated these investments were good substitutes. This could back the claim by Humphrey (2001) who states that, for certain environmental losses, some compensation may be possible despite the fact that there may be no substitution for these environmental losses.

The proportion of compensation funds per type of capital allocated to each compensation option is significantly different according to the statistical tests conducted. The proportion of additional compensation funds allocated to natural capital as the spill size increases could be indicative of some sensitivity to scope. This could mean more compensation for natural capital lost when thresholds are reached (mirroring expectations of higher prices and large welfare losses when analysing WTP scenarios). The caveat however is that the size of this effect is moderate, and social

capital is still the most preferred compensation option despite the hypothetical thresholds being described. This could be indicative of a lack of proportionality in terms of compensation in like-for-like and yet stronger support for Aldred (2002) and Turner (2007).

The most salient findings of the parametric analysis through the use of Multinomial Logit Models provided the following information regarding respondent characteristics that best determine the probability of choosing one compensation option over the *status quo* (man-made capital). On the choice of social capital over the status quo, respondents with lower income, respondents from Madrid, those less concerned about the economy as one of the main socio-economic problems, individuals with higher pro-ecological worldview and a more left-wing ideology are more likely to choose social capital over infrastructures.

On the choice of natural capital over infrastructures respondents from Madrid, younger interviewees, people with lower income, a higher educational attainment, interviewees concerned about the environment as one of the fundamental socio-economic problems, knowing previous spills, having a higher ecological worldview and being more left wing oriented show an increased probability of choosing natural capital over infrastructures.

These findings have to be interpreted with caution due to the limited sample size (663 usable interviews analysed). Overall the determinants of the compensation option were significant and had the expected sign. The negative sign in the income data may be due to the greater need for social capital investments (in education such as schools and in health such as hospitals) compared with infrastructure projects of less wealthy respondents that chose social capital over man-made capital. Greater dependence (less substitution possibilities) on natural resources for either leisure activities or for the livelihood of respondents may help explain why lower income level increases the probability of choosing natural capital over infrastructures as the preferred compensation option. Conversely, wealthier respondents may have both greater substitution possibilities for leisure activities, they are a priori less dependent on natural resources for their work and they are more reliant on a publicly provided road and railway infrastructure system.

In sum, these preferences for a modified Hartwick rule compensation package with a significant amount of respondents moving towards stronger forms of sustainability are relevant in theoretical terms. This thesis presents a practical application and confirmation of Aldred (2002) and Turner (2007) in their claim that when faced with environmental losses such as oil spills of different sizes and consequences money may not be the appropriate compensation but investments in social capital may be appropriate.

Future research could potentially focus on ensuring the reliability of these results in various ways. First, larger sample sizes would be desirable subject to time and resource constraints. Second, it would be interesting to test, through split sample designs, whether changing the institution in charge of compensation packages alters respondents' choices. The purpose would be to analyse whether respondents are just choosing what they would demand from the government regardless of the damage analysed.

CHAPTER 5. AN EMPIRICAL ENQUIRY OF SUSTAINABILITY: VALUATION

5.1 INTRODUCTION

Chapter three compared the views of elites and citizens as regards sustainability. Chapter four explored survey respondent preferences for different compensation 'packages' when environmental damages of varying severity occur. It also analysed the link between the results obtained and the sustainability debate. The findings from the compensation exercise provide evidence of a shift towards a modified Hartwick-type (weak) sustainability rule and confirmation of the aforementioned claim by Aldred (2002) and Turner (2007) about social capital being accepted as compensation when environmental damages happen.

As regards strong sustainability FG participants preferred replacement of like-for-like or prevention investments as compensation. Additionally, a third of survey respondents preferred natural capital as a compensation option when faced with environmental damages, again demanding a stronger version of sustainability. This led to the belief that survey respondents may be willing to pay significantly more to prevent large oil spills compared to the payment they would be willing to make to prevent smaller oil spills. Hence, this last empirical chapter explores survey respondents' willingness to pay to prevent natural capital depletion in the context of oil spills of varying sizes.

This is on the one hand a scope test, both internal and external and it contributes to the debate on scope sensitivity. Some of the most relevant literature on oil spills do not report *external scope tests* (see for example Carson *et al.* 2003 and Loureiro *et al.* 2007, 2009 and Bonnieux and Rainelli, 2003). In the present thesis that implies using a split-sample design so that half of the sample is asked about their WTP to avoid a small and medium size spill and the other half of the sample is asked about their WTP to avoid a medium and large size spill. On the other hand this chapter provides an analysis of the potential link between strong sustainability and valuation techniques, following Pearce *et al.* (2006) as it has been argued that sustainability proponents have yet to explore the costs and benefits of sustainability (Atkinson *et al*. 1997).

The analysis in this chapter also contributes to existing CV studies in oil spill management, taking up the recommendations by Arrow *et al.* (1993) as regards the usefulness of building a body of knowledge regarding WTP for spills of different sizes and consequences.

Additionally, this chapter complements the discussion in chapter 4 with a more in-depth analysis of 'protestors' in a protest-prone setting such as a contingent valuation-type exercise, which could help shed light on this issue (see Atkinson *et al.* forthcoming, Jorgensen *et al.* 1999, Halstead *et al.* 1992, Strazzera *et al.* 2003).

Previous findings, as well as the above mentioned gaps in the literature, motivated complementing the analysis already undertaken with the analysis of a contingent valuation exercise that was included at the end of the questionnaire.

The rest of this chapter is structured as follows: Section 5.2 presents a brief summary of CV and of the valuation scenario construction process based on the salient findings of the qualitative analysis techniques used as well as the pilot interviews and expert input. Section 5.3 presents the critical analysis of the main results obtained, starting with descriptive statistics of those questions relevant to the parametric analysis and followed by logit and interval data models. Section 5.4 concludes by discussing the main findings.

5.2 VALUATION: THEORY AND DESIGN BASED ON SALIENT FINDINGS

5.2.1 Contingent Valuation and oil spill valuation studies

When impacts from activities are not reflected in markets, their value can be obtained by *asking people* to value the merits (or otherwise) of different options through *stated preference techniques*. An example of this would include asking citizens about their preferences for natural capital preservation policies in the context of oil spill management schemes. It has been argued that there can never be a comprehensive valuation since current efforts cannot capture for example *primary values* of the environment. But if decisions regarding these issues are made, and funds are allocated to certain policies, implicit or explicit valuations will be made (Bateman *et al.* 2002). Making these valuations explicit will hopefully imply decisions are made in a more transparent and efficient manner. Equity considerations, complementary to efficiency considerations as well as sustainability constraints, may complete the valuation exercise. The final empirical contribution of this thesis will focus on understanding the value people assign to preserving natural capital which is, to a large extent, not traded in the market. This can help answer the call for further analysis of the benefits of preserving natural capital (and hence strong sustainability) as expressed by Atkinson *et al*. (1997).

Stated preference (SP) techniques obtain data from individuals through survey methods. They ask individuals the amount they would be willing to pay (or WTA) to move from the *status quo* to an alternative situation. Alternatively they may ask individuals their ranking or rating of different situations proposed. SP techniques allow to include questions that uncover motivations for taking action (Arrow *et al.* 1993). Socio-economic characteristics that are expected to shape the outcome of the valuation exercise are also recorded. Stated preference techniques are useful in eliciting both use and non-use values and could potentially be used to evaluate any situation.

Within stated preference techniques, the *Contingent Valuation Method (CVM)* is a questionnaire-based technique that directly asks a representative sample of citizens with standing in the policy decision the amount they would be willing to pay (or WTA) for a change in environmental quality that will affect their welfare. Bowen in 1943 and

Ciriacy-Wantrup first proposed this method in 1947 (for a comprehensive history of CV please refer to Carson and Hanemann, 2005) although its first practical application did not occur until 1963 by Davis. CV was developed as an aid to CBA in the analysis of the contribution of policies or projects to the wellbeing of society (Randall, 1997). In 1984 Hanemann provided the theoretical foundations of future CV analyses (Carson and Hanemann, 2005). The early nineties gave public stance to CV with the *Exxon Valdez* oil spill. Since then CV has arguably become the most widely used non-market valuation technique. If properly executed, CVM is a useful tool in CBA (Carson, Flores and Meade, 2001). Despite the discrete nature of CV analyses and the long-term and global requirements of sustainable development, it is assumed that CV-type studies can be a useful input into the enquiry of sustainability as it provides an explicit check of the social worth of projects and policies that may have long term consequences.

Aggregate WTP is usually estimated using a valuation function. Econometric models such as logistic regression models (if respondents are asked to accept or reject a given bid price in the WTP question) or interval regressions models (if respondents are asked to decide on an interval payment that would be acceptable to them) provide information regarding the relationship between WTP and respondents characteristics (Boardman *et al.* 2001, Lesser *et al.* 1997 or Bateman *et al.* 2002).

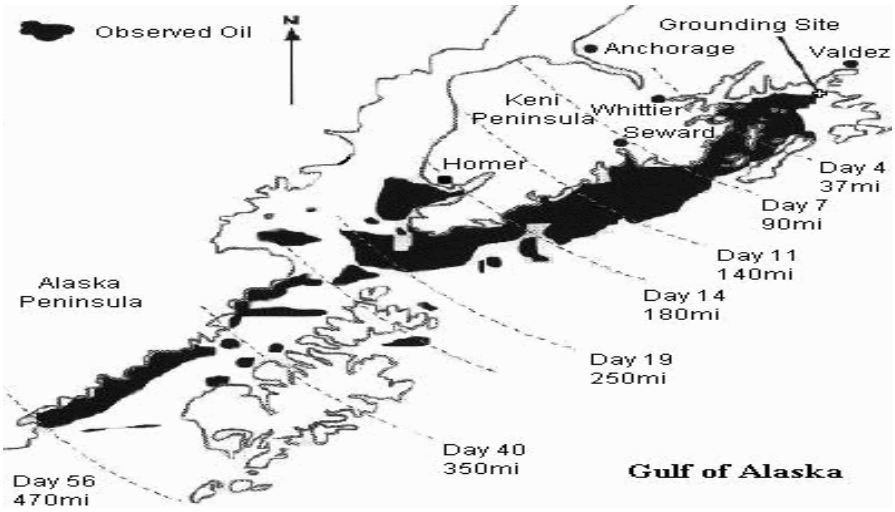
Arguably the basic disadvantage of CVM is that interviewees are asked to evaluate *hypothetical* situations and their actual behaviour might deviate from their sated intentions (Fishbein and Ajzen, 1975). Furthermore, respondents might be asked to value goods they are unfamiliar with. To obtain a meaningful answer to a proposed change in an unfamiliar good, adequate information that depicts understandable, meaningful and credible valuation scenarios should be provided to respondents.

Despite its critics (see for example Diamond and Hausman, 1994), the blueprint provided by the NOAA panel on how to conduct a reliable and valid CV study and various SP manuals (Bateman *et al.* 2002; Champ *et al.* 2003, among others) have helped develop contingent valuation studies. Given that the *Exxon Valdez* was a turning point in the theory and practice of CV, the reminder of this section will summarise the main findings of this and other recent CV studies conducted for oil spills.

The Exxon Valdez CV

The worst oil spill in US history (Skinner and Rielly, 1989; Carson *et al.* 2003), up until the recent Deepwater Horizon spill off the Gulf of Mexico[119], occurred in Prince William Sound, Alaska, in the spring of 1989. The amount of oil spilled exceeded 10 million gallons (equivalent to 37,000 tons according to the CEPRECO, 2007), 350 miles (563. 3 Km) of beaches were affected and the environmental damage caused to a 'pristine' environment were the most serious consequences of this accidental spill. The evaluation of the consequences of the oil spill, with a significant proportion of damages potentially happening due to lost passive use values, was done with the aid of a CV study. The area affected by the spill can be seen in map 5.2.1 below:

Map 5.2.1 Exxon Valdez oil spill



Source: http://library.thinkquest.org/10867/intro/overview.shtml

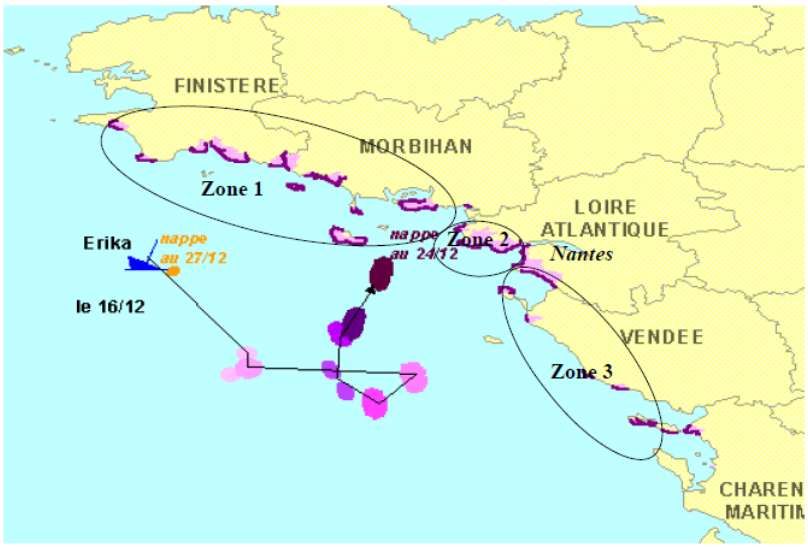
The main findings of the survey were that the median WTP was $31 per household. The mean was $94 per household. This implied that the estimates for the passive use values lost due to the Exxon Valdez spill was 2.8 billion dollars. In the updated analysis of the *Exxon Valdez* CV study by Carson *et al.* (2003) a mean value of 79.2$ is presented as a better estimate of respondents' WTP to pay for their escort ship program to prevent future oil spills in Prince William Sound.

[119] http://news.bbc.co.uk/2/hi/8655683.stm

The Erika CV

Between the 12th and the 13th of December 1999 the *Erika*, a 24 year old single-hulled oil tanker[120] spilled approximately 20.000 tons of heavy fuel oil off the coast of Brittany (France). It was, up to that date, the largest environmental 'catastrophe' according to the media. The CEDRE[121] described the main consequences over marine birds as 'the greatest impact on seabirds ever recorded due to an oil spill'[122]. Shell-fish, local salt production and tourism were the main economic activities affected by the oil spill. Approximately 400Km of coastline was affected by the spill. Map 5.2.2 below shows the main areas affected by the Erika oil spill.

Map 5.2.2 The Erika oil spill. Main impacted areas (in purple)



Source: Bonnieux and Rainelli (2003: 10)

Substantial existence values lost due to the oil spill could 'only' be unveiled through the use of CV (Bonnieux and Rainelli, 2003). A rough estimate of the damages amounted to 914M€ although this estimate excluded the loss of non-use values. Non-use values were analysed using benefit transfer.

The median value respondents were willing to pay to fish in a clean site (estimated using data related to the additional distance they were willing to travel to a 'safe area for their activities) was 58€ annually if the baseline scenario was that of a fishing site that had suffered minor (limited) degradation (scenario 1) and 81€ annually if the baseline scenario was one in which fishing is banned (scenario 2) due to high likelihood

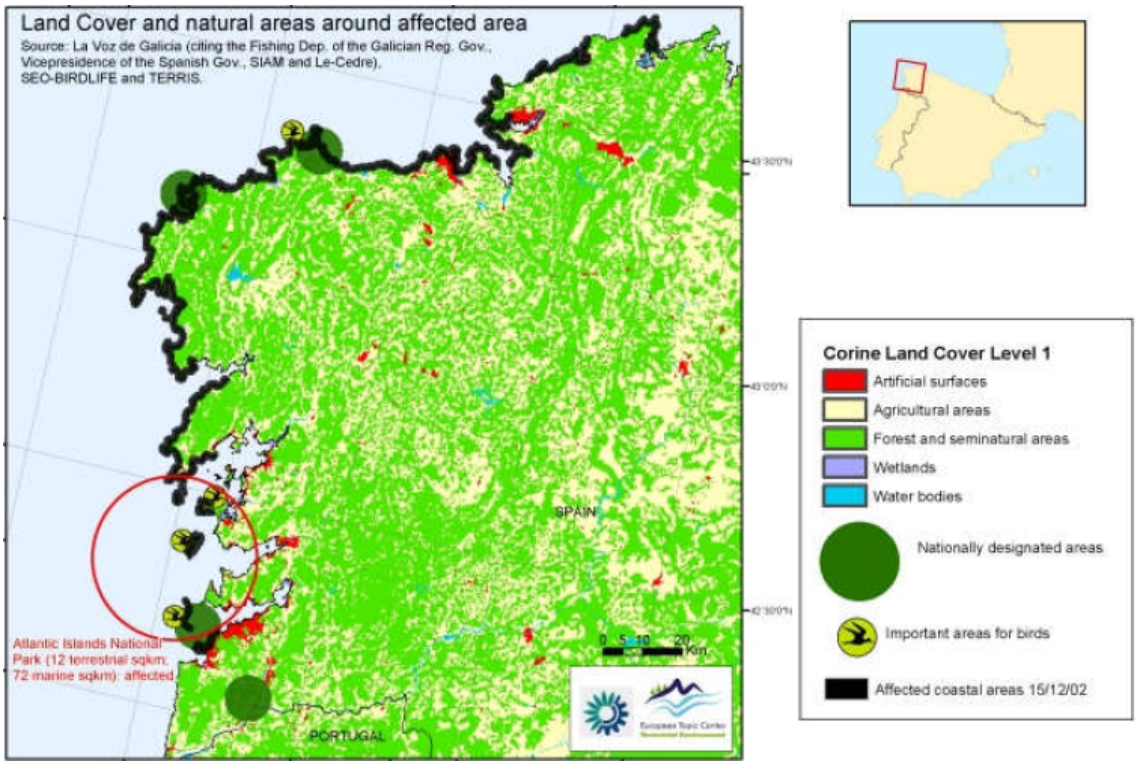
[120] http://www.cedre.fr/en/spill/erika/dos.php#imp
[121] CEDRE is the acronym for Centre of Documentation, Research and Experimentation on Accidental Water Pollution. It is one of the world-wide leading research centres for accidental oil spill analysis.
[122] http://www.cedre.fr/en/spill/erika/dos.php#imp

of severe illnesses if polluted fish is consumed (Appéré, 2002 in Bonnieux and Rainelli, 2003). Mean WTP values would go up to 133.68€ for scenario 1 and 168.72€ for scenario 2.

The Prestige CV

The Prestige oil spill took place in November 2002. Most of the 77.000 tons of heavy fuel oil carried by this old, single-hulled tanker were spilled off the coast of Galicia. According to Varela and Prada (2004) over 1,000 Km of coastline were damaged by the oil slick, which included 745 polluted sandpits, persistent pollution on cliffs, the seabed and mud flats. A large proportion of the affected environmental resources were protected by international environmental agreements such as the RAMSAR convention for wetland protection or the special protection areas for birds (SPA) agreement under Natura 2000 network. The Atlantic Isles National Park was also struck by the oil spill. These areas are migrating routes for birds and mammals and it is estimated that approximately 38 endangered species live in the Galician coast. Additionally Portuguese and French coasts were also affected[123].

Map 5.2.3 The Prestige oil spill. Main impacted areas (black arrows)



[123] http://www.iopcfund.org/prestige.htm

Economic losses and government expenditure derived from the Prestige oil spill have not been fully estimated as 'the economy will suffer the consequences at least until the ecosystem recovers its natural balance and even beyond, and it is clear that such a recovery will only ever be partial and in the very long-term. We are therefore facing a situation where economic and environmental recovery will take at least 10 years, or even 25 years for certain species' García Negro *et al.* (2007: 59). Relatively recent figures for the damages suffered by Spain, France and Portugal amount to 1,100M€ (García Negro *et al.* 2007). Loureiro *et al.* (2006) also offered estimates of the short term (2002-2004) damages caused by the Prestige in Spain, including commercial, cleaning and recovery costs amounting to 770M€. Non-use values are not included in these calculations due to a lack of CV studies at the time these studies were published.

More recently, the existence of a previous CV study on the Prestige spill in Galicia (Spain), Loureiro *et al.* (2009), is useful in terms of comparing the different approaches used by these authors to that of this thesis. It is also useful in terms of analysing the validity of the results obtained in the present thesis (external validity[124]) although this validity analysis is necessarily limited as the scope of the changes presented in the valuation scenarios in the Loureiro study is restricted to the *Prestige* case.

The parametric estimate of the mean individual WTP to avoid another Prestige-type spill is over 40€ in the Loureiro *et al.* (2009) study which gives a lower bound aggregate WTP of just under 575M€ for the Spanish population.

5.2.2 Getting to the valuation question: Elite interviews, focus groups, pilot and experts

This section will present the basic ideas gathered throughout the elite interview process, the focus groups, the pilot interviews conducted and expert input in order to design the valuation question.

In the valuation question respondents were presented with basic information regarding oil spill prevention plans (that would hypothetically preserve natural capital) and they were then asked whether they would be willing to pay and, if so, how much to prevent future spills.

[124] This is defined as the inspection of the validity of the study's results with reference to other studies (Bateman *et al.* 2002). Differences in the payment vehicle, the duration of the contribution and the oil spill prevention programs described will have a bearing on the estimates' differences, but the comparison is *a priori* expected to be useful.

The literature review set the basic framework for constructing the valuation scenarios. Arrow *et al*. (1993), Carson *et al.* (2003), Bateman *et al.* (2002) or Champ *et al.* (2003) among others recommend the provision of information to respondents on the investment program (in our case the oil spill prevention initiatives) that would prevent (or, more realistically, reduce the likelihood and consequences of) future oil spills. In order to make the scenarios credible, understandable and realistic, elite interviewees were asked about prevention measures that would reduce or prevent future oil spills. The detailed information obtained from elite interviews was later synthesised to ensure that respondents' cognitive burden was minimised when answering the valuation question. This summarised information was then 'fed' into the valuation question.

The main areas where elite interviewees thought future prevention plans should be strengthened were classified under three headings: *information, means and rules*. The main requirements of each of these are described below.

Information in elite interviews: Monitoring, reporting and verification (MRV). Baseline information on the state of resources at risk due to oil spills was one of the primary concerns expressed by elites. The available information tends to be better for commercial species and for areas that have a use value. Elites requested baseline information on 'areas, species and activities' of strategic importance as well as on areas at risk and especially sensitive areas. Additional surveillance, mainly aerial, was also requested in order to dissuade boats from bilge cleansing and to enable civil servants to report any accidental spills as soon as they happen in order to minimise damage. Having more controls and inspections are also seen as priorities in future oil spill prevention initiatives. Communicating technical and political decisions to the public was also seen as fundamental by elites in future oil spills.

Means in elite interviews. Personnel, technology and infrastructure. The main demands include: an increase in the amount of inspectors who are expected to be adequately trained, able to judge the risks posed by oil tankers and, furthermore, able to communicate in English. Communication channels that are up and running twenty four hours a day as well as updated and easily accessible databases containing information on the available pollution fighting means were also demanded for future prevention plans. These databases should include information on e.g. oil barriers, suppliers,

delivery times, distance between pollution fighting equipment and coastal areas at risk plus expected replacement needs.

Rules in elite interviews. Operational protocols and regulatory framework. Operational protocols had yet to be finalised in Galicia when the elite interviews were conducted. Personnel involved in managing oil spills were interviewed. Their main requirements regarding prevention included the need for these protocols to be designed, tested and improved. This was especially the case inland as interviewees claimed that approximately 90% of the oil spilled at sea typically ends up on the beach and coastline. Ideally, these protocols were expected to provide information regarding the 'chain of command' in which a quick response, according to technical (rather than political) criteria, should be provided. Flexibility and coordination among different administrative levels (mimicking the Spanish civil protection operational plans) was also seen as essential in the design of these protocols. These protocols were also expected to provide clear guidance regarding: special protection areas, sacrifice areas and recovery protocols (á la IUCN).

A more demanding regulatory framework that was considered as needed in order to ensure future oil spill prevention entailed further development and strengthening of international environmental agreements (IEA's). Suggestions for the future development of the regulatory framework also included exploring the possibility of establishing joint venture initiatives with private firms in oil spill management. Finally, horizontal integration of government initiatives at the national level, so that all government departments involved in oil spill prevention acted following the same guidelines, was also regarded as a top priority.

Similarly to the topics discussed during elite interviews, the three recurrent topics discussed by *focus groups* regarding oil spill prevention included: *information, means and regulation.* An additional area of interest raised was the *specification of the payment process.*

Information in focus groups. Trustworthy information was seen by focus groups as an important confidence builder. FG participants also demanded a re-structuring of the communication strategy between the government and citizens which was perceived as patchy and unreliable. Additionally, providing information regarding the use of funds

collected from taxpayers was seen as important in terms of encouraging people to pay for prevention schemes.

Means in focus groups. Further need for personal and technical means were mentioned by focus group respondents in order to ensure adequate and timely response to future oil spills. As expected, the level of detail of FG answers was significantly lower compared to that of elite interviewees. Focus group participants also requested 'expert advice' in order to ensure technical (rather than political) decision-making.

Rules in focus groups. Specific planning and prevention protocols were requested. This was coupled with a demand for ensuring that polluters are law-abiders (and therefore accidents were not due to negligence or wrongdoing). Ensuring oil carriers are law-abiding parties was said to increase focus group respondents' WTP.

Specification of the payment process in focus groups. The questions and concerns regarding the payment process in the valuation exercise included various issues. Focus group respondents stated they would demand more information on the prevention programs for higher levels of payment requested from them. On the payment vehicle, some respondents wanted voluntary donations, other respondents demanded earmarked taxation and yet others showed no strong preference for or against any particular payment vehicle discussed. A general preoccupation was voiced regarding the need to have a progressive-type payment system for the prevention program whereby richer respondents were asked to contribute more towards these programs. Additionally, respondents wanted to pay for prevention in 'small instalments' rather than through lump sum payments. Furthermore, the payment frequency was also a concern for respondents as well as the use of these funds at times when no oil spills happened. Finally, the valuation exercise was said to be complex and thus efforts were made to simplify the task in the final questionnaire.

5.2.3 The valuation question in the survey

In order to obtain information on individuals' preferences, one of the aims has been to purport policy changes that will avoid future oil spills in an accurate, feasible and understandable (yet comprehensive) manner. The information obtained from the qualitative methods helped in this endeavour. A further aim has been to motivate

respondents to unveil their preferences. According to Arrow *et al.* (1993), if respondents to CV exercises are expected to protest for having to pay for restoring the environmental damages caused by say oil companies or carriers, or if respondents have little faith in the environmental recovery possibilities, prevention scenarios should be used in the hypothetical valuation scenarios. This was the case in this thesis. The importance, consequences, the high visibility of past oil spills, the politicised nature of the public debate, the discussions in the focus groups and the comments made during the pilot, led to the conclusion that respondents could be unwilling to pay for clean-up scenarios.

The typical structure of a CV questionnaire first includes a section in which questions on respondents' attitudes and behaviours are registered. These are expected to help warm-up and enable the analysis of factors that may influence WTP answers. This section is usually followed by the presentation of the valuation scenario as well as follow-up questions that help determine the motivations for the answers to the WTP questions. Finally a section on the socio-economic characteristics of respondents is included to analyse their influence on WTP responses as well as to enable a comparison of sample characteristics to those of the population Pearce *et al.* (2006).

