Evaluation économique des changements des paysages littoraux : le cas du développement des parcs éoliennes dans le mer Méditerranée

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A welfare economic valuation of tourist preferences for the siting of offshore wind farms: The case of the French Mediterranean Sea

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Abstract

The French government has committed itself to an ambitious target of boosting the offshore wind power capacity to reach 6 GW by 2020. Wind turbines onshore as well as offshore are highly contested on visual grounds. Affected stakeholders, ranging from business and property owners, fishermen and elected municipal planners, fear significant negative economic impacts on their ‘business’ or their ‘property’. In the French Mediterranean region of the Languedoc Roussillon, the expectation is that the tourist industry will be chagrined in the presence of an offshore wind farm – giving a windy and cemented image of the region. Till date there is no post-construction evidence that offshore wind farms in the North Sea have damaged the allure of nearby coastal community resorts. It may however be questioned to what extent one can extrapolate such results to the sunny Mediterranean coast. Since talks began about 10 years ago, on the potential for ‘harvesting’ the winds of the Mediterranean Sea, many postulates have been made with regard to the impact on coastal tourism. In particular, resistance mounted when plans to include the Languedoc Roussillon in the 2011 tender for the construction of 2 GW wind power capacity were materialising. In this light, it was considered of pertinence to investigate how offshore wind farms, installed at realistic distances from the coast (5, 8 or 12 km), would affect coastal tourism. Additionally, it was considered of interest to help define strategies that coastal community resort may adopt to boost visiting numbers or profit margins with or without wind farms. To answer these questions a full-scale choice experiment valuation survey with over 350 tourists was undertaken in the summer of 2010 on Languedoc beaches.

Our survey results show (in chapter 3) that average visual disamenity costs tends to zero, when an offshore wind farm is installed somewhere between 8 and 12 km from the shore. We also find that there is considerable demand for “sustainable” coastal community resorts that favours local produce, bicycling, public transport, energy and water saving devices. Thus, our estimates show that a wind farm installed 8 km from the shore could be ‘compensated for’ through the simultaneous ‘greening’ of the coastal community resort. If in addition a wind farm is associated with artificial reefs and recreational user access, our results point to an actual rise in tourist related revenues when the wind farm is located min. 5 km from the coast. The policy

recommendation is thus two fold: Everything else equals, a wind farm located 12 km offshore will have no negative incidence on tourism. With simultaneous application of a coherent environmental policy and wind farm associated recreational activities, wind farm siting can be conceived from 5 km and outwards.

Additionally, the thesis highlights (in chapter 4) that it is not only relevant to understand how the tourist industry and Languedoc service sector may be affected by the installation of offshore wind farms. It is similarly relevant to gain an insight into the wider factor governing public acceptance of offshore wind farm projects. In that regard the thesis provides evidence that there has been an excessive and not very constructive focus on NIMBYism as a mean to explain resistance to wind farm proposals. A large range of factors drives preferences for or against the installation of offshore wind farms - these have a direct bearing on the visual evaluation of wind turbines in the seascape. In particular, we find that concerns over the efficiency and costliness of wind energy and localized consequences on noisescape, seascape, fauna and flora, exacerbates disamenity costs. Climate change concern and aversion to traditional fuels on the other hand serve to lessen disamenity costs of wind farm installation. Similarly, respondents with a higher education also experiences a smaller disutility costs from the presence of wind turbines. Finally, it is noteworthy that nationality stands out as the single most important socio-demographic determinant of preferences for/against the installation of wind farms. This alerts us about the degree to which nation specific energy policies, social norms, and lobbying may be part of leading to widely divergent evaluations.

Finally, in our econometric estimations (in chapter 5) we explicitly account for the well-documented phenomena that individuals tend to over-estimate losses compared with equal-sized gains. By incorporating so-called gain-loss asymmetry in the utility function, we observe that tourists' willingness to pay to remove wind farms had they already been installed (ex-post), is half the compensation they would require to accept their presence during a vacation, prior to their installation (ex-ante). The disamenity costs associated with the view to offshore wind farms would therefore be of a significantly smaller magnitude if the wind farms were already part of the landscape. On the other hand, tourists would experience a greater loss of welfare, if they had to forgo eco-efficiency and wind-farm associated recreational activities given these features were already part of their usual vacation experience. The verdict is that asymmetry should be accounted for, or at least recognised in stated preference valuation studies that simultaneously use utility increasing and utility decreasing attributes.

Conclusively, preferences for the siting of energy producing facilities are inherently heterogeneous. This heterogeneity can fruitfully be addressed in valuation studies so as to help design optimal policy responses.

Key words: Offshore wind farms, artificial reefs, recreation, eco-efficiency, Languedoc Roussillon, sustainable tourism, visual disamenity costs, economic valuation, choice experiment, willingness to pay, willingness to accept, wtp-wtp asymmetry.

Résumé

Le gouvernement français s'est engagé sur un ambitieux objectif de développer l'éolien offshore pour atteindre une capacité de 6 GW d'ici 2020. La construction d'éoliennes terrestres, tout comme les éoliennes offshore, est très contestée en raison de leur impact visuel sur le paysage. Dans la région française du Languedoc Roussillon, les acteurs concernés (industrie touristique, commerces, pêcheurs, élus locaux), craignent que la construction de parc éoliens offshore aie des effets néfastes sur le tourisme, en donnant à la région une image industrialisée et « bétonnée ». Jusqu'à présent, en mer du Nord, il n'a jamais été mis en évidence que la construction de parcs éoliens offshore ait réellement affecté l'attractivité touristique des côtes environnantes. On peut se demander si ce constat peut être extrapolé à la cote méditerranéenne. Depuis une dizaine d'années, lorsqu'ont débuté les débats sur la possibilité d'exploiter les vents méditerranéens, beaucoup de préjugés sont apparus sur l'impact potentiel négatif que cela pourrait avoir sur le tourisme. La réticence a d'autant plus augmenté lorsque le Languedoc Roussillon a été inclus dans le zonage de l'appel d'offre concernant la construction de 2 GW de parcs éoliens.

Il était donc pertinent de mener une enquête auprès des touristes du littoral pour évaluer comment l'installation de parcs éoliens, installés à des distances réalistes des côtés, pourrait affecter le tourisme balnéaire. Par ailleurs, il était également intéressant de proposer des stratégies que les stations balnéaires pourraient adopter pour augmenter le nombre de touristes et leurs profits, avec ou sans parc éolien. Pour répondre à ces questions, une enquête d'évaluation mobilisant la méthode des « choice experiment », a été réalisée durant l'été 2010, auprès de plus de 350 touristes, sur les plages languedociennes.

Les résultats de cette enquête, présentés au chapitre 3, montrent que les coûts liés à la nuisance visuelle s'annulent lorsque le parc éolien est installé à des distances comprises entre 8 et 12 km de la côte. L'enquête a également mis en évidence une forte demande pour la mise en place de démarches éco responsable (favorisant les produits locaux, le vélo, les transports publics et les économies d'eau et d'énergie) par les stations balnéaires. Ainsi, nos résultats montrent que la

nuisance vécue par l'installation d'un parc à 8 km de la cote serait compensée par la mise en place simultanée d'une « démarche verte ». Par ailleurs, la construction de récifs artificiels associé au parc éolien, qui permettrait l'accès à des loisirs récréatifs (plongée sous marine par ex.) génèrerait, d'après nos résultats, une augmentation des dépenses des touristes, si ce parc était installé à une distance d'au moins 5 km de la côte.

De nos résultats émergent deux principaux constats :
- L'implantation d'une éolienne à 12 km de la côte, sans aucune évolution de la station par ailleurs, n'aurait pas d'incidence négative sur le tourisme.
- Si la station balnéaire met simultanément en place des actions environnementales et des activités récréatives, le parc éolien peut alors être conçu à partir d'une distance de 5 km de la côte.

L'écart entre le Consentement à Payer pour un bien et le Consentement à Recevoir une compensation pour renoncer à ce même bien est un phénomène très largement mis en évidence en économie de l'environnement. Dans une seconde partie de la thèse, nous prenons en compte dans nos estimations économétriques cet écart entre les pertes et des gains dans la fonction d'utilité. En tenant compte de cette asymétrie, nous estimons une réduction de moitié de la nuisance vécue par rapport aux éoliennes si le parc éolien est déjà installé. D'un autre côté, les bénéfices liés aux activités récréatives et à une démarche éco responsable sont perçu comme plus élevés si ces activités étaient déjà mises en place.

La thèse démontre également la nécessite de prendre en compte des facteurs globaux influençant l'acceptation publique de ces parcs. Traditionnellement, le syndrome NIMBY[1], a été utilisé comme le composant explicatif principal pour expliquer la résistance aux futurs projets de parcs. Cependant, un grand nombre de facteurs influence directement les préjugés et donc la « perception visuelle » des parcs éoliens. D'une part, certains facteurs aggravent la nuisance vécue tels que les préoccupations relatives à l'efficacité énergétique des éoliennes, leur coût énergétique, leurs conséquences en terme de nuisance sonore, leur impact sur le paysage, la faune et la flore locales. D'autre part, des facteurs comme la préoccupation relative au

[1] Not in my back yard : Chez les autres d'accord, mais pas chez moi.

changement climatique associée et l'aversion pour les énergies fossiles et le nucléaire diminuent la nuisance vécue par rapport aux éoliennes. Les répondants qui ont un niveau d'études élevé ont également une nuisance vécue moins importante concernant la présence d'éoliennes.

Finalement, on remarque que le facteur le plus déterminant parmi les variables socio démographiques impactant sur la position favorable ou non pour la présence d'éoliennes est la nationalité : les ressortissants des pays du nord de l'Europe y sont plus favorables que les français. Cela nous alerte sur l'importance de l'impact des politiques énergétiques, des normes sociales et du lobbying sur les évaluations. En conclusion, les préférences pour l'emplacement des sites de production énergétiques sont profondément hétérogènes. Cette hétérogénéité peut être mise en évidence par le biais d'études d'évaluation économiques et ainsi apporter des réponses pertinentes pour la mise en place de politiques efficaces et durables.

Mot clés: Parcs éoliennes offshore, récifs artificiels, recreation, éco-responsable, Languedoc Roussillon, nuisances visuelles, evaluation économique, choice experiment, consentement à payer, Consentement à Recevoir (CAR), CAP-CAR assymétrie.

« La faculté n'entend donner aucune approbation ni improbation aux opinions émises dans cette thèse ; ces opinions doivent être considérées comme propres à leur auteur ».

Table of contents

Chapter 1:

Introduction and policy background

1.1 Introduction

21st Century problems demand 21st Century solutions. Attaining the international goal of limiting the long-term increase of global temperature to 2° Celsius requires rapid decarbonisation (IEA 2011). The European response to this challenge is articulated in the EU climate and energy package stamped by the European Parliament in December 2008. It covers all 27 Member States, and requires the EU to cut its greenhouse gas emissions by 20 %, to source 20 % of energy from renewable energy sources and a voluntary target increase energy efficiency by 20 % by 2020 (Euroactiv 2012). Wind power plays a major role in meeting the "20-20-20" deal. According to the European Wind Energy Association, a predicted 230 GW of installed wind power could avoid the emission of 342 Mt of CO_2 by 2020. These are domestic emissions reductions equivalent to 31% of the EU's 20% greenhouse gas reduction target for 2020 (EWEA 2011). By 2030, the idea is to expand to 140,000 MW. In other words, the equivalent of 140 one thousand MW conventional power stations (Hockenos 2012)

Attaining these goals however, is not unhindered. While onshore wind energy is to reach parity with fossil-fuel electricity by 2016 as economies of scale and supply chain efficiencies reduce costs[1] (Bloomberg 2011), offshore wind energy technology and industry – have not yet reached 'maturity'. Being at a different point on the technology deployment cost curve, the levelised cost of offshore wind energy[2] is EUR 89/MWh, compared to EUR 64/MWh, or onshore wind energy (EWEA Electricity cost calculator).

Nonetheless, financial support schemes, for offshore wind power have permitted the sector to take-off in Europe, and most recently in France. In May 2012 the French government awarded tenders to produce 2 GW of Energy, and a full second 4 GW round should be launched by next year (EWEA 2012a). But the absence of a stable legal framework, simplified legal procedures and access to capital, significantly hampers offshore wind farm development and innovation, in France as elsewhere (EWEA 2012a; EWEA 2012b). Sales of offshore wind turbines collapsed in the first half of 2012, a sign the power industry and its financiers are struggling to meet the ambitions of European leaders (Bloomberg 2012).

Another major hurdle facing the energy sector as a large today is public acceptance. In the words of Renssen (2011) "Hardly any energy project can succeed without public backing"…. "Policy makers and energy companies may have the grandest of plans, but a simple "no" from a local community can put

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[1] According to Bloomberg New Energy Finance team, some wind farms already produce power as economically as coal, gas and nuclear generators; the average wind farm will be fully competitive by 2016 (Bloomberg 2011).

[2] The cost of energy before any subsidies or support mechanism are applied.

all their efforts to naught". What is particularly noteworthy about wind energy debates is that either side claims to be greener than the other (the Economist 2010). For proponents, wind energy is viewed as an effort to tackle climate change and air pollution. For opponents, wind power developments are of nuisance to the seascape, noisescape and biodiversity. As Sovacool (2009) cleverly argues, the problem faced by renewable energy facilities is that the externalities are concentrated at one point 'the landscape', whereas, traditional fuels are distributed over the entire fuel circle from extraction, transport, combustion to emissions or waste disposal. In this light, it is not surprising that the perceived aesthetic fit of turbines in the landscape is one of the strongest determinants of attitudes to wind farm proposals (Groothius et al. 2008). Although there is no "technical fix" to handle landscape impacts (Bell et al. 2005), and hub heights and rotor diameters continue to take larger dimensions, questions as to how to foster greater acceptance does not stop at the level of the landscape.

Despite pushes to liberate European energy markets, choices over the composition of national energy portfolios are inherently political. What voters think is therefore an important determinant of the success (or failure) to alter the conventional energy mix. Public opinion is influenced by a large variety of factors, including active lobbying (see e.g. www.environnementdurable.net; *www.no-tiree-array.org.uk;* www.saveoursound.org). Lobbying efforts to deter or draw voters to any one energy producing technology, often target a large range of issues, such as efficiency of the technology compared to alternative technologies, health and safety issues, impacts on wildlife and landscapes, and so forth.

In this light, it is not surprisingly, preferences associated with wind farm installation derive from a constellation of multiple factors that stretch beyond NIMBY concerns. This has implications not only for energy planners, but also concretely how different population segments are affected by wind power developments. In the following we addresses the potential consequences of wind farm installation on the French Mediterranean Languedoc tourist industry, by investigating how different tourist segments are affected. We similarly aim to grasp the intricacies of differences in preferences for the installation of wind power, so as to encourage an understanding of the complete dynamic of the dispute and how public acceptance should intelligently be handled. Before presenting these studies we present the Languedoc case-study and the relevant theoretical background.

1.1 Tourism, offshore wind energy in the Languedoc Roussillon

The Languedoc Roussillon stretch from the Rhone delta to the Pyrenees Mountains. It is situated at the natural crossroads of the historic north-south route to Spain and the east-west route from the Atlantic to the Mediterranean. In the 1960s the Languedoc Roussillon region was mainly agricultural, dependent upon fishing and the production of wine. However it held another potential – with an annual average of seven hours' sunshine per day and 200 km of sandy beaches, and a hinterland of unspoilt and varied countryside and distinctive cultural and architectural monuments, an inter-ministerial mission for the conversion of the Languedoc Roussillon coastline was conceived (Klem, 1992). This resulted in the creation of more than a dozen coastal tourist resorts in the early 1960s (fig 1 chapter 3). The operation was accompanied by the drainage of lagoons and a vast mosquito removal program. With visitor numbers increasing from 30'000 in the 1960s to close to 15 million on an annual basis today, the Languedoc Roussillon is now the fourth most important tourist region in France, placed behind L'ile de France (Paris), Rhone Alpes and Cote d'Azur (Lecolle, 2008). One third of all the nights slept is occupied by international tourists, and constitute principally Germans, English and Dutch. The regional tourist industry accounts for 15 % of the regional GDP (70 % of this figure is generated on the coast) and thus constitutes the most important economic activity of the region (Lecolle, 2008). Tourism is furthermore a major pillar on which regional politicians rely for future employment and growth (Raynauld, 2010).

As argued in chapter 2, landscapes and seascapes are a central attribute in any tourist's destination choice. The above and underwater seascape however is of the public domain and characterised by an increasing number of diverse users, competing for scarce resources. Offshore wind power generation technologies figures amongst the newer users. Compared to land-based renewable sources, wind resources are stronger, less turbulent and more available at sea and are not subject to noise pollution. Not surprisingly, in the Languedoc Roussillon, the installation of offshore wind farms is perceived as a threat to the flow of Marine and coastal Cultural ecosystem services (Raynauld 2010). These services are defined as non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation and aesthetic experiences (UNEP 2006). Because the economics of offshore wind power in the near-shore is characterised by transmission, construction, and maintenance costs that rise with increasing distance from the shore (Krueger et al., 2011), installing offshore wind farms 'far-a-shore' is not an economically competitive or viable solution.

1.2 French Energy Policy

France has been entitled as Europe's most enthusiastic devotee of nuclear power (BBC world, 2009), with part of the French establishment is said to be very hostile to wind power (Agasse, 2010). The commitment to nuclear, which accounts for 75% of the country's energy mix, comes a long way of explaining why France boasts the second largest wind power potential in Europe, but has one of the smallest installed capacities (~6.5 GW) (GWEC 2011; EWEA 2012a). This is set to change - during the Grenelle forum II, France pledged to cover 23% of its final energy demand with renewable sources by 2020 (GWEC 2011). Achieving this target necessitates, amongst other things, the installation of some 6 GW from offshore wind power capacity. Consequently, in 2010 a commission was created to define "zones" judged suitable for the installation of offshore wind farms. Relevant stakeholder - ranging from the tourist industry, to representatives of fisheries, anglers, divers, and other sea-sport associations - were consulted to delineate zones where constraints were considered 'low to modest' (Actu-environnement 2010). The Mediterranean region of the Languedoc Roussillon, with its high wind speeds and its large and shallow continental shelf, was identified as one of ten suitable areas. In protest, Languedoc coastal Municipalities mobilised a response, voicing their opposition to the French government. They argued that offshore wind turbines would disfigure the landscape and destroy the allure of their coastal community resorts. Their protests carried fruit and the Languedoc Roussillon "zone" was withdrawn from the 2011 tender (Guipponi 2011; Government portal 2011). Till date, 2 GW of the 6 GW target have been awarded tenders for the building of wind farms in the French Atlantic (EWEA 2012a)

The Ph.D. thesis emerged in the midst of the debate over the appropriate zones with low to medium constraints. Given limited empirical evidence of post-construction effects of offshore wind farms on high-density 'sun and beach' tourist destinations, it was considered of pertinence to investigate how the potential installation of offshore wind farms would affect tourism in the Languedoc Roussillon. Consequently, in 2010, a full-scale state of the art choice experiment Survey was undertaken along coastal community resorts in the departments of l'Herault and Aude. The results from this study are presented in three articles, in chapter 3,4 and 5. The main result of the three articles and their contribution to the existing literature is briefly outlined in the following.

1.3 Thesis content - a briefing on main objectives and main findings

In the first paper, titled: "The case for offshore wind farms, artificial reefs and sustainable tourism in the French Mediterranean" investigate: How much compensation, if any, would induce a tourist to go on a vacation at a coastal destination that features a wind farm in the near view shed 5, 8 or 12 km offshore? Secondly, how might the installation of a wind farm affect the demographics of visitors, and would an offshore wind farm attract or repel the most desirable tourists (loyal visitors with high purchasing power)? And finally, can creating additional artificial reefs in proximity to the turbines foster eco-tourism opportunities such as observational boating and diving at or around artificial reefs and turbine foundations (Cabanis & Lourie, 2010)? Two principal policy recommendations results from this paper: First, everything else being equal, wind farms should be located no closer than 12 km from the shore. Second, and alternatively, a wind farm can be located from 5 km and outwards without a loss in tourism revenues if accompanied by a coherent environmental policy and wind farm associated recreational activities[3]. We furthermore demonstrate the incidence that offshore wind farms may have on different population or tourist segments.

Chapter 4 presents the article titled "The multi-faceted nature of preferences for offshore wind farm siting". The paper develops a conceptual framework for examining the determinants of tourist preferences over the position of offshore wind farms at different distances from the shore in the Mediterranean Sea. The point of departure is the emerging consensus that NIMBYism is a deficient explanation for widespread resistance to the installation of wind power facilities. The paper addresses this deficiency through the conceptual framework, which informs a principal component analysis (PCA). The PCA retrieves general attitudinal themes, which act as covariates in a choice model. The choice model demonstrates the respective role of respondents' opinions on energy policy, perceived urgency of tackling climate change, NIMBY objections, nationality and education in explaining preferences for the siting of offshore wind farms. As such, the underlying framework demonstrates that if local opposition to wind farm siting is to be intelligently tackled, it must address not only the visual impact of wind farms, but similarly deeper concerns related to the observers preconceptions about the effectiveness of wind energy and climate change.

[3] Offshore wind farms act as no-take zones for fish (Punt et al. 2009), the eco-design of wind turbine foundations or the installation of artificial reefs around turbine foundations, serve to create fish habitat and hereby permit to boost tourism and leisure activities, such as diving, angling and observational boating (LaCroix and Pioch 2011).

In chapter 5, titled 'valuing coastal community resort seascape and land-use changes with explicit consideration of loss aversion and increasing price sensitivity' we append to the existing body of evidence, which demonstrates a consistent discrepancy between a person's willingness to pay (WTP) for a good and his willingness to accept (WTA) compensation to forgo the same good (Horowitz and McConnell 2002). In particular, we investigate whether gain-loss asymmetry is prevalent with regard to tourist preferences for the siting of offshore wind farms; recreational activities and eco-efficiency[4]. This is a logical extension to chapter 3 (Westerberg et al., 2013), which shows how coastal community resorts may be affected by these changes, assuming that the WTA/WTP ratio is equal to one. When the WTA / WTP ratio is different from one, the welfare economic consequences of the invigoration of any policy attribute will differ depending on the tourist's perceived 'reference point'. With the payment attribute specified in both gain (WTA) and loss (WTP) domains, chapter 5, find that the disutility associated with an increase in the weekly accommodation rental price is in terms of absolute value, 100% higher than the utility associated with a decrease of the same amount. This implies that the actual welfare impacts from wind farm installation and other land use changes, will depend on whether they have been invigorated or not, and whether we consider that the target population have a property right to the present situation (ex-ante) or the future (ex-post) situation. We show to what extent the welfare estimates differ in the two cases, but argue that correcting for WTP-WTA discrepancies is not an imperative when the implied 'property right' to the landscape and land-use changes is ambiguous.

The above three papers, are novel contributions to the existing literature on the welfare economic consequences of offshore wind farms. The first paper, is the first of its kind, to study the impact of offshore wind farms on tourism in popular 'sun and sand' community resorts in Europe, and how such impacts may be compensated for by other undertakings at community resorts. By providing an analysis of how different tourist segment are impacted by wind farms, the paper provides valuable information to the tourist industry. The wealth of coastal community resorts do not only depend on the 'number of nights slept' or 'number of beds occupied', but equally or more important, on the purchasing power and characteristics of the visiting tourists. Our results may help tourist communities adapt an appropriate response to potential future changes to the seascape. To the author's awareness, the paper is also the first of its kind to value the presence of wind farms in association with complementary undertakings at the resort community, notably eco-efficiency and wind farm associated recreational activities. By showing that the presence of wind farm associated recreational activities can contribute significantly to compensating visual disamenities, the survey presented provides an excellent demonstration of how 'multi-functional' of offshore projects may help lessen user-conflicts and facilitate the realisation of project in the public domain where many competing uses are present.

As the title suggests, 'the multi-faceted nature of preferences for offshore wind farm siting' (chapter 4) investigates the issue of offshore wind farm installation from another angle, namely that of seeking to uncover the true cause of opposition to or embracement of, wind farms. While earlier wind farm

[4] Eco-efficiency is a management strategy of doing more with less. Eco-efficiency is achieved through the pursuit of: Increasing product or service value, optimizing the use of resources and reducing environmental impact (WBCSD 1992).

valuation studies have explained preference heterogeneity with respect to socio-demographic characteristics of the respondents, the paper presented in chapter 4, considers a broader set of drivers (notably concern about climate change, cost and efficiency of renewable energy, concern about substitute energy producing facilities) and their respective weight in determining preferences for the siting of offshore wind farms. By employing a principal component analysis that permits to uncover latent preference constructs in principal components, concerns about endogeneity are overcome.

Finally, in chapter 5, we demonstrate the relevance of explicitly accounting for gain-loss asymmetry, when utility decreasing and utility increasing attributes are used simultaneously. By estimating a reference dependent piecewise-linear utility function, we show that the 'reference state' employed by the respondent is a source of latent heterogeneity, driving a wedge between welfare estimates generated in a 'symmetric' linear utility function and that of the 'asymmetric' piecewise-linear utility function. The chapter consequently calls for future research into the 'reference states' that respondents apply when valuing policy changes. Moreover, the chapter also explores how different respondent characteristics may help explain observed gain-loss asymmetries. To date, the influence of socio-demographic characteristics on WTP-WTA discrepancies in valuation studies has been little studied. Furthermore the number of published choice experiment valuation studies that simultaneously employ utility increasing and utility-decreasing attributes is not substantial (Hess et al. 2008, Hess 2008, Masiero and Hensher 2010, Lanz et al., 2009; Bateman 2009; Strathopoulos and Hess 2011). In these two respects, chapter 5 is a novel contribution to the existing literature on choice modelling.

The next chapter provides a brief introduction to a few fundamental concepts in neoclassical welfare economics, the econometric models that may be used to estimate welfare benefits, and why it is important to consider preference heterogeneity with specific attention to the installation of offshore wind farms. The core chapters of the thesis, 3,4 and 5, are presented as articles. Aside from the core results and discussion themes mentioned above, the three articles cover theoretical aspects that are outside the scope of the two introductory chapters. More particularly, chapter 3 provides information about how the valuation survey was constructed, in particular - the experimental design underlying the choice sets, its content, layout and the sampling strategy undertaken. Chapter 4 explains the theory underlying principal component analysis. Chapter 5 offers an explanation of the rationale behind WTP-WTA asymmetries beyond that which may be explained through standard Hicksian theory. Chapter 6 concludes upon the main findings from the three articles.

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Chapter 2:

Economic Valuation of the Environment

In this chapter we introduce the notion of the public good and the externalities that result from supplying it. This background serve to highlight the pertinence of using welfare economic valuation to investigate the impact of offshore wind farm installation, artificial reef recreation and eco-efficiency on coastal tourism in the Languedoc Roussillon. This analysis is informed by an insight into welfare economic theory, different valuation methods, the econometric models used in this thesis to model choice behaviour, the econometric models employed in subsequent chapters, and a consideration of the importance of accounting for preference heterogeneity.

2.1 Public goods and their implication for policy and valuation

Land use concerns the function or purpose for which the land is used and can be defined as "the human activities which are directly related to land, making use of its resources or having an impact on them" (FAO 1995: 21). Land use affects landscapes, and landscapes are of fundamental importance to human welfare. This is reflected in the preference that people have for living in aesthetically pleasing environments, and the associated higher real estate prices (Costanza et al. 1997). As highlighted above, the landscape or the seascape also constitutes a resource favourable to economic activity, namely tourism.

However, with the free and unlimited access to beaches and coastal promenades, the seascape qualifies as a pure public good, making it both non-rival and non-excludable. Other seascape uses, such as fishing, or fisheries, are non-exclusive, but rival. You cannot exclude someone from taking up a fishing rod and throwing the line. However, once you caught that fish, you have effectively eliminated the possibility that someone else catches the same fish. Fishing can thus be characterised as a common pool good or resource (Ostrom 2010). Supposing now that a wind farm is associated with recreational activities through the installation of artificial reefs or eco-design of turbine foundations (LaCroix et Pioch, 2011) one may well restrict access, although the underwater seascape will (up to a certain extent) not be impacted by the number of recreational divers or observational boats that visit the park. Exclusion and non-rival consumption characterises club goods. These three scenarios contrast with that of the private good, whereby two households cannot jointly consume the same good. An example may be a holiday accommodation. The "good" classification is illustrated in figure 3.2.

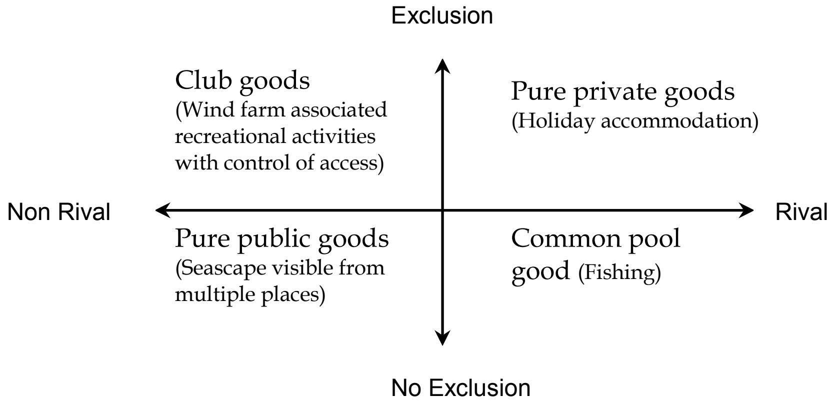

Figure 1: A taxonomy of goods for at a coastal community resort
Source: Adapated from Ostrom 2010 (p.645) and modified.

Economic valuation provides the means for measuring and comparing benefits and costs of a certain land use configuration. However, the public good character of the seascape implies that we cannot observe the value of the visual component of wind farms in markets. Thus, we to retrieve tourist preferences, either by revealed method or stated preference methods. In revealed preference methods, WTP is derived on the basis of actual behaviour reflecting utility maximisation in market transactions. In stated preference methods the individual is confronted with a hypothetical market that permit elicitation of demand. These methods are adept when we are attempting to value something (ex-ante) that has not yet been constructed or when non-use values are prevailing.

The distinction between revealed preference and stated preference valuation methods, and the main valuation methods under each heading is illustrated in figure 1. Alternatives to preference based valuation methods are price and cost methods. These will not be commented on, as it is the tourists' preference for offshore wind farm installation that we wish to uncover.

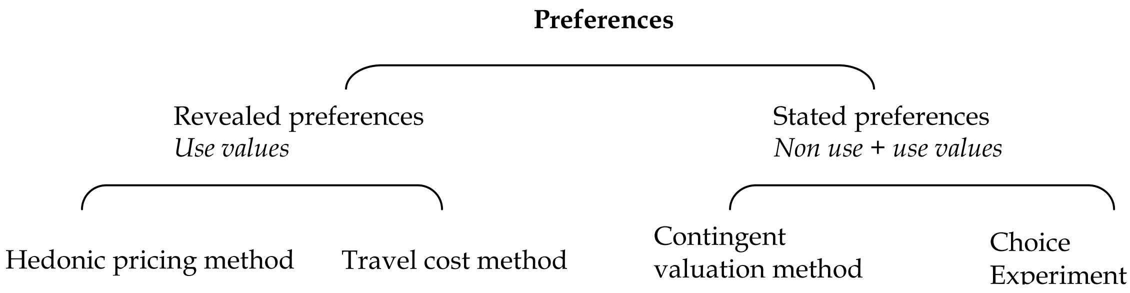

Figure 1, classification of valuation methods (Garrod and Willis 1999*)*

2.2 The welfare economic foundations for economic valuation.

Economic valuation has its roots in neoclassical welfare economics. Its main objective is to indicate the overall economic efficiency of various competing policy outcomes, such that resources are allocated to achieve Pareto optimality. According to the first theorem of welfare economics, if all individuals and firms are selfish price takers, then a competitive equilibrium is Pareto optimal. This is not feasible in many cases, causing a more common rationale for distinguishing between alternative states of the economy according to the Second fundamental theorem of welfare economics). The Second Fundamental Theorem asserts that almost any Pareto optimal equilibrium can be supported via the competitive mechanism, provided appropriate lump-sum taxes and transfers are imposed on individuals and firms. The rationale for distinguishing between alternative states of the economy is the Kaldor-Hicks criterion. If the magnitude of the gains from moving from one state of the economy to another is greater than the magnitude of the losses, then social welfare is increased by making the move even if no actual compensation is made. When no compensation is made, it is a Potential Pareto Improvement (Gowdy 2004). The PPI is "the fundamental foundation–the normative justification–for employing benefit-costs analysis, that is, for searching for policies that maximize the positive differences between benefits and costs (Stavins et al., 2003:340)." As such, the problems of fairness and interpersonal welfare distribution are avoided by assuming that equity considerations are handled separately from the policy being evaluated (Varian 2002).