As can be seen in annexes A.3.1 and A.3.2 the CV study in this thesis followed the typical organisation for a CV. The valuation question asked respondents whether they would be willing to pay to prevent future oil spills. In order to take into account respondents' concerns as analysed above, the questionnaire included the following information presented in box 5.2.1:

Box 5.2.1 Initial background information on the valuation exercise

The sea gives us many things. Plants and animals live in it, we feed from it, we enjoy our holidays in the sea side, etc. Oil spills damage the sea preventing us from enjoying these things
We have just seen that the government cleans up and compensates affected people when spills take place. A better scenario however would be to avoid these spills. According to experts, in order to avoid these spills we should invest in: o **Personnel and equipment to fight against spills** o **Implementing oil spill prevention plans all around the Spanish coast** o **Use maps to tell us which areas should be protected in case of a new spill**
These investments will be undertaken by regional governments with coast and by the central government as everyone in Spain enjoys a clean coast.
A monitoring commission will ensure investments are used only for this purpose. Other EU countries are also analysing these programs.

Once respondents had listened to the initial background information, interviewers read additional information signalling the need to focus on non-economic impacts of oil spills and asking interviewees to state whether they would be willing to fund prevention programs. This information is shown in box 5.2.2 below.

Box 5.2.2 Additional information and WTP question. Version 1 of the questionnaire

In order to avoid spill A and B, which are the most frequent ones, the government must undertake the above investments. These are costly and will only be undertaken if citizens are willing to pay for them.
In this final exercise I am going to ask you to focus on the environmental and health consequences of spill A and spill B as shown in the documentation and I would like to ask you whether you would be willing to contribute to the funding of this investment. The payment would be an annual increase in your income tax as these investments have to be maintained in time.
Spill A and spill B have different consequences and they need different investments. Taking this into account and considering that each person will be asked to contribute according to their income, would you be willing to pay for these investments in order to avoid these spills?

For those respondents who said they would be willing to pay to prevent future spills, a reminder of their income constraints as well as of the existence of substitutes was read by interviewers following generally accepted CV scenario construction guidelines (Bateman *et al.* 2002). The reminder is presented in box 5.2.3 below:

Box 5.2.3 Income constraints and substitutes reminder in the valuation question

Please do not agree to pay any amount if you cannot afford it or if there are other things on which you would rather spend your money! Remember there are other areas in Spain and in other countries that will not be affected by the spill.

The main elements of the valuation exercise are summarised in table 5.2.1 below:

Table 5.2.1 Summary of the main features of the valuation exercise

Section	Elements	Question/information
Valuation	Prevention program	Personnel and equipment to fight against spills
		Implementing oil spill prevention plans all around the Spanish coast
		Use maps to tell us which areas should be protected in case of a new spill
	Institution: regional and central government	In order to avoid spill A and B the government must undertake the above investments
	Opportunity cost reminder	Do not agree to pay any amount if you cannot afford it or if there are other things on which you would rather spend your money
	Substitutes reminder	Remember there are other areas in Spain and in other countries that will not be affected by the spill
	Payment vehicle	Increase in annual income tax
	Valuation question	Spill A and spill B have different consequences and they need different investments. Taking this into account and considering that each person will be asked to contribute according to their income, would you be willing to pay for these investments in order to avoid these spills?
	Follow-up questions	Can you tell me why?
	WTP amount	How much would you be willing to pay to avoid spill A?
	Accounting for uncertainty	Instructions for interviewers: Tick (V) the quantity spontaneously mentioned by the interviewee in the response column for spill A
		Ask the interviewee whether s/he would be willing to pay the quantity immediately above the one mentioned spontaneously and keep raising the amount until the interviewee says no. Leave BLANK all quantities the interviewee agreed to pay after the spontaneous response
		Cross (X) the quantity the interviewee said no.
	Follow-up questions	Can you tell me why you are willing to pay?
		In the spills that we have just seen which consequences/damages have been more important in deciding your answer?

5.3 CRITICAL ANALYSIS OF RESULTS

This section will analyse the main results obtained from the valuation question. The first subsection (5.3.1) will present the summary statistics of questions that are relevant to the valuation exercise. The second subsection (5.3.2) will present the parametric analysis for the valuation exercise.

5.3.1 Key Summary statistics

Part of the information is common to the previous chapter, hence, only the variables that are significant in determining respondents' willingness to pay and different to those already presented in chapter 4 are analysed here.

Summary statistics

Whether respondents were influenced, or otherwise, by the environmental consequences of the spills (*vs*. the health consequences for example) was significant in determining WTP amounts. Table 5.3.1 below provides the basic information on interviewees' responses to this follow-up question.

Table 5.3.1 WTP influenced by environmental damages described

	Percentage of respondents (out of those willing to pay)
WTP amount not influenced by environmental damages	67.27
WTP amount influenced by environmental damages	32.73

For the logit and for the interval data model presented below, whether respondents had previously volunteered to protect the environment was also significant in determining the WTP amount. The main summary statistics data on the amount of volunteers within the sample is presented in table 5.3.2 below:

Table 5.3.2 Volunteers by city

Volunteered	La Coruña		Madrid		Total	
	Frequency	%	Frequency	%	Frequency	%
No	186	73.23	349	86.17	535	81.18
Yes	68	26.77	56	13.83	124	18.82
Total	254	100	405	100	659	100

Over half of the respondents said they would be willing to pay to avoid future spills. Table 5.3.3 presents the results from the dichotomous type question (WTP/NOT WTP).

Table 5.3.3 Respondents' willingness to pay to avoid future spills

Willingness to pay	Frequency	Percentage
No	303	45.7
Yes	360	54.3
Total	663	100

Once interviewees had answered this dichotomous-type question, they were asked about the reasons for their answer. This was done to unveil the motivations for these answers and hence to analyse protest answers and invalid 'yes' responses. According to Bateman *et al.* (2002) invalid (protest) answers do not reveal the welfare change respondents would experience from the change in the hypothetical scenario. On the other hand, legitimate zeros are given by people who either do not have enough money to pay or have no desire to contribute to the change presented because it is of no value to them. The classification between protest answers and legitimate answers is however somewhat blurred in the literature (see Brouwer *et al.* 2008 or Atkinson *et al.* forthcoming). In order to be explicit about the choices made, calculations of protest answers according to the classification provided by Bateman *et al.* (2002) and according to Brouwer *et al.* (2008) will be presented. So, for those who said they would not be willing to pay, the main reasons are summarised in table 5.3.4 below:

Table 5.3.4 Reasons for not being willing to pay

	Protest/Valid			
Reason for NOT being willing to	Bateman *et al* . (2002: 147)	Brouwer *et al* . (2008: 16, 20)	Frequency	% / sample
I need more information to make my mind up	Protest	Protest	2	0.66
I already pay enough	Protest	Valid	101	33.22
Others should pay	Protest	Protest	96	31.58
The polluter should pay	Protest	Protest	49	16.12
This is not a serious problem/ there are no serious consequences	Valid	Valid	2	0.66
I don't have enough money to pay/I cannot afford to pay	Valid	Valid	29	9.54
They should manage the money better	Protest	Valid	5	1.64
Other reason	Protest/valid	Protest/valid	17	5.59

If we calculated protest responses according to the classification of protest answers by Bateman *et al.* (2002), we would have 38% of protest responses. If we calculate the protest response rate according to the Brouwer *et al.* (2008) classification of protest answers, the percentage of protest responses would go down to 22%, which is just slightly higher than that of Brouwer *et al.* (2008) study. Protest answers when stating why respondents were not willing to pay (following the classification by Bateman *et al.*

(2002) Brouwer *et al.* (2008)) as well as biased answers (following the classification by Bateman *et al.* 2002) when asked why respondents were willing to pay were excluded from the calculations of the mean WTP values. Legitimate zero responses (4.3% if we calculate protests according to Bateman *et al.* (2002) and 21% if we calculate protests according to Brouwer *et al.* (2008) were retained to analyse the WTP data and its determinants.

No generally accepted guidelines exist that tell us the percentage of protest responses that invalidates CV results but it is considered good practice to try to minimise these responses through careful pre-testing and assuring respondents that the polluters will pay part of the damage (*ibid.*). Should future CV's use this or an improved version of this questionnaire, more emphasis should be put on these aspects to try to reduce protest responses. A small percentage of respondents provided biased yes answers when they stated the reason for which they would be willing to pay. Following Bateman *et al.* (2002), an analysis of valid and biased answers was done.

The summary results of valid and biased answers are presented in table 5.3.5 below:

Table 5.3.5 Valid & biased reasons for WTP: follow-up questions

Valis / Bias	Reason	Frequency	Percentage
Valid	It is important/necessary	53	14.76
	It will benefit others	34	9.47
	It will prevent future spills	44	12.26
	It is the solution/mitigates	50	13.93
	Due to the damages	5	1.39
	Due to the economic consequences	3	0.84
	It will benefit future generations	16	4.46
	Due to the permanent damages/irreversibility	1	0.28
	Use values (so we have food, beaches, etc)	3	0.84
	It is our duty/it is our responsibility	104	28.97
	It is only a small effort (i.e. it is worth it for me)	1	0.28
	TOTAL VALID WTP RESPONSES	**314**	**87.46**
Bias	I am a caring person, I have a conscience (warm glow)	34	9.47
	TOTAL BIASED RESPONSES	**34**	**9.47**
Other	Other reasons for WTP answer	11	3.06

By looking at table 5.3.5 it is clear that the vast majority of respondents who said they would be willing to pay to avoid future oil spills did so for valid reasons.

The tables below provide non-parametric mean for the maximum amount people were willing to pay. This was hypothesised to be below the amount they said they would not pay and above the last amount they said they would pay. The non-parametric mean

WTP estimates using the Bateman *et al*. (2002) classification of protest answers are presented in table 5.3.6 below:

Table 5.3.6 Non-parametric mean WTP estimates: Bateman *et al.* (2002)

Mean WTP to avoid spill	Observations	Mean (€) per year
Small	196	**65.82**
Medium	377	**79.95**
Large	180	**98.22**

The non-parametric mean WTP using the classification of protest answers according to Bateman *et al.* (2002), ranges from under 66€ for the small spill to under 80€ for the medium spill and to under 99€ for the large spill. As we will see, these estimates are slightly higher than the parametric estimates obtained from the interval data models (in accordance with results obtained in other studies, Loureiro *et al.* (2009) or Atkinson *et al.* forthcoming).

If non-parametric mean WTP estimates were calculated using the protest classification by Brower *et al.* (2008), the results would be as shown in table 5.3.7:

Table 5.3.7 Non-parametric mean WTP estimates: Brouwer *et al.* (2008)

Mean WTP to avoid spill	Observations	Mean (€) per year
Small	246	**52.44**
Medium	482	**62.54**
Large	235	**75.23**

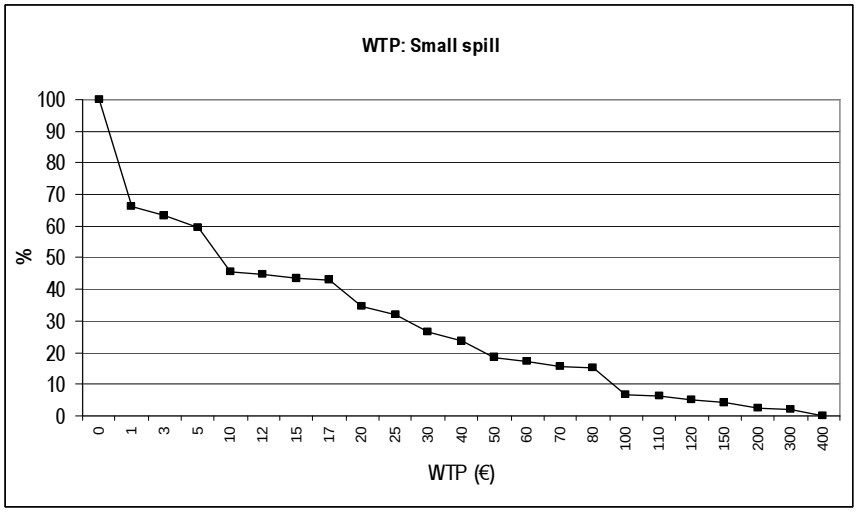
The non-parametric mean WTP using the classification of protest answers according to Brouwer *et al.* (2008), ranges from over 52€ for the small spill to 62.5€ for the medium spill and to over 75€ for the large spill. These estimates are slightly higher than the parametric estimates obtained from the interval data models for the small and the medium spill.

Comparing the non-parametric mean WTP amounts under the two protest classifications (Bateman *et al.* 2002 and Brouwer *et al.* 2008) we see that the latter provide lower WTP values, as was expected due to the fact that, by definition, they include more valid zeros. Simple t-test conducted to see whether these differences were statistically significant show that for the medium and the large spill non-parametric mean WTP are not equal (p-value < 0.05) under different protest classification schemes. This finding underlines the relevance of choosing different protest classifications.

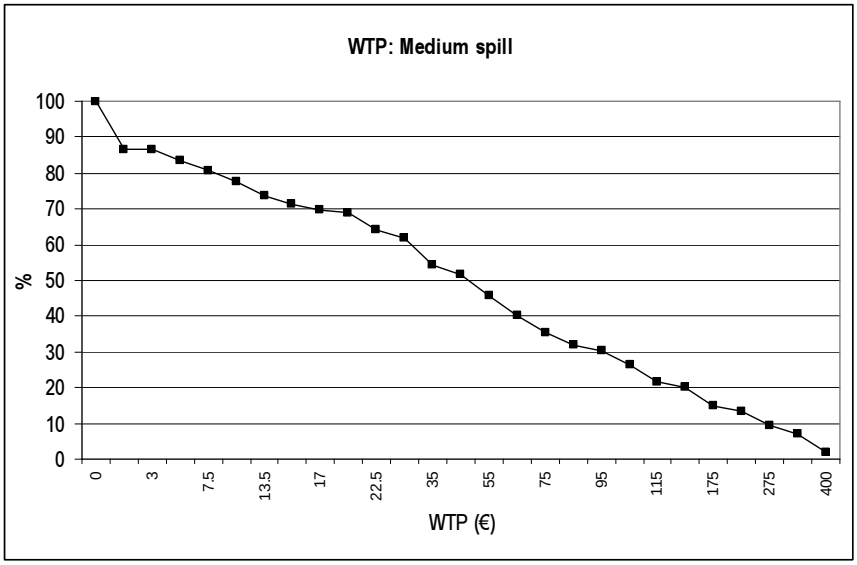
Survival functions that describe the percentage of respondents who were willing to pay at least the amount can be seen along the x-axis, are presented below in figures 5.3.1 (a), b), and c)) as well as in figures 5.3.2 (d), e), and f)). Note that these functions also take into account the different classifications of protests.

Graph 5.3.1 Survivor functions. Protest classification from Bateman *et al.* (2002)

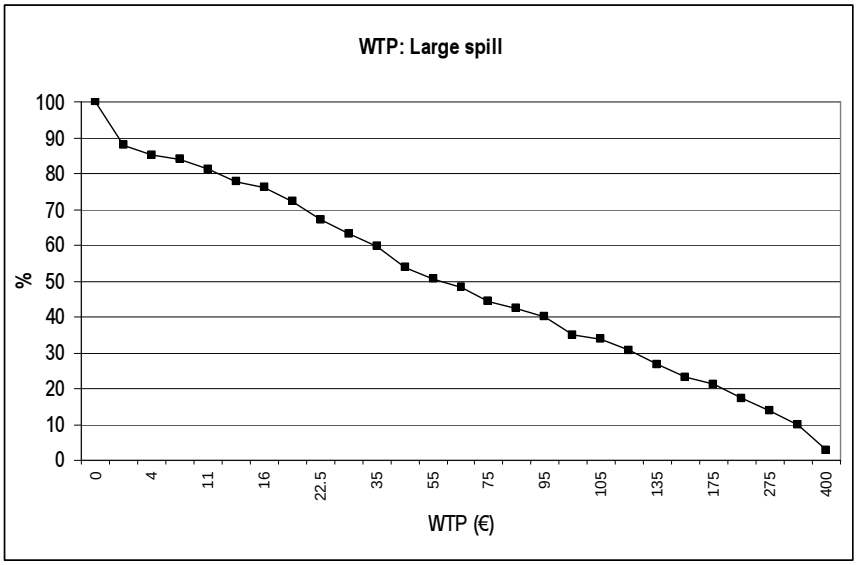
a) WTP to avoid a small spill using the Bateman *et al.* (2002) protest classification



b) WTP to avoid a medium spill using the Bateman *et al.* (2002) protest classification



c) WTP to avoid a large spill using the Bateman *et al.* (2002) protest classification

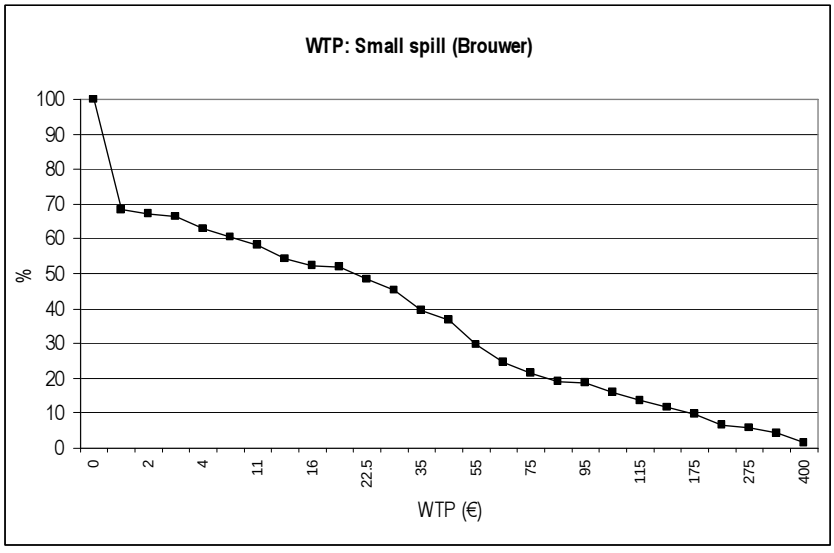


The visual inspection of the survival functions (in graph 5.3.1 a), b) and c)) shows that as the spill size increases there is a more gradual and steady decline in the percentage of people willing to pay higher amounts. This finding agrees with prior expectations (Atkinson, Healey and Mourato, 2005) as payments to avoid greater damages are expected to be higher than payments to prevent smaller damages.

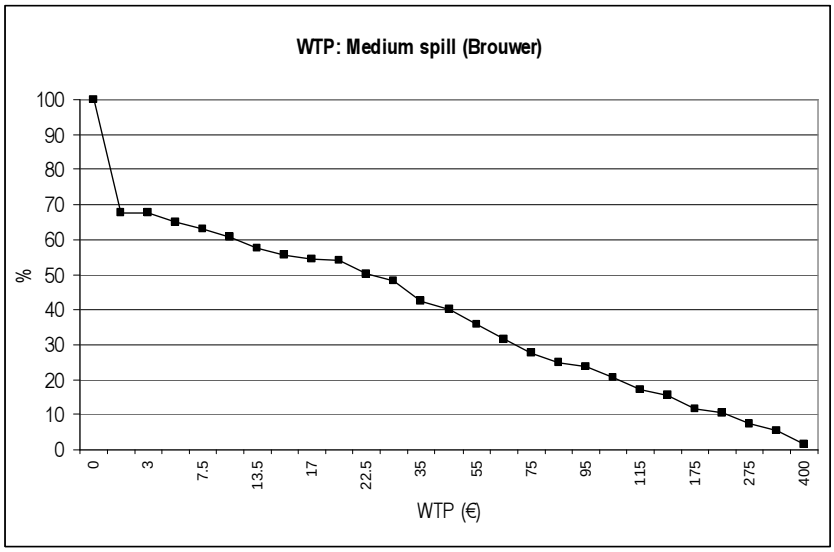
Graph 5.3.2 below presents the survivor functions under the Brouwer *et al.* (2008) classification of protest answers.

Graph 5.3.2 Survivor functions. Protest classification from Brower *et al.* (2002)

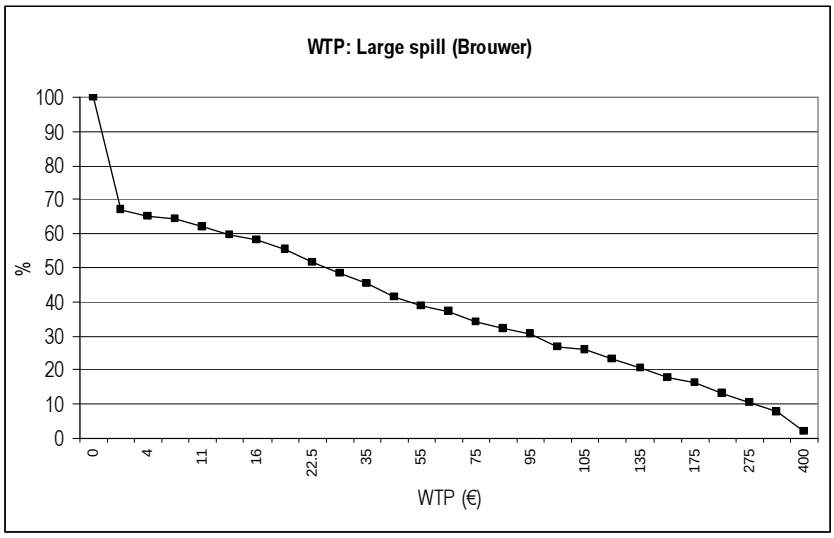
d) WTP to avoid a small spill using the Brower *et al.* (2008) protest classification



e) WTP to avoid a medium spill using the Brower *et al.* (2008) protest classification



f) WTP to avoid a large spill using the Brower *et al.* (2008) protest classification



The second set of survival functions (in graph 5.3.1.2 d), e) and f)) also shows that the right hand side tail of the distributions is larger for the large spill. The fact that the Brower *et al.* (2008) classification of protest answers includes more valid zeros explains the initial steeper drop in the number of people who stated they would be willing to pay (left hand side in graphs d), e) and f)).

The wording of the valuation question gave rise to a significant number of respondents stating they might pay quantities above the spontaneously stated WTP amount, that is, respondents expressed some uncertainty about their stated WTP. In order to test whether there were order effects as regards the uncertainty amounts, variance ratio tests and mean difference tests under the two protest classification (Bateman *et al.*

(2002) and Brouwer *et al.* (2008)) were conducted. A new variable was created (uncertainb) that resulted from the subtraction of the amount respondents were not willing to pay minus the amount respondents spontaneously said they would be willing to pay. The hypothesis tested was whether the mean uncertainty amount was equal across respondents that were asked to state their WTP for the medium spill. Respondents of the first version of the questionnaire answered the WTP question for the medium spill after they had answered the WTP question for the small spill. Conversely, respondents of the second version of the questionnaire answered the WTP question for the medium spill prior to answering the WTP question for the large spill. The outputs can be seen in annex A.4.1.

The results show that we do not reject the null hypothesis that the mean uncertainty amount in WTP to prevent the medium spill of respondents who answered the first version of the questionnaire is equal to the mean uncertainty amount in WTP to prevent the medium spill of respondents who answered the second version of the questionnaire. These findings indicate no order effects were found as regards uncertainty in the valuation question. This is so irrespective of the protest classification used.

Criticisms to CV analyses question the validity of results in the absence of scope sensitivity (see Carson, Flores and Meade, (2000) or Diamond and Hausman, (1994) among others). In order to test whether there was both internal and external sensitivity to scope in the willingness to pay to avoid future spills, repeated measures ANOVA, variance ratio tests and simple t-tests were conducted (Carson and Mitchell, 1993). WTP data was analysed both within survey respondents who received the same version of the questionnaire (internal scope test taking into account the dependent nature of the answers) and across survey respondents who received different versions of the questionnaire (external scope test).

The analysis of the outputs show that we can reject that the mean amount respondents who received version 1 of the questionnaire[125] were willing to pay to avoid the small spill was equal to the mean amount they were willing to pay to avoid the medium spill. These results also show that we cannot reject that the mean WTP to avoid the medium spill for survey respondents who received version 1 of the

[125] in which WTP to avoid a small and a medium size spill were presented.

questionnaire[126] is equal to the mean WTP to avoid the medium spill for survey respondents who received version 2 of the questionnaire[127]. The final part of the scope test consisted in testing whether the mean WTP to avoid the medium spill was equal to the mean WTP to avoid the large spill. This test was performed for people who received version 2 of the questionnaire. The results obtained can be seen in annex A.4.2. These results show that we reject that the mean WTP to avoid the medium spill is equal to the mean WTP to avoid the large spill. Both protest classifications (Bateman *et al.* 2002 and Brouwer *et al.* 2008) were used, yielding the same results.

Even though these results may appear reassuring, this exercise was not intended to resolve the debates surrounding scope sensitivity in CV studies. First, it may be that if the different hypothetical spills had depicted smaller changes, external scope insensitivity would have been found (Bateman *et al.* 2002). Additionally, all survey respondents were shown the three spills (small, medium and large) before asking them about their WTP to avoid only two of them, so they had a reference framework that gave them some baseline knowledge of the size and consequences of more spills than the ones they were finally asked about. This information may have constituted a decision-making aid that may distort the external scope sensitivity analysis. Hence, it could even be argued that there was no real external scope sensitivity test and that internal scope tests are easier to pass than the external scope tests. Variations of this external scope test for oil spill CV studies could clarify whether the findings described above are robust.

A final follow-up question was asked in the valuation section of the questionnaire. Respondents were asked what factors influenced their WTP response. The summary of their answers is provided in table 5.3.8:

[126] in which respondents are asked about their WTP to avoid the small and medium spill.
[127] in which respondents were asked about their WTP to avoid the medium and large spill.

Table 5.3.8 Factors that influenced WTP answers

Factor	Frequency	Percentage
All consequences presented in the scenarios	197	29.71
Quantity spilled	33	4.98
Area affected	54	8.14
Environmental consequences	217	32.73
Health consequences	165	24.89
Recovery time	54	8.14
Economic consequences	24	3.62
Lack of prevention/mitigation	15	2.16
The role of polluting companies	3	0.45
Repeated spills	2	0.3
Large consequences (size of damages)	2	0.3
Lack of political will	4	0.6
Other reasons	17	2.56
Don't know	15	2.26

The main factors that influenced the WTP figure were, firstly, environmental consequences of the spill as approximately 33% of respondents stated this as a relevant factor for their WTP answer. This was followed by under 30% of respondents stating that all the consequences described affected their WTP decision. Health consequences were also said to be relevant in the WTP decision for 25% of respondents. The recovery time, the area affected and the quantity spilled followed in terms of the percentage of respondents who cited them as significantly affecting their WTP answer.

5.3.2 The Valuation exercise

Models

As was discussed in previous sections, in the valuation exercise respondents were first asked whether they would be willing to pay to avoid the spills and then, for those who said they were willing to pay, a payment card was shown. A logit model was run in order to analyse the characteristics that determine whether respondents were willing to pay. This is done under two scenarios. The first scenario eliminates protest answers following Bateman *et al.* (2002). The second one eliminates protest answers following Brower *et al.* (2008).

As we discussed in the previous chapter when the dependent variable is a categorical variable, we resort to discrete choice models in order to analyse the characteristics that determine a given outcome (e.g. being willing to pay to avoid an oil spill/not being willing to pay to avoid an oil spill). In our case, we assume the distribution function of the answers is non linear and therefore we look at non-linear discrete choice models.

In these models we assume respondents are rational and they will choose the alternative that yields the highest utility. In this case, we only have two alternatives and we assume that the utility functions are linear. We would therefore have[128]:

$$Ui_0 = \alpha_{0+} X'_i\beta_0 + \varepsilon_{i0} \quad (1)$$

$$Ui_1 = \alpha_{1+} X'_i\beta_1 + \varepsilon_{i1} \quad (2)$$

Where:
Yi : Choice
U_{io} : Utility of choosing option 0 (Not willing to pay)
U_{i1} : Utility of choosing option 1 (Willing to pay)
α_0, α_1 : Constants
X'_i : Row vector of regressors or explanatory variables for respondent i
β_0, β_1 : Colum vector of coefficients
$\varepsilon_{i0}, \varepsilon_{i1}$: Error terms

So, we assume each respondent will choose according to the following rationale:

$$Y_i=0 \text{ if } U_{i0}>U_{i1} \quad (3)$$

$$Y_i=1 \text{ if } U_{i1}>U_{i0} \quad (4)$$

We know that the utility will depend on the characteristics of the alternative presented as well as on the characteristics of the respondent. Formally (Cabrer Borrás *et al.* 2001: 97):

$$P(Y_i= 1) = P(U_{i1}>U_{i0}) = F(X'_i\beta)= F(Z_i) \quad (5)$$

Where:
Z_i : is a linear combination of $X'_i\beta$
$F(Z_i)$: is the distribution function associated to the decision process

If we assume the distribution function is logistic, then:

$$P(Y_i=1) = \frac{e^{X'i\beta}}{1+e^{X'i\beta}} \quad (6)$$

After using these models, an interval data model is run in order to understand the influence of respondents' socio-economic characteristics, environmental attitudes and related pro-environmental behaviour on stated WTP amounts. Protest and biased answers are excluded from the model and valid zeros are included in the analysis. In this last exercise we also present WTP estimates according to two scenarios. The first one excludes protests according to the classification presented by Bateman *et al.* (2002). The second one excludes protests according to the classification depicted by Brower *et al.* (2008). According to Cameron and Huppert (1989) the parametric estimation of interval data (such as the one retrieved from the payment ladder used in

[128] Cabrer Borrás *et al.* (2001: 25)

the valuation exercise) can be done using the aforementioned interval data models. As we can see from the wording used in the valuation exercise (see annex A.3.1) respondents were allowed to express uncertainty in their stated WTP. This uncertainty implied that the upper bound of respondents' WTP interval was assumed to be somewhere between the last quantity they say they would pay and the quantity they said they would not pay (rather than the quantity just above the quantity they said they would pay). The consequence of this is that intervals tend to be larger and vary significantly across respondents to reflect their uncertainty[129]. Bearing in mind this qualification and following Cameron and Huppert (1989) the probability of choosing a certain stated WTP amount $P(t_{li})$ will be equal to the probability that this quantity lies in the interval:

$$P(t_{li}) = P(t_{li} \leq WTP \leq t_{ui}) \quad (11)$$

Where:
t_{li} : Lower threshold (what respondents spontaneously said they would pay)
t_{ui} : Upper threshold (midpoint between last amount accepted and the amount rejected)

The non-negative distribution implies using a log-normal conditional distribution (Atkinson *et al.* 2008*:* 434) and the WTP will be:

$$Log\ WTPi = x'_i\beta + \varepsilon_i \quad (12)$$[130]

Where:
X'_i : Row vector of regressors or explanatory variables for respondent i
β : Column vector of coefficients
ε_i : Error term (disturbances)

The probability that the WTP is in the interval is, according to Cameron and Huppert (1989: 232):

$$P(Yi \subseteq t_{1i}, t_{ui}) = P((logt_{li} - x'_i\beta)/\sigma < Zi < (logt_{ui} - x'_i\beta)/\sigma) = \Phi(z_{ui}) - \Phi(z_{li}) \quad (13)$$

Where:
Yi : Respondent's 'true' valuation
t_{li} : Lower threshold (what respondents spontaneously said they would pay)
t_{ui} : Upper threshold (midpoint between last amount accepted and the amount rejected)
Z_i : Standard normal random variable
σ : Standard deviation
Φ : Cumulative standard normal density function

The log likelihood function is:

$$Log\ L = \sum_{i=1}^{n} \log[\Phi(z_{ui}) - \Phi(z_{li})] \quad (14)$$

[129] This framing of the valuation question and analysis of the data is different to other payment ladder data analysis (Atkinson *et al.* (2008), Atkinson *et al.* (2005) or Håkansson (2008)) where it is assumed that if a respondent *i* chooses a certain quantity from the payment ladder, the chosen quantity is the lower bound of the interval and his/her hypothetical payment will be between this quantity and the next (higher) amount on the payment ladder. It is however similar to the one in Hanley and Kriström (2003).

[130] ε_i is normally distributed N~ (0, σ)

The mean and median values can be calculated as:

$$\text{Median WTP} = \exp(X_i'\beta^*) \quad (15)$$

$$\text{Mean WTP} = \exp(X_i'\beta^*)\exp(\sigma^2/2) \quad (16)$$

Where:
$X_i'\beta^*$: Fitted values
σ^2 : Variance of error

Regressors

The independent variables that are significant in the models are presented below along with a brief comment regarding their expected sign. This information is firstly provided for the dichotomous question (are you willing to pay to fund the prevention programs described?). The information on the significant variables in the interval data model (answering the question of how much each respondent would be willing to pay) is presented following the dichotomous-type question.

The main goals of the CV design process are: ensuring the quality of the design and yielding a reasonable set of results. Obtaining parameter estimates that are significant and have the expected sign is one way of validating the WTP data obtained. For the logit model the characteristics, their values and their expected sign are presented in table 5.3.9 below:

Table 5.3.9 Description of independent variables valuation exercise: WTP Yes/No

Independent variable	Possible values
City	0= if resident of La Coruña 1= if resident of Madrid
Age	= (18-79)
Income	= midpoint of the income band
Known spills	= 0 if none = 1 if one or more
Aggregated NEP score	15 - 75
Previously volunteered to protect the environment	= 0 if No = 1 if Yes

The expectations concerning the above independent variables included a possible distance decay effect (Hanley *et al.* 2003) whereby people in La Coruña were expected to be more likely to state they would be willing to pay due to the geographical proximity to future spills. Age was expected to be significant and to have a negative sign (Dunlap *et al.* 2000; Giraud, Loomis and Johnson, 1999; Carson, Flores and Meade

and Bateman *et al.* 2002) as younger people are known to state higher pro-environmental attitudes (Olofsson and Öhman, 2006). Income was expected to be significant and to have a positive sign as following an economic optimist perspective higher income can imply higher willingness to pay for environmental protection (Giraud, Loomis and Johnson, 1999; Carson, Flores and Meade and Bateman *et al.* 2002). Whether respondents have prior knowledge of oil spills was expected to be significant and positive in determining WTP. The pro-ecological worldview of respondents was also expected to have a positive and significant weight in determining whether interviewees are willing to contribute to oil spill prevention schemes (Kotchen and Reiling, 2000). Previous environmental volunteering was also expected to be significant and to have a positive sign since those individuals who have already allocated part of their resources (time) to protect the environment may be more likely to be willing to pay to protect the environment.

The significant independent variables in the interval data model are presented in table 5.3.10 below:

Table 5.3.10 Independent variables. Valuation exercise, interval data model

Independent variable	Possible values
City	0= if resident of La Coruña 1= if resident of Madrid
Age	18-79
Income	Midpoint of the income band
Known spills	= 0 if none known = 1 if one or more spills known
Aggregated NEP score	15 – 75
WTP response influenced by environmental consequences described	= 0 if No = 1 if Yes
Previously volunteered to protect the environment	= 0 if No = 1 if Yes

In the interval data models the WTP to avoid spills was expected to increase as the spill size increased (Atkinson *et al.,* 2008). Carson, Flores and Meade (2000) among others claim that, in CV answers, proximity to the event is expected to be related to higher WTP. This expectation was however put on hold as respondents in Madrid are, on average, wealthier and that they have no coast at all which may have resulted in a

positive relationship between respondents from Madrid and stated WTP. This is so due to the fact that higher income is expected to increase stated WTP (*ibid.*).

Age was expected to be negatively related to stated WTP (Giraud, Loomis and Johnson, 1999, Carson, Flores and Meade and Bateman *et al.,* 2002). Knowledge of previous spills was expected to be positively related to the stated WTP. The aggregated NEP score that depicts the pro-ecological worldview was also expected to be positively related to stated WTP (Kotchen and Reiling, 2000). If respondents answered that the most salient consequences from the valuation scenario were the environmental damages that was expected to be positively related to stated WTP. Finally, volunteering to solve an environmental problem was also expected to be significant and to have a positive sign.

Results

The results of the logit models are presented and analysed before the interval data models. Models were run considering both the Bateman *et al.* (2002) classification of protest answers and the Brouwer *et al.* (2008) classification of protest answers. The results are presented in table 5.3.11 below:

Table 5.3.11 Logit model (WTP=yes/no)

	Protest classification	
Variables	**Bateman et al. (2002)**	**Brouwer et al. (2008)**
Constant	-1.007 (2.15)	-1.752 (1.26)
City	-0.813** (0.42)	-0.691*** (0.24)
Age	-0.0007 (0.01)	-0.015** (0.007)
Income	3.91e-06 (0.00001)	9.47e-07 (7.78e-06)
Known spills	1.386** (0.66)	1.133** (0.51)
Aggregate NEP score	0.041 (0.03)	0.048*** (0.02)
Volunteered to protect the environment	0.423 (0.51)	0.546* (0.31)
Pseudo R2	0.051	0.064
Number of observations	358	449

Where : Standard error in parentheses
* =The coefficient is significantly different from zero at a 90% confidence level
** =The coefficient is significantly different from zero at a 95% confidence level
***=The coefficient is significantly different from zero at a 99% confidence level

Using the *Bateman et al.* (2002) *classification of protest answers* the likelihood ratio chi-square is equal to 12.71 (p-value = 0.04). This implies that the model specified fits significantly better than an empty model[131]. Using the Bateman *et al.* (2002) classification of protest answers we see that only the city and whether respondents had prior knowledge of past oil spills are significant in determining willingness to pay at a 95% confidence level. A distance decay can be seen here where people from Madrid (city=1) are less likely to be willing to pay to prevent future spills. Finally, having prior knowledge of oil spills is significant and has the expected positive sign.

Using the *Brouwer et al.* (2008) *classification of protest answers* the likelihood ratio chi-square is equal to 30.56 (p-value = 0.0000). This implies that the model specified fits significantly better than an empty model. The interpretation of the output above tells us that respondents from Madrid (city=1) are less likely than respondents from La Coruña to state a positive willingness to pay. An increase in one year in respondent's age reduces the probability of being willing to pay to prevent future spills. Having previous knowledge about oil spills increases the probability of being willing to pay. A more pro-ecological worldview (measured by a higher aggregate NEP score) implies a higher probability of being willing to pay. Having undertaken previous voluntary work to protect the environment increases the probability of being willing to pay to prevent future spills.

Comparing the logit models according to the different ways of classifying protest answers we see that the logit model run using the Bateman *et al.* (2002) classification of protest answers has a lower number of observations and only two independent variables in the model are significant. The pseudo R^2 is lower compared to the logit model run using the Brouwer *et al.* (2008) classification of protest answers. In the logit model run using the Brouwer *et al.* (2008) classification of protest answers we use a higher number of observations and all the independent variables, except for income, are significant and have the expected sign.

Once respondents had decided whether they wanted to pay (or otherwise) to prevent future spills, those who did want to pay were asked about the amount they were willing to pay. As stated earlier, each respondent was asked about their WTP for two

[131] http://www.ats.ucla.edu/stat/stata/dae/logit.htm

spills (the small and the medium spill in version 1 of the questionnaire and the medium and the large spill in version 2 of the questionnaire).

Rather than ignoring uncertainty in WTP answers[132] we considered the interval as it was defined by respondents (being their WTP somewhere between the quantity they 'spontaneously' said they would pay and the quantity they said they would not pay) and then we calculated the midpoint between the last quantity accepted and the quantity rejected for each respondent's WTP interval to parametrically estimate the factors that determine WTP.

The interval data models for each of the three spills, small, medium and large, are summarised below. As was the case with the compensation exercise, the fact that each respondent answered two valuation questions implied that a high correlation among their answers was to be expected. As it was argued in the previous chapter however, the independent variables across the three spills (and hence for the three interval data models) are the same and therefore it is appropriate to undertake the parametric estimation through three separate interval data models (Judge *et al.* 1988).

In our valuation exercise we have:

$$X'_i\beta = \beta_0 + \beta_1 City + \beta_2 Age + \beta_3 Income + \beta 4 Known\_spills +$$

$$\beta_5 Aggregate\_NEP\_score + \beta_6 Environmental\_consequences + \beta_7 Volunteer \qquad (17)$$

The results obtained from running the interval data models using the Bateman *et al.* (2002) classification of protest answers are presented in table 5.3.12 below:

[132] By modelling the interval data assuming that the upper bound of the interval is the quantity just above the spontaneous WTP stated by respondents and then taking the midpoint of this as the upper bound of the interval.

Table 5.3.12 Interval data models. WTP. Bateman *et al.* (2002) classification

	Small spill	Medium Spill	Large spill
Constant	0.797	-0.232	-2.154
	(1.67)	(1.18)	(1.41)
City	0.429*	0.527***	0.616**
	(0.24)	(0.18)	(0.27)
Age	-0.013	-0.009*	-0.007
	(0.008)	(0.005)	(0.008)
Income	6.81e-06	0.00001**	0.00002***
	(9.54e-06)	(7.18e-06)	(9.53e-06)
Known spills	0.495	0.985	1.597**
	(0.91)	(0.64)	(0.79)
Aggregate NEP score	0.026	0.033**	0.054**
	(0.02)	(0.01)	(0.02)
Environmental consequences	0.313	0.485***	0.511**
	(0.27)	(0.18)	(0.24)
Previously volunteered to protect the environment	0.632**	0.445**	0.318
	(0.29)	(0.20)	(0.29)
σ	1.588	1.565	1.558
Log pseudo likelihood	-410.87	-823.73	-405.01
N	168	331	162

Where: Dependent variable: log WTP
Standard error in parentheses
* =The coefficient is significantly different from zero at a 90% confidence level
** =The coefficient is significantly different from zero at a 95% confidence level
*** =The coefficient is significantly different from zero at a 99% confidence level

The results obtained in the interval data models for the three spills largely confirm prior expectations. The analysis of the main results obtained are summarised below.

Key findings:

The interval data models predicting the WTP to avoid the spills are statistically significant. The Wald Chi-squared was equal to 24.21 (p-value =0.001) for the small spill; the medium spill had a Wald Chi-squared of 52.94 (p-value = 0.000) and the large spill had a Wald Chi-squared of 40.26 (p-value = 0.000). This implies that the null hypothesis that all parameter coefficients are jointly equal to zero[133] is rejected. Testing the null hypothesis that each coefficient is equal to zero (H_0: β_i=0) in each of the three spills, we reject the null hypotheses for city, as the coefficient is significantly different from zero across the three spills. Previous logit models showed that people from La Coruña (with coast and more exposed to spills) had higher probability than people from Madrid of answering positively to the WTP question thus showing a distance decay effect. The findings from these interval regressions show that focusing

[133] (H_0: $\beta_0=\beta_1=\beta_2=\beta_3=\beta_4=\beta_5=\beta_6=\beta_7= 0$)

on those who said they were willing to pay, people from Madrid (who are wealthier on average and have less coast) would be willing to pay more.

For the rest of the independent variables, rejection of the null hypothesis (H_0:βi=0) depends on the size of the spill. Age is significant and has the expected negative sign for the medium spill. Income is significant and has the expected positive sign for the medium and large spill. Whether the respondent had prior knowledge of oil spills is significant for the large spill and has the expected positive sign. The coefficient for pro-ecological worldview (higher aggregate NEP score) is significantly different from zero and has the expected positive sign for the medium and the large spill. Whether respondents had been influenced by environmental consequences of oil spills is also significant and has a positive influence on the amount they said they would be willing to pay for the medium and large spills. Finally, having previously volunteered to protect the environment is significant and has a positive sign for the small and medium spills.

Interpreting the coefficients:

- If the interviewee comes from Madrid the willingness to pay will increase by 42.9%, 52.7% and 61.6% for the small, medium and large spills respectively.
- An increase of one year of age will reduce willingness to pay by 0.9% for the medium spill.
- An increase of 1,000€ in income will increase the willingness to pay by 1% for the medium spill and by 2% for the large spill.
- Having prior knowledge of oil spills will increase the WTP by 159% for the large spill.
- An additional point to the aggregate NEP score will increase the willingness to pay by 3.3% and by 5.4% for the medium and for the large spills respectively.
- If respondents' attention was drawn by environmental consequences in the valuation exercise the WTP increases by 48.5% and by 51.1% for the medium and large spills respectively.
- If respondents have previously volunteered to protect the environment the WTP will increase by 44.5% for the medium spill.

In order to calculate the parametric median and mean WTP we use equations (15) and (16) and we obtain the results presented in table 5.3.13:

Table 5.3.13 Parametric estimates. Mean and median WTP(€). Bateman *et al.* (2002)

	Small Spill	Medium spill	Large Spill
Median = $\exp(X_i'\beta^*)$	15.95	20.49	25.79
Mean = $\exp(X_i'\beta^*).\exp(\sigma^2/2)$	56.26	69.75	86.48

The parametric mean values are lower than their non-parametric counterparts. As was stated earlier, this finding was to be expected (Loureiro *et al.* 2009 and Atkinson *et al.* forthcoming).

The results obtained from running the interval data models using the Brouwer *et al.* (2008) classification of protest answers are presented in table 5.3.14 below:

Table 5.3.14 Interval data models. WTP. Brouwer *et al.* (2008) classification

	Small spill	Medium Spill	Large spill
Constant	-0.593	-0.691	-.0879
	(1.56)	(1.10)	(1.56)
City	0.105	0.242	0.345
	(0.25)	(0.18)	(0.28)
Age	-0.017**	-0.017***	-0.018**
	(0.008)	(0.005)	(0.008)
Income	9.21e-06	0.000012*	0.00001
	(8.89e-06)	(6.62e-06)	(0.00001)
Known spills	0.445	1.089**	1.710***
	(0.77)	(0.47)	(0.52)
Aggregate NEP score	0.049**	0.039**	0.032
	(0.02)	(0.01)	(0.02)
Environmental consequences	0.171	0.391**	0.410
	(0.27)	(0.19)	(0.29)
Previously volunteered to protect the environment	0.680**	0.630***	0.653**
	(0.31)	(0.22)	(0.34)
σ	1.778	1.839	1.914
Log pseudo likelihood	-515.39	-1056.55	-532.49
N	211	420	208

Where: Dependent variable: log WTP
Standard error in parentheses
* =The coefficient is significantly different from zero at a 90% confidence level
** =The coefficient is significantly different from zero at a 95% confidence level
*** =The coefficient is significantly different from zero at a 99% confidence level

The results obtained in the interval data models for the three spills largely confirm prior expectations. The analysis of the main results obtained are summarised below.

Key findings:

The overall data models predicting the WTP to avoid the spills are statistically significant. The Wald Chi-squared was equal to 28.22 (p-value = 0.0002) for the small

spill; the medium spill had a Wald Chi-squared of 48.24 (p-value = 0.0000) and the large spill had a Wald Chi-squared of 26.67 (p-value = 0.0004). This implies that the null hypothesis that all parameter coefficients are jointly equal to zero[134] is rejected. Testing the null hypothesis that each coefficient is equal to zero (H_0: β_i=0) in each of the three spills, we reject the null hypotheses for age and for previously volunteered to protect the environment, as the coefficient is significantly different from zero across the three spills. These two independent variables have the expected sign. Somewhat surprisingly the city is not significant in any of the spills.

For the rest of the independent variables, rejection of the null hypothesis (H_0:βi=0) depends on the size of the spill. Income is significant and has the expected positive sign for the medium spill. Whether the respondent had prior knowledge of oil spills was significant for the large spill and had the expected positive sign. The coefficient for pro-ecological worldview (higher aggregate NEP score) is significantly different from zero and has the expected positive sign for the small and medium spills. Whether respondents had been influenced by environmental consequences of oil spills was also significant and had a positive influence on the amount they said they would be willing to pay for the medium spill.

Interpreting the coefficients:

- An increase of one year of age will reduce willingness to pay by 1.7% for the small and medium spills and 1.8% for the large spill.
- An increase of 1,000€ in income will increase the willingness to pay by 1.2% for the medium spill.
- Having prior knowledge of oil spills will increase the WTP by 108% and 171% for the medium and large spills respectively.
- An additional point to the aggregate NEP score will increase the willingness to pay by 4.9% and by 3.9% for the small and medium spills respectively.
- If respondents' attention was drawn by environmental consequences in the valuation exercise the WTP increases by 39.1% for the medium spill.

[134] (H_0: $\beta_0=\beta_1=\beta_2=\beta_3=\beta_4=\beta_5=\beta_6=\beta_7= 0$)

- If respondents have previously volunteered to protect the environment the WTP will increase by 68%, 63% and 65.3% for the small, the medium and the large spills respectively.

In order to calculate the parametric median and mean WTP we use equations (15) and (16) and we obtain the results presented in table 5.3.15:

Table 5.3.15 Parametric estimates. Mean and median WTP(€). Brouwer *et al.* (2008)

	Small Spill	Medium spill	Large Spill
Median = $\exp(X_i'\beta^*)$	9.2	10.8	12.42
Mean = $\exp(X_i'\beta^*).\exp(\sigma^2/2)$	44.7	58.55	77.47

The parametric mean values are lower than their non-parametric counterparts[135].

As was discussed in section 5.2.1 previous WTP estimates obtained in other CV studies can serve as a comparison with the WTP estimates obtained in this thesis. For example, the Carson *et al.* (2003) updated analysis of the *Exxon Valdez* CV presents a mean WTP value of 79.2$ to prevent a future oil spill. Appéré (2002) in Bonnieux and Rainelli, (2003) estimated the monthly mean WTP to drive to a clean site if the baseline was one of limited degradation after an oil spill. In annual terms this amounted to over 133€. In a second scenario, the baseline was one where there was important degradation resulting in fishing bans. The annual WTP to drive to a clean site amounted to just under 169€. Finally, the Loureiro *et al.* (2007; 2009) studies estimate the parametric mean WTP to avoid another Prestige-type spill is over 40€. The results obtained in this thesis seem reasonable when compared with the above CV analyses. Differences in design and in the features of the hypothetical scenarios may help explain the differences in mean WTP amounts.

A final note should be made regarding the possibility of a sample selection problem due to the exclusion of protest responses from the analysis of WTP data. The state-of-the-art as regards the treatment of protest zeros according to Meyerhoff and Liebe (2008) is to eliminate them from the sample. A word of caution however is needed regarding the elimination of protest responses despite the fact that this is common practice among CV practitioners. If protesters have certain common characteristics that differ from those of people stating valid reasons for their WTP answers, the

[135] Except for the parametric mean for the large spill that is slightly higher than the non-parametric mean.

results of the CV exercise could be biased (Strazzera *et al.* 2003). In order to address this concern, Heckman's two stage model was run (see annex A.4.3). As the inverse of the Mill ratio is not significant it can be concluded that the selection problem is not significant and hence we maintain the estimates presented above.

Chapter 5 in the thesis presents both the mean and the median WTP. The main reason for presenting both measures is that despite the mean WTP being the 'correct' measure to use in cost benefit analyses (Smith *et al.* 1999; Pearce *et al.* 2006), allowing us to calculate aggregate benefits from a policy by multiplying mean values by the number of people with standing, it is sensitive to the distribution of WTP data. In this sense Hanemann (1984: 333) claims that greater attention should be paid to the median as it is 'more robust to errors and outliers in experimental responses' (see also Carson *et al.* 2003 and Carson *et al.* 1992). The mean WTP is nevertheless used in CBA analyses as it more closely reflects the variance of preferences in society (Pearce *et al.* 2006). But, if the WTP values provided by outliers are considered valid, or if there are a significant number of valid zeroes, the mean values will be skewed towards these figures and will not reflect the demand of the majority of respondents.

The reason to be concerned about whether the majority of individuals would support a policy (such as an oil spill prevention program) is, as was previously mentioned, that policies need support from those affected by them to be implemented and maintained (Roberts, 2004; Connelly and Smith, 2003). It is here that the median voter theory becomes relevant. According to Congleton (2002) the precursor of the median voter theory, i.e. majority voting, has been around for thousands of years but it was not until the mid twentieth century that Black (1948) analysed majority voting and Downs (1957) extended his work in writing about representative democracy. Congleton (2002: 3) identifies two forms of the median voter theorem, the *weak* one that states that 'the median voter always casts his or her vote for the policy that is adopted' and the *strong* one that 'median voter always gets her most preferred policy'. In democracies, the above author concludes, it is median voter preferences that tend to emerge and hence the median is relevant for the case study analysed in the thesis. Hence, if we are to inform policy-makers about the acceptability of a given program or policy, the median would be preferred (Pearce *et al.* 2006). Some empirical evidence furthermore confirms that for large scale public projects the theory of the median voter explains

policy decisions (Congleton, 2002) although other scholars do not see broad ranging support for the median voter theory (Thomson and Torenvlied, 2004).

There are however caveats that should be considered when reporting the median rather than the mean. Congleton (2002) argues that the median value is expected to be inconsistent with the Pareto criterion and the Kaldor-Hicks compensation criterion that underlies CBA as the majority can impose costs on a minority without any specific reference to whether these costs could potentially be compensated. Additionally, decision-making according to the median would preclude (hypothetical or real) gains from trade between winners and losers to be identified and realised. Lack of complete information and power asymmetries between voters and, say, powerful elites, can result in deviations from what the median voter wants. Elites and economic elites can hold the loci of power, influencing the policy-process as well as the outcomes of policy (González, 2001). The debate regarding whether to use the mean WTP or the median WTP is still ongoing (Smith *et al.* 1999; Pearce *et al.* 2006) and hence both have been reported.

5.4 DISCUSSION AND CONCLUSIONS

This last empirical chapter has presented the results from the WTP exercise. It was argued that, from a theoretical perspective, CV studies can accommodate the analysis of any hypothetical occurrence. This includes the analysis of oil spill prevention schemes when there is a threat of large, potentially irreversible consequences. Building on the existing literature (Bateman *et al.* (2002), Pearce, Atkinson and Mourato (2006), Arrow, *et al.* (1993), Carson, Flores and Meade, (2000), Carson *et al.* (2003), Loureiro *et al.* (2009), among others) a CV-type exercise was included in the questionnaire. Interviewees were asked, among other things, whether they would be willing to pay to avoid spills of three different sizes and consequences.

Information obtained from focus groups analysis pointed towards the need to limit the cognitive burden of respondents. CV was chosen over the alternative considered, choice modelling. The CV design process followed best practice guidelines albeit subject to the limitations imposed by budget constraints. It also benefited from expert and peer reviews and was shaped by the information obtained from the elite interview process, the focus groups conducted and the pilot questionnaire. These steps were taken to ensure the depiction of a meaningful, credible and understandable valuation exercise in order to obtain valid estimates of WTP to avoid future oil spills.

The analysis of the data revealed that over half of the sampled population was willing to pay to prevent future oil spills from happening. The different protest classification schemes used (Bateman *et al.* 2002 and Brouwer *et al.* 2008) provide non-parametric WTP estimates that show statistically significant differences. From a theoretical perspective this finding could indicate that routinely reporting the protest classification scheme used in CV studies is relevant. It could also help develop additional research into best practice guidelines regarding the treatment and reporting of protest responses.