According to the premises of welfare economic theory, individuals are considered the best judges of their welfare (Varian 2002). On this ground, the hallmark of welfare economics is that policies are assessed exclusively in terms of their effects on the well-being of individuals. This implies that interferences about individuals' welfare can be drawn by observation the individuals choices amount alternative bundles of goods and services (Freeman 1993). Moreover, there is no absolute measure of value there are only equivalences of value between one thing and another. This implies that the measure of any benefit is that cost which would exactly offset it by the individual who benefits (Bateman et al., 2002). The value or the utility that individuals derive from goods and services are reflected in people's willingness to pay to attain them, or their willingness to accept (WTA) compensation to forego them as explained in further depth below.

2.3 Welfare measures

Given a certain change in the price or the quality of a good, the resulting welfare change is defined as the income adjustment necessary to maintain a constant level of utility before and after the change of provision (Bateman 1994). In general, the welfare measure can be distinguished between a variation and a surplus account. If changes are continuous, the consumer (or tourist) may choose the level of good provision that allows him to optimise his bundle such that the marginal rate of substitution is equal to the marginal price ratio between the goods). In this situation the *variation* measure is used. When an individual is restricted to freely alter his bundle of vacation attributes, and a move is associated with some transaction costs, the *surplus* measure should be used (Freeman 1993). Take for example the case of a coastal community resort, which is made up of multiple characteristics (e.g. residences, services, landscapes). Each of these characteristics has an impact on the accommodation price at a given resort, and enter in quantities difficult to change at will. The buyer will therefore find it difficult to equalize his marginal willingness to pay for lodging in the resort, with its implicit price.

For any policy change that results in an improvement in quality, the compensating surplus (CS) equals the maximum amount of money that an individual could give up (must be given) after an increase (decrease) in utility by the land-use changes without being worse off than without the change. In terms of the indirect utility function, the CS is the solution to:

$$WTP(q^0,q^1) = V(p,q^1,B - WTP) - V(p,q^0,B) \quad (1)$$

Where V is the indirect utility function that expresses the utility level given a certain income and prices(p) of goods, and B is the individuals budget constraint. However, the valuation scenarios presented in this thesis also apply to potentially utility decreasing policies. Furthermore, it may be disputed, whether the tourist's have property rights to the status quo or the policy change. If the tourists have a right to the status quo, the compensating surplus (CS) is used. When the tourist has right to a change, the Equivalent surplus (ES) welfare measure must be used. Figure 2a and 2b are used to illustrate the two welfare measures, under the two different property rights regimes. The indifference curves (U) link combinations of private good and public good consumption, between which the individual is indifferent. The example of a pure public good, whereby the budget line is horizontal is used to illustrate the surplus welfare measures. Consulting figure 1a, it can be that, for a proposed welfare gain the CS corresponds to the payment that the individual would be willing to give up (WTP) to ensure that the change occurs, while the ES measure tells us how much the individual would need to be compensated (WTA) for him attain the final improved quality level in the absence of the provision change occurring. As illustrated in figure 1b, for a proposed welfare loss (i.e. the installation of a wind farm in the near view shed) the ES corresponds to how much an individual is WTP to prevent the welfare loss occurring, while the CS shows us individuals' WTA compensation for allowing the welfare loss to occur. The welfare measures are summarised in table 1.

Welfare measure	Price rise or quality decline	Price fall or quality rise
ES : Right to change	WTP to avoid	WTA compensation to avoid
CS : Right to status quo	WTA compensation to accept	WTP to obtain

Table 1: Welfare measures

In summary, the ES measure is used when it is considered that the individual has the right to change, while the CS departs from the consideration that the individual does not have the right to a change. As shown in chapter 4, the distinction between the right to a change (equivalent surplus) versus right to status quo (compensating surplus), is particularly relevant in the presence of WTP-WTA asymmetries whereby the estimated welfare consequences of any policy will differ according to whether it has been implemented (ex-post) or not (ex-ante).

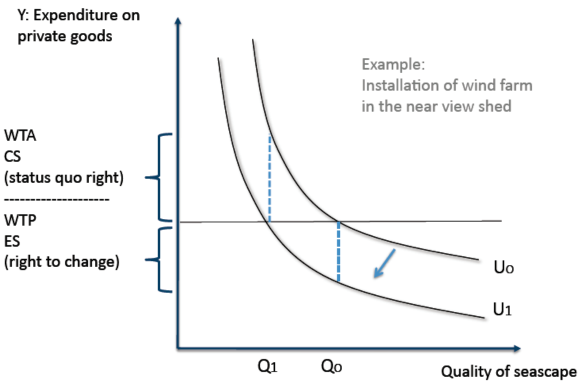

Figure 2a: Welfare measure in the case of a decrease in environmental quality (Adopted from Bateman 1994 and modified)

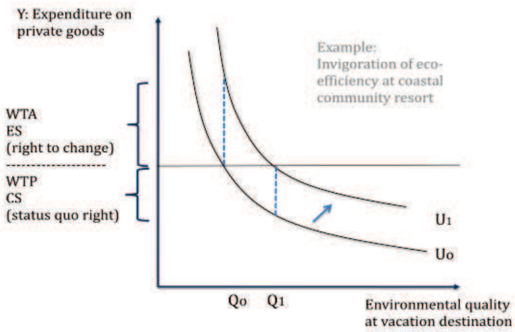

Figure 2b: Welfare measure in the case of an increase in environmental quality (Adopted from Bateman 1994 and modified)

2.4 The Choice Experiment

In the context of valuing potential changes in the land use and seascape configuration of coastal community resorts in the Languedoc Roussillon, it was chosen to use the choice experiment (CE) as a valuation method. In CEs, a number of respondents are asked in a questionnaire to select their preferred destination alternative from a range of potential management alternatives, usually including a status quo alternative. Discrete choices are described in a utility maximising framework and are determined by the utility that is derived from the attributes of a particular good or situation. It is thus based on the behavioural framework of random utility theory (Manski, 1977) and Lancaster's theory of demand (Lancaster, 1966). Unlike Contingent Valuation, which focuses on precise scenarios, the CE can be used to estimate the individual attributes of the coastal community, their internal ranking, and any coastal community management scenario (defined by the different possible attribute combinations) (Louviere et al., 2000). We may thus answer questions such as how much more are tourists willing to pay for a coherent environmental policy relative to wind farm associated recreational activities, or how much are enhanced recreational facilities valued relative to the disamenities associated with wind farm installation?

2.5 CE econometric models

2.5.1 The Conditional Logit Model

To illustrate the basic model behind the CE, consider a tourist, who is choosing a community resort among a set of alternative community resort destinations. For any tourist **i**, a given level of utility is associated with a coastal community resort, **j** can be written:

$$U_{ij} = V(Z_{ij}, S_i) + e_{ij} \qquad (2)$$

Where V_{ij} is a function of the attributes (Z) of the destination alternatives x_{ij}, (does it have an offshore wind farm in the viewshed or is it eco-efficient). As will be shown at length in chapter 3 and 4, utility also depends on the socio-demographic and attitudinal characteristics (**S**) of the respondent. This assertion is manifested in the recognition that the values ascribed to landscapes are inseparable from the institutions and culture from which we come (Claval, 2005). The observable component of utiliy is assumed to be a linear function:

$$V_{ij} = ASC + \beta_k x_{ki} \qquad (3)$$

Where β_k denotes a vector of preference parameters associated with attribute k, x_{ki}, a vector of attributes of alternative j, and ASC denotes an alternative specific constant. The error term in eq (1) implies that predictions cannot be made with certainty. Choices made between alternatives will be a function of the probability that the utility associated with a particular option (**j**) is higher than that associated with other alternatives. Assuming that the error terms are identically and independently distributed with a Weibull distribution, the probability of any particular alternative j being chosen can be expressed in terms of a logistic distribution. Eq. (1) can be estimated with a conditional logit model (CLM) (Greene, 1997: 913–914), which takes the general form:

$$P_{ij} = \frac{e^{V_{ij}}}{\sum_{h \in C} e^{V_{ih}}} \qquad (4)$$

Where the scale parameter is normalized to 1 and omitted while the error term is left out for simplicity. The CL model imposes several restrictive assumptions in that it does not allow for random taste variation, and correlation in unobserved utility over alternatives. Under these circumstances the independence of irrelevant alternatives property is violated (Train 2003) – a property that must hold to estimate the CLM efficiently. In the following we present the latent class model and the random parameter error component model, which have been employed in chapter 3 and 5 to avoid some of these restrictions.

2.5.2 The Latent class model

The conditional logit model assumes homogeneous preferences across respondents, though preferences are in fact normally heterogeneous. Accounting for heterogeneity enables estimation of unbiased estimates of individual preferences, enhancing the accuracy and reliability of estimates of demand, participation, marginal and total welfare (Greene, 1997). The latent class model belongs to a family of models that permit to take into account unobserved heterogeneity. The latent class model is employed in chapter 3, so as to help inform decision makers about who will be affected how by potential landscape and land-use scenarios along coastal community resorts. The approach depicts a population that consists of a finite and identifiable number of segments, or groups of individuals. The groups are created endogenously so as to minimise noise. Thus preferences are relatively homogeneous within segments but differ substantially from one segment to another. Belonging to a specific segment is probabilistic, and may depend on the social, economic, and demographic characteristics of the respondents, as well as their perceptions and attitudes. Respondent characteristics affect choices indirectly through their impact on segment membership. The optimal number of segments is determined using information criteria (AIC, BIC, etc.)

Formally, in the LCM employed in chapter three, the utility that the tourist **i,** who belongs to a particular segment **s**, derives from choosing destination alternative **j** can be written as:

$$U_{ij/s} = \beta_s X_{ij} + e_{ij/s} \qquad (5)$$

where X_{ij} is a vector of attributes associated with destination alternative j and tourist i, and βs is a segment-specific vector of taste parameters. Assuming that the error terms are identically and independently distributed and follow a Gumbel distribution, the probabilistic response function is given by:

$$P_{ij/s} = \frac{\exp(\beta_s X_{ij})}{\sum_{h=1}^{C} \exp(\beta_s X_{ik})} \qquad (6)$$

Consider a segment membership likelihood function M* that classifies the tourist into one of the S finite number of latent segments with some probability Pis. The membership likelihood function for tourist i and segment s is given by:

$$M^*_{is} = \lambda_s Z_i + \xi_{is} \qquad (7)$$

where Z represents the observed characteristics of the tourist, such as his social, economic, and demographic characteristics, and his perceptions and attitudes associated with the policies proposed. Assuming the error terms in the tourist membership likelihood function are independently identically distributed across tourists and segments, and follow a Gumbel distribution, the probability that tourist i belongs to segment s can be expressed as:

$$P_{is} = \frac{\exp(\lambda_s Z_i)}{\sum_{k=1}^{S} (\lambda_s Z_i)} \qquad (8)$$

P_{is} sums to one across the S latent segments and λ_k (k=1,2,...S) are the segment-specific parameters to be estimated. These denote the contribution of the various tourist characteristics to the probability of segment membership. A positive (negative) and significant λ_k implies that the associated tourist characteristic, Z_i, increases the probability that tourist i belongs to segment s. In order to derive a model that simultaneously accounts for the tourist's destination choice and segment membership, (2) and (3) is brought together. The joint probability that individual i belongs to segment s and chooses destination alternative j is given by:

$$P_{ijs} = (P_{ij/s}) * (P_{is}) = [\frac{\exp(\lambda_s Z_i)}{\sum_{k=1}^{S} (\lambda_s Z_i)}] * [\frac{\exp(\beta_s X_{ij})}{\sum_{h=1}^{C} \exp(\beta_s X_{ik})}] \qquad (9)$$

The latent class model is applied in chapter 3 to help indicate to affected stakeholder (the tourist industry in particular) how different tourist segments are affected wind farms, artificial reefs and eco-efficiency. Information on who will be affected by a policy change and the aggregate economic value associated with such changes is necessary for making efficient and equitable policies (Boxall and Adamowicz, 2002).

2.5.3 The random parameter error component logit model

Unobserved preference heterogeneity may also be explicitly accounted for in the Random Parameter Logit Model. In that case, the utility of alternative j may be formulated as:

$$U_{ij} = \beta_i' X_{ij} + \varepsilon_{ij} = b' X_j + \eta_i X_j + \varepsilon_{ij} \qquad (10)$$

where X_{ij} is a vector of observed variables, β′ is a vector of tastes which may be expressed as the population mean (b) and the individual specific deviation from that mean η. η can take on a number of distributional forms such as normal, lognormal, and triangular. The characteristics of the individuals are left out for simplicity. In order to capture the repeated choice nature of the data the RPL accommodates a panel data structure, and thus takes into account the potential corrélation between choice observations at the respondent-specific level.

An Alternative Specific Constant (ASC) is specified for the status quo alternative in order to capture the systematic component of a potential status quo effect. By furthermore incorporating an error component in the model - implemented as an individual-specific zero-mean normally distributed random parameter - any remaining status quo effects in the stochastic part of utility is captured. The error component, *σi*, is assigned exclusively to the two non-status quo alternatives, inducing a correlation pattern in utility over these alternatives. This way, it captures any additional unexplained variance associated with the cognitive effort of evaluating two experimentally designed hypothetical scenarios relative to a status quo scenario. In the context of a tourist i, facing a choice between a status quo and two future destination management alternatives, the utility, U, of these j alternatives can be described in the following way:

$$U_{i1} = \beta_i' X_{i1} + \sigma i + \varepsilon_{i1}$$
$$U_{i2} = \beta_i' X_{i2} + \sigma i + \varepsilon_{i2}$$
$$U_{SQ} = \beta_i' X_{ij} + \varepsilon_{SQ} \qquad (11)$$

For a more thorough and in-depth treatment of the RPL and the RPECL the interested reader is referred to Train (2003), Greene and Hensher 2007; Scarpa *et al.* 2007; Ferrini and Scarpa 2007). Assuming that the error term, ε is Gumbel distributed, the probability of individual i choosing alternative j can be written:

$$P_{ij} = \left(\frac{e^{V'_{ij}+\sigma_{ij}}}{\sum_{h \in C} e^{V'_{ih}+\sigma_{ih}}}\right)\phi(\beta|b,W)\,d\beta \qquad (12)$$

Where $\phi(\beta|b,W)\,d\beta$ is the normal density with mean b and covariance W. This probability can be described as an integral of the CL function evaluated at different values of β with the density function as a mixing distribution (Train 2003).

Having presented a few econometric models that may be used to estimate welfare consequences of potential changes in Languedoc land use and seascapes, the following section will provide a discussion of the pragmatic basis for analysing tourist preferences and preference heterogeneity.

2.6 Preferences and welfare estimates

In conducting welfare economic valuation surveys, it is not only the aggregate economic welfare estimates that are of interest. Understanding *who* is affected *how* by a set of land use changes may help design efficient and equitable policies (Boxall and Adamowicz, 2002), and respond strategically to whichever policies that are put in place. Similarly, we would like to know something about why people 'prefer' one state over the other. Understanding why people are differently affected by a given policy can bring important insights into the processes that underlie our values and how we experience our surroundings. The factors influencing preference elicitation and the processes behind them are recurrent themes in chapter 3,4 and 5.

The strong focus throughout this thesis, on the determinants of respondent preferences is related to the highly politicized question of supplying energy. As such, the visual nuisances that result from the installation of an offshore wind farm may be explained as the joint outcome of a vector of aesthetic and non-aesthetic concerns. In particular, following Stephenson (2008) we make the case that landscape significance can be clustered around: 1, the physical and tangible aspects of a landscape; 2, the activities associated with the landscape and; 3, the meanings generated between people and their surroundings. According to this distinction, an individuals appreciation of a wind farm in a certain landscape or seascape configuration, is related to, (1) what may be at stake for the individual in regard to the wind turbine/farm, (2/3) awareness of the formal qualities of the observed wind turbines and (3) factors related to the observer, such as social and cultural experience, habits and belief systems, traditions of behavior and judgment and styles of living (Gee and Burkhard 2010).

I have attempted to illustrate the 'multiple composite' of preferences for the siting of a wind farm in figure 2. This framework emerged in the early stages of the thesis through internet browsing of different interest groups, semi-structured interviews, focus groups and the peer-reviewed literature. According to this framework, any tourist's preference for or attitude toward the installation of an offshore wind farm in proximity to where he lodges may be explained by:

- The tourist's stake in regard to the employment of this technology, in particular how much time he spend on the beach versus other activities during his holiday.
- His circumstance, for example his age, education, nationality, income level and previous experience with wind turbines.
- His expectation about the effectiveness or costliness of the wind energy versus other alternative sources.
- His esteem or aversion to substitute conventional energy producing facilities.
- And finally his environmental consciousness, in particular whether he is concerned about climate change (and see wind farms as a potential response to climate change) or the impact of wind farms on landscape, noisescape, fauna and flora.

We also stipulate that the individual factors within each category may be correlated. For example, if the respondent is used to seeing wind turbines daily he may perceive their visual intrusion differently to the 'un-experienced'. His experience will feed directly into "what is at stake for him during his holiday". Similarly, a Northern European respondent is exposed to a different energy policy than his French counterpart. He is therefore likely to have another opinion on the effectiveness of renewable energies compared to conventional fuels. And finally, a French respondent's motivation for visiting a particular coastal community resort may be linked to the fact that he has family in the area. He may for this reason have a certain attachment to or stake in that resort community. The paper presented in chapter 3 is concerned with the tourist's 'stake' and 'circumstance'. That is, we consider 'who' - in terms of objectively defined characteristics - are influenced 'how' by wind farm installation and other activities at the coastal community resort. Considering the problem of wind farm installation from a different angle, chapter 4 explores 'why' preferences for wind farm installation differ among respondents. It therefore focuses on 'effectiveness of wind power, aversion to traditional fuels, environmental consciousness and socio-demographic circumstance' as drivers of respondent preferences for wind farm siting. Finally, chapter 5 shows that the socio-demographic circumstances of the tourists have a direct bearing on reference points, endowment effects, and consequent magnitudes of elicited gain-loss asymmetry. The paper therefore demonstrates, that the discrepancy between pre and post-construction welfare estimates depend on the nationality and income of the tourist, and whether he is used to seeing turbines daily (has experience with them).

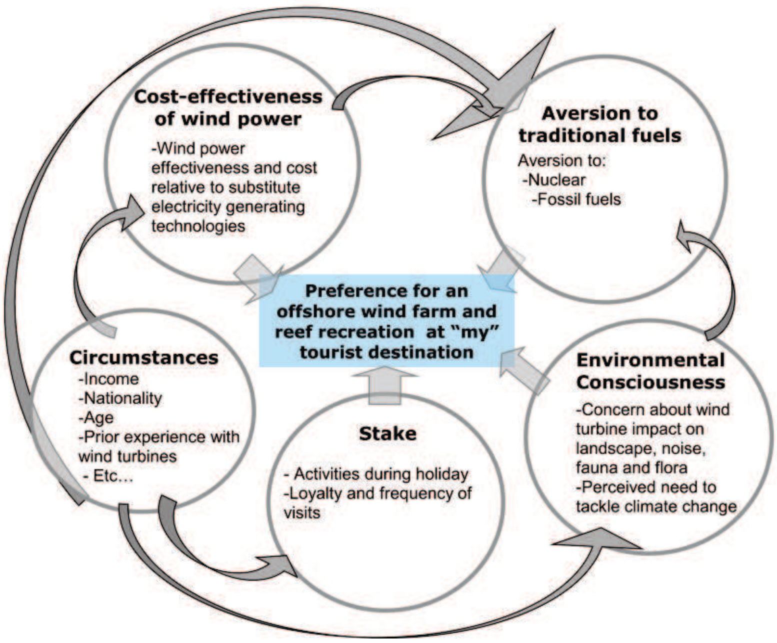

Figure 2: Determinants of tourist preferences with regard to the installation of offshore wind farms

This chapter has provided an insight into the theories guiding the upcoming three chapters. It has considered the theoretical basis for valuing policy changes on the basis of using individual preferences, the relevant welfare measures for valuing changes and a brief insight into the different existing valuation methods. A justification for choosing the Choice Experiment as valuation method is provided, along with an insight into the choice models employed in the following chapters. Finally, it has been demonstrated that a thorough consideration of the attitudinal and socio-demographic factors that drive preference heterogeneity is of fundament importance to analysing, who is affected how by a set of policy changes and why they are affected the way they are. Such insights may help planners and stakeholders to respectively design effective policies and respond strategically to policy changes.

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Chapter 3:

The case for offshore wind farms, artificial reefs and sustainable tourism in the French Mediterranean*

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Abstract

As the French government strives to achieve their offshore renewable energy target, the impact of offshore wind farms on coastal tourism in the Languedoc Roussillon is now being questioned. To assess this issue, a choice experiment was undertaken to elicit tourist preferences for wind turbines at different distances from the shore. We also examined whether potential visual nuisances may be compensated by wind farm associated reef-recreation or by adopting a coherent environmental policy. The findings indicate that age, nationality, vacation activities and their destination loyalty influence attitudes towards compensatory policies. Two policy recommendations are suggested. First, everything else being equal, wind farms should be located no closer than 12 km from the shore. Second, and alternatively, a wind farm can be located from 5 km and outwards without a loss in tourism revenues if accompanied by a coherent environmental policy and wind farm associated recreational activities.

Résumé:

Alors que le gouvernement français a des objectifs de développement de l'énergie éolienne en mer, l'impact de cette source d'énergie sur le tourisme côtier en Languedoc-Roussillon est posé. L'étude par expérimentation des choix proposée ici a été réalisée afin d'éliciter les préférences des touristes concernant la distance à la côte à laquelle les turbines éoliennes doivent être placées pour limiter les impacts. Il a aussi été examiné si les potentielles nuisances visuelles pourraient être compensées par des attractions touristiques au niveau des récifs ou par l'adoption de politiques environnementales cohérentes. Cette étude indique que l'âge, la nationalité, les activités touristiques et leurs lieux de villégiature influencent la préférence pour les mesures compensatrices. De plus, deux recommandations politiques sont proposées. Tout d'abord, toutes choses égales par ailleurs, les éoliennes ne doivent pas être posées à moins de 12 km de la côte. Ensuite, les éoliennes peuvent être placées à 5 km ou plus sans perte de revenus touristiques à la condition qu'une politique environnementale cohérente soit mise en œuvre et que des attractivités touristiques autour des éoliennes soient proposées.

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1. Introduction

The French government launched a national invitation to tender for the construction of offshore wind turbines in 2011. The Mediterranean region of the Languedoc Roussillon, with its high wind speeds and relatively gentle sea-floor[5] descent, was identified as one of ten suitable areas. Coastal municipalities mobilised in response, voicing their opposition to the French government. They argued that offshore wind turbines would disfigure the landscape and destroy the allure of their coastal community resorts. These protests were heard and the proposition for the construction of offshore wind farms in Languedoc Roussillon was withdrawn from the 2011 tender (Guipponi, 2011; Government portal, 2011). There are no studies to either confirm or rebut the fears of the roaring tourism industry, and it would be pertinent for policy makers, the tourist industry and wind farm developers alike to be informed about the economic implications of offshore wind farms for the tourist industry in the French Mediterranean. To investigate this issue, we conducted a choice experiment valuation survey with tourists on the coast of Languedoc Roussillon and assessed their willingness to pay / willingness to accept compensation for wind turbines placed at different distances from the shore.

France boasts the second largest wind power potential in Europe after the United Kingdom, but its installed capacity is amongst the smallest in Europe (EWEA, 2010). By 2020, the French government aims to cover 23% of final energy demand from renewable sources, in order to meet its obligation under the EU Climate and Energy package and the Grenelle Forum6 (Enerzine, 2011; GWEC, 2011). This translates into the installation of 25 GW of wind power, including 6 GW offshore. However, with only 1 GW of additional wind power capacity being installed each year since 2007, the current pace of installations would need to double for France to meet its target (Nadai & Labussière, 2009). France's delay in expanding this capacity has been explained by an institutional lock-in into nuclear energy, with part of the French establishment apparently being very hostile to wind power (Agasse, 2010; Nadai & Labussière 2009). Specifically regarding offshore wind farms, the French environmental ministry has attributed the delay to the depth of the sea floor, which is much greater in the Atlantic Ocean and the Mediterranean Sea than in the North Sea. Consequently, wind farms have to be located closer to the coast and are hence more prone to coming into conflict with the fishing industry and tourism (Agasse, 2010). Indeed in Languedoc Roussillon, recent opposition by local politicians to wind farm installations were principally grounded on concerns over the potential impact on tourism (Conseil Municipal Portiragnes, 2010).

The Languedoc Roussillon (LR) stretches from the Rhone delta to the Pyrenees (Fig 1), and benefits from an annual average of seven hours sunshine per day, 200 km of sandy beaches, a hinterland of unspoilt and varied countryside, and distinctive cultural and architectural monuments (Klem, 1992). It is hardly surprising therefore that the 1960s witnessed the construction of major tourist resorts in the

[5] With average wind-speeds around 9,9 – 10,1 m/s and water depths between 20 and 30 meters within 3,5 and 10 km from the coast, the Languedoc has great potential for near shore wind power development (4Coffshore.com)
[6] The Grenelle de l'environnement was started in 2007 as an open multi-party National consultation process that brought together representatives of national and local government and organizations (industry, labour, professional associations, non-governmental organizations) on an equal footing, with the aim defining the key points of public policy to achieve sustainable development.

Languedoc Roussillon (such as La Grande-Motte, Le Cap d'Agde, Gruissan, and Port Barcarès). With annual visitor numbers increasing from 30,000 in the 1960s to close to 15 million today, the Languedoc Roussillon is now the fourth most important tourist region in France (Klem, 1992; Lecolle, 2008). International tourists account for one third of all the nights slept in LR, principally composed of Germans, English and Dutch visitors. The tourist industry accounts for 15% of the regional GDP and thus constitutes the single most important economic activity of the region (Lecolle, 2008). Regional politicians also rely on tourism as a major pillar for generating future employment and growth (Raynauld, 2010). Today, the coastal Languedoc Roussillon is characterised by the spatial concentration of tourist community resorts, leaving long stretches of kilometre wide 'untouched' fine sand beaches. On the whole, the coastal resorts remain rather family oriented, with camping sites accounting for 65% of the total "overnight" capacity, in contrast to 10% for hotels (INSEE 2008).

At present there is limited empirical evidence of post-construction effect of offshore wind farms on tourism, especially in regard to destinations characterised by high-density sun and beach tourism, where turbine visibility is significant. In this study, we take as our starting point the possibility that there may be scope for maintaining or increasing "visiting numbers" either by lowering accommodation costs or compensating visitors through community resort initiatives. In particular, we are interested in investigating the following four questions: First, how much compensation, if any, would induce a tourist to take a coastal vacation at a destination with a wind farm 5, 8 or 12km offshore? Second, how might the installation of a wind farm affect the demographics of visitors, and would an offshore wind farm attract or repel the most desirable tourists (repeat visitors with high purchasing power)? Third, can wind farms help give a coastal tourist resort a "green image", thus allowing it to gain a market share amongst the desirable wealthy Northern European tourists who are known to be particularly "green"? Fourth and finally, can creating additional artificial reefs in proximity to the turbines foster eco-tourism opportunities such as observational boating and diving at or around artificial reefs and turbine foundations (Cabanis & Lourie, 2010)? This hypothesis is based on the fact that turbine foundations provide substrate suitable for the settlement of benthic organisms, and leads to the emergence of artificial reef-like ecosystems (Wilhelmsson, Malm & Ohman, 2006).

Consequently, we can investigate whether adopting a coherent environmental policy, or associating wind farms with recreational opportunities, can serve to compensate for potential visual nuisances associated with wind farms. As will be made clear in chapter 2, these research questions are all novel contributions to the existing literature. In chapter 2 we consider previous literature on tourist attitudes and preferences towards wind farms, recreational activities and sustainable tourism. In chapter 3 we explain the CE survey and specify the statistical model used in our case study. Following on from this, in chapter 4 we discuss how the choice experiment attributes were defined and in chapter 5 how the questionnaire was constructed and data collected. In chapter 6 the survey results are presented, followed by a discussion in chapter 7. Chapter 8 concludes.

2. Literature review: Evidence of attitudes towards wind farms and green tourism.

2.1 General attitudes towards wind farms

Whereas onshore wind power is criticized for its negative visual impact on the landscape, noise generated from the rotation of blades and shadow and lights effects from the turbines (Warren, et al., 2005), offshore wind farms are primarily reproached for their negative landscape externalities. These however decline with increasing distance from the shore (Ladenburg & Dubgaard, 2007; Krueger, Parsons, & Firestone, 2011; Bishop & Miller, 2007; NFO 2003) and the disamenity cost may even tend to zero at large distances (Krueger, Parsons, & Firestone, 2011). Bishop and Miller (2007) also find that clearer air and sunshine result in greater visual disamenities relative to hazy air. There is evidence that offshore wind farms are preferred to onshore, all else being equal (NFO, 2003; Ek, 2006), but a wind energy case study from Northern Wales suggests that offshore wind farms may be just as controversial as their onshore counterparts, as the negative landscape externalities extend beyond the shore to various land areas as an undesirable visual feature on the horizon (Devine-Wright & Howes, 2010).

In regard to the influence of socio-demographic factors on preference and attitudes to offshore wind farms, an opposing attitude is often found to covariate positively with age (Bishop & Miller, 2007; Frantal & Kunc, 2011; Lilley, Firestone, & Kempton, 2010; Ladenburg, 2010) and income (Firestone & Kempton 2007; Lilley, Firestone, & Kempton, 2010; Ladenburg, 2010). There is also evidence that citizens' use of the coastal zone has a role to play (Ladenburg & Dubgaard, 2009; Ladenburg, 2010). More precisely, anglers and recreational boaters have been found in one study to perceive the visual impacts to be more negative than people who do not use the coastal area for those purposes (Ladenburg & Dubgaard, 2009)

2.2 Evidence on the impact of wind turbines on tourism

Tourism operators often rely on a specific image of the sea, while visitors and residents of coastal communities enjoy the shoreline for the amenity and recreational value (Gee and Burkhard, 2010). Opposition to wind farms often relates to the expected impact on business interests and tourism (BRL, 2003; Dimitropoulos & Kontoleon, 2009; Wolsink, 2010), owing to a perception that the 'visually polluted' landscape will be less attractive (Gordon, 2001). In the following paragraphs, we first review empirical evidence of changes in tourism behaviour following onshore and offshore wind power development. Secondly, we examine stated preference studies on tourist attitudes to wind power developments.

2.2.1 Observed changes in tourist behaviour

There is little evidence of negative consequences for tourism following wind farm construction. One year following construction of one of the world's largest offshore wind farms – Denmark's Horns Rev, Kuehn (2005) found neither a decrease in the community's tourism levels nor any reduction in the price of summerhouse rentals. Svendsen (2010) draws a similar conclusion from the offshore wind farm, Nysted in Denmark. In the UK, the visitor centre of one of the first utility-scale offshore wind farms, at Scroby Sands, welcomed 30,000 visitors within its first six months of opening (BWEA, 2006). As such, regardless of changes in the annual tourist flux, the visitor centre has served to provide an additional attraction for tourists.