Non-parametric mean WTP estimates using the Bateman *et al.* (2002) protest classification amount to under 66€ to prevent the small spill, 80€ to prevent the medium spill and 98€ to prevent the large spill. Non-parametric mean WTP estimates using the Brouwer *et al.* (2008) protest classification scheme are lower; 52€ to prevent the small spill, 62€ to prevent the medium spill and 75€ to prevent the large spill.

Despite the fact that there are statistically significant differences among the non-parametric WTP amounts for the different spills, showing internal and external sensitivity to scope, the payment amounts are not proportional to the damages described. According to Hammitt and Graham (1999: 59) there is no *a priori* guidance emanating from economic theory as regards 'how much WTP should differ between different quantities of an environmental good', which, applied to this thesis, would mean that there is no *ex ante* expectation regarding the proportionality, or otherwise, of WTP to prevent environmental damages of varying sizes.

The lack of proportionality may imply that CV studies are not the best tool to understand the strength of survey respondent preferences for large, potentially irreversible losses. In this sense, respondents' income constraints may be doing a disservice to environmental protection limiting their desire to protect the environment to the ability to pay for it. It may be the case that other evaluation and decision-making criteria could be better. Going back to Randall (2000) it may be that moral pluralism, in cases where irreversibilities and thresholds can happen, advices higher than WTP stated efforts to prevent environmental damages. The reasons for this may be either moral imperatives or respect for rights.

Logit results on the probability of being willing to pay were reported using the Bateman *et al.* (2002) and the Brouwer *et al.* (2008) classification of protest answers. Even though the relevant independent variables have the expected sign, the results under the Bateman *et al.* (2002) classification of protest answers show that only the city and whether respondents had previous knowledge of oil spills were significant in determining whether respondents who had given valid answers were willing to pay.

As regards the question of which respondents' characteristics best explain the amount respondents are willing to pay to avoid a future spill, these are: city, age, income, whether respondents had prior knowledge of past oil spills, the NEP score, whether the respondent was influenced by the environmental consequences described in the valuation exercise and whether the respondent had previously volunteered to protect the environment. All of the above mentioned independent variables have the expected sign and are overall significant. This is a sign of construct validity.

The parametric mean WTP estimates using the Bateman *et al.* (2002) classification scheme amounts to 56€ for the small spill, 69€ for the medium spill and 86€ for the

large spill. Parametric mean WTP estimates using the Brouwer *et al.* (2008) classification of protest answers amount to 44€ for the small spill, 58€ for the medium spill and 77€ for the large spill. This information provides empirically relevant data as regards the benefits of preserving natural capital (defined as one of the key defining features of strong sustainability) through damage prevention programs as demanded by Atkinson *et al.* (1997). Additionally, it also answers the call by Arrow *et al.* (1993) for building a body of knowledge of WTP estimates for spills of different sizes and consequences.

Future research could benefit from having larger sample sizes and a random sampling process that would enable to generalise the results obtained. Cross-fertilization with other disciplines such as neuroeconomics could also help improve survey design and results.

CHAPTER 6. CONCLUSIONS AND DISCUSSION

6.1 INTRODUCTION

The first two chapters of this thesis have analysed sustainable development from a theoretical perspective. The myriad of definitions, interpretations, criticisms and largely theoretical contributions (Pezzey and Toman, 2002) provided scope for an applied enquiry into the pursuit of weak and strong sustainability paradigms in the context of environmental damages caused by oil spills. This empirical enquiry was undertaken by means of a multi-method approach.

Sustainability has been argued to be a multi-level and multi-agent endeavour (Governance for Sustainable Development, 2003 and Jordan, 2008). Sustainability is assumed to be largely dependent on citizens' demands and acceptance of policies. Thus, knowing what citizens want in addition to what is politically feasible and advisable according to experts is argued to be paramount to defining long-lasting environmental policies to protect natural capital. This thesis has tried to shed some light on these issues.

Chapter three analysed the views of elites (experts) and FG participants (non-expert citizens) on sustainable development. This was done through a comparative analysis of the key issues within SD. These included: definitions of sustainable development, substitutability of different types of capital, trade-offs between economic growth and environmental protection, compensation, irreversibilities, thresholds and equity concerns. The policy process heuristic by Roberts (2004) was used as a framework for understanding decisions. Inputs from social psychology (Fishbein and Ajzen, 1975) were incorporated to enhance the understanding of motivations and intentions as regards behaviours. Ethical theories (Randall, 2000) and the development and perception of new social movements (Jiménez, 2007) were explored to enrich the interpretations of elites and FG participants relative to sustainable development.

Chapter four analysed survey respondents' preferences for different compensation options. It also analysed the reasons for survey respondent choices and the variables relevant in determining their choices. Three compensation 'packages' or 'options' were made available to respondents. The first two compensation options were modelled following Pearce *et al.'s* (1989) divide of weak and strong sustainability. The first one offered compensation in man-made capital when natural capital was (hypothetically) lost, i.e. the weak sustainability option. The second one offered natural capital in

compensation for damaged natural capital, replacing *like-for-like*, i.e. the strong sustainability option. A 'third way' in terms of a modified Hartwick-rule was added to the weak and strong sustainability compensation options. This third compensation package consisted of investments in social capital as proposed by Aldred (2002) and Turner (2007).

Chapter five, the last empirical chapter, analysed survey respondents' WTP to prevent environmental damages of varying degrees as a consequence of future oil spill of different sizes. Theoretically, this exercise responded to calls by Arrow *et* al. (1993) to have more WTP estimates in the context of oil spills. It also resulted from the call by Atkinson *et al.* (1997) to analyse the benefits (and costs) of sustainability (i.e. WTP to preserve natural capital) and the link between valuation and strong sustainability as advocated by Pearce *et al.* (2006). Moreover, the empirical findings from previous chapters signalled that (some) respondents may be willing to pay significantly more to prevent large environmental damages, compared to the amount they would be willing to pay to prevent smaller damages.

This last chapter presents the key findings of the thesis. It answers the research questions that were presented in the introductory chapter. This is followed by the policy recommendations that have emerged from the analyses of the data obtained both through the qualitative methods used (elite interviews and focus groups) and from the quantitative method (the survey). The chapter will conclude with a brief reference to future research that could help test the reliability and robustness of the results obtained.

6.2 KEY FINDINGS

This section will discuss the results obtained in the thesis as regards the three main research questions presented in the introductory chapter. These questions were: Do experts and citizens view sustainability similarly? Do citizens exhibit strong sustainability preferences with regards to different compensation schemes? Can CV help substantiate the case for strong sustainability?

The first question, whether experts and non-experts viewed sustainability in the same way was discussed with reference to the answers obtained from elite interviewees and focus groups and from the survey. Elite interviews were asked to *define the term sustainability*. Definitions provided were overall vague, eschewed towards economic development and lacking any recognition of different paradigms within sustainability such as those identified in academic debates (see Pearce *et al.* 1989; Beckerman, 1994, 1995; Daly, 1995a; Jacobs, 1995; Skolimowski, 1995; Neumayer, 1999; Hediger, 1999, among other).

Despite the lack of accurate definitions, the term sustainability is however used in policy strategies and programs. Implicitly, it could be argued that elite interviewees, who were directly in contact with natural resource management, were familiar with issues relevant to the discussion of weak versus strong sustainability. Additionally, and related to the well known diagram of total economic value (see Bateman *et al.* 2002 for example), it can also be argued that, commercial resources with direct use values such as fishing and shell-fishing received, by and large, more detailed attention in terms of information and limits to their use, compared with non-commercial marine resources. This statement is overall in accordance with the ideas voiced by Hassan *et al*. (2005) and WWF (2010) but it further stresses the ill-protection of assets with potentially high non-use values.

Focus group respondents were not directly asked to *define sustainable development*, but the various exercises encouraged them to elaborate on issues relevant to the understanding of the term. The level of detail and knowledge of FGs as regards sustainability was, in accordance with Bäckstrand (2003) more 'local' in nature and less specialised. Additionally, FG participants discussed intergenerational equity concerns when talking about resources whereas elites overall failed to discuss the topic of future generations in their analysis. A possible explanation for this may come from a

public choice approach as explained by Kirchgässner and Schneider (2003) who state that even though policy makers may have several motives for their actions, the fact that they will generally seek re-election may act as a constraint to long term commitments that may hinder current voter wellbeing.

As regards the possibility of *substituting* different forms of capital, it has been argued that elite interviewees' responses were very much in-line with their ideology, reinforcing the analysis by Jiménez (2007) that states that in Spain during the 90's new social movements such as environmentalism aligned with the 'left'. As regards the views of FG participants, both weak and strong sustainability paradigms were impied when discussing the substitutability of different types of capital. There was nevertheless an arguable bias towards strong sustainability. This over-representation of strong sustainability advocates among FG participants may have resulted from the fact that respondents had self-selected themselves and hence may have been more environmentally aware than the average citizen.

Interestingly, when we compare the views of elites and FG participants with those of survey respondents we see that the latter only mention that man-made capital is a good substitute for damaged natural capital if their preferred compensation option is man-made capital. This leads to the preliminary conclusion that for respondents favouring a weak sustainability approach, substitutability and compensatability go hand in hand, perhaps signalling that the damaged resources are not essential (see for example the discussion in Humphrey, 2001).

On the other hand, for survey respondents who chose either social capital[136] or natural capital as their preferred compensation option, very few, if any, stated that the reason for their choice of compensation option was the fact that their option chosen constituted a good substitute. In Humprey's terms (2001) no substitutability would occur but compensation is accepted to improve individual's welfare level.

Yet, a third type of respondents (although very few in the sample) rejected compensation, arguably due to the combination of non-substitutability and non-'compensatability'. This may have been due to the fact that, for these respondents, some of whom stated the environmental damages caused by spills should have been

[136] Choosing a modified Hartwick-rule (providing evidence for the Aldred (2002) and Turner (2007).

prevented rather that compensated, the damages or lost environment might be considered a 'basic good'.

Closely linked to the above reflections is the analysis of the second research question that explores whether interviewees would prefer a strong sustainability-type compensation option. Economic theory of compensation and recent approaches on habitat equivalency analysis[137] have been concerned with *the amount* of money or resources that would return individuals to pre-injury levels when these occur (Ozdemiroglu, *et al.* 2009). Distinguishing between sustainability paradigms however implies, among other things, looking into *the type* of compensation preferred (Pearce *et al.* 1989; Neumayer, 1999). The views of elites and citizens (FG participants and survey respondents) on preferences for different compensation packages is therefore discussed below.

When analysing compensation, elites and FG participants claimed monetary compensation was needed in order to help mitigate the economic losses of individuals and firms directly affected by the spill. Monetary compensation was however seen as morally repugnant and unfair if offered to individuals not directly affected by the spill, echoing Aldred (2002) and Turner (2007). This adverse reaction to monetary compensation has been observed in other empirical studies (O'Neill and Spash, 2000; Frey and Oberholzer-Gee, 1997).

Additional compensation in the form of investment 'packages' was discussed during elite interviews both with reference to the economic recovery plans that were *de facto* implemented after the last large spill (*Plan Galicia and Plan de Dinamización Económica de Galicia*) and with reference to the compensation options that the literature review process suggested. As was the case with the above discussion on substitutability, elite interviewees' perceptions of the compensation packages were very much in line with their political tendencies and professional persona (Jiménez, 2007). Thus, conservative representatives and business representatives largely favoured past investment packages that fundamentally entailed a weak sustainability response, favouring investments in man-made capital (infrastructures). On the other

[137] That have sought to estimate ecological service losses and the *scale* of restoration required to maintain a 'baseline level of ecological functioning' (Roach and Wade, 2006: 421)

hand, nationalists[138] and the NGO's representative showed discontent with these investments (that were largely geared towards building infrastructures) and instead advocated for replacement of damaged natural capital with 'like' natural capital.

FG participants showed a wide range of opinions regarding the preferred compensation option. Overall, FG participants preferred either replacing damaged natural capital with similar natural capital or with investments that would strengthen the existing prevention mechanisms. FG participants were not asked about their ideologies (as it was thought it could affect the dynamics of the FG discussions) and therefore it is not known whether this variable had a bearing on their views on the substitutability and 'compensatability' of environmental losses. What did emerge from the FG sessions, however, was the idea that for most FG participants there seemed to be intra-capital substitutability (i.e. economic losses could be compensated by monetary compensation for directly affected parties; loss of natural capital could be compensated by similar natural capital or by programs that would preserve natural capital from future spills) despite theoretical reservations regarding the feasibility of compensating 'like-for-like' as argued by Dietz and Neumayer (2007). For FG participants, however, there seemed to be no or limited possibilities of substituting man-made capital (infrastructures) for natural capital, that is, no inter-capital substitutability.

Survey respondents overwhelmingly accepted additional compensation in the form of 'investment packages', reinforcing the findings of the FG, and hence shying away from the idea that for the damages described (even in the setting where irreversibilities are present) no compensation would be appropriate (see discussions by Humprey, 2001 and Spash, 1993). This was so despite reminders of the opportunity cost incurred and despite reminders of the availability of (unaffected) substitute sites.

For survey respondents, the most popular compensation option is the investment package labelled 'social capital' (i.e. building schools, hospitals and undertaking R&D) thus providing empirical support for Aldred (2002) and Turner (2007) and perhaps signalling a modification in SD preferences towards a modified Hartwick-type compensation rule.

[138] *Bloque Nacionalista Galego* is a left-wing party that demands more autonomy for Galicia.

Interestingly, the preferred compensation option does not tend to change across spills, signalling stable preferences in terms of compensation for environmental losses. The hypothetical nature of the exercise plus the fact that the government was purported as the provider of additional compensation may have influenced the choice of compensation options, reflecting what respondents would want the government to invest in irrespective of the issue analysed. Future research with split sample designs and various compensation providers could test whether the provider of compensation changes respondents' compensation preferences in ways relevant to the analysis of sustainability.

Hence, survey results provide empirical evidence to doubt a stringent Hartwick-type rule in terms of compensation. This is so even though there is substitutability of 'social capital' for lost natural capital. The fact that over 80% of the compensation funds would be allocated by survey respondents to social plus natural capital compensation packages could arguably signal either a modified Hartwick–type rule or a stronger SD approach.

The most salient findings from the parametric analysis, through the use of Multinomial Logit Models, provided the following information regarding the characteristics that best determine the probability of choosing one compensation option or other on the choice of social capital over the status quo (infrastructures): People with lower income, respondents from Madrid, those less concerned about the economy as one of the main socio-economic problems, interviewees with higher pro-ecological worldview and a more left-wing ideology are more likely to choose social capital over infrastructures.

As regards the choice of natural capital over infrastructures, respondents from Madrid, younger interviewees, people with lower income, a higher educational attainment, interviewees concerned about the environment as one of the fundamental socio-economic problems, people knowing previous spills, citizens having a higher ecological worldview and more left-wing oriented, show an increased probability of choosing natural capital over infrastructures. Except for the income variable[139] the other variables have the expected signs if compared to the predictions of other CV studies

[139] That could be seen as counter-intuitive from an economic optimist perspective (see Neumayer, 1999) and contrary to the findings from WTP-type questions in which WTP is positively related to income levels (see for example Carson *et al.* 2003).

(Giraud, Loomis and Johnson, 1999, Carson, Flores and Meade, 2001 and Bateman *et al.* 2002).

The minus sign in the income variable in the choice of natural capital over infrastructures could be explained from an economic growth pessimist argument adapted to the compensation context analysed (see Neumayer, 1999). This would mean that greater dependence (less substitution possibilities) of natural resources for either leisure activities or for the livelihood of respondents may help explain why lower income level increases the likelihood of choosing natural capital over infrastructures. Conversely, wealthier respondents may have greater substitution possibilities for leisure activities; they are *a priori* less dependent on natural resources for their work and more reliant on largely publicly provided roads and railway infrastructure systems.

To sum up, these preferences for a modified Hartwick rule compensation package, with a considerable amount of respondents moving towards stronger forms of sustainability, are interesting in theoretical terms. This thesis presents a practical application of Aldred (2002) and Turner's (2007) claim confirming their proposition that states that, when faced with environmental losses, such as oil spills of different sizes and consequences, money may not be the appropriate compensation[140] but investments in social capital may be.

The last research question, whether CV can help substantiate the case for strong sustainability, was addressed through a CV-type exercise. This was done after establishing the links between valuation and strong sustainability (Pearce *et al.* 2006) and with the aim of providing empirical evidence of the benefits of sustainability (Atkinson *et al.* 1997). Empirical data regarding demonstrations in the aftermath of the *Prestige* spill, the large number of volunteers that helped in cleanup activities and answers to FG sessions were thought to be indicative of the possibility of finding survey respondents being willing to pay to prevent future spills and hence preserve natural capital. The analysis of the WTP data revealed that over half of the sampled interviewees were willing to pay to prevent future oil spills from happening[141].

[140] This was confirmed in the pilot conducted prior to the survey.
[141] This percentage is lower than that found in the FG which was significantly higher (80%).

Two different classifications of protest answers were used to analyse WTP data: the one proposed by Bateman *et al.* (2002) and the one by Brouwer *et al.* (2008). Non-parametric WTP estimates, logit and interval regression models were reported under these two classifications of protest answers as they provided statistically different non-parametric mean WTP estimates and different model outcomes. The fact that some of the key oil spill CV studies do not explicitly report their classification of protest answers (see Carson *et al.* 2003; Bonnieux and Rainelly, 2003; Loureiro *et al.* 2007, 2009 among others) could lead to non-comparable WTP figures that could hinder building a useful body of knowledge regarding WTP to prevent oil spills. The findings in this thesis could help strengthen the case for routinely reporting the classification of protests used or, alternatively, for designing generally accepted protest response classifications.

The parametric mean WTP estimates using the Bateman *et al.* (2002) classification scheme amounts to 56€ for the small spill, 69€ for the medium spill and 86€ for the large spill. Parametric mean WTP estimates using the Brouwer *et al.* (2008) classification of protest answers amount to 44€ for the small spill, 58€ for the medium spill and 77€ for the large spill. These figures were compared to other oil spill CV studies and the figures obtained in this thesis were in line with the findings of other studies (see Carson *et al.* 2003 or Loureiro *et al.* 2009).

Respondents' characteristics that best explained respondents' willingness to pay to avoid a future spill were also analysed. These were: city, age, income, whether respondents had prior knowledge of past oil spills, the NEP score, whether the respondent was influenced by the environmental consequences described in the valuation exercise and whether the respondent had previously volunteered to protect the environment. All of the above mentioned independent variables (except for city, arguably due to a lower income level of respondents in the La Coruña sample), have the expected sign and are overall significant. This is a sign of construct validity (Bateman *et al.* 2002).

Scope sensitivity was analysed using mean difference tests (Carson and Mitchell, 1993). The results show that there are statistically significant differences among the WTP to prevent a small spill, a medium spill and a large spill. These results are, as explained in the last empirical chapter, indicative of internal and external scope sensitivity. The split sample design and the administration of two WTP questions per

respondent allowed testing for both internal and external sensitivity to scope. These findings would appear to support the findings of other studies (*ibid.*).

Despite the fact that scope sensitivity was found, there remain doubts however regarding whether valuation scenarios are best suited to capture intentions when large, potentially irreversible damages, are presented to respondents. This is so because the payment amounts are not proportional to the damages depicted in the hypothetical spills. A possible explanation is the fact that income is limited, which may limit the proportional payment. Economic theory is silent as regards the proportionality of WTP for different quantities of environmental good (Hammitt and Graham, 1999) so the WTP results do not seem to be invalidated by the lack of proportionality, but it is possible that complementary criteria may be useful when deciding on supporting the preservation of natural capital (see for example Randall, 2000).

6.3 POLICY RECOMMENDATIONS

As acknowledged by Jiménez (2007) citizens, and hence voters, have been increasingly concerned about environmental issues in the past decades. Kirchgässner and Schneider (2003) along the same lines state that this environmental concern should result in increasing acceptance of sustainable policies. The lack of recognition o different sustainability paradigms by elites could however be indicative of a policy distance between sustainability as a theoretical construct that has been successfully propelled to the international policy agenda and a scant practical uptake of sustainable practices in the context analysed.

Added to the above, a lack of environmental policy integration (EPI) to foster sustainability (Jordan and Lenschow, 2008) was discussed in previous chapters. The findings in this thesis, with further calls for coordination across departments, could be pointing towards an existing opportunity of increasing voter satisfaction by way of 'walking the talk' in terms of effective EPI that is recognised by elites and by FG participants to be one of the pending tasks of the Spanish government in marine protection. Additionally, calls for further implementation of civic science (Bäckstrand, 2003) were made by both elites and FG participants.

As was stated in the introductory chapter, the issues of compensation and willingness to pay to prevent oil spills in the future are considered to be relevant policy-related topics to analyse. This is so given the frequency of oil spills suffered in Spain, their consequences, the limited compensation foreseen by international and national legislations and the still evolving oil spill prevention programs. Policy-makers could benefit from the information provided by this thesis as it offers insights into the preferences of voters in terms of compensation packages and willingness to contribute to oil spill prevention programs. It also sheds light on the variables that determine these preferences.

Were a new spill to occur, policy-makers could benefit from knowing that an overwhelming majority of interviewees would want compensation, in addition to that offered by the CLC, IOPC funds and supplementary funds. This is so despite reminders of opportunity costs and substitute sites. Thus, investment programs that would compensate for the damages of future spills would, ceteris paribus, be welcome by voters.

Tailoring compensation plans to the average voter's preferences may help appease civil unrest and may increase the chances of re-election when and if a new spill occurs. This would mean, should we be able to generalise the results obtained, that the allocation of funds among different compensation options would differ from that of the *Plan Galicia and the Plan de Dinamización Económica de Galicia* that allocated the bulk of their budgets to infrastructure projects.

If policy-makers were to take into account survey respondents' allocation of funds among different types of capital they would allocate between 16.5% and 18.2% of the budget to man-made capital and between 45% and 47.5% would be allocated to social capital. Natural capital would receive from 36% to 38% of the compensation funds.

These findings could arguably be useful for decision-makers in designing future compensation schemes. Larger investments in natural capital as requested by interviewees would not only help meet civic science precepts but it could also help bridge the gap between existing compensation schemes and full compensation of environmental losses. Alternatively, policy-makers could pursue increasing the compensation for pure environmental losses offered by international institutions and the oil shipping industry. Until any such international agreement materialises, national and regional policies may be expected to continue providing compensation.

A recent CV study undertaken by Loureiro *et al.* (2009), analyses survey respondents' WTP to prevent a new spill of similar characteristics to those of the *Prestige*. Its larger sample size compared to that of this thesis, plus the fact that CV questionnaires were completed in a larger number of cities in Spain, make these results interesting in terms of comparison as the Loureiro *et al.* (2009) study generalizes the WTP results obtained to the Spanish population. When comparing the two studies, note has to be taken that differences are expected due to the different questionnaire designs. This comparison could be of use to policy-makers in terms of building a body of evidence with a range of possible values that could guide future investment in oil spill prevention policies. It may also provide the basis for using benefit transfer techniques to value environmental losses in future spills.

6.4 FUTURE RESEARCH

Future implementations of the CV developed in this research (or an improved version of it) should have larger sample sizes. This would allow the generalization of parametric mean willingness to pay results to the entire population (following other oil spill CV studies such as Carson *et al.* 2003 or Loureiro *et al.* 2009). Policy-makers could compare these WTP estimates to the annual cost of running additional oil spill prevention and management plans in order to decide on the net benefit of future policies, should CBA criteria be deemed relevant for oil spill management policies.

As it was argued in the section on key findings, the thesis survey results signal a non-existent stringent Hartwick-type rule in terms of compensation for environmental losses in the context analysed. Empirical support for Aldred (2002) and Turner (2007) is instead provided by survey results. There is furthermore evidence of a significant proportion of people preferring natural capital as the preferred compensation option. Future oil spill analyses could explicitly test the reliability of these findings.

Split-sample designs (notwithstanding budget constraints) could be used in future research projects to test whether interviewees chose social capital because this is what they expect the government to provide them with irrespective of the damage suffered. In future survey designs the inclusion of different institutions as compensation providers (e.g. the government, the EU, oil shipping industry, NGO's, etc.) would help researchers answer the question of whether the type of institution providing compensation affects the type of capital chosen by survey respondents and hence whether a modified Hartwick rule would hold irrespective of the institution in charge of providing compensation.

Protest responses are an issue of concern in CV studies. They are routinely excluded from CV calculations due to the fact that they distort WTP estimates as respondents do not provide information on the true value of the environmental change described. But, there is no consensus as regards classification of protest responses in the contingent valuation literature (Atkinson *et al.* forthcoming) and this may result in non-comparable WTP figures across studies. The results from the present thesis show that the classification of protest answers can yield different outcomes (e.g. statistically significant differences in non-parametric WTP estimates). Future developments in CV

could strive to generate a consensus classification of protest answers. This could arguably help improve the quality of WTP estimates.

Finally, the fast growing discipline of neuroeconomics, that is using brain images to disentangle the relationships between feelings and actions, can be the litmus test for CV studies. Future CV-type studies could explore the existence of strategic answers, protest responses or warm glow effects using brain images. According to Camerer, Loewenstein and Prelec (2005), in the future, neuroscience could bring about either incremental changes to economics (helping economists identify previously ignored and potentially significant variables that should be included in models) or radical changes that may bring new understanding of the underlying assumptions of decision-making in economics.

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Annexes

A.1 Maps

A.1.1 Spain. Administrative division. Autonomous Communities or regions.

A.1.2 Map of hydrocarbon traffic world-wide

Source: Vázquez, Varela and Prada (2004: 28)

A.2 Elite interviews and Focus Groups

A.2.1 Elite interviewee presentation letter

Department of Geography & Environment
Houghton Street
London WC2A 2AE
Madrid, date

Dear Ms. XXX,

I am currently carrying out my PhD research project at the London School of Economics in the field of Environmental Economics. My thesis topic focuses on research into sustainability and coastal management; environmental, economic and social aspects of coastal management are being scrutinised in order to produce new insights for future management strategies. To achieve this purpose I am conducting interviews with key people that will add relevant and useful insights to the analysis.

Your views as (add here job position or area of expertise) would greatly contribute to the understanding of salient issues in (add the field of expertise of potential interviewee). I would therefore be most grateful if you would consider the possibility of taking part in the research project. Your help would be acknowledged as part of the London School of Economics sponsored project. The date and place of the interview would be arranged at you convenience and any further information you may require will be provided.

Thank you very much for your time. Please do not hesitate to contact me should you need any further information.

Yours faithfully,

Lara Esther Lázaro Touza
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MSc in Environmental Assessment and Evaluation (LSE)
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A.2.2 FG recruitment guide and reminder

a) Recruitment guide

Good morning / afternoon / evening! My name is Lara and I am conducting a research project on oil spills at the London school of Economics. I would like to ask for your cooperation. I would like to ask you for a couple of minutes of your time now and 90 minutes sometime this week for which you will be gratified.

Information provided to the potential FG participants during the first contact

- Date/s of FG
- Time
- Duration
- Venue
  - Fundación Pedro Barrié de la Maza. C/ Cantón Grande nº 9 – Coruña
  - Hotel Maycar. C/ San Andrés nº 159 - Coruña
  - C.U.Cardenal Cisneros. C/ General Díaz Porlier nº 58 – Madrid
  - C/ Minerva nº 141 - Madrid
- Incentive = 30€

- Information required from interviewees:
  - Name and surname
  - Contact details
    - Address
    - Home telephone
    - Work telephone
    - Mobile
    - E-mail
    - Fax
  - Age range
    - 18-40
    - 41+
  - Occupation
    - Professional and skilled workers
    - Manual workers
  - Educational attainment
    - Primary
    - Secondary
    - College
    - University
    - Postgraduate
- Confirmation email sent (Y / N)
- Reminder call a day before the interview (Y / N)
- Comments:

b) Reminder

Thank you for agreeing to participate in the group discussion about oil spills I am conducting. Your input is most valuable!

Please note you have agreed to attend the following session:

- Date/s of FG
- Time
- Duration.- 90 minutes
- Venue
  - Fundación Pedro Barrié de la Maza. C/ Cantón Grande nº 9 – Coruña
  - Maycar Hotel. C/ San Andrés nº 159 - Coruña

  OR
  - C.U.Cardenal Cisneros. C/ General Díaz Porlier nº 58 – Madrid
  - C/ Minerva nº 141, Piso 5º Letra B - Madrid
- Gratification = 30€

These sessions depend on you and other participants. If you cannot attend PLEASE let me know. Should you have any questions please do not hesitate to ask.

My contact details are as follows:

Name: Lara Lázaro
Mobile: +34 606 02 04 98
Email: lara_lazaro@yahoo.com

Thank you very much!

A.2.3 FG protocol

OIL SPILL MANAGEMENT FOCUS GROUP

Date & place:

Group description:

Other comments:

INTRODUCTION: PARTICIPANTS, TOPIC AND INSTRUCTIONS
Introduction

1 Good morning/afternoon/evening and welcome to today's session.
2 I would like to start thanking all of you for being here to discuss oil spills
3 My name is Lara and I work at the London School of Economics.

Purpose of the focus group

1 The goal of the discussion today is to understand public views and preferences regarding **oil spill managemen**t in Galicia and in Spain.
2 We are interested in **your views**. There are no right or wrong answers and we are here to learn from you.

Instructions

1 There is a wide range of topics to discuss so we will have refreshments as we go along
2 We would like all of you to participate with no-one dominating the discussion. We would like to hear as many things as time allows.
3 If your **experience is different** to the one being discussed please say so. If your **experience is the same** as other peoples' experiences please say so as that is valuable information too. There is always something **unique to each person's experience/views** and we are most interested in hearing **what you have to say**.
4 We will be on a **first name basis** throughout the discussion and in my report no names will be attached to comments. You may be assured of **complete confidentiality**.
5 We would like to ask your **permission to tape record the session**. This will help us register your views in an accurate way.
6 As we are recording the session please try to **speak one at a time** with **no side conversations** between neighbours!
7 The discussion will last 1.5 hours

OPENING QUESTIONS

1 Brief introduction of each participant
2 I would like you to take a moment to think about oil spills you have experienced or have heard of and discuss the main issues of concern with regards to oil spills (brainstorming – focusing on the topic)

Answer:

CONSEQUENCES OF SPILLS

1) BELIEFS AND ATTITUDES
   Which are the main **consequences of an oil spill such as the Prestige?** (Brainstorming - beliefs/ information)

Answer:

Probing: So far we have mentioned (summarise main points discussed). I was surprised we didn't talk about the following (mention those that were not included in the brainstorming exercise) and I would like to know what you think about:

ENVIRONMENT:

1. **Fauna affected**: endangered bird species that disappeared or saw a decline in their numbers (the guillemot, tridactile seagull, puffin, razorbill, the cormorant, plover and shags). Fish and cetaceans: Death of fish and larvae. Malformation of animals. Change in behavioural patterns. Most affected species: dolphins, sea otters, turtles and porpoises.
2. **Flora affected**: Oil as an herbicide. Oil preventing photosynthesis, reproduction and fixation. Likens and vegetation in beaches and cliffs affected.
3. **Environmentally relevant areas affected**: Natural parks such as the Atlantic Isles natural park, Cíes islands, lagoons of Corrubedo, the Costa da morte area, archipelago of Ons and Sálvora, among others

ECONOMY:

4. **Fishing and Shell-fishing**: Death of fish and larvae. Malformation of animals. Change in behavioural patterns. Hake and sardine population especially affected due to previous overexploitation. Bans on fishing and shell-fishing activities. There is missing information regarding the state of crustaceans in Galician waters. Evaluation of crustaceans and how these are affected is thus not possible. Bans started in November 2002 and lasted until October 2003. During the aftermath of the Prestige nearly the entire Galician coast experienced bans on fishing and shell-fishing. The value of fishing and shell-fishing activities in 2002 compared to a year after the Prestige dropped by 70%.
5. **Tourism and related activities**: The drop in tourism was estimated to be between 15-25% compared to 2001 figures.

HEALTH

If ingested the following may occur: coughs, breathing difficulties, vomits, nausea, lethargy, and coma in the most severe cases. Other consequences of direct contact with hydrocarbons include skin irritation and an increase in the cases of skin cancer and lung cancer. There are no known 'safe levels' for humans**.**

2) RELEVANCE OF CONSEQUENCES: SORT CARD EXERCISE

We have just discussed the main consequences that may be derived from an oil spill such as the Prestige. I will now like you to **open the envelope that has just been given to you** (please note an envelope with pictures will be distributed by the assistant to every participant. The purpose of the envelope is to hold all the visual material loosely so each participant can then sort out the cards according to their preferences.). See below for an example of the cards that will be included in the envelopes.

The pictures contained inside the envelope refer to the various consequences we have been discussing. These have been selected from the information available after the Prestige oil spill which is the most recent large scale spill that has affected the Spanish coast. I would now like you to take a few moments to look at the cards inside the envelope and sort them according to the importance of each of the consequences. That is, if you think the most important consequence of an oil spill is its effect on the bird population this card should go on top of the pile. If you think health consequences are the second most important issue, the health card should be ranked second, etc. (Brainstorming/ranking) (relevance of consequences of spill to different forms of capital, i.e. natural capital and man-made capital). If you think two consequences are equally important just say so.

Does anyone have any questions so far? (Let participant sort the cards for no more than a couple of minutes)

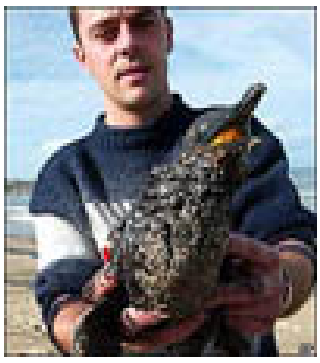
Can I ask each of you to read out loud the order you have given each of the consequences?

Record each participant's answer in a flipchart: (example)

Discuss the reasons for their preferences and agreement regarding general classification (Brainstorming/ranking) (relevance of consequences of spill to different forms of capital, i.e. natural capital and man-made capital)

Fauna affected

1 Birds are the most affected animals as they spent time in the water, their food is inside the sea and their breeding ground may be close to the affected coast
2 Oil may affect their feathers. This can reduce their insulating layer and die of hypothermia. They can also loose their floatability capabilities. Their reproductive capabilities may be disrupted.
3 Their liver, lungs and digestive system may be poisoned due to oil ingested



ricardo grobas **Imagen de un cormorán petroleado en la Isla de Ons.**

Source: SEO-Birdlife (2003)

Source: http://www.imedea.uib.es/pressdbfiles/000107/FaroVigo.pdf

Arao Común petroleado flotando en las aguas del puerto de Malpica

Source: SEO-Birdlife (2003)

Source: EFE- Reuters – IDEAL in http://waste.ideal.es/mareanegra-fotos.htm

Source: EFE- Reuters – IDEAL in http://waste.ideal.es/mareanegra-fotos.htm

Flora and landscape

1 Oil is an herbicide (it kills plants), this means oil will reduce plant photosynthesis or even prevent plant photosynthesis.
2 Plants may fail to reproduce and thrive.
3 Clean-up activities in sensitive areas such as lagoons may change water exchange patterns. This will alter the characteristics of lagoon systems.

ACANTILADOS DE CAMARIÑAS, ENERO 2004.

Source: FEG (2004)

Beach of Barrañán

Source: http://www.xente.mundo-r.com/troncoso/prestige/

Environmentally relevant areas

1 Areas of European relevance such as wetlands are affected
2 Natural parks will be affected. Rich ecosystems in terms of flora and fauna are polluted.
3 Relevant areas for birds are also hit by the oil slick

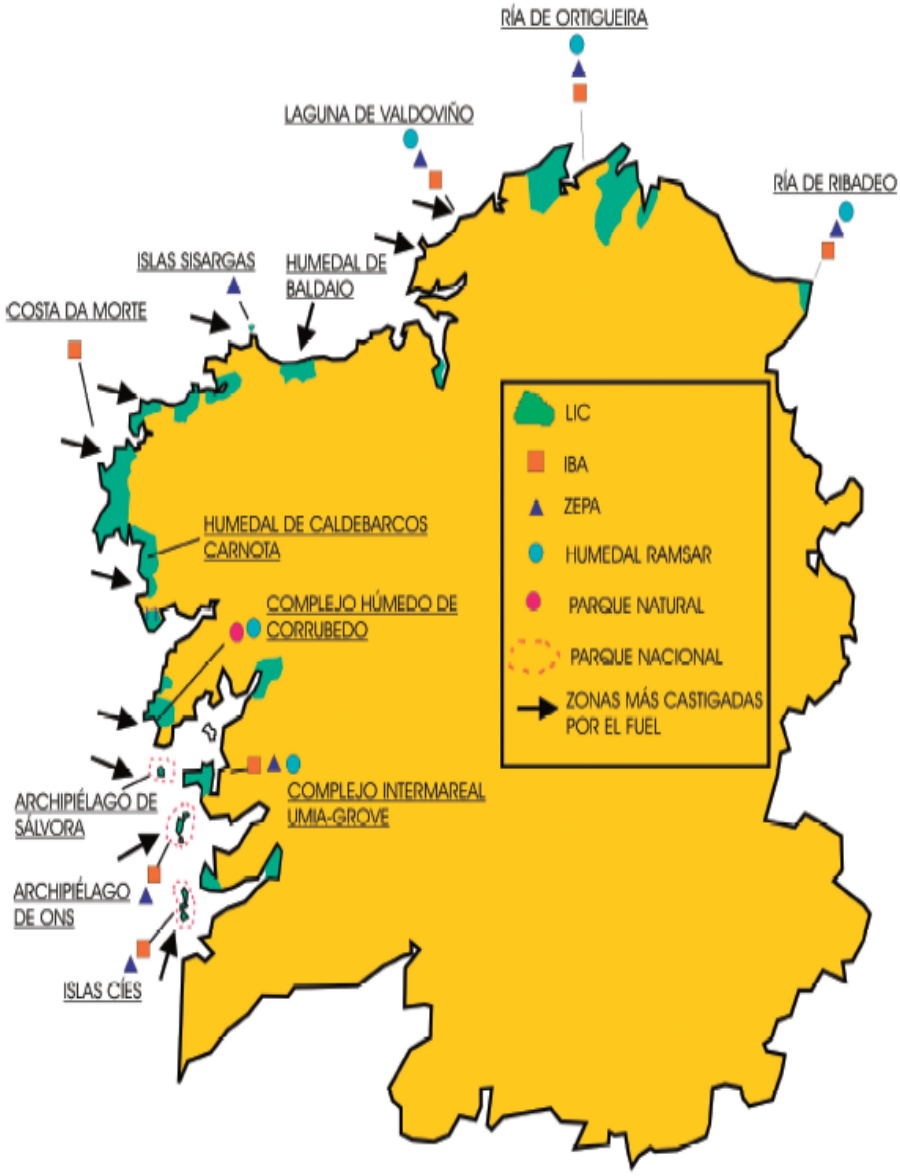


Figura 7.- Espacios naturales de la costa gallega afectados por la marea negra del Prestige. Fuente: Seo/Birdlife (2003). Abreviaturas: IBA, Área de Importancia para las Aves; ZEPA, Zona de Especial Protección para las Aves; LIC, Lugar de Importancia Comunitaria.

Source: González Laxe (2003: 234)

Economy

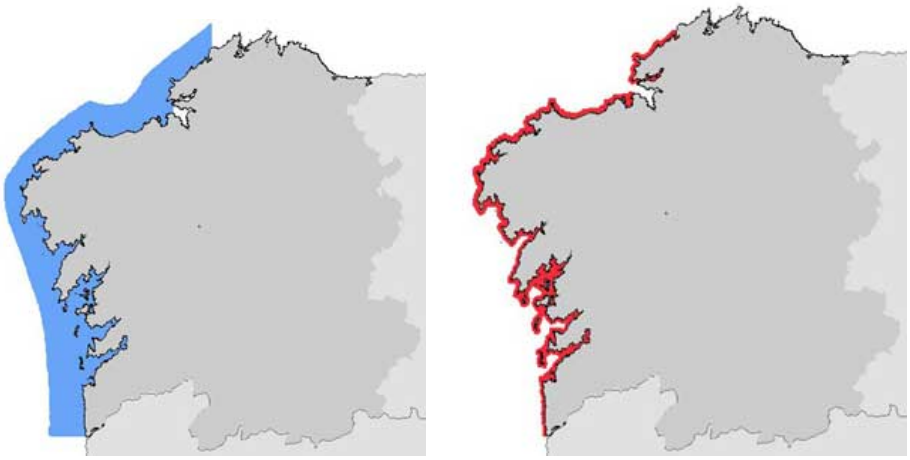
1 Health authorities ban all fishing and shell fishing activities as long as oil is present.

2 Avoiding both oiled fish and damage to fishing equipment is the primary goal of bans

3 Fishermen and people in related activities such as net menders, fish transport industry, tourist industry, etc. are affected by the spill.

Maximum bans in fishing and shell-fishing activities in the aftermath of the spill:

(a) Fishing ban (In blue) (b) Shell fishing ban (in red)



Source: http://www.ccmm-prestige.cesga.es/Prestige_200.htm

Source: http://www.xente.mundo-r.com/troncoso/prestige/

Health effects

1 If ingested the main organs affected are lungs, digestive system and nervous system. The main consequences are coughs, breathing difficulties, vomits, nausea, lethargy and coma in the most severe cases. There is also a risk of increase probability of skin cancer and lung cancer.

2 Direct contact can also cause skin irritation

3 There are no safe levels for humans.

Source: La Voz de Galicia

http://www.lavozdegalicia.es/especiales/prestige/pdf/heroes/olas_de_fuel.pdf

Source: http://www.xente.mundo-r.com/troncoso/prestige/

Answer:

FG #	Environment			Economy	Health
	Fauna	Flora	Sensitive areas	Fishing & tourism	Health

Reasons:

3) INTRODUCING THRESHOLDS

Up to now we have been thinking about the consequences of an oil spill. These however depend to a large extent on the amount of oil **spilled, the** area **affected, the** species **affected, the** time **of the year, the previous state (**clean or polluted**) of the area hit by the spill and the amount of** people **that may be exposed to the spill, among other.**

As the spill increases and the environment affected is more sensitive to pollution, we may reach a level of pollution that makes the environment collapse**. By this I mean that the flora and fauna are so polluted they die.** Birds, plants, mammals, etc. disappear **of the polluted area. There is** no foreseeable recovery**; the species that used to live in the area can no longer live there. These species are replaced by other species that can cope with pollution only after years were no plant or animal may thrive in the affected area. The affected environment is no longer what it used to be.**

I would now like you to consider this scenario as a possibility and discuss how this may affect you. Would you be willing to donate money in order to avoid this from happening, will you be willing to volunteer some of your time in order to undertake for example surveillance duties that would help avoid this from happening? Would you be willing to pay taxes in order to avoid such a spill?

Alternatively, given the fact that there may be other areas in other regions in Spain of environmental importance (in terms of number of species, recreational facilities, economic importance, etc.) that have not been polluted you would not be particularly concerned about a spill such as the one we have just described. If so, what would you do? Nothing? Would you read about it in the newspapers? Would you oppose any investment in order to manage these situations? Other?

Answer:

VALUATION

1) WTP to manage future spills

The following part of the session today will present a number of scenarios that may take place in the event of a future spill. These illustrate different types of spill that may occur and their direct consequences in the short run.

The environment: Oil spills can affect fauna such as birds, flora at sea, in cliffs, estuaries and beaches. Environmentally sensitive areas such as natural parks may also be affected. Depending on the area affected, when the spill takes place, the volume and toxic content of the oil spilled, the recovery of the environment can take up to 25 years. The previous state of the environment (whether clean or polluted) will influence the severity of the damages caused by the oil spill.

The economy: Fishing and shell-fishing activities can be affected by an oil spill due to temporary bans of these activities. These bans can last for years depending on the species affected. Tourism and related activities may suffer until the slick is eliminated from the visited areas. This decline in tourism can be severe in the first year after the spill, reducing its severity after this period.

Health: People can be affected by an oil spill in the event of being directly exposed to pollution or ingesting oil. This can happen in cases of clean-up activities in the aftermath of the spill and in cases of exposure to long-lasting pollution that has not been cleaned.

Spain's image: Oil spills may harm the image of a country. This may result in Spain not being internationally regarded as an attractive investment area, an attractive tourism area, environmentally safe area or other.

Costs: At present your taxes pay for management of minor spills that will be described in detail in the following showcard. In order to manage spills of moderate and major consequences substantial new investments would have to be made which you would have to finance through an increase in taxes. Additional taxes will mean you have less money to spend on other things. The extra amount will be paid every year by everyone in Spain.

I would now like to ask you to look at the following showcard. In each card three potential spills are described along with their consequences. Column **A** illustrates the case of a minor spill where no increase in taxes would be required for the authorities to manage the spill. Column **B** describes a moderate spill and Column **C** describes a major spill. **These last two situations would require an increase in taxes to ensure adequate management of the spill**.

According to present data, a minor spill happens every 2 years. Moderate and major spills take place in Spain every six or seven years. Please look at the following showcard and choose one of the following policy options for oil spill management.

Comments/questions from interviewees before choosing:

Example: I would choose managing a) Minor spills at no extra cost b) Moderate spills paying 50€ every year OR c) Major spills paying 400€ every year

Showcard 1	**Option A: Managing a Small Spill (170 tons)**	**Option B: Managing a Medium spill (13,000 tons)**	**Option C: Managing a Large spill (77,000 tons)**
Environment	State before spill: **Clean**	State before spill: **Polluted**	State before spill: **Clean**
	No collapse of affected environment	X% increase in risk of collapse in affected environment	**Collapse of affected environment**
	Area affected = 4 Km	Area affected = 200 Km	Area affected = 1,000 Km
	253 dead birds. Whales and dolphins oiled.	**19,400** dead birds. Whales and dolphins mildly affected.	Between **115,000** and **250,000** dead birds of 90 Species including endangered. Some whales and dolphins found dead.
	Minor damage to **one** nearby Natural Park	**2** Natural parks badly affected by the spill over a 10 year period	**10** natural parks will collapse. Previous species are no longer able to live in these parks. There is no foreseeable recovery.
Economy	**1** Mollusc fishing ground closed for 3 months	Bans up to **one** year after the spill in all commercial species	Bans lasting up to **7** years to fishing and shell-fishing
	No tourism in affected area for **six months**	Tourism temporarily affected. Drop in tourism lasts **3** years.	**Permanent** drop in tourism due to lost ecosystems
Health	**20 people treated** for respiratory illness. Low increase in risk of cancer.	**236 people treated** for respiratory illness and headaches. Low increase in risk of cancer.	Over **1,400 people treated** for respiratory illness and headaches. Moderate increase in risk of cancer.
Image	Insignificant image loss. Limited coverage of the issue by international press and institutions	Moderate and temporary damage to Spain's image. Some coverage of the spill in international media	Large and permanent damage to Spain's image. Extensive international coverage in the media.
Cost	**No additional cost**	**€ 50**	**€ 400**

Answer:

Participant name	**Option**	**Reason**

2) PREFERENCES REGARDING COMPENSATION

In past oil spills the Spanish government paid compensation to fishermen and directly affected firms and individuals. This compensation was only partly recovered by the Spanish government from the ship's insurer (London P&I Club in the Prestige case) and the International Oil Pollution Compensation Fund.

International funds can **ONLY BE USED TO COMPENSATE** lost revenues, clean-up and reasonable restoration measures. This compensation was **LIMITED** to approximately 171M€ at the time of the Prestige spill. Any loss or damage that was not contemplated by international compensation measures was borne by society. Environmental losses such as ecosystem deterioration, species disappearance, etc. are not covered by compensation mechanisms.

IN THE CASE OF A FUTURE SPILL ANY DAMAGE NOT INCLUDED IN THE INTERNATIONAL COMPENSATION SCHEMES WILL HAVE TO BE PAID BY SPANISH AUTHORITIES AND THEREFORE BY SPANISH SOCIETY. **As there are NO ESTABLISHED PLANS IN SPAIN FOR FUTURE SPILLS WITH REGARDS TO COMPENSATION ADDITIONAL to lost revenues, clean-up and restoration measures**, **WE WOULD BE MOST INTERESTED IN KNOWING WHAT YOU WOULD PREFER**.

The last exercise today will show you several **options** in which different alternatives will be available regarding **compensation that will be provided by Spanish authorities when a new spill occurs**.

1 We ask you to assume the spill is a moderate spill in the first set of options. We ask you to assume the spill is a very large spill in the second set of options. (Show showcards with previous options B and C to remind them of the consequences of each). We would now like you to look at the following showcards and choose the option you would prefer in the event of a future spill.

2 The last row on the showcard translates the investments made by Spanish authorities into the money that would be invested each year per person by the Spanish government into a fund that will implement the policy option chosen.

3 The compensation paid by the Spanish government will mean other investments planned by the government will not be executed or will be delayed. Examples of these investments that will not be executed or will be delayed may include defence strategies, health programs, educational programs, etc.

In the event of a future MEDIUM spill with the following consequences:

Option B: MEDIUM spill (13,000 tons)
Increase in risk of collapse in affected environment
Area affected = 200 Km
19,400 dead birds. Whales and mildly affected.
2 Natural parks badly affected by the spill over a 10 year period
Bans up to **one** year after the spill in commercial species
Tourism temporarily affected. Drop in tourism lasts **3** years.
236 people treated for respiratory illness and headaches. Low increase in risk of cancer.
Moderate and temporary damage to Spain's image. Some coverage of spill in international media

- The government will clean-up and compensate directly affected parties.
- The government will only recover part of the investment made from international compensation funds and insurance companies.
- Additionally the government is thinking about other compensation possibilities. We would like to know what you would like to see happen with regards to this additional compensation in case of a future MEDIUM spill:

Example 1**: In the event of a future** MEDIUM **spill I would ask the Spanish authorities to implement the following option:**

	Policy Option 1 (WS)	**Policy option 2 (SS1 – Like for like)**	**Policy Option 3 (SS2 – CNC)**
Goal	Reinvigorate the economy	Replace the damaged environment	Prevent future spills
compensation	- Railway works - Port facilities for commercial activities - Building motorways - Marketing campaigns to promote affected areas	- Fish-farming and releasing young fish to replace dead animals. - Bringing new birds to affected areas once clean - Creating artificial wetlands to replace the ones destroyed by the spill - Designate special protection areas and natural parks to replace the ones damaged	- Radar satellite surveillance through the entire maritime coast - Investment in risk and sensitivity maps that limit activities in environmentally sensitive areas - Designate sacrifice areas to hold a future spill - Create an international negotiation panel to pursue increased safety measures
WTA	**€700**	**€300**	**€100**

Can you please briefly explain the reasons for your option?

In the event of a future LARGE SPILL with the following consequences:

State before spill: Clean
Collapse of affected environment
Area affected = 1,000 Km
Between 115,000 and 250,000 dead birds of 90 Species including endangered. Some whales and dolphins found dead.
10 natural parks will collapse. Previous species are no longer able to live in these parks. There is no foreseeable recovery.
Bans lasting up to 7 years to fishing and shell-fishing
Permanent drop in tourism due to lost ecosystems
Over 1,400 people treated for respiratory illness and headaches. Moderate increase in risk of cancer.
Large and permanent damage to Spain's image. Extensive international coverage in the media.

- The government will clean-up and compensate directly affected parties.
- The government will only recover part of the investment made from international compensation funds and insurance companies.
- Additionally the government is thinking about other compensation possibilities. We would like to know what you would like to see happen with regards to this additional compensation in case of a future and LARGE spill:

Example 1**: In the event of a future** LARGE **spill I would ask the Spanish authorities to implement the following option:**

	Policy Option 1 (WS)	**Policy option 2 (SS1 – Like for like)**	**Policy Option 3 (SS2 – CNC)**
Goal	Reinvigorate the economy	Replace the damaged environment	Prevent future spills
compensation	- Railway works - Port facilities for commercial activities - Building motorways - Marketing campaigns to promote affected areas	- Fish-farming and releasing young fish to replace dead animals. - Bringing new birds to affected areas once clean - Creating artificial wetlands to replace the ones destroyed by the spill - Designate special protection areas and natural parks to replace the ones damaged	- Radar satellite surveillance through the entire maritime coast - Investment in risk and sensitivity maps that limit activities in environmentally sensitive areas - Designate sacrifice areas to hold a future spill - Create an international negotiation panel to pursue increased safety measures
WTA	**€700**	**€300**	**€100**

Can you please briefly explain the reasons for your option?

Answer:

FG #	**Medium spill (equivalent to description above B)**	**Large spill (equivalent to description above C)**
	Example 1 Op (1vs. 2vs. 3) WS / SS1/SS2	**Example 1 Op (1vs. 2 vs. 3) WS / SS1/SS2**

Reasons

Probing:

1 Did you understand the different options that were just presented to you?
2 Did you need further explanations to understand what was being described and asked?
3 Do you think these situations may arise due to an oil spill?

CONCERN INDICATORS

I would now like to ask you to open the last folder. Three different spills are shown and their consequences are explained in the slides inside the folder.

Below each scenario there is a scale that goes from 1 to 10. I would like to ask you to state how important each described scenario is to you. That is, how much it affects your wellbeing.

Number 1 indicates the scenario is of very little relevance and therefore it has insignificant impact on your wellbeing.

Number 10 indicates the scenario presented is very important and it has a very large impact in your wellbeing.

Answer:

For me a SMALL spill would have an importance of:

Showcard 1	**<u>Option A</u>: SMALL Spill (170 tons)**
	State before spill: **Clean**
	No collapse of affected environment
	Area affected = 4 Km
	253 dead birds. Whales and dolphins oiled.
	Minor damage to **one** nearby Natural Park
	1 Mollusc fishing ground closed for 3 months
	No tourism in affected area for **six months**
Health	**20 people treated** for respiratory illness. Low increase in risk of cancer.
Image	Insignificant image loss. Limited coverage of the issue by international press and institutions
	1 2 3 4 5 6 7 8 9 10
	Very Little Importance / Medium Importance / Very large Importance

For me a MEDIUM spill would have an importance of:

Showcard 1	**<u>Option B</u>: MEDIUM spill (13,000 tons)**
	State before spill: **Polluted**
	X% increase in risk of collapse in affected environment
	Area affected = 200 Km
	19,400 dead birds. Whales and mildly affected.
	2 Natural parks badly affected by the spill over a 10 year period
	Bans up to **one** year after the spill in commercial species
	Tourism temporarily affected. Drop in tourism lasts **3** years.
Health	**236 people treated** for respiratory illness and headaches. Low increase in risk of cancer.
Image	Moderate and temporary damage to Spain's image. Some coverage of spill in international media
	1 2 3 4 5 6 7 8 9 10
	Very Little Importance — Medium Importance — Very large Importance

For me a LARGE spill would have an importance of:

Showcard 1	**<u>Option C</u>: LARGE spill (77,000 tons)**
	State before spill: **Clean**
	Collapse of affected environment
	Area affected = 1,000 Km
	Between **115,000** and **250,000** dead birds of 90 Species including endangered. Some whales and dolphins found dead.
	10 natural parks will collapse. Previous species are no longer able to live in these parks. There is no foreseeable recovery.
	Bans lasting up to **7** years to fishing and shell-fishing
	Permanent drop in tourism due to lost ecosystems
Health	Over **1,400 people treated** for respiratory illness and headaches. Moderate increase in risk of cancer.
Image	Large and permanent damage to Spain's image. Extensive international coverage in the media.
	1 2 3 4 5 6 7 8 9 10
	Very Little Importance — Medium Importance — Very large Importance

Summary of concern indicators for FG

Participant name	Small	Medium	Very large
Average			

Probing:

1 Did you understand the different options that were just presented to you?
2 Did you need further explanations to understand what was being described and asked?
3 Do you think these situations may arise due to an oil spill?
4 Would you suggest any improvements in the information presented to you in order to help others understand the exercise?
5 When you were asked whether you would be willing to pay in order to ensure adequate management of medium size and large size spills did you think it was fair that you should pay for this (due to the fact that you would benefit from adequate management and you use oil in your daily activities for example)? If you don't think it is fair, do you think it is likely that others (International oil tanker insurers or cargo owners, the Spanish government for example) will pay for adequate management of accidental spills? Did you think you should instead be compensated should a new spill occur? If so please state why, who should compensate you and how.