The first large-scale wind power project in Southeast Asia, operational from 2005, comprises 20 turbines implanted directly on the Bangui Bay in the Philippines. This wind farm is said to have revitalised the province's local *tourism* industry by drawing a steady stream of curious visitors to the bay (Jimeno, 2007; Linao, 2007). Similarly SAE wind Power Company, on the cutting edge of onshore and offshore industries, argues that wind farms can perfectly co-exist with sustainable tourism activities. In Smøla in Norway, a 68-turbine wind farm, located within a few hundred meters of the coas,t has resulted in 35 new indirect jobs in commerce and service, and an increase in tourist accommodation capacity from 50 to 600 beds. The roads connecting the wind turbines are now used as cycle lanes for tourists going on excursions to the wind farm and the surrounding nature (Statkraft, 2010).

2.2.2 Stated preference studies of tourist attitudes and preferences

In a Scottish study with tourists visiting the area of Argyll & Bute, 43% of respondents maintained that the presence of (onshore) wind farms had a positive effect, while a similar proportion felt it was neither positive nor negative. 8% felt that it had a negative effect (MORI Scotland 2002)[7]. In the Czech Republic, the majority (84%) of tourists at a popular recreational area stated that the prospective construction of wind turbines would not influence their destination choice. However, respondents who regularly visited the same destination were found more likely to oppose (Frantal & Kunc, 2011). A survey commissioned by the Languedoc Roussillon regional authorities asked 1033 tourists how they would react if they learned that there were wind turbines 10 km from their accommodation. The results show that 37% would go and see them, 6% would try to avoid them and for 55% it would change nothing (CSA, 2003). Finally, Lilley, Firestone & Kempton (2010) used a contingent behaviour study to examine beach visitation in response to a hypothetical wind farm on Delaware beaches (US), sites which may be comparable to the Mediterranean in that they experience high levels of recreational and touristic use. Similarly to the studies of citizen preferences, they found wind farms attained decreasing disamenity costs with an increasing distance from the coast. 55% of respondents indicated that they would continue to visit a beach in the presence of a wind farm 1.5 km offshore. The figure rises to 73% if the turbines are 10 km offshore, and 93% would continue to visit if the distance was 22 km..

In regard to the general role of man-made structures in the landscape, Hamilton (2007) uses the hedonic pricing method to link tourist accommodation price with sea-cliffs, dykes and open coast in the region of Schleswig-Holstein in Germany*.* He finds an increase in the length of 'open coast' to have a positive incidence on the accommodation price, worth EUR 0.56 per night per 1 km increase in open coast. In contrast, the hedonic price of a 1 km increase in dikes leads to a fall in EUR 0.52 per night in a hotel whose usual price is EUR 62 per night (Hamilton, 2007). In Scotland, Riddington et al. (2010) use an internet survey with potential tourists to learn how much they would be willing to pay per night to upgrade the view from a hotel room to one without any man-made structures. The estimated scenic cost was highest for grid lines (29% of basic room price) followed by a wind farm (21 %) and waterfall development (19 %).

[7] It should be borne in mind however, that there is doubt regarding the subjectivity of the results of MORI (2002) due to the use of non-random sampling (Lilley et al 2010), and because wind power developers were behind the commissioning of the studies.

To conclude, the above-mentioned studies provide evidence that wind turbines can be appealing to tourists (Frantal & Kunc, 2011; Linao 2007; Statkraft, 2010; MORI, 2002), especially when a visiting centre is involved (BWEA 2006). However, a fraction of tourists (less than 10%) display significant negative attitudes or preferences against wind turbines in the landscape (CSA 2003; Lilley, Firestone & Kempton, 2010; MORI, 2002). But wind turbines are not unique in this regard; man-made infrastructure, whether it be dikes, grid lines, hydro-power or wind turbines, are all subject to visual nuisances (Hamilton, 2007; Riddington et al., 2010) with a corresponding influence on accommodation prices similar to or worse than that of wind turbines (Riddington et al., 2010).

2.3 Tourist demand for sustainability and recreation

There is broad evidence that consumers are becoming more aware of sustainability issues and knowledgeable about measures of energy and waste conservation (Bachis, Foster & McCabe, 2009). However, the evidence of whether tourists are actually willing to pay more for environmental initiatives is mixed. Surveying tourists in a Malaysian hotel, Kasim (2004) found that the majority of tourists were not in favour of resource reduction and favoured the use of air-conditioning over natural ventilation. The study also showed that most tourists were not willing to pay more money for a hotel that engaged in environmentally responsible initiatives, with 38% undecided and 37% stating they would never pay more (Kasim, 2004). Likewise Dalton, Lockington & Baldock (2008), and Tearfund (2002) demonstrate that only about half of all sampled tourists are willing to pay more to support sustainable initiatives, with a willingness-to-pay (WTP) less than or equal to 10% of accommodation cost or travel expenses (Dalton, Lockington & Baldock, 2008; TNS, 2008).

When recreation and conservation go hand-in-hand, WTP is more pronounced. Considering the value to tourism of coral reef conservation, Arin and Kramer (2002) explore the demand from local and international divers for dive trips to three different protected coral reef areas in the Philippines, where fishing is prohibited. The mean per person daily WTP to enter a Philippines marine sanctuary ranges from USD 3.7 to USD 5.3 depending on the marine reserve. Seenprachawong (2003) uses the Contingent Valuation method and the Travel Cost Method to estimate the WTP for improved coral reef abundance for visits to Phi Phi Marine National Park, in Thailand. His estimates for mean WTP were USD 17.2 for overseas tourists and USD 7.2 for Thai tourists. Other studies confirm that a thriving tourist industry may be built around marketing the perception of a healthy marine and coastal environment (Williams & Polunin, 2000; Dharmanratne et al., 2000; Sobhee 2006). These findings are congruent with other non-valuation studies. In responsibletravel.com (2004) 70% of respondents were interested in taking trips to local wildlife conservation areas and social projects, while the Mintel survey (2007) of the UK population found that consumers who simply wanted to relax, and not concern themselves at all with ethical issues, made up just 23% of the total.

In the light of these previous studies, this paper contributes with several novelties. On the one hand, this is the first valuation study of tourist preferences for the position of offshore wind farms at their holiday destination. In contrast to the increasing number of studies focused on the North Sea, this survey is concerned with a different geographical setting, one characterised by the high-density beach tourism of the Mediterranean Sea. While previous valuation studies on tourist wind farm preferences have focused on evaluating disamenity costs according to willingness to pay or visit more or less, we also propose to weight disamenity costs against other potential compensatory undertakings at a coastal resort community. In particular, the presence of a coherent environmental policy for the holiday destination, and the introduction of recreational activities associated with the wind farm.

Figure 1: Map of the coastal resort communities in the Languedoc Rousillon

3. The Choice Experiment and the econometric model

3.1 The Choice Experiment

To answer questions such as how much tourists are willing to pay for a coherent environmental policy relative to the compensation they demand for enduring the sight of an offshore wind farm, we employ the choice experiment (CE) method. In CEs, a number of respondents are asked in a questionnaire to select their preferred alternative from a range of potential management alternatives in a choice set. The status quo or "do nothing" situation is usually included in each choice set. Discrete choices are described in a utility maximising framework and are determined by the utility that is derived from the attributes of a particular good or scenario. It is based on the behavioural framework of the random utility theory (McFadden, 1974) and Lancaster's theory of demand (Lancaster, 1966). By describing a potential wind farm at a tourist destination in terms of a number of policy relevant attributes and the different potential levels of these attributes, and by including a monetary attribute, the CE allows us to estimate the economic value of the changes in a given coastal tourist community under various future management options. The accuracy and reliability of estimations of demand, participation, social and marginal welfare is enhanced by specifying a model that can account for both observed and unobserved preference heterogeneity (Greene, 2002).

There is evidence to suggest that landscape preferences in regard to renewable energy constructs are highly heterogeneous. According to Stephenson (2008), landscape significance may be clustered around the physical and tangible aspects of a landscape, the activities associated with the landscape and the meanings generated between people and their surroundings. In regard to the latter element, researchers have suggested that the perception and appreciation of landscapes is influenced by observers' personality, habits, and sexual and cultural differences (Macia, 1979; Gee & Burkhard, 2010; Dharmaratne 2000). As such, we expect tourist preferences to differ according to their characteristics and their motivation for embarking on a coastal holiday in Languedoc Roussillon. We considered it appropriate to take account of this by using a latent class model, as tourist specific characteristics were expected to give rise to distinct preference groups, each characterised by relatively homogenous preferences. As such, the latent class analysis facilitates the interpretation of preference heterogeneity in consumer demand analysis, that is, how the order of compensation or payment demand varies amongst tourist population sectors, and thus how the tourist clientele may change following wind farm construction in proximity to popular coastal resort communities. This is particularly pertinent in a market context, where the characteristics of the tourist clientele are determinants of the wealth of the tourist resort. For a greater in-depth description of the CE method, the reader is referred to Bateman et al., 2002.

3.2 The latent class model in theory

The behavioural framework of random utility theory (RUT) is employed to describe discrete choices in a utility maximising framework. Following RUT, the individual i's utility U from alternative j may be specified as:

$$U_{ij} = V_{ij} + \varepsilon_{ij} \qquad (1)$$

where V_{ij} is the systematic and observable component of the latent utility and ε is a random or "unexplained" component assumed IID and extreme value distributed (Louviere et al., 2000). By employing the Latent Class model to account for unobserved preference heterogeneity, we assume that the population consists of a finite number of segments with different preference structures. Classification into segments and utility parameter estimation contingent upon segment is done simultaneously (Train, 2009). Formally described, the utility that tourist *i*, who belongs to a particular segment *m*, derives from choosing tourist destination alternative *j*, can then be written as:

$$U_{ij|m} = \beta_m x_{ij} + \varepsilon_{ij|m} \qquad (2)$$

where x_{ij} is a vector of attributes associated with the tourist destination alternative *j*, and β_m is a segment specific vector of taste parameters. Heterogeneity in attribute preferences across segments is captured in differences in β_m vectors. Assuming that the error terms are identically and independently distributed and follow a Type I (or Gumbel) distribution, the probability of tourist *i* choosing alternative *j* becomes:

$$\Pr(ij) = \sum_{m=1}^{M} s_m \left(\frac{\exp(\beta_m x_{ij})}{\sum_j \exp(\beta_m x_{ij})} \right) \qquad (3)$$

where β with probability s_m takes the values $\beta_1 \ldots \beta_M$.
s_m is thus the probability of membership to segment m and can be written as:

$$s_m = \frac{\exp(\lambda_s Z_i)}{\sum_{s=1}^{S} \exp(\lambda_s Z_i)} \qquad (4)$$

where Z_i is a vector of psychometric constructs and socioeconomic characteristics (Boxall & Adamowicz, 2002). As such, belonging to a segment with specific preferences is probabilistic and depends on the characteristics hypothesized to influence choice. Formulation 4 can be expanded to take into account a panel structure to reflect differences in utility coefficients over people, but constant over choice situations.

In the above form we have assumed that the scale parameter is equal to one. The scale parameter takes into account the variance of the unobserved part of utility (Train, 2009, p. 45). Due to this scale parameter, estimates from different samples cannot be compared if they have different variance, but it does not affect the ratio of any two parameters. For a further insight to the latent class model, we refer to Train (2009).

The Willingness to Pay (WTP) or Willingness to Accept compensation (WTA) for each segment is estimated by the marginal rate of substitution (MRS):

$$MRS = -\frac{\beta_k}{\beta_P} \qquad (5)$$

where β_k refers to the parameter of interest and β_P to the parameter for price. In order to calculate standard errors for the WTP, the Delta method (Greene, 2002) is used.

4. Attribute specification used in the CE

4.1 Distance from the shore to the offshore wind farms

Previously proposed offshore wind farm projects in Languedoc Roussillon are located within 3 km to 10 km of the coast. Beyond 10 km it is prohibitively expensive to construct a seafloor mounted wind farm, as the sea-floor is more than 30 metres deep. In the Atlantic however, several projects are proposed at 12 km or further from the shore. This is also a feasible prospect in the Languedoc Roussillon region, if floating turbines were to be used. There has been no legal minimum set for turbine distance from shore, but the High Sea Commission has advised that wind farms should not be placed closer than 5 km due to the high density of activities taking place within this coastal zone - in particular sea sports and artisanal fisheries (Cabanis & Lourie, 2010). On this basis, the feasible attribute levels for an offshore wind farm were defined at 5, 8 and 12 km from the coast relative to the status quo "no wind farm" level. The wind farm was designed with 30 turbines of 3.6 MW (the type GE 3.6 offshore with a hub height of 75m and a rotor diameter of 104 m) in 3 rows of 10, with 900 metres between each turbine. This is a configuration typically seen in above-mentioned proposals. Photo simulations were made using a professional photo simulation program, WINDPRO version 2.7, using typical midday

August lighting conditions. Fig. 3 depicts an example of a choice set with the wind farm simulation at 5 and 8 kilometres.

4.2 Wind farm associated recreational activities

In the same way that offshore wind turbines have become an attractive fishing ground for anglers in the North sea, it is stipulated that turbine foundations in conjunction with the creation of further artificial reefs could add real recreational value to a coastal community resort. It would enable observational boating during educational excursions, scuba and skin diving. Angling may also be envisaged under certain circumstances. The question then is whether this added recreational value can justify installing the wind farm closer to the shore, that is, can visual nuisances at 5 km and 8 km be outweighed? Wind farm associated recreational activities at 12 km from the shore were considered infeasible, and were hence not included in the choice sets.

4.3 Sustainable tourism and coherent environmental policy

Comparing the Spanish Mediterranean coast with the Languedoc Roussillon coastline, the Spaniards manage to earn significantly more per tourist head than their Languedoc counterpart (Knibiehly, 2010). In an increasingly competitive environment, characterised by fierce price competition and low-cost airlines travelling to an increasing number of coastal destinations, several strategies have been contemplated to create added value. These include efforts to very visibly reduce pressure on the local ecosystems and to reduce the carbon footprint of a holiday in a manner that is obvious to the potential tourist (Knibiehly, 2010). To some tourism operatives, the feeling is that they would need to be another 10 years 'down the road' before this is realisable. In the words of the head of the camping association in the department of Aude, "The typical French beach tourist just wants water, sun and sand for their kid to play with" (Pioch, 2010). We are thus interested in investigating this hypothesis, and establishing whether there is a demand for sustainable tourism amongst the current population. If there is such a demand, from what proportion of the tourist population is it coming and what are their characteristics? Furthermore, a focus group comprised of Scandinavian tourists revealed not only a real demand for greater environmental effort at coastal resort communities, but also that the perception of a wind farm is highly dependent upon whether it is integrated within a larger "eco-beach community" concept. In the survey, it was explained that the municipality (in which the tourists were interviewed) could minimise their impact on the environment by adopting a coherent environmental policy which favours an extended network of bicycle lanes, public transport, solar and PV panels, energy and water saving devices and the use of local and organic produce.

Attribute	Level		Attribute	Level
Wind farm	No Yes 5, 8, 12 km	→	Wind farm and artificial reef associated recreational activities	No Yes
Coherent environmental policy	No Yes			

Change in weekly accommodation price	[- 200, -50, -25, -10, +10, +25, +50, +200] EUR

Table 1: Attributes and attribute levels used in the full-scale survey

4.4 The payment vehicle

Focus groups showed that tourists found it easy to relate to a change in accommodation price and perceived as realistic and credible the argument that an increase in tourist frequentation will put pressure on accommodation prices and vice-versa. Focus groups, pre-testing and a review of accommodation prices (for rentals, hotels, camp sites) gave guidance on reasonable levels of the monetary attribute. The pilot study showed that tourists were more at ease with reference to changes in weekly accommodation prices than daily accommodation prices. During the survey execution of the full-scale study, tourists who were living for free with family and friends were asked to imagine that the price change related to a bonus or a surcharge on their overall spending at the community resort. Finally, tourists were asked to take into account their actual travel budget constraints when making a destination choice.

5. Questionnaire construction and execution

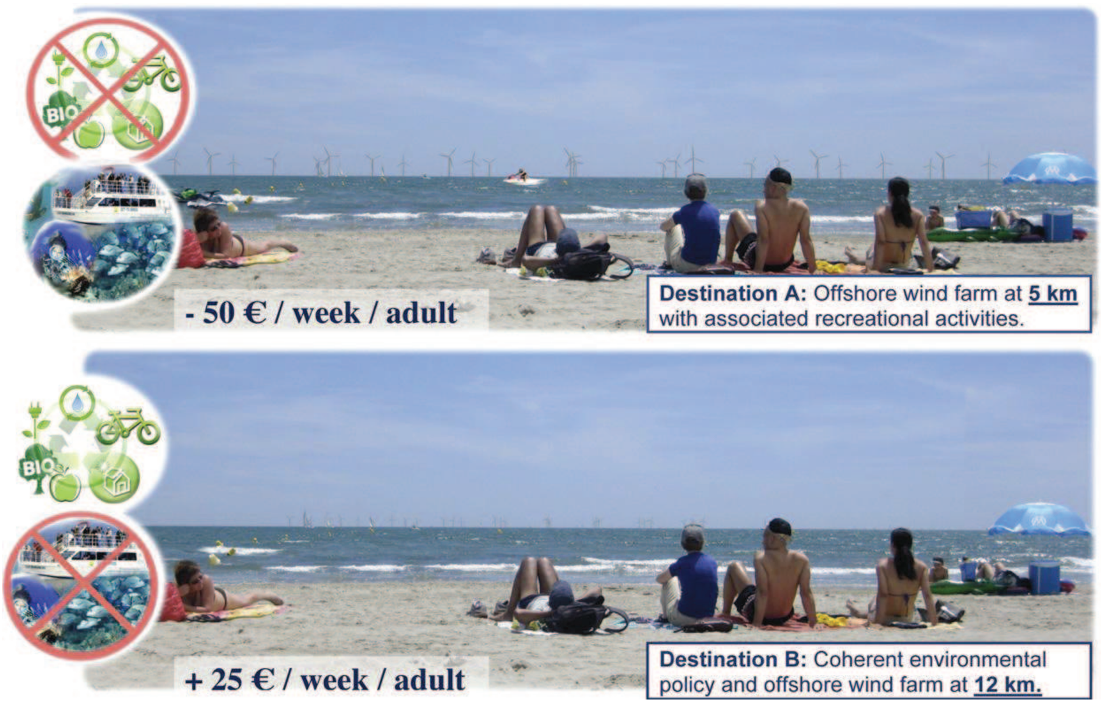
5.1 Survey development

The CE survey design commenced early 2010 with a meeting hosted by the environment ministry with the goal of designating zones in the French Mediterranean for potential wind farm developments. Together with a series of meetings with chambers of commerce, regional and departmental committees for tourism and wind energy and tourism professionals, this background enabled us to sketch a series of pertinent policy attributes. These were narrowed down and further defined in three focus groups held with both international and French national tourists. Different choice-set layouts were tested, ranging from the 'tourist brochure look' to simple photos and short descriptions. The challenge of using a payment vehicle that could cover utility increasing and utility decreasing attributes and a wide range of purchasing power was also addressed. Three focus groups were held with Swedish, Danish and French nationals. A pilot study proved critical for improving the length, the wording and the order of the sections to maximise the respondent's engagement.

The final survey instrument had 6 sections and began by addressing respondents' aesthetic and environmental perceptions about wind farms (onshore and offshore), concern about climate change and perceived efficiency of wind power compared to other energy sources. These questions allowed us to evaluate the relative strength of physical, symbolic and political aspects of visual judgement. The second section constituted a couple of simple questions regarding the respondent's vacation, in particular the length of stay, his/her travelling company and accommodation type and price. Following this, we presented the respondents with an A3 info-sheet with photos and explanations of the policy relevant attributes. These served to familiarise the respondents with the subsequent 8 choice set questions. In each choice set the respondent was asked to elicit his preferred destination between A and B, or "none of them" if neither destination A or B was preferred relative to his current community resort (which has neither a coherent environmental policy, offshore wind farm or associated recreational activities). The fourth section followed up on the choice-set questions to identify protest bidders and lexicographic preferences. The fifth section asked about respondents' motivation for visiting Languedoc Roussillon and their overall satisfaction (or dissatisfaction) with the coastal resort community. The final section elicited respondents' degree of environmental consciousness and their socio-demographic characteristics (table 2). The questionnaire and the accompanying info-sheet were edited in English, French and German.

5.2 Choice experimental design

With 8 payment levels[8] and three policy attributes - two with two levels, and a third with four levels - a full factorial design would have resulted in a total of 256 alternative management combinations. As this would constitute an unreasonably large design in practice, we used a fractional factorial design. Since the model form of our prior parameter utility specification assumed random parameters and an error component, the degrees of freedom demanded a minimum of 16 choice situations. These choice sets were blocked into two, so that each respondent had to evaluate 8 choice sets. The design was d-error minimised by Ngene (ChoiceMetrics, 2010)[9], assuming a MNL model with priors ($\beta \neq 0$) obtained from a pilot study and with interaction effects between wind farms and the coherent environmental policy. The resulting MNL d-error was 0.1085.



8 While the status quo levels were included in the design for all other attributes, this was not the case for the monetary attribute. Hence, the "no change in price relative to today" was not included in the design.

9 The syntax used to create our design:

```
;alts = alt1, alt2,alt3 ; rows=16 ;block=2 ;eff = (MNL,d)
;cond:   if(alt1.A = [0,1], alt1.B = [0]) , if(alt2.A = [0,1], alt2.B = [0]) ;rep = 400
;model: U(alt1) = b0[0] + WF.effect [n,-0.7,0.7|n,-0.3,0.4|n,0.2,0.5] * A[3,2,1,0] + Act[n,0.2,0.3] * B[0,1] + Env[n,1.1,0.5] * C[0,1] +
                 Cost[-0.015] * D[-200,-50,-20,-5,5,+20,+50,+200] + s1 [ec,0.2] + b5 * WF * Env /
        U(alt2) = WF.effect * A + Act*B + Env*C + Cost*D + s1 + b5 * WF * Env
```

5.3 Data collection

Data collection took place during the summer of 2010 from late July to late September on the beaches in Languedoc Roussillon. We used personal interviews in which the interviewer guided the respondent through the survey. Interviews took place in English and French. Germans were provided with a questionnaire and info-sheet in German to facilitate their understanding. In general, those sections demanding more explanation were explained and filled in by the interviewer, while the tourist himself handled simple socio-demographic and attitudinal questions. The population from which the sample was chosen was defined as those of 17 years and upwards, sleeping at least one night either in the resort community at which they were interviewed, or in the neighbouring coastal resort community. The interviews were conducted by approaching respondents on 9 different coastal resort communities along the coastline of the districts of Aude and Herault, the two areas in Languedoc Roussillon with the most significant offshore wind power potential. Interviews for the full-scale study took place from 1st of August to the 30th of September by a group of 4 interviewers (including the author of this paper). Each interviewer began sampling at a different point along the beach. They walked in one direction, stopping at every individual or grouping of friends and family on their way. While a tourist was being interviewed, we explicitly asked accompanying friends or family to not interfere with the interview. This process continued till the interviewer reached the end of the beach, or the zone in which another interviewer had commenced interviewing. On average, one in two tourists were willing to take part in the survey. The socio-demographic characteristics of the tourists are specified in table 2 together with their trip characteristics. Each interview lasted between 25 minutes and one hour. In the presence of open-ended questions some respondents did not hesitate to provide considerable detail in their answers. In total we interviewed 370 respondents of which 15 questionnaires were not fully completed, and therefore not used for final analysis. An additional 16 questionnaires were excluded from the final estimate because the respondents did not consider any potential trade-offs in their answers. This was identified when respondents had either made clear that they refused to consider the price attribute or chose the status quo option in all choice sets even though options A or B were utility dominating[10]. This resulted in a total of 339 individuals and 2712 choice set observations being used.

Individual tourist respondent characteristics	In LC model	MEAN (Std dev)
Net household income In intervals of € 500 per month (min €0, max €>7000)		€ 2500-3500
Higher education Has done at least 2 years of university studies		51 %
Female		59 %
French tourists		73 %
International tourists Of any origin other than French		27 %
Northern European Of Scandinavian, English, Belgian, German, Swiss, Luxembourgian or Dutch origin.	x	26
Age (min 17 yrs, max 81 yrs)		37 years (14.6 years)
Retired The tourist is retired	x	8

[10] By for example offering a refund of EUR 50 everything else equals status quo.

Trip Characteristics		
Accommodation price in EUR per adult per week (min €17, max €1125)		€ 202 (€151)
Accommodation price in EUR per adult per week (min €40, max €1125) Including those living for free with friends or family		€ 158 (€157)
Residing in: Camp sites		42 %
Hotel and B&B		8 %
Friends and family		17 %
Rented house or apartment		26 %
Other (boat, car)		7 %
Loyal LR tourists Those tourists who have spent their vacation several times at the coastal resort where they were interviewed, or a neighbouring one.	x	52 %
Visiting tourists "Visiting friends or family" was an important element of the tourist's vacation.	x	22 %
Culture, history and patrimony enthusiasts "History, culture and heritage" were important elements during the tourist's vacation.	x	15 %
Landscape enthusiasts "Landscape and nature appreciation" were important elements during the tourist's vacation.	x	44 %
Sea and Sun Enjoying the "sun and the beach" were important elements during the tourist's vacation.		77 %

Table 2: Socio-demographic and trip characteristics of the sample

6. Results

6.1 Latent class covariates

Upon testing of the characteristics of the respondents on the preferences for the attributes in a conditional logit model and subsequently in a latent class model, we found that the motivations behind a tourist's destination choice, as well as their socio-demographic characteristics, were likely to affect the latent preference segment that the tourist belonged to. In particular, we found that the age of the tourists, their nationality, their degree of loyalty to the coastal resort community, and their motivations for visiting the particular resort community where they were interviewed, were significant determinants of latent membership. Finally, it should be stressed that demographic attributes, like being French, elderly, etc, does not determine in which segment an individual is situated, but merely increases the probably that any individual would be found in the segment determined by the statistical membership function. Table 2 describes the socio-demographic characteristics of the sample and table 4 describes the membership function.

6.2 Optimal number of segments

The latent class was estimated using NLOGIT version 4.0 and models with 2,3,4 segments were run. In order to determine the optimal number of segments, the BIC, AIC, the log likelihood and adj ρ^2 were consulted. Table 3 reports their values together with the number of parameters for the three models. The criteria used – Log likelihood, adjusted ρ2, AIC and BIC indicates best performance for 3 segments. Furthermore, with less degrees of freedom, some parameters lost statistical significance when specified in a model with more than three segments. Thus, also from the perspective of providing clear policy advice, the 3-segment solution was chosen. In each, parameters for the 3rd segment are normalised to zero during estimation. Thus the other two segments must be described relative to this last segment.

# of segments	# of parameters	Distribution of segments	Log likelihood	Adj ρ^2	AIC	BIC
2	21	0.65;0.35	2193.73	0.260	1.633	1.679
3	35	0.23;0.42;0.35	-2125.06	0.283	1.591	1.667
4	49	0.26;0.39;0.11;0.24	-2194.38	0.256	1.654	1.765

Table 3: Goodness of fit criteria for 2-4 segment models

6.3 Estimated parameter results

Table 4 shows the class probabilities and the coefficients of the attributes. In clear correspondence with other studies, the experienced visual disamenity costs for all sample segments decreases, as the wind farm is located further from the coast. However, we observe a large difference in overall preference structure between the three tourist population segments. Broadly speaking, segment one (most likely of French origin, visitors and loyal tourists) and two (most likely of Northern European origin, loyal tourists, culturally motivated), experience little or no visual nuisance related to the presence of an offshore wind farm, when for example comparing with the values they attribute to wind farm associated recreational activities. Together, these two segments correspond to 65% of the tourist population. On the other hand, the third segment considered the presence of a wind farm to be a visual nuisance at all distances, although they did consider that a wind farm located 12 km offshore could be compensated by a coherent environmental policy enacted at the coastal resort community. This segment of tourists corresponds to 35 % of the underlying sample and they are more likely to consist of retired French tourists, whose vacation choice is particularly motivated by landscape and nature appreciation.

Turning more specifically to segment one and two, respondents considered that the invigoration of an environmental effort at the tourist resort could more than outweigh the visual presence of a wind farm, whether at 5, 8 or 12 km from the shore. Members of segment two; consisting with greater probability of younger or mature, Northern European, Loyal LR tourists - are particularly appreciative of a green policy. This segment furthermore experiences a slight positive utility from the presence of an offshore wind farm at 12 km from the coast, while segment one enjoys a positive utility when the wind farm is implanted 8 km from the shore. In regard to deriving welfare scenario estimates, it is debated how to interpret and use the alternative specific constant (Boxall et al., 2009). Since the parameter for the alternative specific constant (ASC) is equal to the one for the status quo, and is both negative and significant for segments one and three, it either means that the segments have a negative utility associated with the current situation, or that the WTA/WTP-measure for specific alternatives has to be upwardly adjusted beyond marginal values, cf. Table 5. In this study we have preferred to solely consider marginal changes when estimating the value of possible resort community management scenarios, so as to yield lower bound, conservative estimates.

	SEGMENT 1	SEGMENT 2	SEGMENT 3

	French, Visitors of family or friends, Loyal LR tourists.		Northern European, Cultured, Loyal LR tourists, Younger and mature		French, retired, landscape enthusiast, non historically and culturally interested	
Average class probability	22.7%		42.1%		35.2%	
Utility function						
	Parameter	**Std error**	**Parameter**	**Std error**	**Parameter**	**Std error**
ASC	-1.4	0.35 ***	-0.01	0.15	-0.79	0.1 ***
Environmental policy	2.5	0.63 ***	2.46	0.12 ***	1.07	0.11 ***
WF recreational activities	1.39	0.24 ***	0.87	0.09 ***	0.46	0.11 ***
WF 5 km	-1.87	0.40 ***	-0.60	0.14 ***	-3.84	0.18 ***
WF 8 km	1.53	0.95	-0.31	0.12 ***	-2.08	0.13 **
WF 12 km	0.09	0.27	0.66	0.13 ***	-0.57	0.12 ***
Price	-0.06	0.02 ***	-0.02	0.00 ***	-0.01	0.00 ***
Segment membership function						
ASC	-1.07	0.40 **	-0.10	0.32	0 ***	
Retired	-0.94	0.73	-1.01	0.59 *	0 ***	
Northern European	0.44	0.48	1.10	0.38 ***	0 ***	
‘Culture, history and patrimony’ motivated holiday	0.18	0.66	1.11	0.5 **	0 ***	
‘Landscape enjoyment’ motivated holiday	-0.27	0.37	-0.97	0.34 ***	0 ***	
‘Visiting friends and family’ motivated holiday	0.86	0.37 **	-0.03	0.33	0 ***	
Loyal LR tourist	0.71	0.36 **	0.73	0.31 **	0 ***	

Number of observations: 2712

Number of individuals: 339

*Denotes significance at 10% level. **Denotes significance at 5% level. ***Denotes significance at 1% level.

Table 4: Three segment LCM estimates

6.4 Willingness to Accept Compensation and Willingness to Pay

In table 5, the parameter estimates are converted into marginal rates of substitution (WTP or WTA) according to Eq.3. It is on the basis of these that we will discuss the results. Consulting the model, it is immediately remarkable that the WTP and WTA vary significantly across the segments. Taking the example of segment one (visitors and loyal LR tourists), which corresponds to 23% of the sample, would demand an accommodation price reduction or vacation rebate[11] of EUR 29 per week per adult in order to be induced to go on vacation to a destination with a wind farm 5 km from the coast. If the wind farm was constructed just 3 km further offshore, at 8 km, this group no longer perceive any visual nuisance and is willing to pay EUR 24 more per week to see the wind farm at this distance. When it is 12 km offshore they are indifferent to its presence. Turning to segment two (Cultured, Northern Europeans, Loyal tourists), the zero visual-nuisance breaking point apparently lies somewhere between 8 km and 12 km from the shore. That they are willing to pay an additional EUR 43 in accommodation price to face a wind farm 12 km from the shore may potentially be explained by a significant environmental consciousness amongst these tourists. Remarkably, this segment is willing to pay up to EUR 159 more per week for accommodation at a “green” resort community. Equally noteworthy is that the potential for doing recreational activities in proximity to the wind farm is more

[11] For those who were living for free during their vacation.

highly valued than the visual nuisance perceived from positioning the turbines just 5 km offshore. Finally the last segment, which is likely to consist of French, retired, non-loyal tourists, is rather hostile to wind farm implantation especially when situated 5 or 8 km from the shore. Demanding a compensation of up to EUR 265 (week/adult) when the wind farm is 5 km from the shore implies that even if their accommodation was offered for free, they would most likely choose another tourist resort without a wind farm[12]. However, with rather pronounced preferences for a coherent environmental policy (WTP EUR 74 more per week), even this segment of tourists can be induced not to switch destination and actually enjoy a welfare benefit of EUR 35 (EUR 74-39) if the wind farm is installed 12 km from the shore or further.

	SEGMENT 1 Visitors, Loyal LR tourists	SEGMENT 2 Cultured, Northern European, Loyal LR tourists	SEGMENT 3 Retired, French, Landscape enthusiasts
	WTP / WTA in EUR	WTP / WTA in EUR	WTP / WTA in EUR
%	**22.7%**	**42.1%**	**35.2%**
ASC	-21.9 [8.2]***	-0.3 [9.6]	-54.6 [7.5]***
Environmental policy	39.2 [2.7]***	158.7 [6.1]***	73.6 [5.5]***
WF recreational activities	21.9 [4.5]***	56.5 [4.9]***	31.9 [7.6]***
WF 5 km	-29.3 [8.8]***	-38.9 [7.7]***	-264.7 [13.2]***
WF 8 km	24.1 [10.1]***	-20.3 [7.4]**	-143.1 [9.2]***
WF 12 km	1.4 [4.2]	42.8 [9.4]***	-39.1 [7.8]***

WTA / WTP standard errors approximated using the Delta method [squared brackets]

*Denotes significance at 10% level. **Denotes significance at 5% level. ***Denotes significance at 1% level.

Table 5: Latent class marginal WTP / WTA for seaside resort attributes

7. Discussion

Having presented the welfare estimates of the latent class model and the three segments, in the following discussion we emphasise the role of visual disamenities, the results that arise as a consequence of specified tourist characteristics, and the implications for the tourist industry. Finally we discuss some potential caveat of the results.

7.1 Disamenity costs and offshore distance

The general pattern across segments and models is that the requirement for compensation for an offshore wind farm decreases as its distance from the coast increases (table 5 and table 6 column 1). This accords well with findings from other studies (Ladenburg & Dubgaard 2007; Krueger, Parsons, & Firestone, 2011; Bishop & Miller 2007; NFO 2003). However the interesting observation when using a latent class approach is that the simple "nuisance distance-decay" logic does not hold for all tourist segments. Notice that for segments one and two the presence of a wind farm is positively appreciated at 8 and 12 km, respectively. Regarding the visitors (segment one), it may be postulated that tourists who are more likely to be occupied by the relational aspect of the holiday have different landscape criteria from those coming principally for sea, sand, sun, heritage, culture and Languedoc landscapes. Their demand for an offshore wind farm appears to be stimulated by a certain curiosity, demanding that the wind farm is neither too far offshore (12 km) where its visibility would be minimised, nor too

[12] The average accommodation price is 202 EUR/week per adult

close to the coast to cause potentially excessive infringement (5 km). For those more likely to be of Northern European origin and for whom the culture, history and heritage on offer in Languedoc Roussillon is important (segment two), one may postulate that a general positive attitude towards wind farms, or more generally renewable energies, is being weighted against the aesthetic disutility from seeing them while holidaying. This position is supported by the fact that there is a high demand from this segment for environmental endeavours. The presence of a North-South European preference divide was expected prior to the valuation survey, as evidence from focus groups and an interview with the head of a camping association[13] suggested that Northern Europeans had a greater enthusiasm for green initiatives (Pioch, 2010). This again accords well with other studies demonstrating differences in preference structures regarding vacation places among tourists with diverse nationalities (Eleftheriadis, et al., 1999; Kozak 2002; Lee & Lee, 2009). To conclude, the above-mentioned results highlight the subjective nature of landscape preferences, and the extent to which they are related to the observer's social and cultural experience, habit, belief system[14] and lifestyle, as suggested by Gee and Burkhard (2010).

7.2 Policy management scenarios

In order to look at the economic impact for the tourism industry of having an offshore wind farm at different distances from the shore, we have calculated the average WTP / WTA weighted against the percentage of tourists in each segment. The results are displayed in table 6. The LC model points to a slight increase in tourist revenues of about EUR 4 per week per adult if the offshore wind farm is located 12 km offshore, everything else being equal (column 1). As the wind farm approaches the coast however, the average tourist begins to demand compensation to completely offset the wind farm presence. If the turbines are only 5 km away from the coast this amounts to a desired compensation as high as EUR 116. With the average tourist paying EUR 202 per week per adult in accommodation price, EUR 116 implies that the coastal resort community would need to cut accommodation prices by more than 50%, if it wants to maintain the exact same "customer" composition as it enjoys today, while there is no wind farm. A general trend across the three models is that the presence of a coherent environmental policy can more than compensate for the visual nuisances caused by the wind farm at 8 km from the coast (column 2). With the simultaneous employment of a coherent environmental policy and wind farm associated recreational activities, the presence of a wind farm 5 km offshore will not harm the tourist industry. Furthermore, when located at 8 km, a rise in tourist-associated revenues is highly conceivable (column 4). Indeed, the statistical estimations suggest that coastal communities with these features could attract more tourists than the community resorts attract today. While the authors are not aware of any other study to date that has shown such pronounced willingness to pay for environmental initiatives at coastal resort communities, studies have shown significant WTP for onshore and offshore recreation that goes hand in hand with conservation (Dharmanratne et al., 2000; Seenprachawong, 2003; responsibletravel.com 2004; Sobhee, 2006; Arin & Kramer, 2002; Williams & Polunin, 2000). Lastly, our results on preferences for wind farms within close view are noteworthy when comparing them with previous studies. For

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[13] Many campsites have installed recycling infrastructure because their Northern European clientele demands it.

[14] In an upcoming paper we look closer at how respondents' energy policy opinion, concern about climate change and confidence in wind power technology influences their landscape preferences.

example, Ladenburg & Dubgaard (2007) show that disamenity costs can persist at distances beyond 18 km from the shore, while an accumulating body of research suggests that they tend to zero at large distances (Ladenburg & Dubgaard 2007; Krueger, Parsons, & Firestone; Bishop & Miller 2007, Landry et al., 2012). In comparison, our results show that for some individuals there is an amenity value associated with wind farms (provided they are located at least 8 km from the shore), but it cannot be generalised across the entire population.

	No environmental policy, no wind farm recreational activities	Coherent environmental policy at tourist resort	Reef and wind farm associated recreational activities	Coherent environmental policy & wind farm associated recreational activities
No wind farm	0 €	101.6 €	39.6 €	141.2 €
Wind farm 5 km offshore	-115.8 €	-14.2 €	-76.1 €	25.4 €
Wind farm 8 km offshore	-52.9 €	48.6 €	-13.3 €	88.3 €
Wind farm 12 km offshore	4.3 €	105.9* €	43.9 €	145.5* €

*Further out than 8 km it is practically difficult to envisage recreational activities

Table 6: Welfare estimates (per week per tourist) for every possible destination management scenario

7.3 Implications for the tourist and wind energy industry

At first glimpse, the results point to a potential loss for the tourist industry in the municipalities with a view of a wind farm at 8 km or less from the shore, everything else being equal. But by using a latent class model with segment membership, we develop a more refined picture. While the preferences of segment 3 - more likely to be French, elderly, and/or landscape enthusiasts - confirm the worst fears of any tourist industry, the fall in tourist revenues from this segment is offset by the apparent attraction that the wind farm provides to tourists in segment two, when the turbines are installed 12 km from the coast. From the point of view of the tourist industry, segment two is seemingly a highly desirable clientele, likely to be of Northern European origin with destination loyalty, enjoying and spending money on the cultural and historical activities in LR. Placing a wind farm 12 km offshore could thus precipitate a change in tourist composition in a desirable direction. According to the same logic we stipulate that the compensation requirements associated with a wind farm located 8 km from the shore may be attenuated as the tourist composition changes. Segment three tourists will refrain from visiting the resort community, while segment one will be further enticed. If a wind farm is proposed closer than 8 km from the shore, our policy recommendation is that the concerned municipalities endorse a series of efforts to improve the sustainability of the tourist destination, using the wind farm to signal this effort (column 2 and 4 table 6). This strategy will also favour the creation of a destination image in significant contrast to that of the neighbouring community resorts. Studies show that endeavours to build or improve the image of a destination may be a good investment, because the influence of destination image is not limited to the stage of selecting a destination, but is also linked to the likelihood of repeat visitation and willingness to recommend it to others (Chen & Tsai 2007; Enrique Bigné, Sanchez Garcia, & Sanchez, 2001; Bigné Alcañiz, Sanchez Garcia, & Sanz Blas, 2009).

7.4 Caveats of the study

In the current study we have used both WTP and WTA within the same choice sets. A substantial body of evidence suggests that WTA responses may be several times larger than WTP responses for the same change (Freeman, 1993; Horowitz & McConnell 2002). In particular, there is evidence of an "endowment effect" stipulating that individuals who are attached to a certain endowment require a higher level of compensation to part with something than they would be willing to pay to obtain it (Knetsch, 1995). Other authors suggest that the WTP-WTA disparity is more pronounced or likely to persist only for goods that have few if any substitutes (Hanemann 1991; Shrogren et al., 1994), unlike the coastal resort communities of Languedoc Roussillon, which all offer relatively homogenous "sun and sand" products within a few kilometres of each other. In this light we do not expect the WTP-WTA discrepancy to cause systematic differences in the results, and correcting for this effect was considered outside the scope of this paper. Finally, hypothetical bias that lead to overstatements of true WTP is well documented in stated preference methods (Harrison & Rutström 2008; List & Gallet 2001; Murphy et al., 2005). In this survey, two segments showed payment requirements or compensation demands corresponding to about 100% of the weekly accommodation price they were paying during their stay. We stipulate that this may indicate that some tourists have responded strategically so as to influence management policies, either by demanding EUR 200 compensation for remaining at a destination with a wind farm in view or, at the other end, by expressing willingness to pay an extra EUR 200 for a resort with a coherent environmental policy. Considering the actual market for 'green' tourism, that seems unlikely. Nevertheless, since the ASC is negative for two tourist segments and dummy coded for the status quo scenario, it is likely to have captured part of the strategic bidding bias. By evaluating scenarios on the basis of marginal changes alone (i.e. not taking the ASC into account), our estimates may be considered lower bound, counteracting the strategic bias. Furthermore, strategic responses and the choice of how to treat the ASC are unlikely to carry over to the main contributions of the paper: The relative values with respect to the siting of the wind farm, environmental policy and recreational activities are likely to be affected equally by the use of a household payment unit or strategic bidding.

8 Conclusion

While transmission, construction, and maintenance costs typically rise with increased distance, the economics of offshore wind power in the near-shore environment is such that disamenity costs decline as distance from coast increases (Krueger, Parsons, & Firestone, 2011). Our results indicate that the impact of wind farm disamenity costs on tourism revenues tends to zero, somewhere between 8 and 12 km. The study also showed that there is large heterogeneity in the tourists' preferences. While most respondents experience some visual nuisance associated with wind farms, the degree and thus their corresponding compensation requirements decrease when they are; younger or mature, of Northern European origin, frequent visitors to the Languedoc Roussillon, and when their vacation is partly motivated by the objective of visiting friends and family or enjoying cultural and historical experiences, aside from 'sun and sand' tourism. We also showed that there is considerable scope for 'greening' the tourist communities, a strategy which could be boosted in the presence of a wind farm particularly given its significant signalling effect. A green image may, in turn, further facilitate increased destination loyalty or recommending behaviour (Chen & Tsai, 2007). Our results suggest that those tourists who experience the smallest visual nuisance from wind farms are either motivated by the prospect of visiting friends and family or are of Northern European nationality, the latter being a much sought after clientele within the tourist industry. All segments are WTP a significant amount for a coherent environmental policy. Ultimately, this implies that a wind farm 8 km from the shore could be more than compensated for through the simultaneous ‘greening’ of the tourist resort. A rise in tourist related revenues is further conceivable if the wind farm is associated with artificial reefs and recreational user access. Ideally the results from a stated preference study, like this one, should be compared to revealed observations from other locations. The current study however has the advantage of investigating a specific case of considerable interest. It helps to indicate the potential implications for tourism of installing a wind farm in close proximity to ‘sun & sand’ community resorts. Overall, we make two policy recommendations. First, everything else being equal, it is in the interests of the tourist industry that wind farms are installed 12 km offshore in the Languedoc Roussillon. At this distance our results predict a slight rise in tourist visitation numbers, but also a change in the composition of the tourist clientele in the desired direction. Secondly, and alternatively, wind farms can be located as close as 5 km from the shore, if they are accompanied by a coherent environmental policy and wind farm associated recreational activities.

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Chapter 4: The multi-faceted nature of preferences for offshore wind farm siting*

Abstract[1]

There is increasing consensus that NIMBYism is a deficient explanation for widespread resistance to the installation of wind power facilities. This paper addresses this deficiency by examining the determinants of tourist preferences over the position of offshore wind farms at different distances from the shore in the Mediterranean Sea. A principal component analysis is used to retrieve general attitudinal themes, which act as covariates in a choice model. We demonstrate the respective role of respondents' opinions on energy policy, perceived urgency of tackling climate change, NIMBY objections, nationality and education in explaining preferences for the siting of offshore wind farms.

Résumé

Il est de plus en plus apparent que le NIMBYisme est une mauvaise explication de la résistance à l'installation d'infrastructures pour la production d'énergie éolienne. Cet article étudie cela en examinant les déterminants des préférences des touristes pour le positionnement d'éoliennes en mer à des distances différentes de la côte méditerranéenne. Une analyse en composante principale est réalisée pour extraire les thématiques générales autour de l'attitude des individus, qui généralement co-varient dans les modèles de choix. Ce travail démontre que le rôle des opinions pour les politiques énergétiques, l'urgence perçue en matière de changement climatique, les arguments de type NIMBY, la nationalité ainsi que le niveau de formation influencent les préférences pour le positionnement des éoliennes en mer.

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1. Introduction

Energy planners are often said to be faced with the trilemma of sustainability, security of supply and competitiveness, but a fourth problem is increasingly being recognised; that of public acceptance (Renssen 2011). The proposal to install offshore wind farms in the French region of Languedoc Roussillon, to help that nation meet its commitment to increase the share of renewable energy[2], has met significant local resistance (BRL 2003; Guipponi 2011). Opponents argue that offshore wind farms would disrupt a unique seascape, to the detriment of the tourist industry (Conseil Municipal Portiragnes 2010). As nations strive towards transitioning to a low carbon economy, and increase the share of renewables in their energy mix, tackling obstacles at the local level is increasingly urgent. Ellis et al. (2007) suggest that local resistance is related to value clashes over governance, technology, landscape aesthetics, issues of participation and power inequalities. In this light, research that can unpick the dynamic subjectivities framing wind farm disputes may offer insights that point towards how to overcome the current policy impasse (Ellis et al. 2007).

In this paper, we examine the determinants of tourist preferences for the siting of offshore wind farms in the Mediterranean Sea. A principal component analysis is employed to retrieve general attitudinal themes (components), which are used as covariates in a choice model designed to help us understand the various sources of preference heterogeneity regarding the installation of offshore wind farms at different distances from the coast. In explaining preferences for wind farms, previous studies have considered the role of socio-demographic factors and residency (Krueger et al 2011; Bishop and Miller, 2007; Frantal and Kunc, 2011; Lilley et al. 2010; Ladenburg, 2010), prior experience with wind farms (Krueger et al. 2011), and the respondents' use of the coastal zone and coastal zone residence (Ladenburg & Dubgaard, 2009; Ladenburg, 2010; Laudry et al. 2012). To the authors' awareness, none of these valuation studies have addressed the influence of wider concerns such as respondents' awareness of climate change, their assumptions about the effectiveness of wind energy as a generator of electricity, their preference for alternative energy forms, or the relative strength of NIMBY-type opposition on stated preferences for wind farm installation. To account for these influences in a formal way, this paper attempts to develop a conceptual framework for tourists that systemises the multi-dimensional set of discourse-based drivers influencing preferences for the positioning of offshore wind farms. A more formal view on the constituents of tourist preferences is an important contribution to the existing literature, because local opposition to wind farms is often related to the expected impact on local businesses and tourism (Dimitropoulos and Kontoleon 2009, The Economist 2010).

The paper is organised as follows. The next section provides a review of existing literature on preferences for wind power landscapes. We do this by exposing two key concepts, the 'green vs. green debate' and 'NIMBY'ism, which are prevalent in framing wind power debates. We also argue that explanations for opposition or support of wind farm positioning stretch beyond the postulates embedded in these concepts. In chapter 3, we review a set of discrete factors that that the literature has shown to play a role in shaping attitudes and preferences to wind farm proposals. In chapter 4 we develop a conceptual framework of postulated drivers of tourist preferences for the siting of offshore

[2] Following the adaptation of EU climate treaty, France has pledged to increase the share of renewables to 20% of the energy mix by 2020.

wind farms. The framework is tested on our empirical data (described in chapter 5) using a principal component analysis. The framework is subsequently used as covariates in a choice model of preferences for the siting of offshore wind farms. The results are presented, discussed and concluded upon in respectively chapter 6, 7 and 8.

2. Broad discourses on wind farm siting

2.1 Green vs. green and NIMBYism

Scenic views are for the most part public goods in that they are non-excludable and non-rival. Industrial wind turbines are, by their nature, highly visible and have an unavoidable impact on scenic views. Addressing the concerns of those who do not find them aesthetically appealing is therefore a real challenge for developers and policy-makers (Jones and Eiser 2009). It is perhaps then unsurprising that existing research identifies the perceived aesthetic fit of turbines on a landscape as one of the strongest determinants of attitudes to wind farm proposals (Pasqualetti et al. 2002, Wolsink 2010, Jones and Eiser 2009, Groothuis et al., 2008), and the most important factor in explaining contrasting views on wind power installations (Ellis et al., 2007). At the same time, wind energy falls under the category of green energy, as it does not contribute to global warming or other negative externalities such as acid rain or decreased visibility (Kahn, 2000). Typically therefore, while opponents tend to express concern over impacts on landscape, noisescape and local wildlife, supporters tend to view wind turbine development as symbolic efforts to avert climate change and air pollution (Jones et al. 2011; Ellis et al. 2007). This apparent conflict in wind power debates has been termed the green vs. green debate (Warran et al. 2005; Groothius et al. 2008). The juxtaposition of wind energy as a local bad, but with features of global public good, is said to lead to high levels of general public support but frequent local opposition to actual development (Bell et al. 2005). That is, wind energy is accepted and embraced as long as it is not in my backyard (NIMBY). In the following chapter however, we argue that there is an increasing literature that illustrate that both support and opposition to the location of wind power facilities stretches beyond NIMBYism and the Green vs. Green debate.

2.2 Aesthetics, business interests and political conviction.

Recent research has argued that NIMBYism does not adequately explain the attitudes of opposition to local wind farms (Swofford and Slattery 2010, Wolsink, 2006, EK 2005, Devine-Wright 2005, Jones and Eiser 2009). An elaborate attempt to coherently explore citizen discourses on wind farm development is provided in Ellis et al. (2007), who investigate the discourses of supporters and objectors to a proposed offshore wind farm on the Tunes Plateau in Northern Ireland. With regard to objectors, Ellis et al. (2007) show that opposition to wind power developments does not always derive from a desire to protect a pristine natural environment from encroachment, but may derive from an overall scepticism of wind power, an impression of wind power as an expensive source of electricity, or inferior to conventional energy sources, sometimes coupled with a low priority given to climate change. Similar results have been reported elsewhere. In an English region subject to nine wind-farm proposals, Jones et al. (2011) showed that the more favourably respondents felt towards existing coal and gas-powered generation activity, the fewer wind farms they endorsed. In Sweden, Söderholm et al. (2005) found that citizens who were willing to give up ‘economic benefits’ in order to gain ‘environmental benefits’ expressed a more positive attitude towards wind power than those who contested wind energy subsidies or taxes on competing power sources. As such, the question of support for renewable energy may be one of political stance regarding the extent to which governments should interfere in energy markets. The studies also confirm that opposition is not just grounded in 'local' consequences (aesthetics, wildlife, noise, etc), but that citizens are considering the opportunity costs of wind power projects when shaping their preferences.

Finally, there is substantial evidence that individuals who hold an ecological worldview, or regularly buy 'green' products, are more likely to accept local wind farm developments and the less likely to display NIMBY syndrome (Groothius et al., 2008, Söderholm et al. 2005, Jones et al. (in press)). Ellis et al. (2007) show that besides the 'green considerations', support may also be motivated by the expectation that a wind farm may yield local economic benefits and be of aesthetic value. Correspondingly, Swofford and Slattery (2010) stress that there is little evidence that wind turbines are universally perceived as unsightly, which suggests the green vs. green debate which informs NIMBYism may not always be at play.

3. Single based determinants of preferences and attitudes to wind power.

By reviewing the existing literature determinants of preferences and attitudes to wind farm siting, the following section provide evidence that support for or opposition against wind farms is influenced by the site-specific consequences of wind turbines, the context in which they are installed, personal experience with turbines, and the socio-demographic characteristics of those who are eliciting their preferences for them.

3.1 Physical and contextual factors.

What we may reasonably expect from the existence of Not-In-My-Backyard motives is that attitudes and preferences towards wind farms depends on their physical characteristics, and the context in which they are installed. In particular the height of the turbines, their size, the number of turbines and the landscape in which they are installed have been found as significant determinants (Devine-Wright 2011, Wolsink 2010, Van der Horst 2007). The distance of a wind farm from an individual's residence also affects his/her likelihood to accept the facility, although the direction of change is not uniform across studies (Devine-Wright 2005, Ladenburg 2011, Swofford and Slattery 2010). While negative impacts on tourism revenues has been demonstrated when offshore wind farms are within the near viewshed, the disamenity costs decline with increasing distance from the shore (Krueger et al. 2011, Westerberg et al. 2013, Landry et al. 2012). Beyond the landscape context, resistance to wind power installations is also induced by concern over the impact on local ecosystems and the noisescape (Dimitropoulos and Kontoleon, 2009, Firestone and Kempton, 2007, Firestone 2009, Warren, Lumsden, O'Dowd, & Birnie, 2005).

3.2 Stake and Institutional structure

The institutional context in which a facility is being prepared and built is also of prime importance. In particular, it is argued that involving local citizens in the financial framework and the decision making process of wind farm positioning facilitates public acceptance of the project (Wolsink 2007, Rebel et al. 2011, Haggett 2011). More generally, preferences will vary, depending on the individual's stake in the wind farm and the area under consideration. For instance, with regard to the siting of an offshore wind farm in North Wales, Devine-Wright and Howes (2010) find that opposition is stronger when locals experience a strong sense of place attachment. Conversely, when it comes to tourists, Westerberg et al. (2013) found that visitors loyal to a specific community resort expressed smaller wind farm disamenity costs than tourists who were visiting the resort for the first time. Westerberg et al. (2013) also found that tourists who spend more time engaging in cultural, historical and gastronomic activities experienced smaller visual disamenity costs from wind farms relative to tourists who spend more of their time on the beach. Consequently, the stake that tourists have in a changing seascape also depends on how tourists allocate their vacation time-budget.

3.3 Socio-demographic factors and nationality differences

Socio-demographic factors have consistently shown to have a consequence on respondent preferences for wind farms (whether onshore or offshore). In particular, opposition to, or preference against wind farms is often found to correlate positively with age (Frantal and Kunc, 2010, Lilley et al., 2010, Ladenburg 2010, Westerberg et al. 2013; Molnarova et al. 2012) and income (Firestone and Kempton 2007, Lilley et al. 2010, Ladenburg 2010). Evidence on the impact of education on preferences for location of wind farms is meagre and mixed (Ladenburg, 2007; Molnarova et al, 2012; Krueger et al. 2011). However Bergman et al. (2007) have shown that inhabitants in Scotland with higher levels of education are more likely to support renewable energy projects in general.

While we may expect differences in preferences around wind farms and wind power in general across nationalities, the empirical literature has paid scant attention to this topic. Our expectation is that the citizens of one country may have significantly different energy provision preferences than citizens from another country, owing to cultural circumstances and the prevalence of trust in government and democratic institutions. This hypothesis is supported by evidence that attitudes towards wind farms alter as individuals interact with family, friends and neighbours (Johansson and Laike 2007), and that an individual's opinion tends to converge on the overall opinion of the community in which he/she lives (Jones and Eiser, 2009). In a cross-country study, Tjernstöm and Tietenberg (2008) find that a population's trust in government, the prevalence of democratic institutions and concern over climate change translate into lower national greenhouse gas emissions. To the extent that concern about climate change varies from one country to another, we also expect that attitudes to wind energy may vary from one country to another.

3.4 Experience

Personal experience with wind turbines has been found to have a bearing on preferences for additional installations (Krueger et al. 2011; Molnarova 2012; Ladenburg 2010; Johansson and Laike 2007). Ladenburg (2011) provides a thorough review of exiting studies on how different types of prior experience affect preferences for wind farms both onshore and offshore. Depending on the study, the results show that previous experience with wind energy installations may facilitate acceptance, rejection, or indifference towards additional wind farms. However, the overarching conclusion is that the impact of onshore wind turbines on the viewshed leads to reduced support for additional onshore wind power development, whilst offshore viewshed effects have no impact on the support or opposition to additional offshore development.

3.5 Summary of the literature

The studies mentioned above provide evidence that support for or opposition against wind farms is influenced by the site-specific consequences of wind turbines, and the context in which they are installed. However citizens are also considering the opportunity costs of employing wind power more broadly, both in regard to local business interests and public funds. These opportunity costs refer to the perceived benefits or pitfalls of alternative energy producing technologies and the overall cost burden to society (of government support schemes for renewable energy). How the citizen perceives these opportunity costs depends on their political conviction, socio-psychological and socio-demographic traits. We would also argue that despite an accumulating body of literature on parameters, which affect attitudes and preferences around wind power, the evidence so far represents rather fragmented 'snap-shots' of impact variables. The literature thus fails to provide an overall representation of dominant opinion-based discourses (identified in section 2) that citizens may hold. As far as the authors are aware, no study to date has captured the impact of actual discourses on monetarised welfare estimates associated with the establishment of wind farms. To confront these shortcomings, chapter 4 presents a conceptual framework to help in understanding discourse-based drivers of opinions around offshore wind farms for non-residents/tourists.

4. Conceptual framework of drivers of preferences for offshore wind farm locations.

On the basis of above exposition, supplemented with internet research of wind power interest groups, stakeholder interviews, and through conducting focus groups, we developed a conceptual framework that schematizes the expected make-up of tourist preferences for the establishment of offshore wind farms (at 5,8 or 12 km from the coast).

The framework (fig 1) presupposes that respondents hold one or several of the 'main opinion variables' relating to the tourist's perception and attitudes towards the local impact of wind farms, climate change and alternative energy sources. These opinion variables are articulated through expected impact variables. Consequently, we stipulate that the tourist attempting to make a visual judgement about a wind farm will assess local consequences against what they perceive as global costs and benefits. By local consequences, we refer to perceived aesthetic intrusion or enrichment of their vacation destination, expected noise and wildlife interference. Global impacts on the other hand, refer to the tourist's perceptions about the need for urgent action on climate change and the role that renewable energies may play in this; the tourist's perceived threat of nuclear energy and the role that wind energy may play in reversing reliance of nuclear derived electricity; and the tourist's expectation about the impact of wind power development on public finance and consequent changes in electricity prices or taxes. The framework presupposes that each of these opinion variables hold direct implications for how the visual impact of the wind farm is evaluated at 5, 8 and 12 km distance from the shore. This presupposition is consistent with a body of literature, which argues that there are personality, habitual, sexual, national, and cultural differences in the perception and appreciation of landscapes (Gee and Burkhard 2010; Eleftheriadis et al 1990). A further implication is that the beauty or unsightliness of a landscape need not be objectively defined *per se*, and that an individual's evaluation of the landscape ultimately depends on the associations they make with that which they observe. Lastly, the framework also allows for incorporation of socio-demographic traits such as the nationality of the respondent, age, education and prior experience with wind turbines. In particular, we assume that the main opinion variables are correlated through these background variables, and that these should be included in a statistical analysis to uncover non-belief based sources of preference heterogeneity.

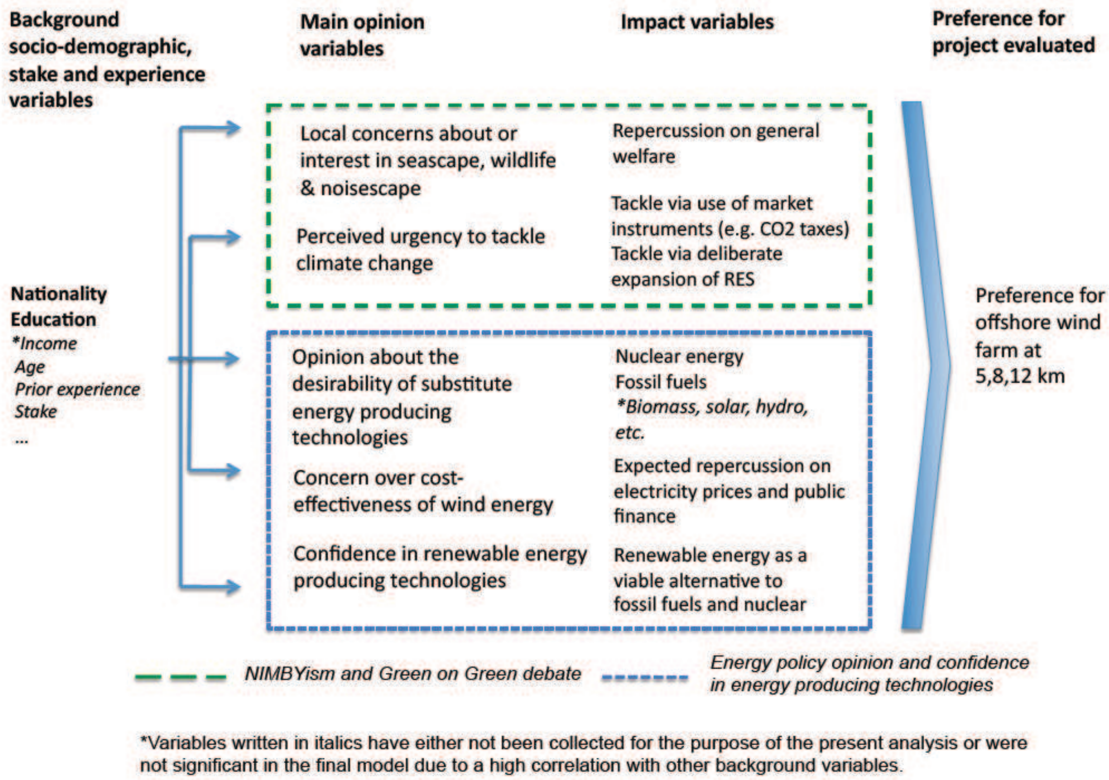


Figure 1: Conceptual framework of key discourse-based drivers of preferences for wind farm project

5. Case, materials and methods

5.1 The Languedoc Roussillon case study

Languedoc Roussillon is in Southern France and benefits from an annual average of seven hours' sunshine per day, 200 km of sandy beaches, a hinterland of unspoilt and varied countryside, and distinctive cultural and architectural monuments (Klem, 1992). The coastal Languedoc Roussillon is characterised by the spatial concentration of tourist community resorts, making the region the fourth most important tourist region in France (Lecolle, 2008). Languedoc Roussillon also holds a great offshore wind power potential, due to regular and strong winds and a large shallow continental plateau (BRL 2003). As a consequence, attention was drawn to Languedoc Roussillon when the French Government committed to more than double its share of renewable energies by 2020, under the EU Climate and Energy package and the Grenelle Forum (Enerzine, 2011; GWEC, 2011). Reaching a target of 23% renewable energy by 2020 will necessitate the installation of 6 GW of wind power along the Mediterranean and French Atlantic coastlines (CleanTechnica, 2012). Whereas the fishing industry constitutes the primary source of opposition in the French Atlantic regions, wind power projects in the

Mediterranean have been stalled primarily due to fears that they will be of detriment to the Languedoc tourist industry (Cabanis and Lourie 2011).