WRAP-UP

1 These were the last topics I wanted to discuss today. Are there any other issues you would like to talk about?
2 Thank you all very much for your time and ideas. Goodbye!
3 Process payments

A.3 Compensation

A.3.1 Questionnaire

Ipsos	**QUESTIONNAIRE 1**	080017910101CU0106	
	Survey: Policy options and thresholds		Date : 19.06.08

IPSOS Consultant: Bernardo Lanuza	Departament : (received/accepted)
Signed: BLS	Signed:

IPSOS

SURVEY Nº 080017910101 (1 – 7)

080017910101CU0106

Alcalá, 95
28009 MADRID

QUESTIONNAIRE Nº (10 - 14)

Balmes, 40
08007 BARCELONA

Stated preferences: Preferentes regarding policy options and thresholds

FICHA (8 - 9) 01

A) Survey data: CIRCLE THE SURVEY VERSION (1/2)	1
	2
SURVEY CODE:	

In accordance with the LAW ON DATA PROTECTION in force and the CCI ESOMAR code on data protection and data management, all the information provided in this questionnaire will be used for statistical análisis exclusively. This implies that the information cannot be liked to you and it cannot be distributed to third parties.

A) Survey data

City : _____

Date of interview: _____

INTERVIEWER: READ

GOOD MORNING/AFTERNOON, MY NAME IS ...., I WORK FOR IPSOS IN A RESEARCH PROJECT FOR A UNIVERSITY. WE ARE DISTRIBUTING A SURVEY TO KNOW CITIZENS' OPINIONS REGARDING ENVIRONMENTAL ISSUES.

YOUR OPINIONS ARE IMPORTANT. THERE ARE NO RIGHT OR WRONG ANSWERS. COULD YOU PLEASE SPARE 15 MINUTES TO ANSWER THESE QUESTIONS? ALL INFORMATION IS STRICTLY CONFIDENTIAL.

QUOTAS: INCOME, AGE, GENDER

S.1 **INTERVIEWER: Write down the interviewee's gender**

	(15)
Male	1
Female	2

S.2. ¿CAN YOU PLEASE TELL ME YOUR AGE?

INTERVIEWER: Write answer down (16-17)

_____

S.3. ¿IN ORDER TO ANALYSE DATA IN A RIGOROUS MANNER CAN YOU PLEASE TELL ME YOUR INCOME?

INTERVIEWER: Tell the interviewee to go to page 2 in the documentation. Please tick (√) the option chosen

Monthly Gross salary (€)	Annual Gross salary (€)	(18)
< 600	< 7.200	1
601 - 1.200	7.201 - 12.000	2
1.201 – 2.000	12.001 – 24.000	3
2.001 - 3.000	24.001 - 36.000	4
3.001 - 4000	36.001 - 48.000	5
4.001 - 5.000	48.001 - 60.000	6
5.001 - 6.000	60.001 - 72.000	7
6.001 - 8.000	72.001 - 96.000	8
8.001 - 10.000	96.001 - 120.000	9
10.001 - 12.000	120.001 - 144.000	0
		(19)
12.001 - 15.000	144.001 - 180.000	1
>15.0001	> 180.001	2
No income	No income	3
Refused –END INTERVIEW	Refused–END INTERVIEW	4

B) Environmental Issues: Knowledge, beliefs & Attitudes

INTERVIEWER: Tell the interviewee to go to page 3 of the documentation

B.1. I AM GOING READ A LIST OF VARIOUS PROBLEMS. CAN YOU TELL ME, IN YOUR OPINION, WHICH IS THE MOST IMPORTANT FOR YOU? CAN YOU TELL ME WHICH IS THE SECOND MOST IMPORTANT FOR YOU?

INTERVIEWER: Circle the options chosen

	PROBLEM	MOST IMPORTANT	SECOND MOST IMPORTANT
		(20)	(22)
B.1.1	Economic problems	1	1
B.1.2	Crime	2	2
B.1.3	State of health services	3	3
B.1.4	Environmental problems	4	4
B.1.5	State of education	5	5
B.1.6	Other *(write answer)* _____	(21)	(23)
B.1.7	Doesn't know/No answer (do not read) _____	9	9

INTERVIEWER: Tell the interviewee to go to page 4 of the documentation

B.2. I AM GOING READ A LIST OF VARIOUS ENVIRONMENTAL PROBLEMS. CAN YOU TELL ME, IN YOUR OPINION, WHICH IS THE MOST IMPORTANT FOR YOU? CAN YOU TELL ME WHICH IS THE SECOND MOST IMPORTANT FOR YOU?

INTERVIEWER: Circle the options chosen

	PROBLEM	MOST IMPORTANT	SECOND MOST IMPORTANT
		(24)	(26)
B.2.1	Water scarcity	1	1
B.2.2	Forest fires	2	2
B.2.3	Oil spills	3	3
B.2.4	Air pollution	4	4
B.2.5	Over fishing	5	5
B.2.6	Other *(Write down answer)* _____	(25)	(27)
B.2.7	Doesn't know/No answer (do not read) _____	9	9

B.3. IN THE PAST VARIOUS SPILLS THAT HAVE AFFECTED SPAIN HAVE TAKEN PLACE. CAN YOU TELL ME WHETHER YOU HAVE HEARD ABOUT ANY SPILLS?

INTERVIEWER: Spontaneous answer. Circle the options chosen. May answer several

	PROBLEM	(28)
B.3.1	Prestige	1
B.3.2	Aegean Sea	2
B.3.3	Polycommander	3
B.3.4	Andros Patria	4
B.3.5	Urquiola	5
B.3.6	Sierra Nava	6
B.3.7	Don Pedro	7
Go to B.5. ←B.3.8	None	8
B.3.9	Other (Write down answer) _____	(29)
B.3.10	Doesn't know/No Answer (do not read)	9

INTERVIEWER: If B.3.8 is selected DO NOT ASK B.4

B.4. ¿HOW DID YOU LEARN ABOUT THESE SPILLS?

INTERVIEWER: Spontaneous answer. Circle the options chosen. May answer several

	MEDIO	(30)
B.4.1	TV	1
B.4.2	Radio	2
B.4.3	Newspapers	3
B.4.4	Internet	4
B.4.5	Magazines	5
B.4.6	Seminar/Workshop	6
B.4.7	Family	7
B.4.8	Friends	8
B.4.9	Personal experience	9
B.4.10	Other (Write down answer) _____	(31)
B.4.11	Doesn't know/No Answer (do not read) _____	0

B.5. I AM GOING TO READ SOME SENTENCES ABOUT THE ENVIRONMENT ¿CAN YOU TELL ME WHETHER YOU STRONGLY AGREE, AGREE, DISAGREE, STRONGLY DISAGREE OR NEITHER AGREE NOR DISAGREE WITH THESE SENTENCES?
INTERVIEWER: Tell the interviewee to go to page 5 in the documentation. Circle the option chosen for each statement

	STATEMENT	Strongly agree	Agree	Neither/ Nor	Disagree	Strongly disagree	Don't know (Do not read)	
B.5.1	We are reaching the limit in the population that can live in the earth	1	2	3	4	5	9	(32)
B.5.2	Humans have the right to modify the environment to satisfy their needs	1	2	3	4	5	9	(33)
B.5.3	When we interfere with nature there are often disastrous consequences	1	2	3	4	5	9	(34)
B.5.4	Our ingenuity will ensure we do not make the earth unliveable	1	2	3	4	5	9	(35)
B.5.5	We are severely abusing the environment	1	2	3	4	5	9	(36)
B.5.6	The earth has enough resources if we learn how to use them	1	2	3	4	5	9	(37)
B.5.7	Plants, animals and humans have the same right to exist	1	2	3	4	5	9	(38)
B.5.8	Nature is strong enough to resist human impacts	1	2	3	4	5	9	(39)
B.5.9	Despite our abilities we are still subject to the laws of nature .	1	2	3	4	5	9	(40)
B.5.10	Environmental problems have been greatly exaggerated	1	2	3	4	5	9	(41)
B.5.11	The earth has very limited space and resources	1	2	3	4	5	9	(42)
B.5.12	Humans we meant to rule over the rest of nature	1	2	3	4	5	9	(43)
B.5.13	Nature's balance is very fragile and it can be easily upset	1	2	3	4	5	9	(44)
B.5.14	We will learn enough about how nature works to be able to control it	1	2	3	4	5	9	(45)
B.5.15	If things continue as they are we will soon face a large scale ecological crisis	1	2	3	4	5	9	(46)

C) Information related to previous spills & concern question

INTERVIEWER: Tell the interviewee to go to page 6 in the documentation. (map) very important to read the following information.

- **In Spain we have had various oil spills.**
- **According to the experts, one every 7 years.**
- **Nature recovers if pollution is within certain limits.**
- **If pollution is beyond those limits permanent damages may occur.**
- **This can happen due to one very large spill, or with various spills (and maybe a combination of other factors).**
- **I am now going to show you a table with 3 spills. These are of different sizes and have different consequences. The data presented come from scientific studies. (INTERVREWER: Tell interviewees to go to page 7 in the documentation and read spills A, B & C.)**
- **There are people who are worried about these spills and people who are not worried about these spills because they have other things to worry about. Once you read the information I would like to know, considering the rest of your problems (economic, personal, etc.) the extent to which these spills worry you.**

INTERVIEWER: Allow the interviewee to read the information before asking C.1

C.1. IMAGINE YOU HAVE 100 POINTS TO BE DISTRIBUTED AMONG THE SPILLS WE HAVE SEEN. THE MORE YOU WORRY ABOUT A SPILL THE MORE PONTS YOU GIVE TO THIS SPILL. YOU CAN GIVE ANY AMOUNT FROM 0 TO 100 TO ANY SPILL, BUT ADDED TOGETHER THE POINT MUST NOT ADD UP TO MORE THAN 100.
INTERVIEWER: Write down the points allocated to each spill.

	SPILL	Points/ 100	
C.1.1	A		(47-48)
C.1.2	B		(49-50)
C.1.3	C		(51-52)

D) COMPENSATION

INTERVIEWER: Read

- After an oil spill the government always cleans up affected areas and provides monetary compensation for those people who are out of work
- The government is analysing the possibility of investing in other projects **additionally to the clean up and compensation activities.** As we all know money is limited and if we choose these additional investments there will be other things we won't be able to do.
- **The additional investment options include:**
  Investing in things such as roads and railways
  Investing in things such as schools and hospitals
  Investing in things such as releasing fish in the sea and creating natural parks

D.1 IN CASE OF A NEW SPILL, WOULD YOU AGREE TO ADDITIONAL SPENDING OF GOVERNMENT MONEY IN THESE PROJECTS?
INTERVIEWER: Tick (√) the option chosen

		(53)
(Go to D.3) D.1.1	Yes	1
(Go to D.2) D.1.2	No	2
(Go to D.3) D.1.3	Doesn't know/No Answer (do not read)	9

D.2 CAN YOU PLEASE TELL ME WHY YOU WOULD NOT WANT THE GOVERNMENT TO INVEST IN THESE PROJECTS?
INTERVIEWER: Write down answer and go to section E

_____	(54)(55)
_____	(56)(57)
_____	(58)

INTERVIEWER: Read

- As the funds for these investments come from our taxes **I would like to know how you would like this money to be spent.**
- Focusing on the **environmental and health effects** I am going to show you the three spills with very different consequences and I would like you to tell **me how you would like the government to spend the money.**
- Remember there are **other areas in Spain and elsewhere that will not be affected** by these spills.

INTERVIEWER: Tell the interviewee to go to page 8 in the documentation and wait until s/he reads the consequences and the investment options before asking D.3

D.3 AS THIS IS A MINOR SPILL, THE GOVERNMENT IS GOING TO INVEST 100€ PER PERSON AMONG THESE OPTIONS, HOW WOULD YOU DISTRIBUTE THE MONEY? YOU CAN ALLOCATE ANY AMOUNT FROM 0 TO 100€ TO ANY OPTION BUT ADDED TOGETHER THEY HAVE TO ADD UP TO 100€
INTERVIEWER: Write down the answer for each option.

OPTION	€/100	
		(59)
1		1
2		2
3		3

D.4. IN YOUR OPINION WHICH INVESTMENT OPTION IS BETTER?
INTERVIEWER: Tick (√) the option chosen

OPTION	(60)
1	1
2	2
3	3
Doesn't know/No Answer (do not read)	4

D.5 CAN YOU TELL ME WHY?
INTERVIEWER: Write down answer

_____	(61)(62)
_____	(63)(64)
_____	

INTERVIEWER: Tell the interviewee to go to page 9 in the documentation and read:

I AM NOW GOING TO SHOW YOU A LARGER SPILL WITH MORE SEVERE CONSEQUENCES (SPILL TYPE B). I WOULD LIKE YOU TO THINK ABOUT THE CONSEQUENCES OF THE SPILL.

INTERVIEWER: wait until s/he reads the consequences and the investment options before asking D.6

D.6 AS THIS IS A LARGER SPILL THE GOVERNMENT IS GOING TO INVEST 500€ PER PERSON AMONG THESE OPTIONS, HOW WOULD YOU DISTRIBUTE THE MONEY? YOU CAN ALLOCATE ANY AMOUNT FROM 0 TO 500€ TO ANY OPTION BUT ADDED TOGETHER THEY HAVE TO ADD UP TO 500€
INTERVIEWER: Write down the answer for each option.

OPTION	€/500	
		(65)
1		1
2		2
3		3

D.7 IN YOUR OPINION WHICH IS THE BEST INVESTMENT OPTION?
INTERVIEWER: Tick (√) the option chosen

OPTION	(66)
1	1
2	2
3	3
Doesn't know/No Answer (do not read)	4

D.8. CAN YOU TELL ME WHY?
INTERVIEWER: Write down answer

_____	(67)(68)
_____	(69)(70)
_____	

INTERVIEWER: Tell the interviewee to go to page 10 in the documentation and read:

I AM NOW GOING TO SHOW YOU THE LARGEST SPILL THAT CAN CAUSE PERMANENT DAMAGE. I WOULD LIKE YOU TO THINK ABOUT THE CONSEQUENCES OF THE SPILL

INTERVIEWER: wait until s/he reads the consequences and the investment options before asking D.9

D.9. AS THIS IS THE LARGEST SPILL THE GOVERNMENT IS GOING TO INVEST 1,000€ PER PERSON AMONG THESE OPTIONS, HOW WOULD YOU DISTRIBUTE THE MONEY? YOU CAN ALLOCATE ANY AMOUNT FROM 0 TO 1,000€ TO ANY OPTION BUT ADDED TOGETHER THEY HAVE TO ADD UP TO 1,000€

INTERVIEWER: Write down the answer for each option.

OPTIÓN	€/1,000	
		(71)
1		1
2		2
3		3

D.10. IN YOUR OPINION WHICH IS THE BEST INVESTMENT OPTION?

INTERVIEWER: Tick (√) the option chosen

OPTIÓN	(72)
1	1
2	2
3	3
Doesn't know/No Answer (do not read)	4

D.11. CAN YOU TELL ME WHY?

INTERVIEWER: Write down answer

_____	(73)(74)
_____	(75)(76)
_____	

E) Valuation

INTERVIEWER: Read

- THE SEA GIVES US MANY THINGS. PLANTS AND ANIMALS LIVE IN IT, WE FEED FROM IT, WE ENJOY OUR HOLIDAYS IN THE SEA SIDE, ETC. OIL SPILLS DAMAGE THE SEA PREVENTING US FROM ENJOYING THESE THINGS
- WE HAVE JUST SEEN THAT THE GOVERNMENT CLEANS UP AND COMPENSATES AFFECTED PEOPLE WHEN SPILLS TAKE PLACE. A BETTER SCENARIO WOULD BE TO AVOID THESE SPILLS. ACCORDING TO EXPERTS, IN ORDER TO AVOID THESE SPILLS WE SHOULD INVEST IN:
  - **PERSONNEL AND EQUIPMENT TO FIGHT AGAINST SPILLS**
  - **IMPLEMENTING OIL SPILL PREVENTION PLANS ALL AROUND THE SPANISH COAST**
  - **USE MAPS TO TELL US WHICH AREAS SHOULD BE PROTECTED IN CASE OF A NEW SPILL**
- THESE INVESTMENTS WILL BE UNDERTAKEN BY REGIONAL GOVERNEMTS WITH COAST AND BY THE CENTRAL GOVERNMENT AS EVERYONE IN SPAIN ENJOYS A CLEAN COAST.
- A MONITORING COMMISSION WILL ENSURE INVESTMENTS ARE USED ONLY FOR THIS PURPOSE. OTHER EU COUNTRIES ARE ALSO ANALYSING THESE PROGRAMS.

INTERVIEWER: Tell the interviewee to go to page 11 in the documentation and read:

IN ORDER TO AVOID SPILL A AND B, WHICH ARE THE MOST FREQUENT ONES, THE GOVERNMENT MUST UNDERTAKE THE ABOVE INVESTMENTS. THESE ARE COSTLY AND WILL ONLY BE UNDERTAKEN IF CITIZEN'S ARE WILLING TO PAY FOR THEM.

IN THIS FINAL EXERCISE I AM GOING TO ASK YOU TO FOCUS ON THE ENVIRONMENTAL AND HEALTH CONSEQUENCES OF SPILL A AND SPILL B AS SHOWN IN THE DOCUMENTATION AND I WOULD LIKE TO ASK YOU WHETHER YOU WOULD BE WILLING TO CONTRIBUTE TO FUNDING THIS INVESTMENT. THE PAYMENT WOULD BE AN ANNUAL INCREASE IN YOUR INCOME TAX AS THESE INVESTMENTS HAVE TO BE MAINTAINED IN TIME.

E.1. SPILL A AND SPILL B HAVE DIFFERENT CONSEQUENCES AND THEY NEED DIFFERENT INVESTMENTS. TAKING THIS INTO ACCOUNT AND CONSIDERING THAT EACH PERSON WILL BE ASKED TO CONTRIBUTE ACCORDING TO THEIR INCOME, WOULD YOU BE WILLING TO PAY FOR THESE INVESTMENTS IN ORDER TO AVOID THESE SPILLS?

OTIÓN		(77)
Go to E.2, E.2A & E.3 ←	YES	1
Go to E.4 ←	NO	2

INTERVIEWER: (For E.2) Tell the interviewee to go to page 11 of the documentation.

E.2. HOW MUCH WOULD YOU BE WILLING TO PAY TO AVOID SPILL A?
E.2.A. HOW MUCH WOULD YOU BE WILLING TO PAY TO AVOID SPILL B?

INTERVIEWER: Read

PLEASE DO NOT AGREE TO PAY ANY AMOUNT IF YOU CANNOT AFFORD IT OR IF THERE ARE OTHER THINGS IN WHICH YOU WOULD RATHER SPEND YOUR MONEY! REMEMBER THERE ARE OTHER AREAS IN SPAIN AND IN OTHER COUNTRIES THAT WILL NOT BE AFFECTED BY THE SPILL

INTERVIEWER:

1. **Tick (√) the quantity spontaneously mentioned by the interviewee in the response column for spill A.**
2. **Ask the interviewee whether s/he would be willing to pay the quantity immediately above the one mentioned spontaneously and keep raising the amount until the interviewee says no. leave BLANK all quantities the interviewee agreed to pay after the spontaneous response**
3. **Cross (X) the quantity the interviewee said no**

Repeat steps (1. 2. & 3.) **for spill B**

FICHA (8 - 9) 02

(10)	€ TO BE PAID ANNUALLY	REPONSE COLUMN FOR SPILL A	(13)	€ TO BE PAID ANNUALLY	REPONSE COLUMN FOR SPILL B
1	0		1	0	
2	1		2	1	
3	3		3	3	
4	5		4	5	
5	10		5	10	
6	12		6	12	
7	15		7	15	
8	17		8	17	
9	20		9	20	
0	25		0	25	
(11) 1	30		(14) 1	30	
2	40		2	40	
3	50		3	50	
4	60		4	60	
5	70		5	70	
6	80		6	80	
7	90		7	90	
8	100		8	100	
9	110		9	110	
0	120		0	120	
(12) 1	150		(15) 1	150	
2	200		2	200	
3	250		3	250	
4	300		4	300	
5	400		5	400	

INTERVIEWER: For people willing to pay go to E.3.

E.3. CAN YOU TELL ME WHY YOU WOULD BE WILLING TO PAY?

INTERVIEWER: Write answer down.

_____ (16)(17)

_____ (18)(19)

INTERVIEWER: If not willing to pay go to E.4

E.4. CAN YOU TELL ME WHY YOU WERE **NOT** WILLING TO PAY?

INTERVIEWER: Write answer down.

_____ (20)(21)

_____ (22)(23)

E.5 IN THE SPILLS THAT WE HAVE JUST SEEN WHICH CONSEQUENCES HAVE BEEN MORE SIGNIFICANT IN DECIDING YOUR ANSWER?

INTERVIEWER: Do NOT read options below

CONSEQUENCES

	(24)
All consequences	1
The quantity spilled	2
The area affected	3
The environmental consequences	4
The health consequences	5
The recovery time	6
Other **(Write down answer)** _____	(25)
Don't know/No answer _____	9

F) Clasification: Socio-economic data and behaviour

INTERVIEWEE: Read

LASTLY, I WOULD LIKE TO ASK YOU A FEW QUESTIONS ABOUT YOU AND YOUR HOME. ALL THE INFORMATION WILL BE KEPT CONFIDENTIAL

F.1. THE FOLLOWING QUESTIONS REFER TO YOUR RELATIONSHIP WITH THE ENVIRONEMNT. PLEASE ANSWER YES OR NO

INTERVEWER: Tick (√) the option chosen

		YES	NO	Don't know/No answer (Do not read))	
F.1.1	HAVE YOU EVER **SIGNED** A LETTER ASKING THE GOVERNMENT OR A FIRM TO PROTECT THE ENVIRONMENT?	1	2	9	(26)
F.1.2	HAVE YOU EVER **WRITTEN** A LETTER ASKING THE GOVERNMENT OR A FIRM TO PROTECT THE ENVIRONMENT?	1	2	9	(27)
F.1.3	HAVE YOU EVER PARTICIPATED IN A **DEMONSTRATION** FOR AN ENVIRONMENTAL CAUSE?	1	2	9	(28)
F.1.4	HAVE YOU EVER **DONATED MONEY** TO HELP SOLVE AN ENVIRONMENTAL PROBLEM?	1	2	9	(29)
F.1.5	HAVE YOU EVER **VOLUNTEERED** TO HELP SOLVE AN ENVIRONMENTAL PROBLEM?	1	2	9	(30)

F.2. CAN YOU TELL ME HOW OFTEN (NEVER, SOMETIMES, OFTEN, ALWAYS) YOU DO THE FOLLOWING THINGS AT HOME??

INTERVIEWER: Tell the interviewee to go to page 12 of the documentation. Please tick (√) the option chosen.

ACTION	FREQUENCY					
	Never	Sometimes	Often	Always	Don't know/No answer (Do not read))	
Take a shower instead of taking a bath	1	2	3	4	9	(31)
Separate waste	1	2	3	4	9	(32)
Use high energy efficiency appliances (A+ Label)	1	2	3	4	9	(33)
Turn appliances off when they are not in use	1	2	3	4	9	(34)
Use public transport	1	2	3	4	9	(35)
Buy ecological products	1	2	3	4	9	(36)

F.3. CAN YOU PLEASE TELL ME HOW MUCH YOU SPEND A MONTH IN FOOD AND CLEANING PRODUCTS?

INTERVIEWER: Tell the interviewee to go to page 13 of the documentation. Tick (√) the option chosen.

Monthly expenditure in household shopping (€)

	(37)
0 - 100	1
101 - 200	2
201 - 400	3
401 - 600	4
601 - 800	5
801 - 1000	6
1001 - 1300	7
> 1301	8
Doesn't know/No Answer (do not read)	9

INTERVIEWER: Please write down the details for the interviewee, the 'main contributor to the household budget and other people living in the household as requested.

F.4 CAN YOU TELL ME WHETHER YOU ARE THE MAIN CONTRIBUTOR TO YOUR HOUSEHOLD'S INCOME?
INTERVIEWER: Tick (√) the option chosen.

HEAD OF THE HOUSEHOLD	(38)
YES	1
NO	2

F.5. CAN YOU PLEASE TELL ME THE HIGHEST LEVEL OF EDUCATION YOU HAVE ACHIEVED? AND THAT OF THOSE IN YOUR HOUSEHOLD?
INTERVIEWER: In the third column (people living with the interviewee) please insert the number of people aside from the interviewee and head of household in each level of studies

	Interviewee	Head of household	F.5.C Write down n° of people in each category living with interviewee
	(39)	(40)	(41)
• Illiterate	1	1	
• NO education, can read	2	2	
• Nursery school	3	3	
• Primary education (up to 10 years of age)	4	4	
• High school or equivalent (up to 14 years of age)	5	5	
• Secondary school certificate (up to 18 years of age)	6	6	
• Graduate	7	7	
• Bachelor, Master or PhD	8	8	

F.6. CURRENT/MOST RECENT JOB.

INTERVIEWEE: _____

(If interviewee is not head of household in F.6)

HEAD OF HOUSEHOLD: _____

F.6A. TO CURRENT OR RECENT SELF-EMPLOYED INTERVIEWEES

A l

	INTERVIEWEE (42)	HEAD OF HOUSEHOLD (43)
AGRICULTURE/FISHING		
Businessman with 6 or more employees	1	1
Businessman with 1-5 employees	2	2
Businessman with NO employees	3	3
Member of an agricultural co-op	4	4
TRADE/INDUSTRY		
Businessman with 6 or more employees	5	5
Businessman with 1-5 employees	6	6
Businessman with NO employees	7	7
Member of a Non- agricultural co-op	8	8
• Liberal professionals (doctor,lawyers, etc.)	9	9
Self-employed manual workers and craftsmen (construction worker, plumber, etc.)	0	0

F.6B. CURRENT OR RECENT EMPLOYEES.