Coastal municipalities argue that wind turbines would disfigure the landscape and hereby destroy the attractiveness of their tourist resorts (Guipponi, 2011). However, little is known about the post-construction effect of offshore wind farms on tourism, especially in regard to destinations characterised by high-density sun and beach tourism, where turbine visibility is significant (Westerberg et al. 2013). In the perspective of a potential invitation to tender for the construction of offshore wind farms in Languedoc Roussillon (Agasse 2010), it was considered pertinent to inform the tourist industry and wind farm developers about how tourist numbers are likely to be affected To investigate this, we conducted a choice experiment valuation survey with tourists on the coast of Languedoc Roussillon and elicited willingness to pay / willingness to accept compensation for wind turbines at different distances from the shore. The results, with direct implications for the tourist industry, are discussed in Westerberg et al. (2013).

5.2 Survey development

The CE survey design commenced early 2010 with a series of meetings with chambers of commerce and industry, regional and departmental committees for tourism and with professionals in the wind power and tourist industry. This background helped in sketching a series of pertinent attributes to be valued. These were narrowed down and further defined in three focus groups held with both international and French national tourists. The selected attributes were wind farm placement at different distances from the shore; with or without wind farm associated recreational activities[3]; the presence or absence of a coherent environmental policy at the coastal tourist community; and an increase or decrease in the weekly overnight expense. Further description of the attributes and their levels are provided in table 1 and Westerberg et al. (2013).

The final survey instrument had 6 sections. It began with eliciting respondents' perceptions of the aesthetic and environmental risk of wind farms; concern about climate change; feelings of personal responsibility and perceptions about the efficiency of wind power compared to other energy sources, offshore versus onshore, etc. The second section constituted a couple of simple questions regarding the mode of respondent's vacation; the length; with whom they were travelling; accommodation type and price. The respondents were then presented with an A3 info-sheet with photos and explanations of the policy relevant attributes of various wind farm scenarios (described in table 1). These served to familiarise the respondents with the subsequent 8 choice set questions. In each (A4 page) choice set the respondent was asked to elicit his preferred alternative (A, B) or "none of them" if he preferred his current vacation attributes (without a coherent environmental policy, offshore wind farm or associated recreational activities). Photo simulations of wind farms were made using the professional photo simulation program, 'WINDPRO version 2.7' with typical August lighting conditions at midday. Figure 2 depicts an example of a choice set with the wind farm simulation at 5 and 8 kilometres. The fourth section of the survey instrument followed up on the choice-set questions in order to identify

[3] Offshore wind farms act as no-take zones for fish (Punt et al. 2009), the eco-design of wind turbine foundations or the installation of artificial reefs around turbine foundations, serve to create fish habitat and hereby permit to boost tourism and leisure activities, such as diving, angling and observational boating (LaCroix and Pioch 2011).

protest bidders. The fifth section asked about respondents' motivation for visiting to the Languedoc Roussillon and their overall satisfaction (or dissatisfaction) with the tourist resort. The final section elicited respondents' social, economic and attitudinal characteristics (table 2).

Attribute	s	Attribute	Level	Attribute description as in questionnaire
Offshore Wind farm	No Yes 5,8,12 km			A single offshore wind farm of 30 wind turbines can furnish electricity of up to 115,000 households. However, it may be contested on visual grounds. To minimise potential visual nuisances the wind farms can be entirely avoided or placed further offshore. Placing them further offshore is however a more costly option. Distances of 5 km, 8 km and 12 km from the coast correspond to wind farm projects currently or previously proposed in the Mediterranean.
		Wind farm associated recreational activities	Yes No	A range of recreational activities can be associated with the wind farm itself or nearby structures. The implantation of artificial reefs and the eco-design of turbine foundations may create new habitats for fish, crabs, mussels, lobsters and plants, creating a more diverse and dense population of marine life at wind farm sites than surrounding control sites. This will open up for a range of recreational activities such as sea-safaris, diving and angling.
Coherent environmental policy	Yes No			Coastal municipalities may minimise their impact on the environment by adopting a coherent environmental policy. An example of an environmentally responsible sustainable tourist resort, is one which: Favours the use of local and organic produce; limits the circulation of speed boats and scooters at sea; favours public transport on-shore; has an extended network of bicycle lanes; favours solar panels, energy and water saving devices and is equipped with adequate waste and sewerage facilities.
Price	[- 200, -50, -20, -5, +5, +20, +50, +200]			Change in weekly accommodation price relative to status quo (where the tourists were vacationing during the interview).

Table 1: Description of attributes

6 Data analysis

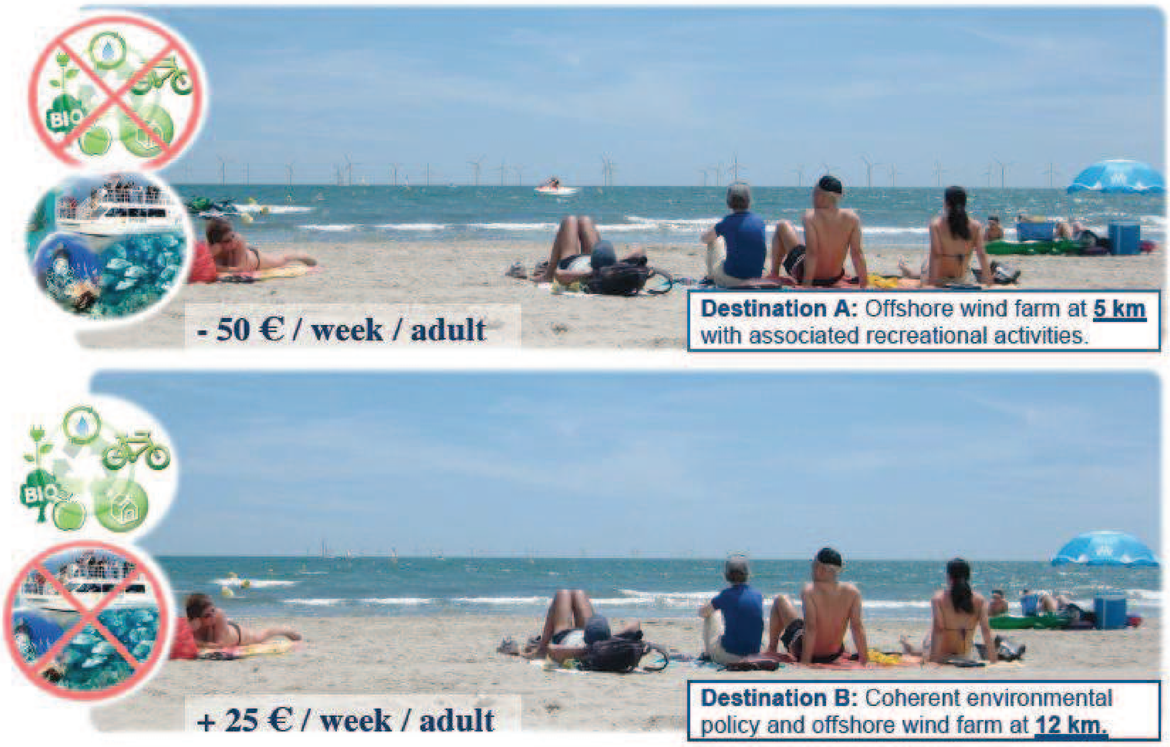
Our data analysis consists of two parts – a principal component analysis (PCA) and a choice experiment where the output from the PCA is used.

6.1 Principal component analyses

Thurstone (1931) was the first to introduce the term factor analysis, which is a multivariate exploratory technique that can be used to examine a wide range of data sets (Börner et al. 2003). A key method in factor analysis is Principal Component Analysis (PCA). PCA is used to transform a number of (possibly) correlated variables into a (smaller) number of uncorrelated variables called principal components. Uncorrelated components can be used as interaction terms in further statistical analysis, as is our case. In correspondence with our conceptual framework, thirteen attitudinal variables (appendix 4.1) were considered pertinent to our principal component analysis. When conduction PCA analysis the first extraction of components is generally followed by an orthogonal (varimax) rotation, resulting in uncorrelated principal components. This procedure simplifies the factor structure and makes its interpretation easier and more reliable (Abdi 2003). Formally presented, the first PC is given by the linear combination of the variables $X_1, X_2, \ldots X_P$.:

$$PC_1 = \beta_{11}(X_1) + \beta_{12}(X_2) + \ldots \beta_{1p}(X_p) \qquad (1)$$

Where PC_1 is the subject's score on principal component 1 (the first component extracted), β_{1p} is the regression coefficient (or weight) for observed variable *p*, as used in creating principal component 1 and X_p is the subject's score on observed variable *p*.



The first principal component is calculated such that it accounts for the greatest possible variance in the data set. The regression weights are determined such that for a given set of data, no other set of weights could produce a set of components that are more successful in accounting for variance in the observed variables. Successive components are similarly calculated according to eq. 1, and continue until a total of *p* uncorrelated principal components have been calculated, equal to the original number of variables. Eigenvalues are the variance explained by each principal component, and are constrained to decrease montonically from the first PC to the last. The PCs are rotated using an orthogonal (varimax) rotation, which simplifies the factor structure and makes its interpretation easier and more reliable (Abdi 2003). For a detailed treatment of principal component analysis, we refer the reader to Harman (1976), Smith (2002), Abdi (2003), and Jolliffe (2002). So far, PCA has been used only a handful of times, to assess heterogeneity in stated preference methods (Boxall and Adamowicz, 2002; Nunes and Schokkaert, 2003; Karousakis and Birol, 2008; Kontoleon and Yabe 2006).

6.1.1 Opinion and attitudinal variables

A comprehensive set of attitudinal statements was used in order to assess the tourist's opinion about energy policy, climate change, the effectiveness of wind power and renewable energy. Respondents were asked to rate (or agree or disagree with) each question. Some questions contained a 5-point likert scale and others a 3-point likert scale. To counteract that a variable has a higher variance than another, simply due to its likert scale, all responses were recoded to a 3-point scale. Furthermore, to get the same meaning for all labels, negative statements were reversed for the analysis. The list of the attitudinal statements and their scale is found in appendix 1.

6.2 Econometric Specification of the choice experiment

To describe discrete choices in a utility maximising framework, the CE employs the behavioural framework of random utility theory (RUT). When the relationship between utility and characteristics is linear in the parameters, the individual *i*'s utility *U* from alternative *j* is specified as:

$$U_{ij} = V_{ij} + e_{ij} = V(X_{ij}, S_i, P_i) + e_{ij} \qquad (2)$$

where V_{ij} is the systematic and observable component of the latent utility and ε_{ij} is a random component assumed IID and extreme value distributed (Louviere et al., 2000). The choice of one alternative (*j*) over another alternative is a function of the probability that the utility associated with *j* is higher than that associated with other alternatives. In this case, the probability of any particular alternative *j* being chosen can be expressed in terms of a logistic distribution and Equation 1 can be estimated with a conditional logit model (CLM) (Greene, 2003), which takes the general form:

$$P_{ij} = \frac{e^{V_{ij}}}{\sum_{h \in C} e^{V_{ih}}} \qquad (3)$$

It is possible to allow for preference heterogeneity, e.g. through a random parameter logit model. In this study however, we are interested in looking at how much heterogeneity can be explained by the latent factors from the PCA and therefore we opted for the use of a simpler conditional logit model[5]. In particular we interact the factor components from the PCA (PC) and socio demographic characteristics (S) with wind farm distance attributes. Because the factor components are latent, we do not bias the estimates in the conditional model. While we test different specifications of the deterministic part of the utility function, specified to be linear in the parameters, the most elaborate one presented in Section 7 takes the following form:

$$\begin{aligned} V_{ij} = {} & \beta_{ASC} + \beta_1 X_{WF\text{-}5km} + \beta_2 X_{WF\text{-}8km} + \beta_3 X_{WF\text{-}12km} + \beta_4 X_{Reef\ Rec} + \beta_5 X_{Env.policy} + \beta_6 X_{Cost} + \\ & \delta_7 (X_{WF\text{-}5km} \cdot P_{WF\text{-}INEFFICIENCY}) + \delta_8 (X_{WF\text{-}8km} \cdot PC_{WF\text{-}INEFFICIENCY}) + \delta_9 (X_{WF\text{-}12km} \cdot PC_{WF\text{-}INEFFICIENCY}) + \\ & \delta_{10} (X_{WF\text{-}5km} \cdot PC_{PRO\text{-}RES}) + \delta_{11} (X_{WF\text{-}8km} \cdot PC_{PRO\text{-}RES}) + \delta_{12} (X_{WF\text{-}12km} \cdot PC_{PRO\text{-}RES}) + \\ & \delta_{13} (X_{WF\text{-}5km} \cdot PC_{CLIMATE}) + \delta_{14} (X_{WF\text{-}8km} \cdot PC_{CLIMATE}) + \delta_{15} (X_{WF\text{-}12km\ t} \cdot PC_{CLIMATE}) + \\ & \delta_{16} (X_{WF\text{-}5km} \cdot PC_{NIMBY}) + \delta_{17} (X_{WF\text{-}8km} \cdot PC_{NIMBY}) + \delta_{18} (X_{WF\text{-}12km\ t} \cdot PC_{NIMBY}) + \\ & \delta_{19} (X_{WF\text{-}5km} \cdot S_{NORTH\text{-}EUR}) + \delta_{20} (X_{WF\text{-}8km} \cdot S_{NORTH\text{-}EUR}) + \delta_{21} (X_{WF\text{-}12km\ t} \cdot S_{NORTH\text{-}EUR}) + \\ & \delta_{22} (X_{WF\text{-}5km} \cdot S_{HIGHER\text{-}EDUC}) + \delta_{23} (X_{WF\text{-}8km} \cdot S_{HIGHER\text{-}EDUC}) + \delta_{24} (X_{WF\text{-}12km\ t} \cdot S_{HIGHER\text{-}EDUC}) \end{aligned} \qquad (4)$$

The β_{ASC} is the parameter for the alternative specific constant (ASC), which accounts for variations in choices that are not explained by the attributes or socio-economic variables. The vector of coefficients $\beta_{1\ldots}\ \beta_K$ and $\delta_{1\ldots.}\ \delta_m$ is attached to a vector of attributes (X) and interaction terms (XS and XPC) that

[5] We have included a RPL model in appendix 4.2, which serves to show that the mean of the four principal components interacted with wind farm placement, display the same significance as in the CLM.

influence utility respectively. PC is a vector of variables that factored together in the principal component analysis and S is a dummy variable equal to 1 if the respondent was of Northern European origin or had a higher education level. As the focus of this paper is on the determinants of preferences for the siting of wind farms, P and S were only interacted with the wind farm attribute. Given that opinion, psychometric and socio-demographic characteristics (S and PC) are constant across choice occasions for any given respondent they can only enter as interaction terms with the management attributes.

The Willingness to Pay (WTP) or Willingness to Accept compensation (WTA) is estimated by the marginal rate of substitution (MRS):

$$MRS = -\frac{\beta_k}{\beta_P} \qquad (5)$$

where β_k refers to the parameter of interest and β_P to the parameter for price. In order to calculate standard errors for the WTP, the Delta method (Greene, 2002) is used.

Background socio-demographic characteristics	Description	Present in final model	Mean % (st. dev)
Higher Education	Has done at least 2 years of university studies	X	51%
Northern European	Of Scandinavian, English, Belgian, German, Swiss, Luxembourgian or Dutch origin.	X	26%
International tourists	Of any origin other than French		27%
See wind turbines daily	The tourist sees wind turbines daily, for example during his trip to work.		32 %
Net household income	In intervals of € 500 per month (min €0, max €>7000)		€ 2500 - € 3500
Age	Age (min 17 yrs, max 81 yrs)		37 years (14.6 years)
Female			59%

Table 2: Socio-demographic characteristics of the sample

6.3 Choice experimental design

With 8 payment levels[15] and three policy attributes, two of which have two levels while another has four, a full factorial design would have resulted in a total of 256 alternative management combinations. As this would constitute an unreasonably large design in practice, we asked respondents to evaluate 8 choice sets that were determined through the use of a fractional factorial design assuming an MNL model with priors (β ≠ 0) obtained from a pilot study. The design was d-error minimised by Ngene (ChoiceMetrics 2010), with a resulting MNL d-error of 0.1085.

[15] While the status quo levels were included in the design for all other attributes, this was not the case for the monetary attribute. Hence, the “no change in price relative to today” option was not included in the design.

6.4 Results

6.4.1 PCA Results

The principal component analysis was undertaken using the principal factor extraction method in SAS 9.2 and varimax rotation. Based on a scree-test and the eigenvalue-one criterion (Kaiser, 1960), four PCs were retained, accounting for 49% of cumulative variance. Loadings above 0.40 were considered as factoring together (Harman, 1976). Although it is often recommended that retained PCs should account for a minimum of 70% of total cumulative variance, lower percentages in the order of 50% can serve as an adequate summary when each component has interpretive meaning that makes sense in terms of what is known about the constructs under investigation (Everitt and Dunn, 1991). The PCs have been named on the basis of the variables that factored together in the rotated factor pattern (table 3), as well as the relative magnitude of the factor loadings. The 1st PC, labelled "Wind Power inefficiency", consists of those questions that refer to the perception that wind power is an inefficient technology, with consequences for the price of electricity, and for public finance. The 2nd PC, labelled "pro renewable energy sources (RES)" reveals a desire to see the phase out of nuclear and fossil fuels, and the belief that renewable energies offer a viable substitute to these conventional fuels. The 3rd PC labelled 'NIMBY syndrome' consists of questions representing explicit concern about wind power development on the local environment with respect to the seascape, noise and aquatic marine life. The 4th PC, 'climate change concerned' includes the conviction that climate change is a serious problem; that efforts should be taken to reduce climate change and that fossil fuel consumption should be subject to a CO2 tax.

	WIND POWER INEFFICIENCY	PRO-RES	NIMBY SYNDROME	CLIMATE CHANGE CONCERN
Electricity prices will increase as wind power increasingly penetrates the energy market	75*	-14	-1	-7
General taxes will increase as wind power increasingly penetrates the energy market	68*	-7	14	-3
Wind power is an inefficient source of electricity	55*	-7	11	-6
Renewable energies offer a viable substitute to fossil fuels	-30	72*	-5	0
Renewable energies offer a viable substitute to nuclear energy	-5	63*	21	4
Avoid use and development of fossil fuel sourced energy	-13	58*	-20	23
Avoid use and development of nuclear energy	37	50*	-30	-9
Offshore wind farms have a negative influence on the seascape	8	-14	52*	-6
Offshore wind farms have a negative influence on life in the sea	4	-5	69*	0
Offshore wind farms have a negative influence on noise levels	12	16	74*	5
The introduction of CO2 taxes is desirable	-1	21	-20	60*
Climate change is a problem that should be taken seriously	-13	2	16	67*
Efforts should be made to significantly reduce CO2 emissions in my country	-3	-4	-1	82*
Eigenvalues	2.29	1.53	1.30	1.24
Variance explained by each factor	1.62	1.61	1.57	1.55
Cumulative variance	0.18	0.29	0.39	0.49

The printed values of the loadings are multiplied by 100 and rounded to the nearest integer. Values greater than 0.40 are flagged by an '*'.

Table 3: Rotated factor Pattern

6.5 Choice experiment results

6.5.1 Parameter estimates

2712 choices elicited from 332 respondents were analysed using NLOGIT version 4.0. Two models were specified - a CLM with interactions between the wind farm management attribute and socio-psychometric constructs captured in the PCs, and socio-demographic dummies and a simple CLM for comparison. A Random Parameter Logit specification was also estimated, and yielded similar results. As we are interested in interactions per se, we chose to employ a simpler model. The estimates on the tourist sample for the CLM without interactions are reported in table 4. They reveal that wind farm associated reef recreation; the presence of a coherent environmental policy and the presence of wind farms are all significant factors in choosing a coastal tourist destination. It is also clear that the overall fit of the model, as measured by the adjusted McFadden's ρ^2 of 0.17, is good by conventional standards used to describe probabilistic discrete choice models (Ben-Akiva and Lerman, 1985; Louviere et al., 2000).

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	Basic CLM		CLM with interactions		Marginal WTP	
FIXED PARAMETERS	β	t-value	β	t-value	€	
Alternative Specific Constant	-0.59	(-6.3) ***	-0,61	(-6,5)***	-39.2	[-51;-27]***
Coherent environmental policy	1.47	(17.7) ***	1,49	(17,7)***	95.2	[88;103]***
Artificial reef-associated recreation	0.70	(10.2) ***	0,71	(10,1)***	45.2	[37; 53]***
Wind farm 5 km	-1.83	(-15.5) ***	-2,19	(-15,6)***	-140.0	[-154;-126]***
Wind farm 8 km	-1.07	(-10.3) ***	-1,31	(-10,2)***	-83.9	[-99;-69]***
Wind farm 12 km	-0.13	(-1.4)	-0,27	(-2,2)**	-17.0	[-32;-2]
Cost	-0.02	(-22.8) ***	-0,02	(-22,9)***		
INTERACTIONS (OBSERVED HETEROGENEITY)						
Wind Power Inefficiency*WF 5 km			-0,17	(-2,6)***	-10.7	[-19;-3]***
Wind Power Inefficiency*WF 8 km			-0,21	(-3,1)***	-13.6	[-5;-22]***
Wind Power Inefficiency*WF 12 km			-0,07	(-1,0)	- 4.2	[-12;4]
Pro RES*WF 5 km			0,14	(2,2)**	8.9	[1;17]**
Pro RES*WF 8 km			0,12	(1,7)*	7.6	[-1;16]*
Pro RES*WF 12 km			-0,06	(-0,9)	-3.7	[-12 ;5]
NIMBY*WF 5 km			-0,37	(-5,6)***	-23.4	[-32;-15]***
NIMBY*WF 8 km			-0,16	(-2,3)**	-10.0	[-19;-1]**
NIMBY*WF 12 km			-0,21	(-3,3)***	-13.6	[-22;-5]***
Climate change concern*WF 5 km			0,22	(3,5)***	14.0	[6;22]***
Climate change concern*WF 8 km			0,16	(2,3)**	10.2	[2;19]**
Climate change concern*WF 12 km			0,06	(0,9)	3.9	[-4;12]
Northern European*WF 5 km			0,72	(4,8)***	46.3	[27;65]***
Northern European*WF 8 km			0,39	(2,4)**	24.7	[4;45]**
Northern European*WF 12 km			0,19	(1,2)	12.3	[-7;32]
Higher education*WF 5 km			0,26	(2,0)**	16.6	[0;33]**
Higher education*WF 8 km			0,28	(2,0)**	18.0	[0;36]**
Higher education*WF 12 km			0,17	(1,3)	11.1	[-6;28]
Final log-likelihood:	-2370.9		-2305.9			
Likelihood ratio test:	1346		1342.5			
Adjusted rho-square:	0.170		0.187			
BIC	1.76888		1.7786			
Number of observations	2712		2712			
Number of individuals	337		337			

*denotes significance at 10% level. **denotes significance at 5% level. and ***denotes significance at 1% level. WTP is calculated using eq.5 and refers to the WTP for the average respondent in the CLM with interactions model. The lower and upper bounds for 95% confidence intervals are calculated using the delta method and reported in the brackets.

Table 4: CLM results

The parameter estimates reveal that the experienced visual disamenity costs decrease as the wind farm is situated further from the coast, and that disamenity costs associated with a wind farm at 5,8 or 12 km may be fully compensated for by the presence of a coherent environmental policy or wind farm associated recreational activities. Some debate surrounds how to interpret and use the alternative specific constant, when deriving welfare scenario estimates (Boxall et al., 2009). Since the parameters for the alternative specific constant (ASC) are equal to those of the status quo, and are negative and significant, it either means that the tourist sample has a negative utility associated with the current situation or experiences a positive utility from any move away from the status quo. We consider the latter explanation more appealing than the former, given that the tourists by definition should be enjoying a welfare benefit from their vacation and not the opposite. This interpretation has implications for our scenario estimates and discussion in sections 6.6 and 7.

The conditional logit model with interactions is similarly displayed in table 4. In this model, the wind farm attributes interact with the four components derived from the PC analysis, as well as two socio-demographic dummies; namely whether the respondent has a higher university degree or is of Northern European nationality as opposed to French[16]. Seeing wind turbines daily, being a higher income earner, and age were similarly significant determinants of wind farm preferences. However, we found that the effect of these characteristics were insignificant when considered simultaneously with nationality and education level of the respondents. Consulting table 4, we see that the main parameter estimates display the same pattern as the simple CLM. However when accounting for socio-demographic and opinion related variables, wind farm installation at 12 km from the coast is a source of disutility to the respondent who does not hold the characteristics specified in the interaction terms.

Considering at first the principal component interactions, we can see that the results are in correspondence with our hypothesis. Perceived inefficiency of wind power, and NIMBY-attitudes, increase the experienced disutility from holidaying in proximity to a wind farm. In contrast, concern about climate change, confidence in renewable energies and aversion towards nuclear and fossil fuel sourced electricity, serve to lessen the disutility experienced when a wind farm is located in the near viewshed (at 5 km and 8 km from the coast). In concrete terms, judging from parameter estimates, NIMBY type attitudes are stronger determinants of experienced disutility than the perceived inefficiency of wind power. As for the utility enhancing components, the perceived urgency of tackling climate change reduces the negative welfare impacts of wind turbines to a greater extent than aversion to nuclear and fossil fuels. It is noteworthy that being of Northern European nationality, as opposed to of French nationality, is the single most important determinant of differences in preferences for the siting of offshore wind farms. Northern Europeans, as well as more highly educated respondents, are less sensitive to the installation of offshore wind farms at 5 and 8 km from the coast. When a respondent possesses both these characteristics, the average compensation requirement is significantly reduced.

6.6 WTP estimates

Having defined the most appropriate model, a WTP measure for changes in coastal destination characteristics may be obtained by converting parameter estimates into marginal rates of substitution, according to equation 4. These, and their corresponding confidence intervals are reported in the last column of table 4. Consulting the table we see that those respondents who hold none of the characteristics specified in the interactions, require an average compensation of 140€ per week per adult to be willing to holiday at a coastal tourist resort with a wind farm at 5 km from the coast. However, the presence of a coherent environmental policy and wind farm associated recreational activities, worth respectively 95€ and 45€, more than compensate for the visual nuisance experienced by the presence of the wind farm at 5, 8 or 12 km. By further accounting for the fact that the ASC is negative and significant, it becomes clear that wind farm eco-design associated recreational activities

[16] Seeing wind turbines daily, being a higher income earner, and age were similarly significant determinants of wind farm preferences. However, we found that the effect of these characteristics were insignificant when considered simultaneously with nationality and education level of the respondents.

alone can compensate for the visual nuisance imposed by the wind farm, when the facility is installed 8 km from the shore (39€ + 45€ - 84€ = 0).

Considering WTP and WTA estimates in the light of the typologies of the tourists captured in the principal components, we can see that when the development of wind power is perceived as costly to society, respondents experience an increase in disutility from holidaying at a coastal community resort with an offshore wind farm. This disutility translates into an additional 10€ to 14€ weekly compensation requirement respectively when the wind farm is located 5 to 8 km from the shore. When the respondent holds NIMBY-like attitudes, the additional compensation requirement is in the order of 23€, 10€, and 14€ for turbines located offshore by 5,8 or 12 km respectively. If an individual is keen for society to engage in efforts to reduce climate change, his or her compensation demands for a wind farm in the near viewshed drop by about 10€ to 14€ (or about 10-12%), compared with the respondent who is not concerned about climate change. In a similar sense, we can see that aversion to fossil fuels and nuclear energy, and simultaneous confidence in the ability of renewable energies to substitute these fuels, translates into a compensation requirement of 130€ (rather than 140€) and 71€ (rather than 84€) when the wind farm is sited 5 and 8 km from the shore respectively. It should be born in mind that such respondent characteristics will typically co-exist with one or several of the other interactions (such as having a higher education and being concerned about climate change), which render the necessary compensations even lower. When a wind farm is located 12 km from the shore, the preferences of those concerned about global warming or conventional energy are not significantly different to those who are not as concerned.

Lastly, we observe that Northern European tourists would require almost 50€ less (33% less) in compensation than their French counterparts when a wind farm is installed 5 km from the shore. When the wind farm is installed at 8 km from the shore, the compensation requirement is likewise about one third less for the Northern European respondents. Higher education also plays a role in reducing the perceived visual nuisances, of an order of about 12% to 20% less when a wind farm is installed at 5 km to 8 km from the shore.

7. Discussion

Several interesting remarks can be made in regard to above-presented results. Firstly, with respect to the PCs and the socio-demographic characteristics, the results point to little divergences in preferences with respect to installing a wind farm 12 km from the coast. When a wind farm is installed 12 km offshore, the only interaction term that is significant is that of NIMBY-associated objections. This result suggests that respondents concerned about wind farms' intrusion on the landscape, noise pollution, or damage to wildlife are not easily bribed to accept wind farms 'just because' they are installed further offshore.

Secondly, placing a wind farm 12 km from the coast appear to neutralise objections by those who consider wind power to be 'a blow to ratepayers, businesses, and municipalities who are being asked to bear billions of dollars in new electricity costs' (Alliance of Nantucket Sound 2011). This is rather surprising since tourists were told during the interview that the installation, operation and maintenance costs rise with as wind farms are installed further from the coast (Möller et al. in press).

One may thus stipulate that the disutility experienced as a result of seeing a wind farm, is the combined result of viewing the wind farm in the near viewshed and perceiving the technology as inefficient.

Thirdly, our principal component interactions show that concern over climate change, nuclear energy and the cost-effectiveness of wind power are important determinants of the welfare economic impacts that individuals experience when vacationing in proximity to an offshore wind farm. This is noteworthy given that we were eliciting respondent preferences for wind farms captured in photo illustrations (figure 2). The results point to the fact that although we may think that we are eliciting preferences for 'objective' physical characteristics of a landscape, the elicited preferences are inherently shaped by 'political, technical, economic or ecological' implications of the object or landscape under consideration. In particular, the results lead us to postulate that the broader implications of new developments may be at least as significant in shaping preferences, as the physical characteristics of that which is being valued. This is a novel contribution to the existing literature on preferences for wind farm siting.

Finally, our results indicate that nationality stands out as a significant determinant of tourist preferences regarding the location of offshore wind farms. In particular, the presence of an offshore wind farm compromises the welfare of Northern European tourists (majority German) significantly less than that of their French counterparts. This is particularly noteworthy given that we have controlled for other factors, such as the desire to phase out nuclear, or concern about climate change. In this regard, it is not unreasonable to consider that adherence to a certain energy orientation (e.g. towards renewables) is dependent on the energy policy pursued in the respondent's country of residence. This hypothesis is supported by empirical observations. German energy policy, for example, is being increasingly dominated by a diverse and growing group of renewable energy supporters who enjoy broad political and public support. These forces have convinced the Merkel government to transform the nuclear and fossil-fuel dominated energy system into one based predominantly on renewable energy sources (Bossen 2012). In contrast, in an article titled "France and renewable - a not so passionate love-affair", Saint Jacob (2008), describes how the French public, economists, scientists, and policy makers are little convinced about the benefits renewable energy. Correspondingly, the BBC has labelled France as Europe's most enthusiastic devotee of nuclear power (BBC world, 2009).

What do the above observations imply for overall welfare estimates? Assuming someone is of Northern European nationality, has a higher education and is concerned about climate change, then the compensation requirements associated with the installation of a wind farm 5 km from the shore will be of an order of approximately 24€ / week (-140€ + 14€ + 46€ + 9€ + 17€ + 39€[17]). As such, we may conclude that even for the 'globally concerned highly educated' tourist, a wind farm in the near viewshed is still associated with some disutility, and prompt demand for compensation. In trying to explain the sources of disamenity costs and general resistance to renewable energy installations, Sovacool (2009a: p4510) argues that unlike current energy production and use, "most renewable

[17] Since the ASC is dummy coded as equal to one for the status quo, and it is negative and significant, any change away from the status quo (including the installation of wind farms), can be interpreted as welfare enhancing according to its marginal value.

power generators concentrate all of their externalities in one point, rather than distributing them over a vertically complicated fuel cycle (as nuclear and conventional units do)". Coupled with this, a slow and subtle shift to modern-day natural gas or electric heaters has reduced almost all human involvement in the production of heat to the mere flicking a switch (Sovacool 2009b).

As conventional electricity production units are for the majority 'out-of-sight', they are also 'out-of mind'. In contrast, decentralised renewable energy facilities, scattered in the landscape, are to a greater extent susceptible to immediate critique. One may thus postulate, in accordance to our results, that an individual who is aware of the externalities of nuclear or fossil fuel generating units will be less inclined to 'condemn' wind turbines whose externalities are concentrated where they are sited. Indeed, an interesting feature that comes out of our results is that higher educated respondents are less sensitive to the installation of offshore wind farms at 5 and 8 km from the coast. This leads us to postulate that higher education is a factor, which may facilitate awareness of the broader discussions about conventional electricity generating units, such as climate change or the storage of radioactive waste. This is in line with Bergman et al. (2007) who find that Scottish citizens who have a higher education are more likely to support renewable energy projects.

Lastly, it should be remarked that our results undeniably indicate that installing wind farms further distances from the coast can serve to ease opposition to wind power projects. There is henceforth scope for optimism from the point of view of wind farm developers, as most wind farm projects to date are proposed or installed no closer than 10 km from the shore (4coffshore). The depth of the Languedoc Roussillon Sea floor however is such that wind farm installation 12 km offshore is the economically feasible frontier in the light of current and foreseeable feed-in tariffs for seafloor mounted wind power installations (Lourie and Cabanis 2011). A breakthrough in floating wind turbine technology will challenge that constraint.

7.1 Caveats of the study

A substantial body of evidence suggests that WTA responses are several times larger than WTP responses for the same change (Freeman, 1993; Horowitz and McConnell, 2002). Our aim in this study was to demonstrate the influence of socio-demographics and opinion-based discourses on demand or aversion to wind farm siting. We therefore considered correcting for WTP-WTA asymmetry as beyond the scope of this paper. The interested reader is referred to Westerberg et al. 2012b. The core contribution of this paper lies in the conceptual framework presented in figure 1. The framework calls for a few extensions to the preference-drivers that we have considered in the present study. In particular, we did not include specificities about the kind of experience that subjects have with wind turbines and other renewable energy producing facilities. With respect to the latter, Ladenburg (2012) shows that demand for wind power, biomass or solar power development depends on: whether an individual has a view to one or many wind turbines from his property; the distance of the turbines from the property and; whether the turbines are located offshore or onshore. Lastly, it may also be stipulated that demand for any one renewable energy source is the outcome of a joint matrix of experience and knowledge based parameters for all existing energy sources, renewable and non-renewable (Ladenburg 2012). Further research is needed to properly account for the effect of experience and knowledge on the marginal rates of substitution between different energy producing technologies.

8 Concluding remarks

Opposition to energy facility siting has generally been explained by the 'Not in my back yard, but happily on anyone else's patch' reaction. But the NIMBY label 'leaves the cause of opposition unexplained' (Kempton et al., 2005) and consequently it lacks explanatory value. In this paper, we have attempted to propose an alternative, coherent conceptual framework to replace the NIMBY concept. Our motivation for building this framework is based on arguments such as Tjernström and Tietenberg (2008: p322) who contend that: "most researchers who study attitudes, perceptions and preferences do so because they sense that what people believe matters beyond the individuals' lives". Specifically, by applying our framework to a stated preference valuation study we show that perceived impacts on landscape, noisescape and wildlife; perceived effectiveness of wind power compared to alternative energy sources, and the perceived urgency of tackling climate change or replacing nuclear energy can each help explain the degree of aversion that individuals experience to locating offshore wind farms in the near viewshed.

At the actual planning stage of a wind farm, discourses are characterised by identifying necessary trade-offs between perceived landscape impacts, the protection of sensitive areas, installation costs and returns on wind speed (Ellis 2007). However, in many instances the wind farm project is abandoned before the necessary trade-offs have taken place. Typically, the project is abandoned when faced with significant local resistance. Our results suggest that tourist community preferences around wind farms in the near viewshed are likely to be influenced by the information they have on climate change; the real cost of wind power (compared to alternative energy sources); the effectiveness of renewable energies and its capacity to replace conventional fuels. We also show that nationality and education matter, most probably because these two factors are likely to influence how informed citizens are with respect to the former issues. These results are in line with Fimereli et al (2008) who show that knowledge about energy producing facilities can drive up demand for renewable energy sources, such as wind power. Our research findings are of pertinence to current practice - public acceptance has been referred to as the energy sector's biggest headache (Renssen 2011). To confront this policy impasse, our results emphasize the importance of recognising that beyond physical aspects, people's choices are shaped and constrained by their social, cultural and institutional contexts (Owans and Driffil 2008).

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Appendix 4.1 - Attitudinal variables used in the PCA

	Transformed scale (1-3)	Original scale (1-5 / 1 - 3)
In terms of energy Policy, how do you rate the prospect of the following choices?		
• The continued use and development of nuclear energy • The continued use of fossil fuels and the development of their extraction and combustion techniques • The employment of CO2 taxes (reversed scale)	(1) Important / very important (2) Little important / not important (3) To be avoided altogether	(1) Very important (2) Important (3) Little important (4) Not important (5) To be avoided
Your opinion about climate change: • Do you consider that climate change is a problem, which should be taken seriously? • Do you consider that your country ought to carry out significant reductions in its CO2 emissions?	(1) No (2) Maybe (3) Yes	-ii-
Do you think that renewable energies used for generating electricity offer a viable substitute for:		
• Nuclear energy • Fossil fuels	(1) No (2) To some extent (3) Yes	-ii-
As wind power penetrates the energy market, what do you think will happen to:		
• Electricity prices? • tax burden on Citizens?	(1) Significant decrease/ decrease (2) No impact (3) Increase/ increase significantly	(1) Significant decrease (2) decrease (3) no impact (4) increase (5) significant increase
What association do you make with wind power in regard to its efficiency?		
	(1) Very efficient/ efficient (2) Neutral (3) Inefficient/ very inefficient	(1) Very efficient (2) efficient (3) neutral (4) inefficient (5) very inefficient
In your opinion, what influence do you think offshore wind turbines could have on:		
• The landscape • Life in the sea • Noise levels	(1) Very positive/positive (2) Neutral (3) Negative/very negative	(1) Very positive (2) Positive (3) Neutral (4) Negative (5) Very negative

Table A.1: Attitudinal variables used in PCA

Appendix 4.2 - RPL model with PCA interactions

Atribute levels and interactions	β	t-value	significance
Alternative Specific Constant	-0,74	-5,61	***
Coherent environmental policy	-4,25	-8,96	***
Coherent environmental policy - st.dev	1,04	2,10	**
Artificial reef-associated recreation	-2,31	-8,53	***
Artificial reef-associated recreation - st.dev	1,44	4,15	***
Wind farm 5 km	-0,48	-2,16	**
Wind farm 5 km - st.dev	3,07	6,47	***
Wind farm 8 km	1,36	6,76	***
Wind farm 8 km - st.dev	1,46	3,56	***
Wind farm 12 km	2,47	9,66	***
Wind farm 12 km - st.dev	1,44	4,30	***
Cost	-0,03	-9,30	***
Cost - st.dev	0,01	2,87	***
Wind Power Inefficiency*WF 5 km	-0,26	-1,81	*
Wind Power Inefficiency*WF 8 km	-0,33	-2,54	**
Wind Power Inefficiency*WF 12 km	-0,09	-0,80	
Pro RES*WF 5 km	-0,72	-4,51	***
Pro RES*WF 8 km	-0,23	-1,82	*
Pro RES*WF 12 km	-0,37	-3,13	***
NIMBY*WF 5 km	0,45	3,09	***
NIMBY*WF 8 km	0,26	2,01	**
NIMBY*WF 12 km	0,10	0,92	
Climate change concern*WF 5 km	1,55	4,26	***
Climate change concern*WF 8 km	0,69	2,33	**
Climate change concern*WF 12 km	0,33	1,21	
Northern European*WF 5 km	0,40	1,36	
Northern European*WF 8 km	0,49	1,91	*
Northern European*WF 12 km	0,24	1,01	
BIC	1,746		
Adj R2	0,235		
Final log likelihood function	-2250,6		
Number of draws	1000		
Number of observations	2712		
Number of individuals	337		

Chapter 5:

Valuing Mediterranean seascape and land-use changes with explicit consideration of loss aversion and increasing price sensitivity

Abstract

This disparity between WTP for a good and the WTA compensation to forgo the same good is one of the most widely documented phenomena in environmental economics. We find that tourists lodging along the French Mediterranean coast display a WTA / WTP ratio of 1.94 with respect to the installation of an offshore wind farm, reef-associated recreational activities and green tourism. With respect to wind farm installation, the ratio imply that the disutility of seeing an offshore wind farm in the near view shed, is 94 % higher than the utility associated with removing the wind farm, once it is in place. We investigate the extent to which the income effect, in alignment with standard Hicksian theory may help explain observed discrepancies. Prospect theory offers an alternative explanation to observed WTP-WTA asymmetry. According to this theory the perception of the current endowment is a central aspect of the respondents' valuation (Khaneman and Tversky 1979). We show that nationality has a bearing on asymmetries, potentially rooted in differences in perceived endowments. Consistent with previous research we also show that experience with wind turbines, serve to lessen loss aversion. Lastly, we find evidence of increasing sensitivities both in regard to paying more and paying less on overnight expenditure.

Résumé

L'écart entre le CAP pour un bien et le CAR une compensation pour renoncer à ce même bien est un phénomène très largement mis en évidence en économie de l'environnement. Nous trouvons que les touristes hébergés le long de la côte méditerranéenne française ont un ratio CAR/CAP de 1.94 pour l'installation d'éoliennes en mer, d'attractions autour du récif et pour l'éco-tourisme. En ce qui concerne l'installation d'éoliennes en mer, la valeur de ce ratio signifie que désutilité liée à la vue d'une éolienne en mer qui est proche de la côte est 94% plus grande que l'utilité obtenue lorsque l'éolienne est retirée de son emplacement. Nous examinons si l'effet revenu, en référence à la théorie Hicksienne, pourrait expliquer un tel phénomène. La « théorie du prospect » offre une explication alternative intéressante à cette symétrie entre CAP et CAR. Dans le cadre de cette théorie, la perception des dotations actuelles de l'individu est un aspect central de l'évaluation de l'individu (Khaneman and Tversky 1979). Il est montré que la nationalité influence l'écart entre le CAP et le CAR, et cela pourrait être expliqué par des différences sur les dotations perçues. En accord avec de précédentes recherches, nous montrons aussi que l'expérience de l'individu en matière d'éolienne réduit l'aversion à la perte.

1. Introduction

There is widespread evidence of a consistent discrepancy between a person's willingness to pay (WTP) for a good and his willingness to accept (WTA) compensation to forgo the same good. Particularly, Tversky and Kahneman (1991) find that when comparing losses with equal-sized gains, people tend to significantly over-estimate losses, setting the value of losses to the double of the value of equal-sized gains. This disparity between the two measures of value is one of the most widely documented phenomena in environmental economics (Bateman 2002) and has been observed for market and non-market goods in real, hypothetical and experimental settings (Horowitz and McConnell 2002). The practical implication for economic valuation surveys is that the perception of the current endowment is a central aspect of the respondents' valuation, providing a potentially important source of unobserved heterogeneity (Lanz et al. 2009). Standard Hicksian economic theory allows for two explanations of observed WTP – WTA discrepancies (Randall and Stoll, 1980). The first one assert that if there is lack of substitutes for the good that is being valued, then this will lead to extreme WTA values, because it will be very difficult to compensate an individual for the removal of the good (Hanemann 1991). The second avenue holds that an income effect of a price rise will constrain WTP, thus putting an upper bound on possible WTP. Demand for compensation, one the other hand, is not constrained by the income effect. An increasing consensus in the literature however, acknowledges that the degree of discrepancy observed in empirical studies would have to be generated by unreasonable levels of income and substitution effects (Sugden 1999)

A prominent alternative explanation, to observed WTP-WTA asymmetry, accepted by researchers in a variety of disciplines has its roots in prospect theory (Khaneman and Tversky 1979). In prospect theory, an individual's decision-making process involves the evaluation of gains and losses defined in relation to a reference point, with a higher evaluation for losses than gains and decreasing marginal values in both positive and negative domains. Thaler (1980) proposed an extension and generalisation of the prospect theory to choices not involving uncertainty, by postulating an endowment effect on individuals' valuation functions and a kink in this function at the status quo point. The endowment effect refers to the notion that goods are considered to be more valuable when they are part of a person's endowment than when not in the endowment, all else equal. Experimental findings of WTA-WTP disparity experiments led Tversky and Kahneman (1991:1041) to describe "an endowment effect which is produced apparently instantaneously, by giving an individual property right over a consumption good". Consequently, one of the basic phenomena of choice under both risk and uncertainty is that losses loom larger than gains (Tversky and Kahneman, 1991).

In contrast to classical theory, where the utility of an uncertain prospect is the sum of the utilities of the outcomes each weighted by its probability, prospect theory postulates that 1) the carriers of value are gain and losses, not final assets and 2) the value of each outcome is multiplied by a decision weight. As such, risk aversion and risk seeking are determined jointly by the value function and by a cumulative weighting function[1]. More particularly, in the evaluation of outcomes, the reference point is the boundary that distinguishes gains from losses. In the evaluation of uncertainty, there are two natural boundaries, certainty and impossibility (corresponding to endpoints of the certainty scale).

[1] In expected utility theory, risk aversion and risk seeking are determined solely by the utility function.

More generally, the literature has shown that the WTP / WTA gap is bigger for non-market goods than for marketed goods, and increasing in size the further the good is from an ordinary private good (Horowitz and McConnell (2002). A further and related explanation of the disparity is limited experience and knowledge of the good being valued (Shogren, 1994; Plott and Zeiler 2003, List 2004). When respondents are uncertain about their true value for goods which are complex and unfamiliar, natural caution suggest that when asked a WTP question they may be inclined towards values at the lower end of the interval, while WTA questions may draw more responses from the higher end (Bateman et al 2002). Moreover, psychological insights suggest that, individuals construct preferences using a variety of decision heuristics or rules of thumb (Slovic 1995; Tversky and Khaneman 1992:p317). In non-market valuation studies, this is likely to results in stated preferences exhibiting a range of anomalies of which the asymmetry of gains and losses is one of the best documented (Bateman 2009:p116). In this regard, Bateman et al., 2009 has also shown that visual 3D representations of data as opposed to numeric information significantly reduce gain-loss asymmetry, by helping to convey accurate meaning of information. In accordance with these findings, it may be expected that 'experience' with the good that this being valued, can help respondents tap into underlying preferences and reduce their propensity to use of simple gain-loss heuristics (according to which respondents are able distinguish an increase from a decrease, but can not comprehend the magnitude of that change) when eliciting their preferences.

In this paper we investigate whether reference dependence is prevalent in the context of a study on tourist preferences for the siting of offshore wind farms; eco-tourism activities and eco-efficiency at the tourist resort in the French Mediterranean. This is a logical extension to Westerberg et al (2013), who show how resorts may be affected by these changes, assuming that the WTA/WTP ratio is equal to one. When the WTA / WTP ratio is different from one, the welfare economic consequences of the invigoration of any policy attribute will vary depending on the tourist's perceived 'reference point'. This also implies that the actual welfare impacts from any policy, will depend on whether it has been invigorated or not, and whether we consider that the target population have a property right to the present situation (ex-ante) or the future (ex-post) situation. We show the extent to which welfare estimates vary in the two cases, and discuss when and whether it is imperative to correct for WTP-WTA discrepancies. A second contribution of this paper consists of investigating whether there are particular respondent specific characteristics that have an effect on reference dependence and implied gain-loss asymmetry. To the authors' awareness, the influence of socio-demographic characteristics on WTP-WTA discrepancies in valuation surveys has been little studied. This is inevitably a result of the relatively few studies that simultaneously use utility increasing and utility decreasing attributes and WTP and WTA elicitation formats (Hess et al. 2008, Hess 2008, Masiero and Hensher 2010, Lanz et al., 2009; Bateman 2009 ; Strathopoulos and Hess 2011). Needless to say, multi-attribute choice experiments invite themselves to the use of WTP and WTA elicitation formats, whenever there are both utility increasing and utility decreasing attributes present in the choice tasks. In this study, we sought to investigate the influence of higher income, nationality and experience on WTP – WTA assymetries. Our interest is the extent to which the income effect (in alignment with standard Hicksian theory) contributes to explaining observed discrepancies. Secondly, departing from the basis that the theory of loss-aversion help explain WTP-WTA asymmetries; we investigate whether experience is a factor that can help improve respondent's comprehension or 'evaluability' of what they are being asked to value (Bateman et al 2009). Lastly, we investigate whether the WTA-WTP discrepancy is larger for French nationals than foreign tourists on the hypothesized basis that foreign tourists, are less inclined to consider the policy attributes of relevance as part of their endowment.

2. Study Design

2.1 Study Background

Under the EU Climate and Energy package, the French Government has committed to more than double its share of renewable energies by 2020 (GWEC, 2011). To fulfil this objective, the French Med region of the LR, has been under scrutiny, holding a significant offshore wind power wind power potential, due to regular and strong winds and a large, shallow continental plateau (BRL 2003).. Till present however, wind power projects in the Mediterranean have been stalled due to fear of the potential negative impact on tourism (Cabanis and Lourie 2011). Coastal municipalities argue that wind turbines would disfigure the landscape and hereby destroy the attractiveness of their tourist resorts (Guipponi, 2011). To investigate this hypothesis, we conducted a choice experiment valuation survey with tourists on the coast of Languedoc Roussillon and elicited willingness to pay / willingness to accept compensation for wind turbines at different distances from the shore. The results, with direct implications for the tourist industry, are discussed in Westerberg et al. (2013).

Attribute	Level	Acronym
Wind farm and no artificial reef	Yes 5, 8, 12 km →	WF5, WF8, WF12
Associated recreational activities (If windfarm is present)	Yes, no	Recreation
Coherent environmental policy (if windfarm is present)	Yes No	Eco-efficiency
Change in weekly accommodation price	[- 200, -50, -20, -5, +5, +20, +50, +200] EUR	

Table 1: CE Attributes and levels

2.2 Data

The CE survey design commenced early 2010 with a series of meetings with chambers of commerce and industry, regional and departmental committees for tourism and with professionals in the wind power and tourist industry. This background helped in sketching a series of pertinent attributes, consisting of wind farm placement at different distances from the shore, with or without wind farm associated recreational activities,[18] the presence or absence of a coherent environmental policy at the

[18] Offshore wind farms act as no-take zones for fish (Punt et al. 2009), the eco-design of wind turbine foundations or the installation of artificial reefs around turbine foundations, serve to create fish

coastal tourist community, and an increase in the weekly overnight expense (table 2). The full-scale survey was undertaken in the summer of 2010 on the beaches of 9 different coastal resort communities in Languedoc Roussillon. We used personal interviews in which the interviewer guided the respondent through the Survey, in French or English. The final sample comprises a total of 337 individuals and 2712 choice set observations. The descriptive statistics of the sample are provided in table 2. Further description of the attributes and the data collection process, are provided in Westerberg et al. (2013).

Background socio-demographic characteristics and trip characteristics	Description	Present in analysis	Mean % (st. dev)	Weekly accommodation price: per person (st.dev) / per household (st dev)
High income	With net monthly income above EYR 5000 / month	X	31 %	€199 (209) / €729 (971)
Lower income	With net monthly income below EUR 5000 / month	(X)	20 %	€139 (124) / €443 (435)
Northern European	Of Scandinavian, English, Belgian, German, Swiss, Luxembourgian or Dutch origin.	X	26%	
Experience	See wind turbines daily (for example during a commute to work).	X		
Net household income	In intervals of €500 per month (min €0, max €>7000)		€ 2500 - € 3500	
Higher Education	Has done at least 2 years of university studies		51%	
International tourists See wind turbines daily	Of any origin other than French The tourist sees wind turbines daily, for during his trip to work.		27% 32 %	
Age Female	Age (min 17 yrs, max 81 yrs)		37 years (14.6 years) 59%	
Average accommodation price in EUR per adult per week			€ 158 (€157)	

Table 2: Socio-demographic characteristics

3. Methodology and Model description

3.1 Expected utility theory and random utility theory

To describe discrete choices in a utility maximizing framework, the CE employs the behavioral framework of random utility theory (RUT). When the relationship between utility and characteristics is linear in the parameters, the individual i's utility U from alternative j is specified as:

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habitat and hereby permit to boost tourism and leisure activities, such as diving, angling and observational boating (LaCroix and Pioch 2011).

$$U_{ij} = V_{ij} + e_{ij} \quad (1)$$

where V_{ij} is the systematic and observable component of the latent utility and e_{ij} is a random or **"**unexplained**"** component assumed IID and extreme value distributed (Louviere et al., 2000). The choice of one alternative (*j*) over another alternative is a function of the probability that the utility associated with *j* is higher than that associated with other alternatives. In this case, the probability of any particular alternative *j* being chosen can be expressed in terms of a logistic distribution and Equation 1 can be estimated with a conditional logit model (CLM) (Greene, 2003), which takes the general form:

$$P_{ij} = \frac{e^{V_{ij}}}{\sum_{h \in C} e^{V_{ih}}} \quad (2)$$

To uncover potential latent preference heterogeneity across respondents we also specify a random parameter logit model (RPL) with error component (RPLEC). In this model, each attribute is associated with a mean β_j and an individual specific deviation (η_i) from that mean:

$$\beta_{ij} = \beta_j + \eta_i + \gamma_{ij} v_{ij} \quad (3)$$

v_{ij} is a random variable with mean 0 and variance a_j^2 (see Greene and Hensher 2007) for further description). The normal distribution was chosen as statistical distribution for all attributes, because it delivered the best model fit. For a more thorough and in-depth treatment of the RPLEC, the interested reader is referred to Train (2009), Hensher and Greene (2003) or Hensher et al. (2005), Greene and Hensher (2007).

Under standard welfare economic expected theory, the symmetric deterministic part of the utility function, specified to be linear in the parameters, may be presented as:

$$V_{ij} = \beta_{0ij} + \beta_1 X_{1ij} + \beta_2 X_{ij} + ... + \beta_K X_{Kij} + \beta_c C_{ij} \quad (4)$$

Where $\beta_{1…}$ β_k are parameters associated with the policy attributes, β_c with the payment attribute and β_{ASC} is the alternative specific constant (normalised with respect to the status quo reference alternative), that accounts for variations in choices that are not explained by the attributes. Specifically for our case, with attributes given in table 2, the symmetric value function is specified as follows:

$$V_{ij} = \beta_{ASC} + \beta_1 X_{WF5} + \beta_2 X_{WF8} + \beta_3 X_{WF12} + \beta_4 X_{Reef\text{-}rec} + \beta_5 X_{Env.policy} + \beta_C X_{Cost} \quad (5)$$

3.2 Reference dependence

To verify and test the presence of linear asymmetric preferences, we tuse the reference-pivoted nature of our experimental design. Following Lanz et al (2009) and Masiero and Hensher (2010), this is done by dividing the cost attribute (Xc) into decreasing and increasing values by taking the difference between the attribute and its relative reference value. As shown in table 1, the monetary attribute is the only attribute, which have symmetric utility increasing and utility decreasing levels. The piecewise-linear function is a direct extension of the linear utility function and represents a simple non-linear formulation, whereby:

$$v(X_C) = \begin{cases} \beta_{(INC)} X_C, & X_C > 0 \\ \beta_{(DEC)} X_C, & X_C < 0 \end{cases} \qquad (6)$$

The reference dependent utility function therefore becomes:

$$V_{ij} = \beta_{ASC} + \beta_1 X_{WF5} + \beta_2 X_{WF8} + \beta_3 X_{WF12} + \beta_4 X_{Reef\text{-}rec} + \beta_5 X_{Env.policy} + \beta_{Ci\,(INC)} X_C + \beta_{Ci(DEC)} Xc \qquad (7)$$

With this specification, the gain–loss asymmetry associated with the payment attribute is characterised as a discontinuity in the function at the status quo attribute level (the reference point).

3.3 Observed gain-loss heterogeneity

In the presence of gain-loss asymmetry, it is of particular interest to examine whether there are particular respondent characteristics affecting that contribute or avert reference dependence and loss aversion. After testing various respondent characteristics, we found that higher income; northern European nationality and; experience with wind turbines had a particularly strong impact on reducing asymmetries in the loss domain. To capture gain-loss heterogeneity in the underlying population, we incorporated a piecewise linear-in-spline cost parameter in the deterministic part of the utility function (Morey et al., 2003; Scarpa et al., 2007). The most elaborate specification of the asymmetric piecewise-linear utility function presented in section 2 takes the following form:

$$V_{ij} = \beta_{ASC} + \beta_1 X_{WF\text{-}5km} + \beta_2 X_{WF\text{-}8km} + \beta_3 X_{WF\text{-}12km} + \beta_4 X_{Reef\,Rec} + \beta_5 X_{Env.policy} + \beta_{6i(INC)} Xc_{+} + \beta_{7i(DEC)} Xc +$$
$$\delta_{8(INC)}(X_C \cdot Z_{HIGH\text{-}INCOME}) + \delta_{9(INC)}(X_C \cdot Z_{NORTH\text{-}EUROPEAN}) + \delta_{10(INC)}(X_C \cdot Z_{EXPERIENCE}) + \delta_{11(DEC)}(X_C \cdot Z_{EXPERIENCE}) \qquad (8)$$

Where the vector of coefficients $\beta_{1\ldots}\ \beta_K$ and $\delta_{1\ldots.}\ \delta_m$ are attached to a vector of attributes (X) and interaction terms (XZ) with the payment terms, that influence utility respectively. The definitions of the variables (**Z**) that describe the characteristics of the respondents are provided in table 2. We adjust the relevant cost parameter to take into account of heterogeneity in WTP-WTA discrepancies, as follows – taking the example of higher income:

$$\beta c_{(INC\text{-}higher\ income)} = \beta c_{(INC)} + \beta c_{(INC)} \times_{higher\ income} \qquad (9)$$

3.4 Non-linear sensitivity

Another key ingredient of (cumulative) prospect theory is that individual expectations about the likelihood that a gain or a loss will occur, gives rise to different formulations of the curvature of the utility function. In particular, Tversky and Kahneman (1992) provide experimental evidence of a distinctive fourfold pattern of risk attitudes: risk aversion for gains and risk seeking for losses of high probability; risk seeking for gains and risk aversion for losses of low probability. The value function is therefore specified as concave for gains, and convex for losses of high probability, or convex for gains and concave for losses with low probability' (Tversky and Kahneman, 1992). The piecewise-linear functional form (eq 7) can capture reference dependence and gains-loss asymmetry, but it rules out potential non-linearity within gain and loss domains. By diminishing sensitivity, we assume that the first and second derivatives exist. In that case, diminishing and sensitivity may be represented by the following properties:

$$v''(X_C) \leq 0,\ \forall X_C > 0 \qquad (10)$$
$$v''(X_C) \geq 0,\ \forall X_C < 0$$

That is, the impact of a change diminishes with the distance from a reference point. On the contrary, increasing sensitivity is given by:

$$V''(Xc_{(INC)}) < 0$$
$$V''(Xc_{(DEC)}) > 0 \qquad (11)$$

To capture such non-linearities within gain and loss domains, a good model fit was found using a quadratic function, so that the utility of attributes and the price attribute X_C is given by:

$$V_{ij} = \beta_{ASC} + \beta_1 X_{WF5} + \beta_2 X_{WF8} + \beta_3 X_{WF12} + \beta_4 X_{Reef\text{-}rec} + \beta_5 X_{Env.policy} + \beta_{ci\,(INC)} X_C + \beta_{cci\,(INC)} X_C^2 + \beta_{ci(DEC)} X_C + \beta_{cci(DEC)} X_C^2 \qquad (12)$$

The specifications provided through eq. 5 to 12, will permit us to compare the standard linear function to the two non-linear functional forms, and assess the bearing that gain-loss asymmetry has on our results and survey conclusion.

4. Welfare measures and the calculation of WTP and WTA

4.1 Welfare measures

Welfare changes resulting from land-use and landscape changes are defined as the income adjustment necessary to maintain a constant level of utility before and after the change of provision. For discrete or fixed changes in the quantity of public good provision, welfare changes are measured using the compensating surplus or the equivalent surplus measure (according to table 3). For a proposed welfare gain the CS corresponds to the payment that the individual would be willing to give up (WTP) to ensure that the change occurs, while the ES measure tells us how much the individual would need to be compensated (WTA) for him attain the final improved quality level in the absence of the provision change occurring. Consequently, the ES measure is used when it is considered that the individual has the right to change, while the CS departs from the consideration that the individual does not have the right to a change (Bateman 1994).

Welfare measure	Price rise or quality decline	Price fall or quality rise
ES : Right to change	WTP to avoid	WTA compensation to avoid
CS : Right to status quo	WTA compensation to accept	WTP to obtain

Table 3: Welfare measures

Analogous to the discussion on reference dependence, is the question of whether the individual perceives that he has the right to the change, or the right to the status quo. Depending on his inferred endowment, the welfare economic consequences of a policy change will vary, driving a wedge between WTA and WTP for the same good. This is illustrated in figure 1, where the indifference curves (U) link combinations of private good and public good consumption, between which the individual is indifferent. The example of a pure public good, whereby the budget line is horizontal is used to illustrate the surplus welfare measures. Following Bateman et al. (2002), under the endowment effect, each indifference curve has a reference point and each reference point has its own family of indifference curves kinked at their respective reference points. Assume the individual considers that he has the property right to the lower level of utility (U_{oA}), then U_{oA} is kinked at A. The higher indifference curve (U_{1A}) associated with an improvement in environmental quality is kinked at D and B. If the individual starts at A, his WTP for an increase in the public good from Q_o to Q_1 to is BC. If instead the individual perceives that he has the property right to a higher level of utility, then for preferences as viewed from B, the appropriate indifference curve is U_{1B} (kinked at B). His WTA compensation for a decrease in the public good to Q_o is then EA consistent with the theory of reference dependence, according to which losses have a greater substantive significance than gains (Bateman et al 2002).