	INTERVIEWEE (44)	HEAD OF HOUSEHOLD (46)
Director of public or private firms 25 or more employees	1	1
Director of public or private firms 25 or less employees	2	2
Top management	3	3
Middle management	4	4
Foreman, Non commissioned officer (NCO)	5	5
Business agent, representative	6	6
Office workers, clerks	7	7
Skilled workers, civil guard and police	8	8
Salesman, shop assistant	9	9
	(45)	(47)
Caretakers, janitors, night porters, etc.	1	1
Unskilled labour, domestic service	2	2
Labourer	3	3
Other unskilled workers	4	4

F.7. CAN YOU TELL ME HOW MANY PEOPLE LIVE IN YOUR HOUSEHOLD FOR EACH AGE GROUP?

INTERVIEWER: Write down the number in each category.

RANGE	Nº	(48)
0- 5 years		1
6 - 19 years		2
20 - 60 years.....		3
> 61 years		4
Refused		5

F.8. CAN YOU PLEASE TEL ME WHICH NEWSPAPERS YOU NORMALLY READ?

INTERVIEWER: tick (√) the options chosen.

NEWSPAPER	(49)
ABC	1
EL MUNDO	2
EL PAIS	3
LA RAZON	4
PUBLICO	5
NINGUNO	6
Other *(specify)*: _____	(50)
Doesn't know/No Answer (do not read) _	9

F.9. DO YOU HAVE ANY COMMENTS/SUGGESTIONS REGARDING THE QUESTIONNAIRE?

INTERVIEWER: Write answer down

_____ | |

THIS IS THE END OF THE SURVEY
THANK YOU VERY MUCH FOR YOUR HELP!

INTERVIEWER COMMENTS: Please write down issues that were not understood by the Interviewee

_____

_____

NAME OF INTERVIEWEE:

_____

_____

DATE AND TIME OF THE INTERVIEW:

_____ / _____ / 2008; _____ hs.

NAME OF THE INTERVIEWER:

_____

_____

CITY : _____

TELEPHONE NUMBER OF THE INTERVIEWEE : _____

INSPECTION: _____

_____

A.3.2 Documentation for interviewees

8001791CU0106

QUESTIONNAIRE 1

DOCUMENTATION FOR INTERVIEWEES

¡THANK YOU FOR TAKING PART IN THE SURVEY!

PLEASE WAIT UNTIL THE INTERVIEWER TELLS YOU TO TURN THE PAGE

S – 3

Gross monthly salary (€)	Gross annual salary (€)
Less than 600	Less than 7,200
601 – 1,200	7,201 – 12,000
1,201 – 2,000	12,001 – 24,000
2,001 – 3,000	24,001 – 36,000
3,001 – 4,000	36,001 – 48,000
4,001 – 5,000	48,001 – 60,000
5,001 – 6,000	60,001 – 72,000
6,001 – 8,000	72,001 – 96,000
8,001 – 10,000	96,001 – 120,000
10,001 – 12,000	120,001 – 144,000
12,001 – 15,000	144,001 – 180,000
More than 15,001	More than 180,001
No salary	No salary

B - 1

- **Economic problems**
- **Crime**
- **State of health services**
- **Environmental problems**
- **State of education**
- **Other *(please specify)***

B - 2

- **Water Shortages**
- **Forest fires**
- **Oil spills**
- **Air pollution**
- **Over fishing**
- **Other *(please specify)***

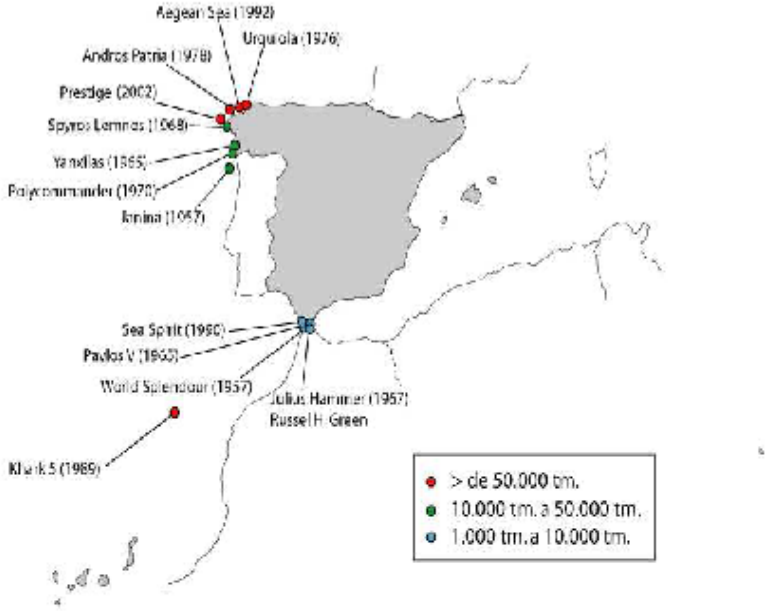
B - 5

I am going to read some statements and I want you to tell me whether you:

- **Strongly agree**
- **Agree**
- **Neither agree nor disagree**
- **Disagree**
- **Strongly disagree**

C

Mayores vertidos de hidrocarburos en las costas españolas por accidentes marítimos (> de 1.000 tm.)



• In Spain we have had various oil spills.
• According to the experts, one every 7 years.
• Nature recovers if pollution is within certain limits.
• If pollution is beyond those limits permanent damages may occur.
• This can happen due to one very large spill, or with various spills (and maybe a combination of other factors).
• I am now going to show you a table with 3 spills. These are of different sizes and have different consequences. The data presented come from scientific studies. (INTERVREWER: Tell interviewees to go to page 7 in the documentation and read spills A, B & C.)
• There are people who are worried about these spills and people who are not worried about these spills because they have other things to worry about. Once you read the information I would like to know, considering the rest of your problems (economic, personal, etc.) the extent to which these spills worry you.

C - 1

	SPILL A	SPILL B	SPILL C
QUANTTY SPILLED	**70** tons	**70,000** tons	**200,000** tons
COASTLINE AFFECTED	**2**Km	**1,000**Km	**2,500**Km
ENVIRONMENT 	**2** beaches polluted Full recovery after **2** years **253** dead birds **No** threat of extinction of species	**700** beaches polluted Full recovery after **15** years **150,000** dead birds Reduction in the numbers of threatened species in polluted area	**1,400** beaches polluted **Full recovery after 70 years** **300,000** dead birds **Threatened species will disappear from polluted area**
ECONOMY 	Fishing bans for **1 year.** Pollution is above safety levels Tourism banned for **2 weeks**	Fishing bans for **3 years.** Pollution is above safety levels Tourism banned for **10 months**	Indefinite fishing bans Pollution is above safety levels Tourism banned for **2 years**
HEALTH 	**20** people affected Breathing diseases, head aches and skin irritation for **1 month** **No** increase in the risk of cancer	**1,400** people affected Breathing diseases, head aches and skin irritation for **3 months** **Slight increase in the risk of cancer**	**4,200** people affected Breathing diseases, head aches and skin irritation for **1 year** **Larger increase in the risk of cancer**

If spill A happened …

	SPILL A
QUANTITY SPILLED	**70** tons
COASTLINE AFFECTED	**2**Km
ENVIRONMENT 	▪ **2** beaches polluted ▪ Full recovery after **2** years ▪ **253** dead birds ▪ **No** risk of species extinction
HEALTH +	▪ **20** people affected ▪ Breathing diseases, head aches and skin irritation for **1 month** ▪ **No increase in the risk of cancer**

Additionally to clean-up and compensation the government is thinking about investing in the following

OPTION 1	OPTION 2	OPTION 3
• Build roads and railways • Build ports • Launch marketing campaigns to promote affected areas	• Invest in education • Invest in health programmes • Invest in R&D programs	• Release young fish in clean areas • Reintroduce birds in clean areas • Create new natural parks

How would you divide these 100€ among these options? You can allocate any amount from 0 to 100 euros to any option, but together they have to add up to 100€.

OPTION	€/100
1	
2	
3	

If spill B happened …

	SPILL B
QUANTITY SPILLED	**70,000** tons
COASTLINE AFFECTED	**1,000**Km
ENVIRONMENT 	▪ **700** beaches polluted ▪ Full recovery after **15** years ▪ **150,000** dead birds ▪ Reduction in specimens from endangered species
HEALTH +	▪ **1,400** people affected ▪ Breathing diseases, head aches and skin irritation for **3 months** ▪ **Slight increase in the risk of cancer**

Additionally to clean-up and compensation the government is thinking about investing in the following

OPTION 1	OPTION 2	OPTION 3
• Build roads and railways • Build ports • Launch marketing campaigns to promote affected areas	• Invest in education • Invest in health programmes • Invest in R&D programs	• Release young fish in clean areas • Reintroduce birds in clean areas • Create new natural parks

How would you divide these 500€ among these options? You can allocate any amount from 0 to 500 euros to any option, but together they have to add up to 500€.

OPTION	€/500
1	
2	
3	

If spill C happened…

	SPILL C
QUANTITY SPILLED	**200,000** tons
COASTLINE AFFECTED	**2,500**Km
ENVIRONMENT 	▪ **1,400** beaches polluted ▪ **Full recovery expected after 70 years** ▪ **300,000** dead birds ▪ **Threatened species disappear from protected areas**
HEALTH +	▪ **4,200** people affected ▪ Breathing diseases, head aches and skin irritation for **1 year** ▪ **Larger increase in the risk of cancer**

Additionally to clean-up and compensation the government is thinking about investing in the following

OPTION 1	OPTION 2	OPTION 3
• Build roads and railways • Build ports • Launch marketing campaigns to promote affected areas	• Invest in education • Invest in health programmes • Invest in R&D programs	• Release young fish in clean areas • Reintroduce birds in clean areas • Create new natural parks

How would you divide these 1,000€ among these options? You can allocate any amount from 0 to 1,000 euros to any option, but together they have to add up to 1,000€.

OPTION	€/1,000
1	
2	
3	

	SPILL A	SPILL B
QUANTITY SPILLED	70 tons	70,000 tons
COASTLINE AFFECTED	2Km	1,000Km
ENVIRONMENT 	▪ 2 beaches polluted ▪ Full recovery after 2 years ▪ 253 dead birds ▪ No risk of species extinction	▪ 700 beaches polluted ▪ Full recovery after 15 years ▪ 150,000 dead birds ▪ Reduction in specimens from endangered species
HEALTH +	▪ 20 people affected ▪ Breathing diseases, head aches and skin irritation for 1 month ▪ No increase in the risk of cancer	▪ 1,400 people affected ▪ Breathing diseases, head aches and skin irritation for 3 months ▪ Slight increase in the risk of cancer

EUROS YOU WOULD PAY TO AVOID	
SPILL A	SPILL B
0	0
1	1
2	2
3	3
5	5
10	10
12	12
15	15
17	17
20	20
25	25
30	30
40	40
50	50
60	60
70	70
80	80
90	90
100	100
110	110
120	120
150	150
200	200
250	250
300	300
400	400

F - 2

Never

Sometimes

Often

Always

F - 3

0 – 100 €

101 – 200 €

201 – 400 €

401 – 600 €

601 – 800 €

801 – 1,000 €

1,001 – 1,300 €

More than 1,301 €

A.3.3 Sampling

This section will analyse the sampling process followed prior to the implementation of the survey. The first subsection will provide a brief discussion of the theory behind the sampling decisions made and the second subsection will critically analyse the practical application of the theory to the present research project. The conclusions will be covered in the third subsection.

Sampling: Theoretical background

Choice of sampling method: theory

One of the criticisms CV studies have had to face is the poor quality of the samples which lead to unrepresentative results (Carson *et al.* 2000). Time and resources limitations make interviewing all individuals in the population impossible. Adequate sampling can provide us with unbiased and precise[142] information about the population we are interested in at a reduced cost. The optimal sampling procedure (Rodríguez Osuna, 1991, Arrow *et al.* 1993, Carson *et al.* 2000, Bateman *et al.* 2002, Champ *et al.* 2003, etc.) is to have a probability sample in which all members of the population of interest have a known, not necessarily equal, independent and nonzero probability of being chosen. If there is adequate information (i.e. the sampling frame is complete) then the questionnaire can be distributed to a random sample of individuals. This will allow the researcher to generalise the results obtained to the population from which the sample was extracted.

Lack of comprehensive sampling frames, limited time and/or resources can result in researchers resorting to semi-probability and non-probability sampling[143]. One of the semi-probability sampling methods available[144] called superior semi-probability sampling by Tukey and Cochran (Pérez, 1999) entails a random selection of some of the sampling units through say postcodes or streets for which there exist data on the probability of selecting them and then the elements or final sampling units (say the individuals) have an unknown probability of being selected. Interviewers make, in this sampling method, the final decision as to who should be interviewed.

[142] Unbiased and precise estimations imply that the values we obtain from the sample approximate to those of the population and thus can be extrapolated to the latter (Rodriguez Osuna, 1991)

[143] Semi probability sampling implies a random selection of some of the sampling units and a non-random selection of other sampling units. For a comprehensive description and analysis of the different sampling procedures see Pérez (1999) and Rodíguez Osuna (1991).

[144] the one used for the present research project, see the following subsection.

This multi-stage sampling process can include certain selection criteria to be met by interviewees. These criteria are used for example in quota sampling[145] for the selection of final sampling units to ensure respondents have certain characteristics normally with the purpose of ensuring respondents resemble population characteristics. Examples of quota categories that may be of interest include age, gender, income, educational level, etc. as these may influence individuals attitudes, intentions and behaviours with regards to a wide range of economic and environmental issues.

Quota sampling has several advantages. First, this sampling method is widely used in social sciences and its results, although not probabilistic *stricto sensus*[146], are used to generalise results to the population as empirical work has shown that the results obtained using this sampling approach are 'of great value' (Rodríguez Osuna, 1991: 14). Second, it is relatively less expensive compared to probability sampling methods, in terms of the sampling frame needed and the speed in gathering the data as parks, busy streets and any open space can be chosen to minimise travel time between surveys. For these reasons this sampling method was used in this thesis. The main disadvantage is the difficulty in meeting quotas and therefore the possible 'stretching' of categories by interviewers in order to meet the quotas. Overall, however, careful selection of quotas, planning of fieldwork and control of the survey process are known to provide good survey results. A further disadvantage of semi-probabilistic sampling is that sampling errors cannot be calculated *a priori*.

Sample size: theory

One of the most important decisions before conducting any survey is to decide the sample size (Pérez, 1999). The main factors that will affect the sample size are: the population size, the variable that will be estimated, the error, the variability among data, the sampling method and the confidence coefficient (Rodríguez Osuna, 1991).

It should be noted that due to the similarities between quota sampling and stratified random sampling with proportional allocation, we initially considered the formulae of the latter to calculate the sample size. Additionally, given that we also assumed constant variability of data across all strata, simple random sampling and stratified

[145] ´A quota sample is one in which the units are not selected at random, but in terms of a certain number of units in each of a number of categories', Everitt, (2002: 309)

[146] But nevertheless considered to have a similar structure to probability sampling, in particular to that of stratified random sampling with proportional allocation (Espínola Vílchez, pers. Comm..)

random sampling coincide and therefore the final formula used in determining the sample size was that of simple random sampling with a given error and a confidence coefficient to obtain the estimator for the proportion:

Formula A.3.3.1 Sample size for a given sampling error and given confidence coefficient (tolerance level): estimator for the proportion

$$n = \frac{\lambda^2_\alpha \, NPQ}{e^2_\alpha \, (N-1) + \lambda^2_\alpha \, PQ}$$

n = sample size
λ_α = critical value in a typified normal distribution of the data
N = population size from which the sample is drawn
P = proportion of people willing to pay
Q = (1-P) = proportion of people not willing to pay
e_α = estimation error

Source: (Pérez, 1999: 181)

For a comprehensive explanation of the formula see Pérez (1999: 179-182). In any case, formula A.3.3.1 can be easily obtained from the formulae for calculating the sample size in simple random sampling for the mean where: $n=\lambda^2_\alpha NS^2 / (Ne^2_\alpha + \lambda^2_\alpha S^2)$ being S^2 the quasi variance. By substituting $(N/N-1)*PQ$ for (S^2) we arrive at formula A.3.3.1. This formula coincides with the formula used to calculate the sample size in stratified random sampling when the error and the confidence levels are given for the estimator of the proportion.

In stratified random sampling, the sample size for the mean is: $n=\sum W_h S_h^2/((e^2/\lambda^2_\alpha)+(1/N)*\sum W_h S_h^2)$ being S_h^2 the population quasi-variance for the stratum and W_h the ponderation coefficients. Given that variability is assumed to be constant for all strata, then S_h^2 can be taken out of the summation and $\sum W_h=1$ and therefore simple random sampling and stratified random sampling with proportional allocation coincide.

Quotas: theory

Quotas are the number of final sampling units (e.g. individuals) that meet certain pre-requisites (e.g. being over 18, being female, etc.). Once the quotas are determined, the interviewer will choose the first individual in each category that meets the criteria. The decision regarding the variables according to which quotas will be determined is based on the existence of sound knowledge of the characteristics of the population from which the sample is drawn which are of interest for the research project. Variables according to which quotas can be established include any socio-economic characteristic that may be relevant to the research project.

The aforementioned similarities in the structure of quota sampling and stratified random sampling with proportional allocation imply that the selection of interviewees in both methods follows a similar logic even though the final phase in the selection of respondents is not random in quota sampling.

Sampling in this thesis

Choice of sampling method: the research project

The expected high cost of probability sampling plus the lack of an adequate population sampling frame from which to draw our random sample of individuals for the present research project implied looking for other sampling options that were feasible, less expensive, and as close as possible to the 'gold standard' (Bateman *et al.* 2002: 97) provided by probability sampling. Semi-probability and non-probability sampling options were considered. Following the theoretical precepts discussed in previous subsections a superior semi-probability sampling, with a *multi-stage process*, was followed in order to select the final sampling units.

The *first stage* consisted in selecting, according to uniform allocation, an equal number of questionnaires for each postcode. These postcodes were randomly selected from the list of postcodes for the city of Madrid and for the city of La Coruña. IPSOS then provided interviewers with a map including the postcode boundaries and interviewers travelled to the location where they chose individuals that met the quota criteria, therefore following quota sampling for the *second and final stage* in the sampling process. Choosing the final sampling units (i.e. individuals) was left at the discretion of the interviewer.

In practical terms, maps and lists of the postcodes of the city of Madrid and the city of La Coruña were obtained from the local government (Madrid Council and La Coruña Council). The differences in size and city management criteria meant that whereas in Madrid the information was publicly available without the need to request this information in writing, La Coruña did require the researcher to provide a written request form in which the purpose of the research and the institution for which the research was conducted were specified. This additional red tape was however compensated by the provision of more up to date population data and detailed interactive maps of the city of La Coruña.

A final practical consideration in planning and collecting the data was, as was discussed in previous subsections, the cost. According to Bateman *et al.* (2002) the cost of completing each face-to-face interview in 2000 was in the range of £25-50 when professional interviewers from market research companies are employed. In the present study the price paid to IPSOS per completed questionnaire was just under 22€ (£17.6)[147]. The lower price compared to the prices mentioned by Bateman *et al.* (2002) may be derived from the fact that IPSOS partially funded the research[148].

Sample size: the research project

In order to calculate the sample size we assumed that the variability of the population's willingness to pay is equal across all strata. We made this assumption as we decided to assume the worst possible scenario (P=Q= 0.5) which meant that the proportion of people that would be willing to pay would be equal to the proportion of people not willing to pay. We therefore used the formulae of simple random sampling given that if we consider constant variability in the willingness to pay distribution across the different strata then simple random sampling and stratified random sampling coincide and as we mentioned earlier, quota sampling and stratified random sampling share similarities in their structure.

The *initial sample size* of 601 interviewees was based on time and budget constraints, expert advice on the appropriate number of surveys for this type of studies and the literature review conducted (Rodríguez Osuna, 1991). Using formula A.3.3.1, the sample sizes for Madrid and for La Coruña were calculated (400 in Madrid and 201 in La Coruña). We adjusted the sampling error so that we did not go over the number of questionnaires we could afford. This meant that in theory, the errors made with the initial sample size where 4.9% for Madrid and 6.9% for La Coruña both with a 95% confidence coefficient[149].

The *final sample size* differed from the initial sample size calculated above. The reason for this difference is that a total of 720 surveys were completed but 8% had to be

[147] http://www.ecb.int/stats/exchange/eurofxref/html/eurofxref-graph-gbp.en.html. Exchange rate used as of 5th of September 2008 as the payment for IPSOS was done in this date (1euro=0, 80930£).

[148] The partial funding by IPSOS Public Affairs Department is gratefully acknowledged. Their cooperation, in particular that of Bernardo Lanuza, the field team in Madrid and in La Coruña is greatly appreciated.

[149] Note that the gross personal income data on which the sample size was calculated is based on the IEF studies which is a sample of the population in the city of Madrid and in the city of La Coruña.

discarded due to errors made during the interview process (IPSOS, 2008). The final number of surveys that were analysed was 663. The number of usable questionnaires completed in Madrid was 405 and 258 in La Coruña[150]. The estimated errors for the final sample size amounted to 4.87% in Madrid and 6.08% in La Coruña.

Quotas: the research project

Age and income are considered relevant socio-economic variables that can affect people's willingness to pay for the policy change proposed in the study (see Bateman *et al.* 2002). And, one of the core exercises of this valuation study is to know if people are willing to pay to avoid a future oil spill. An additional variable that was considered in the study was gender which was not expected to influence WTP but it was nevertheless included as one of the quota variables due to its relevance as a socio-economic factor that defines population characteristics. Further reasons to include income as one of the quotas are:

- Availability of gross income data provided by the Institute of Fiscal Studies[151]
- Expert advice on the analysis of data suggested including income quota as one of the questions in order to facilitate the analysis of survey data[152].

It must be noted that the population from which we determined our sample is in turn a sample of people who submitted their tax return in 2003 that were included in the IEF database in the city of Madrid and in the city of La Coruña. This may well differ from the general population, but the data we had access to only included personal annual gross income for these individuals. As we did not have data on age or gender characteristics for the people who paid their income tax, we used the census

[150] The number of surveys conducted in La Coruña was higher than the number initially planned due to errors made by IPSOS who instructed interviewers in Galicia to ask about household gross income rather than personal gross income which was the quota question asked in the survey. This mistake was made despite of the in person debriefing conducted in Madrid and despite the telephone debriefing conducted with the head of fieldwork in Galicia. The mistake was only spotted while monitoring the survey process (following interviewers whilst they were interviewing people).

[151] I am indebted to César Pérez for providing personal gross income data for Madrid and for La Coruña which had not been publicly released when the survey was carried out. The input of Rosa Espínola Vílchez, lecturer at the Statistics School (Universidad Complutense de Madrid) is also gratefully acknowledged in the entire sampling process.

[152] I am indebted to Mª Dolores Robles, Lecturer in Econometrics at the Universidad Complutense de Madrid for helpful comments on income questions and the revision of early versions of the questionnaire. The input of María Loureiro in this matter is also gratefully acknowledged.

population data in Madrid[153] and La Coruña as well as the Statistics Institute for Galicia (IGE).

Sampling: conclusions

This section has analysed the theoretical background and the practical implementation of sampling guidelines in this thesis. The initial aim of following the 'gold standard' of probability sampling had to be scaled down to a superior semi-probability sampling process. This entailed a multi-stage approach in which initial random selection of postcodes gave way to the interviewer discretion of respondent selection according to income, age and gender quotas. The sample size was calculated according to simple random sampling formulae under the assumptions of similarities of quota sampling and stratified random sampling with proportional allocation and the equivalence of the latter to simple random sampling formulae as explained in this section. The final number of usable interviews amounted to 663 which is reasonable for this type of studies according to the literature reviewed and the experts consulted.

[153] Please note the census data available was gathered in 2001 and this could have caused a selection bias.

A.3.4 implementation issues

According to IPSOS (2008), the survey seemed complicated at the outset due to the length of the questionnaire and the depth of the questions. The implementation of the survey was however more dynamic than expected and after debriefing, Q&A sessions with interviewers and some final adjustments, the survey ran smoothly. A total of 720 surveys were completed between the 23rd of June 2008 and the 16th of July 2008. The coding and data cleaning process took place in the months following the surveys. Once this process was complete, the analysis of the data obtained started. This annex will present the process by which professional interviewers were trained for this research project, the main hurdles faced and the measures taken to overcome these difficulties.

In order to ensure all interviewers had understood each question, two sets of meetings were organised with the IPSOS field team. The first set of meetings took place before the questionnaires were administered. In Madrid these were held in-person. During the first meeting the main goal of the questionnaire was explained to the interviewers. Each question was read out loud and explained to ensure there were no problems in understanding the contents and instructions. At this stage, no major issues were raised by the field team in Madrid.

Time and budget constraints did not allow for the same in-person briefing to happen in La Coruña and thus the questionnaire was explained over the phone to the head of the field team in La Coruña. The main comments made were:

That the quota questions at the start of the survey could be problematic due to the sensitive nature of the income question. This was acknowledged but there was no alternative as it was one of the variables of interest that was expected to influence WTP answers. Additionally, the budget provided by IPSOS was for 601 interviews and thus it was mandatory to have the quota questions at the start in order to meet the quota criteria and avoid exceeding the number of questionnaires that were budgeted by IPSOS.

Local newspapers had not been included. This fact was also acknowledged but it was not seen as a serious shortcoming as there was the option for adding other newspapers under the option ‘other: please state’.

Once these briefing meetings had taken place, the heads of the two field teams were given the go-ahead and the questionnaires began to be administered in Madrid and in La Coruña. Two further quality control steps were taken. Two interviewers in Madrid were followed by the researcher during one day. The purpose of this was to ensure they had understood the questions and they were following the instructions given during the in-person briefing session. The same process was followed in La Coruña where two out of the four interviewers hired were followed during one day. After the researcher had followed the interviewers, the debriefing meetings were conducted both in Madrid and in La Coruña to review the main issues observed by interviewers and to gather their impressions about the process. The *main findings* of the quality control exercise were:

On the interviewers:

Path dependencies play a significant role in the way professional interviewers ask questions. This implies that if similar questions have been repeatedly asked for other questionnaires in a certain fashion, it is highly likely that these will be asked in the same fashion unless various reminders and checks are introduced. This happened with the income question which was not being correctly asked. Interviewers were asking for household income (which is the usual income question in other market research studies) rather that for individual gross income data. This was seen as a serious mistake as it differed from the quota information obtained from the IEF. It was also different from the WTP question, which asked about the amount (if any) that *the interviewee*, not the household, was willing to pay. The solution given to this implied calling all those interviewees in Galicia who had completed the questionnaire up until the error was spotted. The correct income information was then recorded and further questionnaires had to be completed to try to meet the quota criteria.

Some instructions were overlooked, especially when interviewers were asked not to read the possible answers out loud. The main lesson from this is not to include in the questionnaire anything that is not meant to be disclosed.

Skip-patterns were not always followed. Minimising these patterns and checking for these mistakes in the briefing part of the quality control process could improve this in future research.

The payment card with uncertainty levels was somewhat complex for interviewers and thus instructions on how to complete this section were repeated after following the interviewers around.

Interviewers benefited from examples and illustrations used and stated that more of these would have been desirable. The trade-off between a comprehensive explanation and having to complete the questionnaire in as little time as possible[154] made including more examples difficult, but this will be taken into account in future research.

The implementation time was approximately 15 minutes.

On the questions:

The fact that the survey asked about environmental issues and that a university was interested in respondents' views was seen as a confidence builder that encouraged people to participate.

Interviewers found it difficult to meet all the quota criteria, especially the income quotas for people in the higher income group.