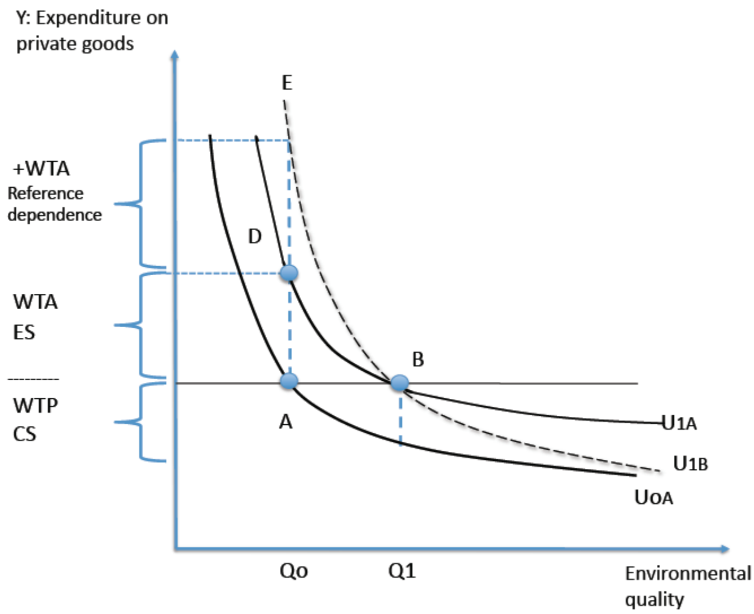

Figure 1: Reference dependence and implied loss aversion

4.2 The calculation of WTP and WTA

Utility-equivalence analysis uses equation 7 to estimate the change in one (or more) attribute(s) that is necessary, on average to exactly offset the utility effect of a change in some other attribute(s). Setting the total derivate of the indirect utility function equal to zero ($dV_{njt} = \beta_k dX_k + \beta_c dC = 0$) and solving for dX_k/dC yields the change in cost (or WTP) that keeps utility unchanged given an improvement in X_k. In the symmetric linear additive RUM, we have:

$$dX_k/dC = WTP_k = WTA = -(\beta_k/\beta_C) \qquad (13)$$

Therefore, WTP and WTA is the ratio of the marginal (dis)utility of an attribute to the marginal (dis)utility of the cost attribute**.** The estimation of two different cost parameters, with positive and negative deviations from a reference point, in the asymmetric model implies the following computation:

$$WTP = -\,(\beta_k/\beta_{C(INC)}) \qquad (14)$$
$$WTA = -\,(\beta_k/\beta_{C(DEC)})$$

The same approach can be employed for RPL models, when the price parameter is held fixed (i.e. the denominator is a non-zero constant)(Revelt and Train, 1998). For the purpose of this paper however, we deliberately decided not to keep the price parameter fixed, so as to verify whether there is, unobserved heterogeneity in addition to observed heterogeneity, associated with compensation and payment. If we were to calculate WTP / WTA from this model, marginal rates of substitution would become a ratio of two random distributions. In such cases, the resulting distribution may produce a number of undesirable properties, not the least of which are extremely low or large WTP/WTA values (Rose and Masiero 2010). Therefore, when we examine the existence of reference dependence, we employ the simple CLM model.

5. Results and discussion

Results for the 5 different models estimated are displayed in table 3. For simplicity we will base most of our discussions on the CLM models, but we will include discussion of results from an RPL model where relevant. In the following we start out by comparing the symmetric CLM with the asymmetric CLM. Secondly, we consider the implication of allowing for non-linearity in the gain and loss domain, using a simple CLM with a quadratic function for the cost parameter. Subsequently, we consider two types of respondent characteristics that have a different degree of loss aversion compared to the remaining population.

5.1 The symmetric model versus the asymmetric model

Considering at first the linear symmetric CLM model (column 1, table 4), we observe that all estimated coefficients except the placement of wind farms at 12 km from the shore, are found be statistically different from zero, and have the expected sign. That is, the invigoration of reef-associated recreational activities and a coherent environmental policy, are increasing the tourist's utility, while the installation of a wind farm at 5 or 8 km from the shore, relative to none today, decreases respondents utility. The ASC is negative and significant, indicating that tourists either derive a negative utility from the status quo, or derives a positive utility from a move away from the status quo, all other things equal. The payment attribute is negative and significant, in correspondence with the fact that paying more for housing is associated with a disutility.

Comparing the linear model with the non-linear model, we see that the non-linear specification fit the data better than the linear specification in terms of both log-likelihood and the adjusted R^2 which increases from 0.17 to 0.18. As for the parameter estimates, it is worthy to note that, in all instances the absolute value of the coefficient estimates associated with the non-linear model, are lower in absolute terms than in the linear model. Specifically, we observe that the magnitude of the coefficient capturing the disutility of the status quo (ASC) declines when gains and losses are estimated separately. This indicates that the constraint imposed by a linear utility specification artificially inflates the welfare estimates attributed to the SQ alternative (Lanz et al 2009; Hess and Rose, 2009).

In the asymmetric model, the coefficient on the accommodation price is as expected negative on both the gain and loss domains (a marginally higher bill is bad whether above or below the SQ). The absolute coefficient estimates, provides evidence of gains-loss asymmetry; a €1 increase in the accommodation bill leads to an incremental disutility of 0.2, whereas a €1 fall in compensation (implied by a rising negative cost attribute) only leads to a 0.1 increase in disutility[2]. Using the asymptotic t-ratio test (or paired t-test[3]) to formally evaluate the significance of the difference between decrease and increase parameters, we find a t-value of 61.06, confirming the presence of asymmetry. Additionally, by taking the ratio in absolute values du/dC(inc)/du/dC(dec), we are able to quantify a value greater than zero in the case of loss aversion. In the linear asymmetric model, the asymmetry ratio for the cost attribute (Bc(inc)/Bc(dec)) is 2. This means that the disutility of an increase in the accommodation price is in terms of absolute value, 100% higher than the utility associated to a decrease of the same amount. This gain-loss asymmetry for the price attribute and how it compares to the linear model and the quadratic function model (discussed below), is illustrated in figure 3

[2] The negative coefficient of the b(dec) parameter estimates, is inversed when compensation payment increases.
[3] A paired (samples) t-test is used when you have two related observations (i.e., two observations per subject) and you want to see if the means on these two normally distributed interval variables differ from one another.

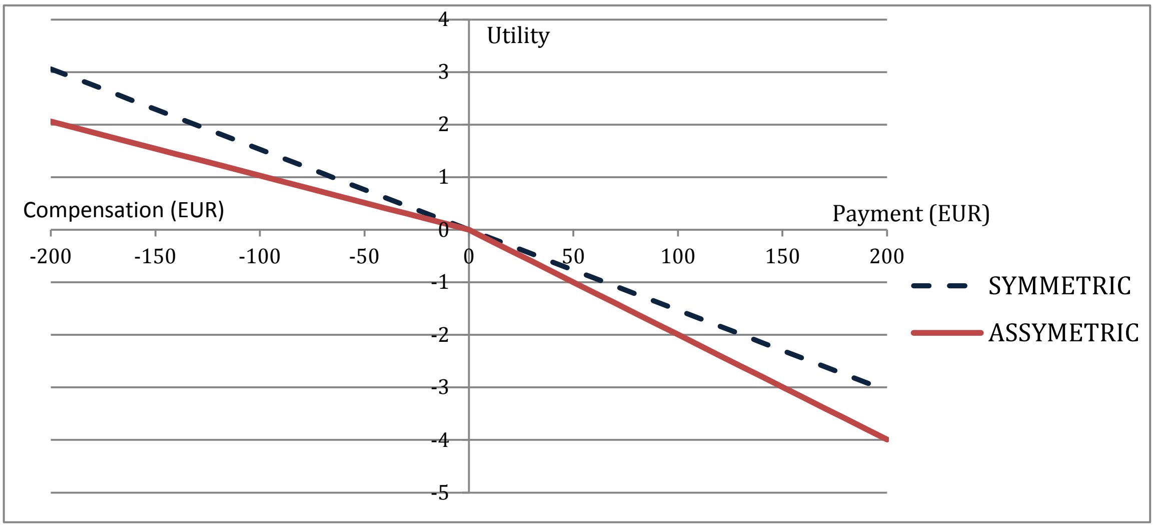

Figure 3: Gain-loss asymmetry for the payment attribute

	Symmetric CLM			Assymetric CLM			Assymetric CLM			Non-linear assymetric CLM			Assymetric RPL model		
Parameters	β	t	p	β	t	p	β	t	p	β	t	p	b	t	p
ASC	-0.59	-6.24	***	-0.67	-7.06	***	-0.66	-7.0	***	-0.85	-7.4	***	-0.99	-6.1	***
ENV1	1.47	17.79	***	1.36	16.24	***	1.38	16.4	***	1.51	14.8	***	2.14	12.6	***
St.dev													1.19	8.9	***
ACT1	0.71	10.27	***	0.56	8.04	***	0.57	8.1	***	0.61	8.6	***	0.85	6.5	***
St.dev													0.92	6.5	***
FIVE	-1.84	-15.52	***	-1.38	-10.51	***	-1.37	-10.4	***	-1.21	-8.7	***	-2.09	-9.7	***
St.dev													1.90	9.5	***
EIGHT	-1.07	-10.36	***	-0.58	-4.73	***	-0.56	-4.5	***	-0.30	-2.1	**	-0.58	-3.2	***
St.dev													0.79	3.3	***
TWELVE	-0.13	-1.4		0.13	1.32		0.14	1.4		0.32	2.8	***	0.34	2.3	**
St.dev													0.57	1.9	*
CAP	-0.015	-22.81	***												
Assymetry															
$\beta c_{(INC)}$				-0.020	-10.99	***	-0.025	-15.5	***	-0.0395	-8.2	***	-0.048	-11.3	***
Std dev													0.021	7.0	***
$\beta c_{(DEC)}$				-0.010	-19.58	***	-0.009	-9.6	***	0.0033	0.9	0.381	-0.013	-7.8	***
Std dev													0.006	3.0	***
Diminishing Sensitivity															
b(inc)*b(inc)										0.00009	4.1	***			
b(dec)*b(dec)										0.00006	3.6	***			
Interactions															
B(inc)*High income							0.004	2.5	**				0.007	1.536	
B(inc)*Northern							0.006	3.6	***				0.010	2.252	**
B(dec)*Experience							-0.002	-2.0	**				0.004	0.968	
B(inc)*Experience							0.003	1.8	*				-0.003	-1.347	
SigmaE01													1.07	6.36	***
Final log-likelihood	-2371			-2345			-2337.8			-2335			2117		
AIC	4756			4705			1.732			1.729			1.576		
Adjusted rho-square	0.169			0.178			0.181			0.181			0.287		
Number of observations	2712			2712			2712			2712			2712		

Table 4: Main models

5.2 Increasing sensitivity versus linear sensitivity

Consulting table 3, column 4, we see that the quadratic function that assures a non-linear value function. Moreover, the non-linear specification fit the data slightly better than the linear specification in terms of both log-likelihood and information criterion. We find little evidence of diminishing sensitivity (implied by an S shaped value function). Our results rather tend to point to increasing sensitivity in both gain and loss domain. The experiments undertaken by Khaneman and Tversky (1992), and cumulative prospect theory predict risk seeking for gains and risk aversion for losses, for low probability events. For high probability events cumulative prospect theory predicts risk aversion for gains and risk seeking for losses. Comparing our results with those of Khaneman and Tversky (1992), we may postulate in the gains domain, that tourists consider it little likely (low probability) that they will actually be compensated for visual 'nuisances'. This will lead to risk seeking for gains. On the other hand, tourists may consider the probability of an actual loss from rising accommodation prices as higher, since they are more likely to be used to experience rising prices, than decreasing prices. Perceiving a loss with greater probability, leads to risk seeking for losses rather than risk aversion. These hypotheses are consistent with what we observe in figure 4. A counter argument to this postulate is that because tourists can easily substitute between different tourist resorts, a site-specific increase in the price levels at one tourist community will have a small probability of having a bearing on the accommodation price of a nearby community to which they may choose to travel. However, that does not seem to be the case here based on our results.

Finally, it must be acknowledged that when conducting CE we have little way of knowing the probability that respondents assign to events occurring. It is often implicitly assumed, that we can ignore it policy uncertainty by making the survey incentive compatible However, since surveys by construct are purely hypothetical set-ups, perfect incentive compatibility is likely to be the exception rather than the rule. This observation, calls for more research into the probabilities that respondents assign to events occurring in stated preference surveys. Moreover, when attributes have different framing effects or are formulated in gain and loss domains as above, it is unlikely that the subjects assign the same probability to the two states of nature. This postulate is consistent with Khaneman and Tversky (1992), who suspect that decision weights are sensitive to the formulation of prospects, as well as to the number, the spacing and level of outcomes. In this regard, there is also some evidence suggesting that the curvature of the weighting function is more pronounced when the outcome are widely spaced (Camerer, 1992). This effect may also be part of explaining, why we see an increasing curvature of the value function as the spaces between the levels of the payment attribute increases[4].

[4] Recalling from table 1, the price levels are: -200,-50,-25,-10,5,(0),10,25,50,200.

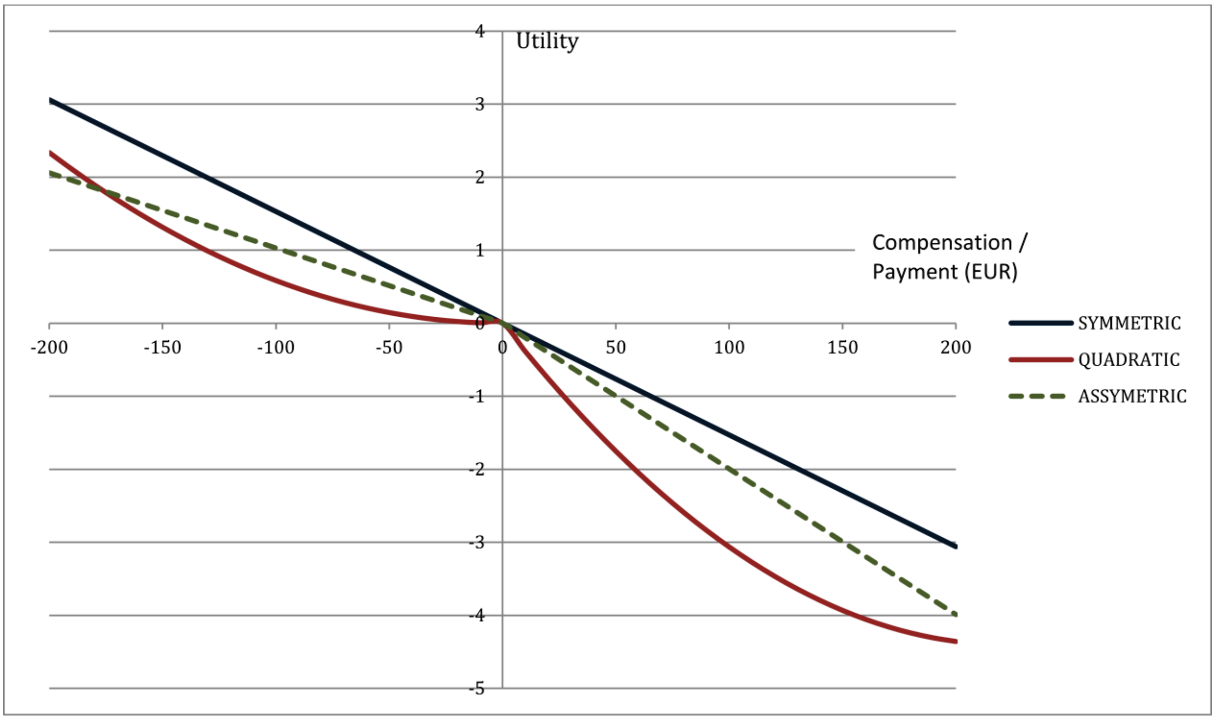

Figure 4: Non-linear gain-loss assymetry

5.3 Respondent characteristics influencing WTP-WTA discrepancies

To the authors' awareness, the influence of socio-demographic characteristics on WTP-WTA discrepancies in valuation surveys has been little studied. In the following we study the effect of income, country of residence (French vs. Northern European), and experience with wind farms on WTP-WTA asymmetry. We provide some preliminary insights into why these various respondent groups display different degrees of loss-aversion.

Consulting the asymmetric model with interactions, table 3, column 3, it is noteworthy that when interacted with the loss domain of the payment attribute Bc(inc) - higher income, northern European (as opposed to French nationals), and experience with wind turbines, are all significant. Income and nationality on the contrary, have no bearing on the gains domain of the payment attribute. For the RPL model we find the same, except that once we have accounted for unobservable heterogeneity, high income interaction looses significance. As in section 5.1, we take the ratio in absolute values du/dC(inc)/du/dC(dec) and incorporate interactions. The results are displayed in table 5.

The table makes clear that respondents with higher income (> 5000 € net / month / household), of northern European nationality, who are used to seeing wind turbines daily, have a significantly lower gain-loss asymmetry than those without these characteristics. In more precise terms, our results show that if someone is of Northern European origin, the disutility of an increase in the accommodation price is in absolute value, 80% higher than the utility associated to a decrease of the same amount. However, for French respondents, who do not have a higher education or household income above > €5000 net, the disutility of a similar increase in the accommodation price is 160% higher than the utility associated with a decrease of the same amount. Together, higher income, Northern European Nationality, and experience reduce the gain-loss asymmetry by 71%.

Adjusted $\beta c_{(INC)}$ parameters from table 4, column 3	
$\beta c_{(INC)}$	-0.025
$\beta c_{(DEC)}$	-0.009
$\beta c_{(INC\text{-higher income})}$	-0.021
$\beta c_{(INC\text{-North European})}$	-0.019
$\beta c_{(INC\text{-Experience})}$	-0.022
$\beta c_{(INC\text{-higher Income-Northern European-Experience})}$	0.017
$\beta c_{(DEC\text{-Experience})}$	-0.012
Absolute ratio du/dC(loss)/du/dC(gain)	
$\beta c_{(INC)}/\ \beta c_{(DEC)}$ for whole sample confounded (column 2)	2.0
$\beta c_{(INC)}/\ \beta c_{(DEC)}$ for French, lower education & lower income earners.	2.6
$\beta c_{(INC\text{-higher income})}/\beta c_{(DEC)}$	2.2
$\beta c_{(INC\text{-Northern European})}/\beta c_{(DEC)}$	2.0
$\beta c_{(INC\text{-Experienc})}/\beta c_{(DEC\text{-Experience})}$	1.8
$\beta c_{(INC\text{-higher Income-Northern European-Experience})}/\ \beta c_{(DEC\text{-Experience})}$	1.4

Table 5: Respondent gain-loss asymmetries

Our results are note-worthy. Considering at first the effect of higher income, we recall that according to Tversky and Khaneman (1992) and other authors, the observed asymmetry observed between gains and losses in experimental studies, is far too extreme to be explained by income effects or by decreasing risk aversion. In particular it is remarked that the financial incentives provided in experiments, are small compared to peoples income (Tversky and Khaneman, 1992). Our results lead us to postulate that choices that have a bearing on vacation budgets are of a different nature to choices related to an any-day purchase. This is consistent with what was told in the focus group prior to our survey. With regard to how individuals plan for their vacation, focus groups indicated that respondents do not only evaluate changing vacation accommodation prices against their overall income but equally against their allocated vacation budget[5]. As such, it appears that individuals with constrained incomes plan for their holiday in advance, considering carefully the maximum accommodation cost, so as to know approximately how much (remaining) money they can spend on other goods and activities. Therefore provided that a certain tourist's income is below a certain threshold, we postulate that he/she is particularly sensitive to proposed changes in

[5] In the choice experiment, the maximum proposed change in weekly accommodation price (up to 200€ increase/ week/adult) was above the price (150€) the average tourist was paying for high accommodation during his vacation.

accommodation price. On the other hand, beyond that threshold, we expect the actual accommodation cost to play a smaller role[6].

In table 2 we have illustrated the average accommodation prices for the two categories of income earners. As expected, higher income earners pay significantly more (€200 / week / adult) in accommodation price relative to their 'lower income' counterpart (€120/ week / adult). As such, the payment levels used in the Choice Experiment, ranging from ± 10€ - 200€ constitute a significant share of their total accommodation budget, and especially so for the lower income earners. We therefore conclude that the Hicksian theory comes some of the way in explaining observed gain-loss asymmetry, but does not suffice to explain all of the observed gain-loss asymmetry. Finally, it also remains to be explained is why income seems to be effective in reducing asymmetry in the loss-domain, but not gains-domain for which there is no upper bound as to possible compensation. Our postulate is that framing may play a role. In particular, by framing a valuation question in WTA, feelings of loss aversion may accentuated by inducing respondents to think that something is lost (Freeman 1993).

Turning subsequently to the role of nationality in explaining gain-loss asymmetry, we depart from the hypothesis that French respondents may have, on the whole a different sense of endowment, or reference point than their Northern European counterparts. In particular, we are induced to think that French respondents are more prone to consider that their endowment (or property right) is one in which the land-use policies have been invigorated. Northern Europeans on the other hand, are likely to consider a larger range of potential future vacation destination choices (incl. outside France), and as such are more likely to elicit their preferences from the point of view of a 'status quo endowment' without wind farms, a coherent environmental policy and recreational activities. As for French and Northern Europeans alike, their WTA compensation for not enjoying a certain destination attribute is greater than their WTP for attaining that same attribute. However, the disutility of paying is smaller for Northern Europeans than their French counterpart. We postulate that because French respondents are more prone to consider the policy attributes (such as the installation of wind farms) as their endowment, they also have a greater propensity to 'protest' towards paying for recreation, eco-efficiency or avoiding the wind farms. Loss aversion is thus larger for the respondent group whose stakes are larger – in this case, French nationals. This is in correspondence with Vieder (2011) who find that loss-aversion increases with stake sizes for mixed prospects.

Turning lastly to the impact of experience on gain-loss asymmetry, we can see by consulting figure 5 that respondents, who are used to seeing wind turbines daily, have a lower gain-loss asymmetry, both in the gains and the loss domain. Even if this is not so clear from the RPL model, the findings from the CLM is in accordance with earlier empirical results, according to which the endowment effect is essentially the result of an inexperienced consumer's mistake, which disappears in the process of learning (e.g. Coursey, Hovis and Schulze (1987), Shogren et al. (1994), List 2004). In our case, we are thus tempted to conclude that respondents with limited experience of wind turbines,

[6] When we interacted the cost parameters with tourist's declared accommodation prices, gain-loss asymmetry was further reduced. But the changes were only significant at 88% level of confidence. We expect this has to do with the large number of tourists who were lodging for free with friends and family.

will be more inclined to elicit WTP (for avoiding wind turbines) at the lower end of the interval, while compensation requirements will be drawn from the higher end. If in addition, respondents had experience with reef–associated eco-tourism, and eco-efficiency, we stipulate that the gain-loss assymetry would be even further reduced. This resonates Bateman et al. (2009) who finds that if individuals are able to connect with and understand a piece of information on an 'affective' level, their responses are more likely to tap into any underlying true preferences rather than using simple gain-loss heuristics (Bateman et al 2009).

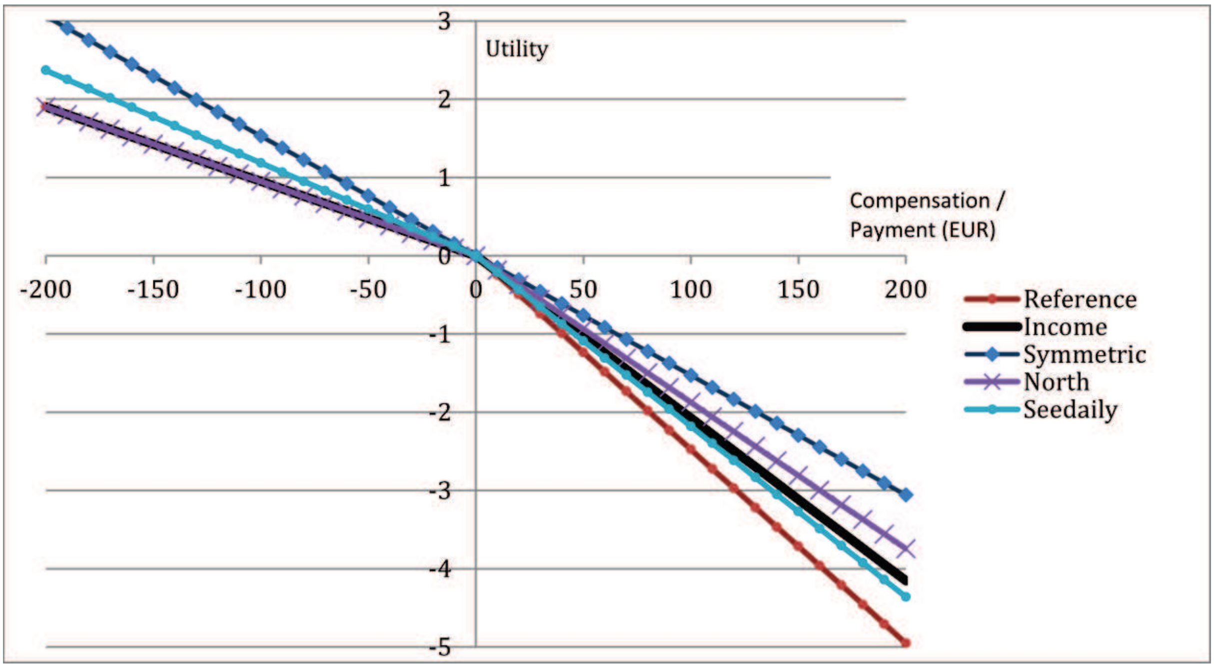

Figure 5: Gain-loss asymmetry in utility space across different respondent characteristics

5.4 Unobserved preferences and the error component

Before turning to welfare estimates, we turn to the RPL model with error component. Consulting Table 3, column 5, we note a very significant improvement of the measures of fit when comparing the RPLEC component model with the CLM model. The adjusted R^2 increasing from 0.18 to 0.28, and there is evidence of significant latent preference heterogeneity for all attributes. This confirms the importance of accounting for the panel nature of observed choices, unobserved heterogeneity and the error component. Of particular interest with regard to the gain-loss asymmetry, it is noteworthy that the standard deviation coefficient is more pronounced in the loss-domain of the payment attribute, than in the gains domain. This implies that there is a greater degree of unobservable heterogeneity associated with paying, which is not explained by experience, income or nationality. The error component, σi, is implemented as an individual-specific parameter and is assigned to the two non-status quo alternatives. The fact that the error component is positive and significant indicates that respondents overall experiences greater uncertainty, when choosing any of the two future hypothetical destination alternatives relative to staying at the community resort where he is interviewed. This is in accordance with what we may expect.

5.5 Implication of reference dependence on WTP and WTA

In studying the implications of reference dependence on welfare measures, we will draw use of the linear asymmetric CLM model (2rd column table 4)[7], and compare it to the symmetric CLM model (1 column table 4). This allows us to examine how our results are modified according to whether we explicitly incorporate reference dependence into the estimation of welfare measures or not. Furthermore, we highlight how income and education can be part of attenuating differences in the symmetric versus the asymmetric approach to studying welfare consequences. In the following we draw on section 4.2, to define how WTP and WTA should be calculated for the asymmetric indirect utility function. We subsequently compare our results to the symmetric treatment.

Supposing that the tourist have property right to the landscape as it is today, then the CS measure is adapt for measuring the respondents WTA compensation requirement for allowing a welfare loss from wind farm installation, to occur. With regard to eco-tourism activities and eco-efficiency, the CS for a gain is the appropriate measure of value, telling us how much money income the individual would be willing to give up (WTP) to ensure that the change occurs. We solve for dC/dX_k (in eq. 7) to find the change in the accommodation price that keeps utility unchanged for a change in the seascape, eco-efficiency, or recreational activities. Results are displayed in column 3, table 6.

Supposing instead that the tourist perceives that he has the endowment of (or property right to) a community resort with eco-efficiency, a wind farm and associated recreational activities, then the compensating variation is the appropriate measure of value. We use it to estimate how much an individual is willing to pay to prevent the welfare loss occurring, and how much how much extra money income, would have to be given to an individual (WTA) for him to attain the final improved quality level with eco-efficiency and eco-tourism, in the absence of the provision change occurring. Results are displayed in column 4, table 6.

	WTP = -(β/βc(inc))	WTA = -(β/βc(dec))	Asymmetric model: Perceived status-quo endowment	Asymmetric model: Perceived right to future endowment	Symmetric model WTP=WTA=β/βc
ASC	-33.42	-64.7	-64.7	-33.42	-38.3
Eco-efficiency	68.28	132.3	68.3	132.3	96.3
Eco-tourism activities	28.25	54.7	28.3	54.7	46.1
WF 5 km	-69.13	-133.9	-133.9	-69.1	-120.1
WF 8 km	-29.03	-56.2	-56.2	-29.0	-69.9
WF 12 km	0	0	0	0	8.6

Table 6: Implied WTP and WTP

5.6 Interpretation of results

The welfare estimates resulting from the linear symmetric and the linear asymmetric model are summarized in table 6. When the perceived endowment is the landscape as it is today, the linear asymmetric model estimates, yield lower WTP estimates (for recreation and eco-efficiency)

[7] The RPL does not invite itself for such an analysis, because dividing one random parameter with another random parameter does not provide meaningful results.

compared to the symmetric model. In contrast, the WTA compensation for the removal of such undertakings is significantly higher than the WTP in the symmetric model. Considering subsequently, the asymmetries associated with wind farm installation, we can see that WTA compensation for their installation 5 km or 8 km from the coast, decreases from 134€ (56€) in the asymmetric model to 120€ (70€) in the symmetric model. In contrast the implied WTP to avoid the wind farms (when the tourists perceive them as their endowment), is only of an order of 69 EUR, and thus significantly lower. The implication of this asymmetry on WTP and WTA measures for wind farm installation/removal at 5 km from the coast is illustrated in figure 6.

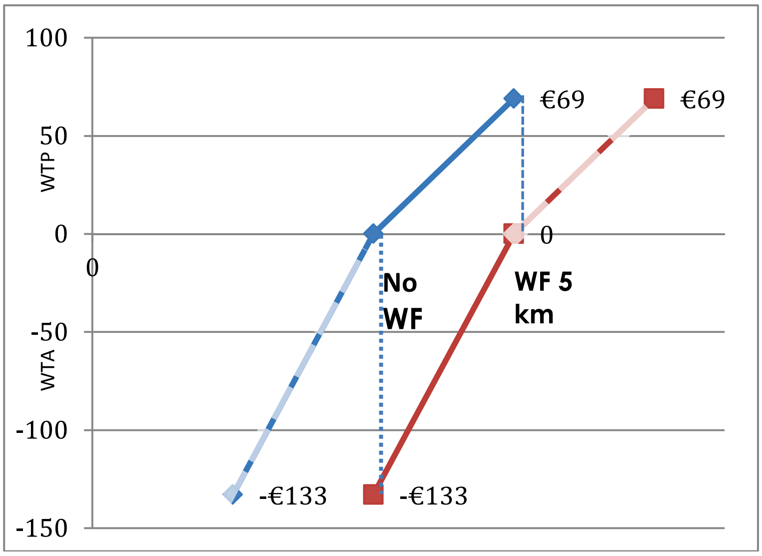

Figure 6: Imputed gain-loss asymmetry with regard to the installation of off-shore wind farms

From table 6 we find a WTA / WTP ratio of 1.94. Considering specifically the implication for welfare estimates associated with wind farm installation, the ratio imply that the disutility of seeing an offshore wind farm in the near view shed, is 94 % higher than the utility associated with removing the wind farm, once it is in place. Our results conform to previous findings. In their review of 45 studies, Horowitz and McConnelll (2002), find that the mean WTA/WTP ratio to be 7.2 with a median of 2.6, suggesting a pre-dominance of WTA/ WTP ratios in the lower end (like ours). More recently, in the choice modelling transport literature, Masiero and Hensher (2010) find a WTA/WTA ratio ranging between 2.7 for transport time and 2.9 for punctuality. Depending on reference point for transport time, Strathopoulos and Hess (2011) find the asymmetry to vary between 0 and 4.5. Lastly, Lanz et al. (2009) test loss aversion for internal sewer flooding in an environmental water supply CE, and find a WTP /WTA ratio as high as 65.

Conclusively, the evidence from our WTP and WTA estimates suggest that when the implied property right is 'the landscape and land-use as we know it today', there is a tendency for the symmetric model to overestimate WTP and under-estimate WTA relative to the asymmetric model. On the other hand, if respondents had property right to the future scenario, the results are reversed. The symmetric model over-estimates WTA and under-estimate WTP compared to the asymmetric linear model. Since the symmetric model provides welfare estimates that are in-between those of the asymmetric model with two different property right regimes - our results suggest that the reference point or perceived property right of the respondents in our sample are not uniform across respondents.

From a policy perspective, the above analysis implies that if tourists are considered to have the property right to the landscape and land-use activities as we know them today (not a bad assumption), then Westerberg et al. 2013 underestimates the disutilility associated with wind farm installation, and overestimates utility from recreational activities and eco-efficiency. If we instead picture a situation at a future date, in which the wind farm is already installed in conjunction with reef associated recreational activities and eco-efficiency, then the symmetric model in Westerberg et al 2013, overestimates the visual disamenities associated with wind farms, and underestimate the welfare benefit that comes from the eco-efficiency and the offer of eco-tourism activities.

The pinnacle question that follows is whether one should correct for gain-loss asymmetry when estimating welfare economic consequences of new initiatives at coastal community resorts? The natural response would be: Yes, if there is clear consensus about the implied property right of the respondents. In our context, it is ambiguous. The French government has decided to increase its share of renewable energies – a target, which will be fulfilled in part through the installation of offshore wind farms, in the Atlantic and potentially in the Mediterranean. Once installed, wind farms will be visible from a number of coastal community resorts. In the presence of a firm government decision to install wind farms, the implied property right is no longer the 'landscape as it is today'. However, it is far from guaranteed that artificial reefs will be installed, and eco-efficiency will follow. Therefore, the actual property rights, or endowment of the respondents is not clear-cut. In this case, correction for asymmetries is sub-ordinate. More relevant it seems, is to limit sources of WTP-WTA discrepancies. In this regard, Bateman (2007) note that a focus on accuracy of information provided to survey respondents should be coupled with an equal concern about the 'evaluability' of that information (Bateman et al 2007). The results presented in this paper point to the importance of familiarizing respondent with the goods that they are being asked to value.

6. Conclusion

Within the context of an analysis of tourist demand for or aversion to land use and land management destination alternatives, this paper confirms the widespread evidence of a consistent discrepancy between a person's willingness to pay (WTP) for a good and his willingness to accept (WTA) compensation to forgo the same good. We find that the disutility associated with an increase in the accommodation price is in terms of absolute value, 100% higher than the utility associated with a decrease of the same amount.

Secondly, by specifying the loss and the gain domain of the payment attribute as a quadratic function, we find a slightly better model fit, and evidence of a non-linear value function. Drawing on Tversky and Kahneman (1992), we conclude that non-linearity in the value function is most likely associated with risk seeking or risk aversion behavior, which in term depends on whether respondent consider 'paying' or 'receiving' compensation as likely. This observation calls for more research into the probabilities that respondents assign to events occurring in stated preference surveys.

Thirdly, we also investigate whether and how, experience, nationality, income may influence gain-loss asymmetry. Smaller gain-loss asymmetry for higher income and more experienced subjects is in accordance with standard neoclassical theory. We stipulate that smaller gain-loss asymmetry among Northern Europeans has to do with the fact that their reference point (perceived endowment) is different from French nationals, and that the respondent group whose stakes are larger (i.e. the French), have a larger aversion to losses.

In the presence of gain-loss asymmetry, the question that logically follows is whether analysts should explicitly account for gain-loss asymmetry in choice experiments that use attributes that are both utility increasing and utility decreasing? Our response is that it depends on whether there is clarity with regard to the implied property right (endowment) of the respondents. Our WTP and WTA estimates suggest that the symmetric (non-corrected) model overestimate WTP and under-estimate WTA, if respondents implied property right is the landscape and land-use activities, as we know them today. On the other hand, if respondents had property right to the future scenario in which policy changes are invigorated, the results are reversed: The symmetric model over-estimates WTA and under-estimate WTP compared to the asymmetric linear model. Thus, when the appropriate property rights are ambiguous for the population under scrutiny, our analysis suggest that it is not 'incorrect' to use the standard symmetric model to estimate welfare economic consequences of land use changes. This is because the symmetric model provides welfare estimates that are in-between the present and future property right regimes of the asymmetric model (fig 6). More importantly, our results suggest that the reference point or perceived property right of the respondents in our sample is not uniform across respondents. This fact calls for amendment and advancement of stated preference surveys, as we know them today. In particular, when the implied property right is unambiguous, survey instruments should be more explicit about 'what right' respondents have. In the absence of such affirmation different perceived endowments will remain a potentially important source of latent heterogeneity.

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Chapter 6: Conclusion

As nations strive to green their economies, tackling blockades related to the siting of renewable energy facilities is increasingly urgent. Research that can unpick the dynamic subjectivities that frame wind farm disputes, and inform concerned stakeholders about the impact of new installations on local economies, is needed to help overcome the current policy impasse.

The thesis emerged from these aspirations, and led to the conduct of a full-scale face-to-face valuation survey with 350 tourists interviewed on the beaches of dozen coastal community resorts in the Langudoc Roussilon, the summer of 2010. The analytical outputs of this survey are presented in chapter 3,4 and 5 and briefly recapitulated in the following.

The first part of the thesis serves to inform concerned stakeholders about the impact of wind farm developments on 'sun & sand' tourism, and whether reef-associated recreational activities can offset potential nuisances associated with the wind farms. The thesis also investigated potential demand for a coherent environmental effort (also called eco-efficiency), independently or in association with the installation of a wind farm, at the community resort.

It is shown that disamenity costs associated with wind farm installation tend to zero when wind farms are installed between 8 and 12 km from the coast. Average figures however, hides important subtleties. The compensation requirement decreases when tourist's are younger or mature, of northern European origin, when they display destination loyalty, and are motivated by the objective of visiting friends and family. Nationality also stands out as a significant determinant of tourist preferences for wind farm siting, even when we control for the respondent opinions about climate change and alternative energy producing facilities (in chapter 5). There is thus evidence that adherence to a certain energy orientation is dependent on the energy policy pursued in the respondent's country of residence.

Only 23% of the tourists we sampled corroborate the fears of Languedoc policy makers in terms of refraining from visiting a coastal community resort (in the absence of compensation), no matter whether the wind farm is installed 5, 8 or 12 kilometres from the shore. These tourists are more likely to be elderly and of French origin. However, since the Languedoc tourist industry is particularly keen to attract Northern European tourists (with high purchasing power) and repeat visitors there is evidence that placing wind farms no closer than 8 km from the shore in a association with a reef associated recreational activities, could precipitate an influx of tourists in the desired direction. Finally, it is shown that there is a significant demand for a coherent environmental policy at coastal community resorts - On average tourists are willing to pay an additional 140€ for eco-efficiency on top a weekly accommodation price of 200€. This implies that the invigoration of a coherent environmental policy at a coastal community resort would almost entirely compensate the tourists for the presence of a wind farm at 5 km from the shore.

The second part of the thesis go a step further in terms of understanding sources of opposition to (articulated in WTA) and support for (articulated through WTP) the siting of offshore wind farms in the near view shed. The juxaposition of wind energy as a local bad but with features of a global public good gives rise to an interesting debate that has been termed 'green on green'. It highlights, that while opponents express concerns over the impacts on noisescape, landscape and local biodiversity, supporters tend to see wind turbines as symbolic efforts to avert climate changes and air pollution (Jones et al. 2011). Thus far however, economic valuation studies on the siting of offshore wind farms, presents rather fragmented snapshots of impact variables and fail to provide an over representation of dominant opinion based discourses that citizens may hold.

To address this weakness, chapter 4 developed a conceptual framework of discourse-based drivers of preferences. The framework informed a principal component analysis, which determined four overarching respondent characteristics. By interacting these with wind farm attributes in the choice experiment, we show that 'concern about climate change', 'confidence in the ability of renewable energies to substitute traditional fuels', and 'aversion towards nuclear and fossil fuel sourced electricity', serve to lessen the disutility that an individual experiences when a wind farm is located 5 and 8 km from the coast.

In contrast, perceived inefficiency of wind power and NIMBY-attitudes (concern about impact on landscape, wildlife and noise) increases the experienced disutility from vacating in proximity to a wind farm. The results point to the fact that although we intend to elicit preferences for 'objective' physical characteristics of a landscape, in actual fact these preferences are inherently shaped by 'political, technical, economic or ecological' implications of the object or landscape under consideration. Another interesting feature of the results presented in chapter 4 is that higher educated respondents are less sensitive to the implantation to offshore wind farms at 5 and 8 km from the coast. In this regard it is not unreasonable to postulate that higher education is a factor, which may facilitate the awareness of the wider percussions, such as climate change, or the storage of radio active waste - associated with conventional electricity generating units. Conclusively, it should be emphasized that beyond site-specific local impacts, citizens also consider the wider implications of employing wind power on local business interests, public finance, and substitution away from other electricity generating technologies.

In the presence of utility increasing and utility decreasing policy attributes, and controversy with regard to whether wind farms are unanimously viewed upon as utility decreasing, the survey allowed for both compensation (WTA) and payment (WTP) in the choice exercise. In chapter 3 and 4 it was shown how tourist welfare is affected by land-use and seascape changes assuming that the WTP/WTA ratio is equal to one. When the WTP/WTA ratio is different from one, it means that the reference point employed when conducting the survey varies from tourist to tourist. Moreover, asymmetry between WTP and WTA also implies that the welfare economic consequences of a policy invigoration will differ depending on whether we are valuing it ex-ante versus ex-post. There is a substantial body of evidence, which suggests that individuals who are attached to a certain 'endowment' require a higher level of compensation to part with something than they would be willing to pay to obtain it (Knetsch, 1995). To investigate whether the endowment effect, and associated gain-loss asymmetry was present among tourists surveyed, we specified a piece-wise linear functional form for the indirect utility function and found that the disutility associated with an increase in the accommodation process is 100% higher than the utility associated with a decrease of the same amount. With regard to the implication of the siting of wind farms, this result suggests that average disamenity costs are halved once the wind farms are installed and part of the seascape. This result however hides important subtleties. Previous literature has shown that WTP-WTA disparity is more pronounced or likely to persist for non-market, complex, unfamiliar, and unique goods (Shogren, et al., 1994, Horowitz & McConnell, 2002; Bateman et al 2002). Income effects may similarly play a role by putting an upper bound on WTP, but no lower bound on WTA.

These findings are consistent with our results. In chapter 5 it is shown that WTP and WTA discrepancies can be explained in part by: constrained income (giving credentials to standard Hicksian theory); poor familiarity with wind turbines; and nations-specific proximity to the policy questions under scrutiny. With regard to the latter explanation, Chapter 5 shows that the disutility of paying is smaller for Northern Europeans than for French respondents. This draws attention to the fact that Northern Europeans may employ a different reference point than French respondents. We stipulate that French respondents may be more prone to consider that their endowment is one in which new land use policies have already been invigorated. If that is so, they will have a higher propensity to assign the 'WTP' measure to avoid wind farms (rather than the WTA measure to accept their presence). Northern European tourists on the other hand, are more likely to consider a larger number of potential coastal community resorts (outside France), and will not have overheard discussions on the installation of French wind farms in their backyard. However, we cannot be sure that these are factors that may explain the observed discrepancy between French and Northern European residents. It is therefore recommended that more research will be undertaken for the purpose of understanding the reference states that respondents apply when eliciting preferences for different choice set alternatives.

Drawing on the theory of cumulative prospect theory, we also consider whether the utility function may be non-linear. In cumulative prospect theory, the value of each alternative is multiplied by a decision weight according to a cumulative weighting function. The utility function is therefore determined jointly by the value function and a cumulative weighting function (Tversky and Khaneman 1992). The results presented in chapter 5 point to increasing sensitivity (risk seeking) among the tourists, in both gain and loss domain. According to experimental evidence by Tversky and Khaneman (1992) risk seeking in losses occurs when subjects consider that a loss (increase in coastal accommodation price) as highly probable, whereas risk seeking in gains take place when individuals consider gains as highly unlikely. Since price inflation, as opposed to deflation, is common to most economies, our results appear consistent with expectations. Unfortunately however, we have little way of knowing the probabilities that tourists attribute to the likelihood of 'choice set' events occurring. To the author's awareness, this has not yet been a subject of inquiry in stated preference valuation studies. Nevertheless, to the extent that increasing or decreasing sensitivities are not consistent with the assumption upon which valuation studies are conducted, namely perfect incentive compatibility - this is an area of research that merits more attention.

Efforts were made in the survey construction and execution to ensure incentive compatibility and prompt honest responses. Yet, we cannot preclude the existence of biases in survey responses - in particular strategic bias[19] - that are inherent to stated preference surveys. Nonetheless, although absolute values for certain attributes may be slightly overvalued or undervalued, this does not carry over to estimates of relative attribute or socio-demographic and attitudinal determinants of preferences. Henceforth, the overarching conclusions of the thesis holds true.

The thesis has given an insight into the controversy that exists with regard to installing a wind farm in the near view shed. It has been shown, that simply departing from the assumption that wind turbines are inherently unsightly or simply referring to NIMBY when explaining resistance, oversimplifies underlying causes of resistance. Independently of the physical characteristics of a wind farm, our results suggest that information on climate change, the real cost of wind power (compared to alternative sources), the effectiveness of renewable energies, and their capacity to replace conventional fuels, are all likely to influence the preferences that local or tourist communities hold with respect to the installation of wind farms in the near view shed.

Chapter 3 and 4 indicate that wind farm acceptance may be bolstered, by installing wind farms far away (min. 12 km) from the coast. However, placing wind farms further offshore would compromise the scope for enjoying wind-farm associated activities close to the shore, and potentially render offshore wind farm installation prohibitively expensive. Alternatively and increasingly recognised, another opening consist of rendering offshore wind farms multifunctional (LaCroix and Pioch 2011; Westerberg et al. 2013). Given that the physical three dimension of the offshore wind farm enables the whole water column to be used, innovative synergies can be created between socio-technical and ecological uses. As an example, artificial reefs and the eco-design of wind turbine foundations can create sea grass settlement, fish habitat and the boosting of tourism and leisure activities, such as diving, angling and observational boating. Indeed, our result shows that associating a wind farm with recreational activities can serve to compensate tourists for their visual nuisance provided they are located no closer than 8 km from the shore. If in addition eco-efficiency is invigorated, and provided effective signalling of this effort, our results point to an actual rise in tourist related revenues when a wind farm is located no closer than 5 km from the shore.

Finally it should be stressed that although public acceptance has been referred to as ‘the energy sectors biggest headache’ (Renssen 2011), there is scope for intelligently tackling opposition. On the one hand, multi functionality of wind farms may simultaneously benefit otherwise opposing stakeholders, and hereby help facilitate acceptance of new offshore infrastructure. On the other hand, recognition should be given to all the drivers of public acceptance - physical, social, cultural, political and institutional - and the prominent role of lobbying in shaping individual preferences. Conclusively, steps in the public acceptance process requires transparency of information and adequate communication to affected stakeholders; a strong political message; support from key civil society groups; public engagement, before the decisions are taken, and lastly, some sort of compensatory undertakings for any inconveniences or losses incurred (Wolsink 2007; Rebel et al. 2011; Renssen 2011).

[19] Questions as to the influence of ’right-wrong responses’, range bias, starting point bias’, are outside the scope of this thesis.

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Appendix 1: Questionnaire

LAMETA
Laboratoire Montpelliérain d'Economie Théorique et Appliquée

Université Montpellier 1

UNIVERSITY OF COPENHAGEN

Survey on tourist preferences for landscape quality and environmental policy

A group of researchers at the Montpellierain Laboratoiry of Applied and Theoretical Economics (LAMETA), are currently undertaking a scientific investigation of tourist preferences in regard to landscape quality, renewable energies and sustainable development.

More precisely, we wish to understand how your choices may be affected by efforts to supply renewable energy and environmentally responsible seaside community resorts.

Responding to this questionnaire takes about 20 minutes and your answers remain strictly confidential. Thank you very much in advance.

To be filled in by the interviewer

Name of the interviewer: ……………………………………………………………………………

Date of the interview: …… / …… / 2010   QUESTIONNAIRE - BLOCK : ………………….

Place where the interview took place:

Is the tourist lodging at the coast ? ☐ YES   ☐ NO

On what coastal community resort is he lodging? …………………………………..

What is his nationality? ……………………………………

Partie A: Renewable energies and climate change

As a consequence of the adoption of the European Commission's "energy climate" package, France is set to increase its share of renewable energy from 10,3% today to 23% by 2020. As part of this strategy, offshore wind farms are proposed in the Mediterranean sea.

We are interested in knowing what effect this may have on the tourist frequentation of the concerned beaches. As part of this investigation we are interested in your opinion on the following energy related questions.

A1 – Your opinion about climate change

	Yes	Maybe	No
Do you consider that climate change is a problem which should be taken seriously?	☐	☐	☐
Do you consider that the acceleration of climate change is primarily created by humans?	☐	☐	☐
Do you consider that your country ought to carry out significant reductions in its CO2 emissions?	☐	☐	☐

A2 – In terms of energy policy in your country, what do you think about the desirability of the following choices?

	Very important	Important	little important	Not important	Not at all preferable	Don't know
Continue to use nuclear energy and develop its technology?	☐	☐	☐	☐	☐	☐
Continue to use renewable energies and develop their technology ?	☐	☐	☐	☐	☐	☐
Continue to use fossil fuels and develop their technology ?	☐	☐	☐	☐	☐	☐
Employ CO2 taxes and emission permits?	☐	☐	☐	☐	☐	☐
Assure low electricity prices?	☐	☐	☐	☐	☐	☐

A3 – Do you consider renewable energy to be a viable alternative to:

	Yes	To a certain extent	Not at all
Nuclear	☐	☐	☐
Fossile fuels (Petrol/ Gas/ Charbon)	☐	☐	☐

A4 - What is your general opinion on wind turbines?

	Very positive	rather positive	Neutral	rather negative	Very negative	Don't know
What is your general opinion on wind turbines on land?	❑	❑	❑	❑	❑	❑
What is your opinion regarding the construction of more turbines on land in your own country?	❑	❑	❑	❑	❑	❑
What is your general opinion on offshore wind turbines (on the sea)?	❑	❑	❑	❑	❑	❑
What is your general opinion on the construction of offshore wind turbines in your own country?	❑	❑	❑	❑	❑	❑

A5 – In your opinion, what influence do you think that offshore wind turbines may have on:

	Very positive	rather positive	Neutral	rather negative	Very negative	Don't know
The landscape	❑	❑	❑	❑	❑	❑
Noise levels	❑	❑	❑	❑	❑	❑
Sea life (flora and fauna)	❑	❑	❑	❑	❑	❑

A6 – According to you, what influence do you think that on land wind turbines may have on:

	Very positive	rather positive	Neutral	rather negative	Very negative	Don't know
The landscape	❑	❑	❑	❑	❑	❑
Noise levels	❑	❑	❑	❑	❑	❑
Impact on birds	❑	❑	❑	❑	❑	❑

A7 – According to you, what influence do you think that the development of wind energy may have on:

	Decrease visibly		No impact		Increase visibly	Don't know
Electricity price	❑	❑	❑	❑	❑	❑
Impact on taxes	❑	❑	❑	❑	❑	❑
Creation of jobs and the local economy	❑	❑	❑	❑	❑	❑

A8 – When someone mentions wind turbines, what associations come to your mind?

Efficient	○	○	◎	○	○	: Inefficient
Cheap	○	○	◎	○	○	: Expensive
Peaceful	○	○	◎	○	○	: Stressful
Good	○	○	◎	○	○	: Bad

A9 – Is there wind turbines in proximity to your principal or secondary residence ?

❑ No ❑ Yes

A10 –Do you see wind turbines daily (such as on commute drive to work)

❑ No ❑ Yes

A11 – Is there a nuclear central in proximity to your principal or secondary residence ?

❑ No ❑ Yes

If the respondent has other thoughts / opinions :

PART B : Your vacation destination choice

B1 – In what kind of accommodation are you staying during this vacation?

- ❑ Mobil home / Caravane
- ❑ Hôtel / Gîte / Chambre d'hôtes
- ❑ Vacation appartment
- ❑ Tent
- ❑ With family or friends
- ❑ Other …………………………………………….

B2 – Do you currently have an accommodation with view over the sea

❑ Yes ❑ No

B3 – Do you travel ?

- ❑ Alone
- ❑ In couple
- ❑ With my friends
- ❑ With my children

B4 – Your residence ?

The length of your stay: ……………………… €

The cost of your stay : …………………….

Number of adults : …………………. Adults (More than 17 years of age)

"I will now present you with different management options for French Mediterranean coastal resorts. These have been defined through consultation with the tourist industry and pertinent experts working with renewable energies and coastal management".

"Please study the policy management options carefully on the A3 INFO sheet".

Before presenting the choice set exercise, the interviewer makes a calculation and communicates to the respondent « Your accommodation price is : … € PER WEEK PER ADULT

1.Offshore wind farms and the landscape:

Offshore wind farms may be a future component of the Mediterranean seascape. While a single offshore wind farm of 30 wind turbines can provide electricity of up to 115,000 households it may be contested on visual grounds. To minimise potential visual nuisances the wind farms can be entirely avoided or placed further away from the coast. Placing them further offshore is however a more costly option.

Distances of **5 km, 8 km and 12 km** from the coast correspond to wind farm projects currently proposed in French waters. Note that at all distances there is no noise nuisances from offshore wind farms on the coast.

2.Offshore wind farms and recreation:

A range of recreational activities can be associated with the wind farm itself or nearby structures.

Those interested in leaning about the harvesting of energy from offshore wind resources, may profit from educational excursions to the wind farms;.

The turbine foundations act as habitats for fish, crabs, mussels, lobsters and plants, creating a more diverse and dense population of marine life at wind farm sites than at control sites away from the farms

Furthermore, in proximity to the wind farms it is possible to implant structures called "artificial reefs" on which mussels, algae, and a variety of plants rapidly install themselves. This "feeding ground" attracts fish of all colours and sizes. This will allow the observation of marine life from boats or through diving.

The feasibility of these activities however depends on the location of the wind farm and whether authorities decide to allow access or not. In the presence of an offshore wind farm, you may either have :

- **Access** to the offshore wind farm and associated recreational activities, OR
- **No access** to the offshore wind farm and no associated recreational activities

3.Sustainable tourism :

The concentration of many people on the same spot results in significant pressure on local ecosystems. By adopting a range of environmental initiatives, coastal municipalities may minimise their impact on the environment.An example of an environmentally responsible sustainable tourist resort, is one which:

• Limits the circulation of speed boats and scooters at sea
• favours public transport on-shore. In addition it has an extended network of bicycle lanes.
• Camp sites, hotels and public building employ energy and water saving devices and are equipped with adequate waste and sewerage facilities.
• Solar panels provide renewable energy
...omoted to the fullest extent possible

- **Environmentally responsible,** OR
- **No particular environmental policy**

Eco-efficiency at a tour... e in the absence of an offshore win... resort is thus characterised as either

- No windfarm

- A wind farm at 5 km distance

- A wind farm at 8 km distance

- A wind farm at 12 km distance

The Choice Experiment Questions :

To aid decision makers in their choices regarding the orientation of the French Mediterranean seaside resorts, we now ask you to choose between different hypothetical destinations.

On each of the following 8 pages, you are asked to choose the resort that you prefer. Each destination is associated with different accommodation prices (per night per adult), more or less expensive than that which you pay now. The accommodation prices vary exclusively due to the illustrated characteristics. The two resorts are exactly the same in all other aspects.

If none of the two seaside resorts pleases you, you may also choose to go to "none of them"

CHOICE SET 1 :

VACATION CHOICE : DESTINATION A ☐ DESTINATION B ☐ NONE OF THEM ☐

CHOICE SET 2 :

VACATION CHOICE : DESTINATION A ☐ DESTINATION B ☐ NONE OF THEM ☐

CHOICE SET 3 :

VACATION CHOICE : DESTINATION A ☐ DESTINATION B ☐ NONE OF THEM ☐

CHOICE SET 4 :

VACATION CHOICE : DESTINATION A ☐ DESTINATION B ☐ NONE OF THEM ☐

CHOICE SET 5 :

VACATION CHOICE : DESTINATION A ☐ DESTINATION B ☐ NONE OF THEM ☐

CHOICE SET 6

VACATION CHOICE : DESTINATION A ☐ DESTINATION B ☐ NONE OF THEM ☐

CHOICE SET 7 :

VACATION CHOICE : DESTINATION A ☐ DESTINATION B ☐ NONE OF THEM ☐

CHOICE SET 8:

VACATION CHOICE : DESTINATION A ☐ DESTINATION B ☐ NONE OF THEM ☐

Destination A: Coherent environmental policy and offshore wind farm at **8 km** with associated recreational activities.

Destination B: Coherent environmental policy and offshore wind farm at **5 km**, with associated recreational activities

CHOICE SET 2


- 50 € / week / adult
Destination A: Offshore wind farm at **8 km** with associated recreational activities.


+ 200 € / week / adult
Destination B: Coherent environmental policy and **no** offshore wind farm.

…6 additional A4 page choice sets shown to the respondent

What is your favourite policy outcome ?

☐ **No wind turbines** ☐ **5 km** ☐ **8 km** ☐ **12 km**

☐  ☐ 

☐ 

☐ 

What is the maximum extra sum, if any that you would be willing to spend per week for these options ? ______________

Part C : Follow-up on the choice set exercise

C1 – Is your opinion regarding offshore wind farms different after this exercise ?

Are you rather? ☐ More favourable ☐ Less favourable ☐ No change

C2 – During the choice experiment exercise, which characteristics did you pay most attention to ?

Classe thèse from 1 to 4 according to their order of importance	The price	The environmental policy	The presence of the windturbines	The recreative activities
(**X** si no importance)	☐	☐	☐	☐

C3 – Do you adhere to the following statements ?

	Agree	Rather agree	Do not agree	Don't know
« I don't want to see wind farms when I am on holiday»	☐	☐	☐	☐
« Wind farms should not be situated in the Mediteranean »	☐	☐	☐	☐

C4 – What image do you associate with a coastal community ressort that has an offshore wind farm ?

	Completely	A bit	Not at all
« Advanced and modern »	☐	☐	☐
« Industrial and artificial »	☐	☐	☐
« Respectful of the environment »	☐	☐	☐
Other______________	☐	☐	☐

Part D : Your vacations here

I will now ask you to consider your motivations for coming to this seaside resort and what you are interested in doing during your vacation.

D1 – Is it your first trip to this seaside resort, or a neighbouring one in the Languedoc Rousiilon?

- ❑ It's the first time
- ❑ I've been here several times before
- ❑ I come each year

D2 – What were your motivations to come to Languedoc-Roussillon?

	Very important	Important	Not important
Relaxation, sea and sun	❑	❑	❑
Landscapes and nature	❑	❑	❑
History, culture and patrimony	❑	❑	❑
Food and wine	❑	❑	❑
Water sports	❑	❑	❑
Pure curiosity	❑	❑	❑
Night life	❑	❑	❑
Visiting friends and family	❑	❑	❑
For my children's sake	❑	❑	❑
Work related purposes	❑	❑	❑

D3–How much time do you spend at the beach resort compared to other attractions in the region?

- ❑ I spend most of my time on the beach the village / town / tourist resort near to it
- ❑ I alternate between the beach and other cultural and historical activities in the surrounding region

D4 – At the beach resort, are you currently satisfied with the following elements?

	Very satisfied		Neutral		Very unsatisfied
General tidiness	❑	❑	❑	❑	❑
Noise	❑	❑	❑	❑	❑
The quality of your accommodation	❑	❑	❑	❑	❑
The quality of restaurants	❑	❑	❑	❑	❑
The fluidity of traffic in the town	❑	❑	❑	❑	❑
Activities for children	❑	❑	❑	❑	❑
OTHER ? ____________	❑	❑	❑	❑	❑

D5 – How likely is it that you will recommend this coastal community resort to a friend or a colleague?

1 2 3 4 5 6 7 8 9 10

1= Not at all : ○ - ○ - ○ - ○ - ○ - ○ - ○ - ○ - ○ - ○ : 10 = Definitely

D6 – Is there other coastal destinations that you appreciate in France ?

Which ones? ________________

D7 – Is there other coastal destinations that you appreciate outside France
(Ex : Maroc, Tunisia, Turkey, Croatia, Thailand …)

Which ones? ________________

Part E : Personal characteristics

I will now ask you a couple of general questions about you, not relating to your holiday. These questions are necessary in order to be able to analyse our results. Your responses remain ANONYMOUS and CONFIDENTIAL.

E1 – Do you practice any water sports?

- ❑ Yes Which one ? ________________
- ❑ No

E2 – Do you plan to do a trip on the sea, or have you already done one during your vacation here ?

- ❑ Yes
- ❑ No

E3 – On a scale from 1 to 5 with what frequence do you :

	1 Never	2	3 sometimes	4	5 Always
Buy organic produce	❑	❑	❑	❑	❑
Give charitable donations to environmental organisations (WWF, LPO…)	❑	❑	❑	❑	❑
Recycle household waste such as glass or newspaper	❑	❑	❑	❑	❑
Buy fairtrade products e.g. fair-trade coffee or fair-trade chocolate	❑	❑	❑	❑	❑

E4 – What do you think about the following affirmations ?

	Perfectly agree	Rather agree	Don't know	Mildly disagree	Strongly disagree
« Humans are severely abusing the environment»	❑	❑	❑	❑	❑
« The balance of nature is very delicate and easily upset»	❑	❑	❑	❑	❑
« Only a minority of people are ready to make an effort to protect the environment »	❑	❑	❑	❑	❑

Socio-demographic characteristics

E5 – What is your age?

____

E6 – How many children do you have less than 18 years old ?

____

E7 – If your principal residence is in France, can you please indicate your department ?

____

E8 – What is your educational background?

- ☐ No diploma
- ☐ Primary school
- ☐ Secondary School / high-school
- ☐ GNVQ (technical school)
- ☐ A-levels or similar
- ☐ University bachelors degree
- ☐ University master or more

E9 – What is your status at this moment ?

Catégorie		*Statut actuel*
1	☐	*Student*
3	☐	*Manual worker (bluecollar)*
4	☐	*Farmer / Fisher*
5	☐	*Self employed*
6	☐	*Private sector, liberal profession*
7	☐	*Public sector employee*
8	☐	*Upper public sector employee*
9	☐	*Private sector employee*
10	☐	*Upper private sector employee*
11	☐	*Unemployed*
12	☐	*Not active*
13	☐	*Retired*
14-	☐	*Not to be pronounced*

Other ________________________

G12- Would you be kind to indicate the net monthly income of your household ?

- ❑ *Less than 500 €/month*
- ❑ *From 501 to 1000 €/month*
- ❑ *From 1001 to 1500 €/month*
- ❑ *From 1501 to 2000 €/month*
- ❑ *From 2001 to 2500 €/month*
- ❑ *From 2501 to 3000 €/month*
- ❑ *From 3001 to 3500 €/month*
- ❑ *From 3501 to 4000 €/month*
- ❑ *From 4001 to 4500 €/month*
- ❑ *From 4501 to 5000 €/month*
- ❑ *From 5001 to 5500 €/month*
- ❑ *From 5501 to 6000 €/month*
- ❑ *More than 6001 €/month*
- ❑ *NSP or refuse to respond*

E12 – Do you live :

Alone	❑
In a couple	❑

Thank you for your participation in this survey

We wish you a continued good vacation

If you wish to receive the results of this survey, please write you email here :

____

****

To be completed by the interviewer

Length of the survey in minutes: _______________

The respondent is:

❑ a woman

❑ a man

Was he/she serious during the exercise ?

How would you rate his/her degree of awareness about renewable energy ?

Other remarks that could be of relevance for further analysis?

VU et PERMIS D'IMPRIMER

A Montpellier, le

Le Président de l'Université Montpellier I

Philippe Augé