Warm up and attitudinal questions were generally unproblematic. The exception to this was encountered in statement number 6 of the NEP scale in which, according to interviewers, respondents answered in a contradictory manner. A further comment made regarding the NEP scale was that it gave rise to a significant number of people commenting on the statements and this led to increasing the questionnaire completion time.

The main issue with the first internal scope test[155] exercise was that a few (less educated and older respondents) experienced some difficulty following the instructions. Repetition and clarification by interviewers was seen as key in order to minimise this limited understanding.

The large number of people wanting compensation may have implied that the explanation of the opportunity cost of investing in compensation programs was not seriously considered by respondents.

[154] Due to the nature of intercept interviews which were taking place outdoors

[155] for which respondents were asked to allocate from 0 to 100 points to three different spills (small, medium and large) according to how concerned they would be if each of the presented spills happened.

The information prior to the valuation question was perceived as somewhat long by interviewers although they said that there were no major problems as interviewees understood what was being asked. Some respondents however found it tricky to decide on the quantity they would pay. This was to be expected as market transactions resemble more a dichotomous choice type question in which consumers either accept the price of the good or forego the purchase.

Some respondents had problems recalling some of the self-reported pro-environmental behaviours. This is expected to occur if the time lapse between the event, say attending a demonstration and the questionnaire, is long. Providing concrete examples such as stating the name of the organisation or salient events which happened during the demonstrations were said to 'awaken' these memories.

So, even though there were some implementation issues, briefing and debriefing, on site monitoring of the interview process and holding meetings with interviewers resulted in a relatively smooth implementation of the survey.

A.4 Valuation

A.4.1 uncertainty

Output A.4.1.1 Uncertainty analysis: Protest responses according to Bateman *et al.* (2002). Variance ratio tests and mean difference tests

```
. sdtest  uncertainb, by(vers)

Variance ratio test
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
1	196	39.29592	4.853443	67.9482	29.72394	48.8679
2	181	44.0884	5.59316	75.24828	33.0518	55.12499
combined	377	41.59682	3.681936	71.49027	34.35705	48.83658

```
    ratio = sd(1) / sd(2)                                         f =   0.8154
Ho: ratio = 1                                 degrees of freedom = 195, 180

    Ha: ratio < 1               Ha: ratio != 1                 Ha: ratio > 1
  Pr(F < f) = 0.0812         2*Pr(F < f) = 0.1624           Pr(F > f) = 0.9188

. ttest uncertainb, by(vers) unpaired

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
1	196	39.29592	4.853443	67.9482	29.72394	48.8679
2	181	44.0884	5.59316	75.24828	33.0518	55.12499
combined	377	41.59682	3.681936	71.49027	34.35705	48.83658
diff		-4.792479	7.375377		-19.29476	9.709798

```
    diff = mean(1) - mean(2)                                      t =  -0.6498
Ho: diff = 0                                  degrees of freedom =      375

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.2581         Pr(|T| > |t|) = 0.5162          Pr(T > t) = 0.7419
```

We do not reject the null hypothesis that the mean uncertainty amount in WTP to prevent the medium spill of respondents who answered the first version of the questionnaire is equal to the mean uncertainty amount in WTP to prevent the medium spill of respondents who answered the second version of the questionnaire. No order effects are present in the uncertainty expressed by respondents to the WTP question.

Output A.4.1.2 Uncertainty analysis: Protest responses according to Brouwer *et al.* (2008). Variance ratio tests and mean difference tests

```
. sdtest uncertainb, by (vers)

Variance ratio test
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
1	241	31.19502	4.072102	63.21603	23.1734	39.21665
2	241	33.87552	4.368519	67.81766	25.26998	42.48105
combined	482	32.53527	2.98357	65.50279	26.67283	38.39771

```
    ratio = sd(1) / sd(2)                                         f =   0.8689
Ho: ratio = 1                                 degrees of freedom = 240, 240

    Ha: ratio < 1               Ha: ratio != 1                 Ha: ratio > 1
  Pr(F < f) = 0.1385         2*Pr(F < f) = 0.2771           Pr(F > f) = 0.8615
```

```
. ttest uncertainb, by (vers) unpaired

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
1	241	31.19502	4.072102	63.21603	23.1734	39.21665
2	241	33.87552	4.368519	67.81766	25.26998	42.48105
combined	482	32.53527	2.98357	65.50279	26.67283	38.39771
diff		-2.680498	5.9721		-14.41519	9.054192

```
    diff = mean(1) - mean(2)                                      t =  -0.4488
Ho: diff = 0                     degrees of freedom =      480

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.3269         Pr(|T| > |t|) = 0.6538          Pr(T > t) = 0.6731
```

We do not reject the null hypothesis that the mean uncertainty amount in WTP to prevent the medium spill of respondents who answered the first version of the questionnaire is equal to the mean uncertainty amount in WTP to prevent the medium spill of respondents who answered the second version of the questionnaire. No order effects are present in the uncertainty expressed by respondents to the WTP question.

A.4.2 Scope

Scope sensitivity was tested in the questionnaire via two exercises. The first one asked respondents to state how worried they would be on a scale of 1 to 100 if a small spill, a medium sized spill and a large spill were to occur. The second exercise where scope sensitivity was analysed was through the valuation question. In this question interviewees were asked about their WTP to prevent both the small and the medium spill (version 1 of the questionnaire) or about their WTP to prevent the medium spill and the large spill (version 2 of the questionnaire).

CONCERN

In the first scope sensitivity question in order to test whether there were statistically significant differences between the concern (worry) felt by questionnaire respondents when presented with the three different spills we took into account the fact that all respondents were presented with the three spills. This meant respondents' answers were not independent and thus we used the repeated measures analysis of variance (ANOVA – repeated measures) to test for internal scope sensitivity.

Output A.4.2.1 Repeated measures ANOVA: concern exercise

```
. anova concern  cuestn  spill, repeated(spill)

                   Number of obs =      1986     R-squared     =  0.6245
                   Root MSE      =    20.055     Adj R-squared =  0.4361

          Source |  Partial SS    df       MS           F     Prob > F
-----------------+----------------------------------------------------
           Model |  884163.097   663  1333.57933        3.32     0.0000
                 |
          cuestn |  174.992951   661  .264739714        0.00     1.0000
           spill |  883988.104     2  441994.052     1098.93     0.0000
                 |
        Residual |  531714.563  1322  402.204662
-----------------+----------------------------------------------------
           Total |  1415877.66  1985  713.288494
```

The value of Mauchly's W test for sphericity was 0,386 which meant the sphericity assumption is not met hence; the following correction factors are used:

Output A.4.2.2 Corrections for violation of Sphericity

```
Between-subjects error term:  cuestn
                     Levels:  662        (661 df)
     Lowest b.s.e. variable:  cuestn

Repeated variable: spill
                                          Huynh-Feldt epsilon        =  0.6201
                                          Greenhouse-Geisser epsilon =  0.6195
                                          Box's conservative epsilon =  0.5000

                                            ------------ Prob > F ------------
                  Source |     df      F    Regular    H-F      G-G      Box
              -----------+----------------------------------------------------
                   spill |      2  1098.93   0.0000   0.0000   0.0000   0.0000
                Residual |   1322
              -----------+----------------------------------------------------
```

The output above and its p-values (< α =0.05) indicate that we reject the null hypothesis that the mean concern felt by respondents as expressed by the 'points' allocated to the small spill is equal to the mean concern for the medium spill and equal to the mean concern felt regarding the large spill (H_0: μ1 = μ2 = μ3).

The post-hoc estimations using Scheffé produce the following pairwise comparisons:

Output A.4.2.3 Pairwise comparisons: Scheffé

```
. oneway concern spill, scheffe

                        Analysis of Variance
    Source              SS         df      MS            F     Prob > F
------------------------------------------------------------------------
Between groups      883988.104      2   441994.052   1647.85     0.0000
 Within groups      531889.556   1983   268.224688
------------------------------------------------------------------------
    Total           1415877.66   1985   713.288494

Bartlett's test for equal variances:  chi2(2) = 317.4089  Prob>chi2 = 0.000

                        Comparison of concern by spill
                                  (Scheffe)
Row Mean-|
Col Mean |          1          2
---------+----------------------
       2 |    10.7508
         |      0.000
         |
       3 |    49.1511    38.4003
         |      0.000      0.000
```

Scheffé's post hoc test reflects that we reject the null hypotheses that mean concern for the small spill is equal to mean concern for the medium spill; that mean concern for the medium spill is equal to the mean concern for the large spill and finally, that mean concern for the small spill is equal to mean concern for the large spill.

Output A.4.2.4 Variance ratio tests and mean difference tests for WTP to avoid small and medium oil spills: Bateman et al. (2002)

a) High midpoint of the WTP interval (H_0: midwtpahigh=midwtpbhigh)

```
. sdtest  midwtpahigh=midwtpbhigh if(vers==1)

Variance ratio test
```

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
mi~ahigh	196	65.82908	6.612902	92.58062	52.78709	78.87107
mi~bhigh	196	80.22959	7.251691	101.5237	65.92778	94.53141
combined	392	73.02934	4.914304	97.29825	63.36757	82.6911

```
    ratio = sd(midwtpahigh) / sd(midwtpbhigh)                     f =   0.8316
Ho: ratio = 1                                 degrees of freedom = 195, 195

    Ha: ratio < 1               Ha: ratio != 1                 Ha: ratio > 1
  Pr(F < f) = 0.0994         2*Pr(F < f) = 0.1988          Pr(F > f) = 0.9006
```

At a 99% confidence level we do not reject that mean variances are equal

```
. ttest  midwtpahigh=midwtpbhigh if(vers==1)

Paired t test
```

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
mi~ahigh	196	65.82908	6.612902	92.58062	52.78709	78.87107
mi~bhigh	196	80.22959	7.251691	101.5237	65.92778	94.53141
diff	196	-14.40051	2.016736	28.2343	-18.37793	-10.4231

```
     mean(diff) = mean(midwtpahigh - midwtpbhigh)                 t =  -7.1405
 Ho: mean(diff) = 0                             degrees of freedom =      195

 Ha: mean(diff) < 0           Ha: mean(diff) != 0           Ha: mean(diff) > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 1.0000
```

We reject that mean WTP to prevent the small spill is equal to WTP to prevent the medium spill.

Output A.4.2.5 Variance ratio tests and mean difference tests for WTP to avoid the medium oil spill: Bateman *et al.* (2002)

a) Variance ratio test and mean difference test testing equality of mean WTP to prevent the medium spill across sub-samples. External scope test

```
. sdtest midwtpbhigh, by (vers)

Variance ratio test
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
1	196	80.22959	7.251691	101.5237	65.92778	94.53141
2	181	79.66575	7.488796	100.7514	64.88862	94.44287
combined	377	79.95889	5.202771	101.0195	69.72871	90.18906

```
    ratio = sd(1) / sd(2)                                         f =   1.0154
Ho: ratio = 1                                 degrees of freedom = 195, 180

    Ha: ratio < 1               Ha: ratio != 1                 Ha: ratio > 1
  Pr(F < f) = 0.5408         2*Pr(F > f) = 0.9185          Pr(F > f) = 0.4592
```

At a 99% confidence level we do not reject that mean variances are equal

```
. ttest midwtpbhigh, by (vers) unpaired

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
1	196	80.22959	7.251691	101.5237	65.92778	94.53141
2	181	79.66575	7.488796	100.7514	64.88862	94.44287
combined	377	79.95889	5.202771	101.0195	69.72871	90.18906
diff		.563846	10.42762		-19.94009	21.06779

```
    diff = mean(1) - mean(2)                                      t =   0.0541
Ho: diff = 0                     degrees of freedom =      375

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.5215         Pr(|T| > |t|) = 0.9569          Pr(T > t) = 0.4785
```

We do not reject that mean WTP to prevent the medium spill is equal across samples. This finding would indicate external sensitivity to scope.

Output A.4.2.6 Variance ratio tests and mean difference tests for WTP to avoid the medium oil spill and the large spill: Bateman *et al.* (2002)

a) High midpoint of the WTP interval (H_0: midwtpbhigh=midwtpchigh)

```
. sdtest  midwtpbhigh= midwtpchigh if (vers==2)

Variance ratio test
```

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
mi~bhigh	181	79.66575	7.488796	100.7514	64.88862	94.44287
mi~chigh	180	98.225	8.440555	113.2419	81.56921	114.8808
combined	361	88.91967	5.653431	107.4152	77.80177	100.0376

```
    ratio = sd(midwtpbhigh) / sd(midwtpchigh)                     f =   0.7916
Ho: ratio = 1                     degrees of freedom = 180, 179

    Ha: ratio < 1                Ha: ratio != 1                Ha: ratio > 1
  Pr(F < f) = 0.0591         2*Pr(F < f) = 0.1183          Pr(F > f) = 0.9409
```

At a 99% confidence level we do not reject that variances are equal

```
. ttest  midwtpbhigh= midwtpchigh if (vers==2)

Paired t test
```

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
mi~bhigh	180	79.58056	7.530029	101.0259	64.72151	94.4396
mi~chigh	180	98.225	8.440555	113.2419	81.56921	114.8808
diff	180	-18.64444	3.688614	49.48795	-25.92321	-11.36568

```
     mean(diff) = mean(midwtpbhigh - midwtpchigh)                 t =  -5.0546
 Ho: mean(diff) = 0                     degrees of freedom =      179

 Ha: mean(diff) < 0           Ha: mean(diff) != 0           Ha: mean(diff) > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 1.0000

.
```

We reject that mean WTP to prevent the medium spill is equal to mean WTP to prevent the large spill for respondents who answered version 2 of the questionnaire. The statistical analyses conducted are indicative of internal and external sensitivity to scope using the Bateman et al. (2002) classification of protest answers.

Output A.4.2.7 Variance ratio tests and mean difference tests for WTP to avoid small and medium oil spills: Brouwer *et al.* (2008)

a) High midpoint of the WTP interval (H_0: midwtpahigh=midwtpbhigh)

```
. sdtest  midwtpahigh= midwtpbhigh if (vers==1)

Variance ratio test
```

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
mi~ahigh	239	53.09623	5.682124	87.8435	41.90256	64.28991
mi~bhigh	241	64.51452	6.24702	96.97983	52.20853	76.82051
combined	480	58.82917	4.227662	92.62343	50.52211	67.13622

```
    ratio = sd(midwtpahigh) / sd(midwtpbhigh)                     f =   0.8205
Ho: ratio = 1                                 degrees of freedom = 238, 240

    Ha: ratio < 1               Ha: ratio != 1                 Ha: ratio > 1
  Pr(F < f) = 0.0635         2*Pr(F < f) = 0.1269          Pr(F > f) = 0.9365
```

At a 99% confidence level we do not reject that variances are equal

```
. ttest  midwtpahigh= midwtpbhigh if (vers==1)

Paired t test
```

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
mi~ahigh	239	53.09623	5.682124	87.8435	41.90256	64.28991
mi~bhigh	239	64.7113	6.296242	97.33754	52.30782	77.11478
diff	239	-11.61506	1.693213	26.17644	-14.95066	-8.279464

```
     mean(diff) = mean(midwtpahigh - midwtpbhigh)                 t =  -6.8598
 Ho: mean(diff) = 0                             degrees of freedom =      238

 Ha: mean(diff) < 0           Ha: mean(diff) != 0           Ha: mean(diff) > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 1.0000
```

We reject that mean WTP to prevent the small spill is equal to WTP to prevent the medium spill in the high midpoint of the WTP interval.

Output A.4.2.8 Variance ratio tests and mean difference tests for WTP to avoid the medium spill across samples: Brouwer *et al.* (2008)

a) Variance ratio test and mean difference test testing equality of mean WTP to prevent the medium spill across sub-samples. External scope test

```
. sdtest  midwtpbhigh, by (vers)

Variance ratio test
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
1	241	64.51452	6.24702	96.97983	52.20853	76.82051
2	241	60.56639	6.029879	93.60889	48.68815	72.44463
combined	482	62.54046	4.337637	95.23065	54.0174	71.06352

```
    ratio = sd(1) / sd(2)                                         f =   1.0733
Ho: ratio = 1                                 degrees of freedom = 240, 240

    Ha: ratio < 1               Ha: ratio != 1                 Ha: ratio > 1
  Pr(F < f) = 0.7080         2*Pr(F > f) = 0.5841          Pr(F > f) = 0.2920
```

At a 99% confidence level we do not reject that variances are equal

```
. ttest  midwtpbhigh, by (vers)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
1	241	64.51452	6.24702	96.97983	52.20853	76.82051
2	241	60.56639	6.029879	93.60889	48.68815	72.44463
combined	482	62.54046	4.337637	95.23065	54.0174	71.06352
diff		3.948133	8.682436		-13.11215	21.00841

```
    diff = mean(1) - mean(2)                                      t =   0.4547
Ho: diff = 0                     degrees of freedom =      480

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.6752         Pr(|T| > |t|) = 0.6495          Pr(T > t) = 0.3248
```

We do not reject that mean WTP to prevent the medium spill is equal across survey respondents who were administered different versions of the questionnaire. This would be indicative of external scope sensitivity.

Output A.4.2.9 Variance ratio tests and mean difference tests for WTP to avoid medium and large oil spills: Brouwer *et al.* (2008)

a) High midpoint of the WTP interval for the medium and the large spill

```
. sdtest  midwtpbhigh= midwtpchigh if(vers==2)

Variance ratio test
```

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
mi~bhigh	241	60.56639	6.029879	93.60889	48.68815	72.44463
mi~chigh	233	75.4485	7.065163	107.845	61.52842	89.36858
combined	474	67.88186	4.640277	101.026	58.76375	76.99996

```
    ratio = sd(midwtpbhigh) / sd(midwtpchigh)                     f =   0.7534
Ho: ratio = 1                    degrees of freedom = 240, 232

    Ha: ratio < 1                Ha: ratio != 1                 Ha: ratio > 1
  Pr(F < f) = 0.0150         2*Pr(F < f) = 0.0299          Pr(F > f) = 0.9850
```

At a 99% confidence level we do not reject that variances are equal

```
. ttest  midwtpbhigh= midwtpchigh if(vers==2)

Paired t test
```

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
mi~bhigh	233	61.12661	6.220623	94.95369	48.87048	73.38274
mi~chigh	233	75.4485	7.065163	107.845	61.52842	89.36858
diff	233	-14.32189	2.894087	44.17631	-20.02394	-8.619838

```
     mean(diff) = mean(midwtpbhigh - midwtpchigh)                 t =  -4.9487
 Ho: mean(diff) = 0                     degrees of freedom =      232

 Ha: mean(diff) < 0           Ha: mean(diff) != 0           Ha: mean(diff) > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 1.0000
```

We reject that mean WTP to prevent the medium spill is equal to WTP to prevent the large one.

So, no matter the protest classification used, the results of the mean t-tests indicate internal and external sensitivity to scope.

A.4.3 Heckman's two-stage model

In the interval data models presented in section 5.3.2 above there is a sample selection problem due to the fact that there are survey respondents who protest and are excluded from the sample following the Bateman *et al*. (2002) classification of protest answers and the Brouwer *et al.* (2008) classification of protest answers. Eliminating protesters *could* lead to biased results. In order to solve this problem, we follow the Heckman (1976, 1979) method that allows to correct this problem obtaining consistent estimators.

Given our interval data model as specified in section 5.3.2 above:

$$LogY_{1i}=X'_{1i}\beta + \varepsilon_i \quad (1)$$

Where:
Y_{1i} : WTP amount
X'_{1i} : Row vector of regressors
β : Column vector of coefficients
ε_i : Error term

We have:

$$Y^*_{2i}=X'_{2i}\beta + \varepsilon_i \quad (2)$$

Where:
Y^*_{2i} : Unobservable (latent) variable. Informs about respondent predisposition not to protest
X'_{2i} : Row vector of regressors
β : Column vector of coefficients
ε_i : Error term

And

$$Y^*_{2i} \begin{cases} = 1 & \text{if } Y^*_{2i} \geq 0 \text{ if the predisposition not to protest is high (i.e. NO protest)} \\ = 0 & \text{if } Y^*_{2i} < 0 \text{ if the predisposition not to protest is low (i.e. protest)} \end{cases}$$

Hence, we only observe Y_{1i} if Y_{2i} =1, that is, if the respondent does not protest

In our case, Heckman's correction for the possible sample selection problem entails the following steps:

1) Estimate a probit for the sample selection problem (e.g. protestors) with all respondents, protestors and non-protestors:

$$P(Y_{2i}=1) = \Phi (X'_{2i}\beta) \quad (3)$$

Where:	
Φ	is the standard normal distribution function

And from β* (estimated) we obtain the inverse Mills ratio:

$$\lambda^*_i = \theta (Z_i) / 1- \Phi(Z_i) \quad (4)$$

Where:	
λ^*_i	: Estimated inverse Mills ratio
θ	: Density function of the standard normal distribution
Zi	: = $-X'_{2i}\ \beta^*$

The results from the probit models run are as follows for the Bateman *et al.* (2002) classification of protest answers and the Brouwer *et al.* (2008) classification of protest answers is as shown in table A.4.3.1:

Table. A.4.3.1 Independent variables in the valuation exercise: WTP Yes/No

Independent variable	Possible values
City	0= if resident of Coruña 1= if resident of Madrid
Age	= (18-79)
Education	= 1 if illiterate = 2 if no formal education but can read = 3 if nursery school = 4 if primary education (up to 10 years of age) = 5 if high school or equivalent (up to 14 years of age) = 6 if secondary school certificate = 7 if undergraduate = 8 if postgraduate
Previously volunteered to protect the environment	= 0 if No = 1 if Yes

The results are presented in table A.10.2 below:

Table A.4.3.2 Logit model (protest: Yes = 0 / No = 1)

	Protest classification	
Variables	**Bateman *et al.* (2002)**	**Brouwer *et al.*(2008)**
Constant	1.42***	2.126
	(0.33)	(0.35)
City	-0.305***	-0.253**
	(0.10)	(0.11)
Age	-0.015***	-0.012***
	(0.03)	(0.003)
Education	-0.044	-0.108***
	(0.03)	(0.04)
Previous donations to protect the environment	0.109	0.076
	(0.08)	(0.09)
Pseudo R^2	0.036	0.026
Number of observations	656	656

Where : Standard error in parentheses

* =The coefficient is significantly different from zero at a 90% confidence level

** =The coefficient is significantly different from zero at a 95% confidence level

*** =The coefficient is significantly different from zero at a 99% confidence level

Using the *Bateman et al. (2002) classification of protest answers* the Wald chi-squared is equal to 31.30 (p-value = 0.000). This implies that the model specified fits significantly better than an empty model. Using the Bateman *et al.* (2002) classification of protest answers we see that the city and the age of respondents are significant in determining protest answers at a 99% confidence level. Respondents from Madrid are more likely to protest compared with respondents from La Coruña. Older respondents are more likely to protest than younger respondents. For the Bateman *et al.* (2002) classification of protest responses neither the education level of respondents nor previous donations to protect the environment (natural capital) are significant in determining the decision to protest. Using the *Brouwer et al. (2008) classification of protest answers* the Wald chi-squared is equal to 19.88 (p-value = 0.0005).

This implies that the model specified fits significantly better than an empty model. Additionally, city, age and education are significant in determining protest responses at a 95% confidence level. The interpretation of the output above tells us that respondents from Madrid are more likely to protest than respondents from La Coruña. Older respondents are more likely to protest than younger respondents and respondents that have attained a higher educational level are more likely to protest than respondents with lower educational attainment. Whether the respondent had previously donated money to protect the environment was not significant in determining the decision to protest.

2) Introduce λ^*_i as an additional regressor in the interval data model:

$$LogY_{1i}=X'_{1i}\beta + \alpha\ \lambda_i + u_i \quad (5)$$

Where:

X'_{1i}	: Row vector of regressors
β	: Column vector of coefficients for the independent variables Xi
α	: Coefficient for the Mills ratio λ^*_i
u_i	: Error term

The interval data model results were calculated for both, the Bateman *et al.* (2002) classification of protest responses and for the Brouwer *et al.* (2008) classification of protest responses. These are presented in table A.4.3.3 below:

Table A.4.3.3 Interval data models with Heckman's correction. WTP using the Bateman *et al.* (2002) classification of protests

	Small spill	Medium Spill	Large spill
Constant	1.069 (2.47)	-0.072 (1.26)	-1.92 (1.45)
City	0.56 (0.42)	0.691** (0.34)	0.851 (0.58)
Age	-0.005 (0.02)	-0.001 (0.01)	-0.006 (0.008)
Income	7.12^{e-06} (9.59^{e-06})	0.00001** ($7.27e^{-06}$)	0.00002*** (9.70^{e-06})
Known spills	0.498 (1.12)	1.033 (0.71)	1.577** (0.79)
Aggregate NEP score	0.025 (0.02)	0.033** (0.01)	0.054** (0.02)
Environmental consequences	0.298 (0.28)	0.489*** (0.18)	0.534** (0.24)
Previously volunteered to protect the environment	0.606** (0.30)	0.420** (0.20)	0.291 (0.29)
Mills	-0.902 (2.25)	-1.04 (1.74)	-1.49 (2.93)
σ	1.593	1.567	1.556
Log pseudo likelihood	-409.33	-819.87	-402.67
N	167	329	161

Where: Dependent variable: log WTP
Standard error in parentheses
* =The coefficient is significantly different from zero at a 90% confidence level
** =The coefficient is significantly different from zero at a 95% confidence level
*** =The coefficient is significantly different from zero at a 99% confidence level

The above results indicate that the inverse Mills ratio is not significant in any of the spills. This implies we do not reject the null hypothesis that the coefficient for the inverse Mills ratio is equal to zero. The selection problem is not relevant and therefore we would maintain the results obtained in table 5.3.12. Additionally, if we compare table A.4.3.3 with table 5.3.12 we see that the results are very similar.

For the Brouwer *et al.* (2008) classification of protest answers, the interval data model including the inverse Mills ratio is as follows:

Table A.4.3.4 Interval data models with Heckman's correction. WTP using the Brouwer *et al.* (2008) classification of protests

	Small spill	Medium Spill	Large spill
Constant	-0.681 (1.66)	-0.868 (1.14)	-1.114 (1.57)
City	0.110 (0.34)	0.174 (0.25)	0.089 (0.41)
Age	-0.018 (0.01)	-0.021** (0.009)	-0.028** (0.01)
Income	9.25^{e-06} (9.14^{e-06})	0.000011* (6.62^{e-06})	0.00001 (0.00001)
Known spills	0.541 (0.88)	1.170** (0.50)	1.654*** (0.53)
Aggregate NEP score	0.049** (0.02)	0.039** (0.01)	0.033 (0.02)
Environmental consequences	0.180 (0.27)	0.402** (0.19)	0.418 (0.29)
Previously volunteered to protect the environment	0.684** (0.31)	0.632*** (0.22)	0.621* (0.35)
Mills	0.088 (2.34)	0.772 (1.73)	2.312 (2.85)
σ	1.782	1.841	1.914
Log pseudo likelihood	-515.74	-1052.57	-530.06
N	210	418	207

Where: Dependent variable: log WTP
Standard error in parentheses
* =The coefficient is significantly different from zero at a 90% confidence level
** =The coefficient is significantly different from zero at a 95% confidence level
*** =The coefficient is significantly different from zero at a 99% confidence level

The above results indicate that the inverse Mills ratio is not significant in any of the spills. This implies we do not reject the null hypothesis that the coefficient for the inverse Mills ratio is equal to zero. The selection problem is not relevant and therefore we would maintain the results obtained in table 5.3.14. Additionally, if we compare table A.4.3.4 with table 5.3.14 we see that the results are very similar.