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Assessing the Determinants of Local Acceptability of Wind Farm Investment: A Choice Experiment in the Greek Aegean Islands

by

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Assessing the Determinants of Local Acceptability of Wind Farm Investment: A Choice Experiment in the Greek Aegean Islands

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Abstract

This paper aims at analysing the factors which motivate communities to resist the installation of wind farms in their vicinity. To this end, the choice experiment methodology was employed in communities in two Greek Aegean Islands to assess the determinants of preferences towards different wind farm projects. Unlike other studies the willingness to accept welfare measure was adopted. The results of our analysis show that the conservation status of the area where the wind farms are to be installed, along with the governance characteristics of the planning procedure are the most important determinants of local community welfare in relation to wind farms. In contrast to other studies, we find that the physical attributes of wind farms appear to be of less relative importance from a local community welfare point of view. Implications for the EU's future energy policy are drawn

Keywords: wind farms; local acceptability; willingness to accept

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1. Introduction

The EU's latest Green Paper on a European Strategy for Sustainable, Competitive & Secure Energy reinforced and strengthened the EU's commitment (as expressed in EC Directive 2001/77) to invest in renewable energy sources with the construction of new wind farms being placed top of its energy policy agenda. Further, a recent Eurobarometer survey (European Commission 2006) has identified that Europeans are strongly in favour of promoting wind power. Yet, at the same time actual investment in wind-farms is not in pace neither with the expressed political will in the EU's Green Paper nor with the documented benefits that the general public associates with wind-power. This lack of adequate investment has been attributed among other things to local aesthetic externalities, technical and infrastructure problems, excessive bureaucracy and the opposition of numerous local communities (e.g. Bergmann et al. 2006; Douglas et al. 2008; Hatziargyriou et al. 2006; Ladenburg and Dubgaard 2007; Kabouris and Hatziargyriou 2006; Kaldellis and Kavadias 2004; Wolsink 2007).

This paper focuses on assessing the last of these four impediments to wind-farm investment. In particular, we will aim to identify, analyse and evaluate the factors or determinants which give rise to local communities' resistance towards plans for wind power investments in their vicinity. In doing so, we use results from a study based on local societies in medium to small Greek Aegean islands. This was motivated by three main reasons. First, among EU states, Greece has shown an even greater determination in meeting the Green Paper's renewable energy target of 20% of all energy sources by 2020 via a focus on wind farms. For example, the Hellenic Ministry for Development aims at achieving more than half of its 2020 mandatory target by the deployment of wind power, a goal based on various geographical, technical and financial criteria (Hellenic Ministry for Development 2007). Secondly, the geomorphology of the Aegean islands is known to be associated with an exceptional wind power potential (Hatziargyriou et al. 2006; Kabouris and Hatziargyriou 2006; and Kaldellis 2004, 2005). Yet at the same time, the distinctive technical characteristics of the current electricity supply in these islands, due to their geographical location as well as their local economic conditions, makes investment in wind power particularly challenging (Hatziargyriou et al. 2006; Kabouris and Hatziargyriou 2006; Kaldellis and Zafirakis 2007). Thirdly, local resistance to such investment has been particularly acute and has received widespread coverage in local and national Greek media (Giannarou 2007; Haralampakis 2007; Howden 2007; and Kathimerini 25/11/2006).

Since there is no existing market information from which one could reveal the intensity and nature of local community preferences towards future wind power installations we opted for using a stated preference approach. Further, as we aimed to treat wind farms as a combination of physical, siting and institutional attributes, the choice experiment (CE) technique was employed as the most appropriate method for the problem at hand. The CE method is a survey based method that is significantly regimented, structured and incentive compatible (compared to simpler opinion poll studies) such that it can yield information over the direction, intensity and determinants of local community preferences for wind farms. Moreover, in order to account for regional heterogeneity across islands, our analysis compared preferences towards wind farms across two carefully selected Aegean Sea islands, namely those of Naxos and Skyros.

Two main aspects of this study differentiate it from others undertaken in the same context. First, the emphasis is not put on the assessment of the general public's preferences for wind farms nor on their general external environmental costs or their visual impact (Álvarez-Farizo and Hanley 2002; Bergmann et al. 2006; Ek 2002; and Hanley et al. 2005). Instead we specifically focus on evaluating the factors which might influence the *local* acceptance of wind farms. In particular, we exploit the findings from recent papers from the institutional, governance and attitudinal literatures which suggest that local disapproval of wind farms is partly associated with the way in which planning and siting decisions are reached (Devine-Wright et al. 2001; Gross 2007; Krohn and Damborg 1999; Söderholm et al. 2007; and Wolsink 1996, 2000, 2007). We, thus, explicitly incorporate such governance considerations in our CE design and our results appear to empirically confirm these authors' propositions.

Secondly, we explicitly acknowledge that in many cases wind farms have public bad characteristics at the local level whilst public good characteristics at the national or international level. At the same time, we account for the fact that local communities normally possess the property rights over the use of local land. In doing so, in the context of assessing the local welfare impacts of wind farm investment we estimate the more appropriate willingness to accept (WTA) welfare measure. This contrasts past wind farm valuation studies which have focused on estimating willingness to pay welfare measures.

In what follows, Section 2 briefly discusses the factors which influence local resistance towards wind farms. Section 3 provides a concise presentation of the Greek wind power sector, while Section 4 discusses the main steps undertaken to design the study. Section 5 summarises the implementation of the study and Section 6 presents results on the samples' attitudinal characteristics towards wind farms. Section 7 presents the results from the CE exercise as well as the derived welfare estimates, while Section 8 discusses the policy implications of the study.

2. Determinants of local opposition towards wind farms

The growing concern over climate change as well as the economic and political disadvantages associated with a large dependency on oil has considerably contributed to the boost of the wind power sector. Furthermore, investment in wind power has also been linked to the creation of additional employment opportunities particularly in rural areas (Hanley and Nevin 1999). Yet, despite these positive benefits the literature[1] has cited numerous cases in which local communities actively and strongly oppose to the installation of wind farms and managed either to impose additional costs to the developers or have the investment project severely delayed or even entirely cancelled.[2]

There are various factors that have been identified as determining local community opposition towards wind farms. Ladenburg and Dubgaard (2007), Kaldellis et al. (2003) and Wolsink (2000, 2007) suggest that the primary motive stems from concerns over landscape intrusion, although this is strongly related to the type of landscape where the turbines are to be installed and its perceived unity by the local population (Johansson and Laike 2007). Resistance to wind power installations is also argued to be induced by the expected noise and impact on the local ecosystem (McLaren Loring 2007 and Wolsink 2000). The latter incorporates the threats to local flora and fauna (mostly birds), not only while the turbines are in operation but also throughout their installation period. Thayer and Freeman (1987) report annoyance at non-functioning wind turbines as another reason for opposition. Technical issues such as unreliability, inefficiency and high costs are also mentioned to be considered by the locals (Devine-Wright 2005). As visual intrusion, noise and the impact on the ecosystem are effects which are non-rival and non-excludable at the local level, it could be argued that wind farms may be perceived to have public bad characteristics at the local scale.

Moreover, Wolsink (2000) emphasises the dynamic aspect of attitudes towards wind farms and argues that they can be crucially affected by institutional factors, such as the pattern in which decisions concerning the siting of the turbines are made and how well-informed local communities are with regard to wind energy issues (see Jobert et al. 2007 and Krohn and Damborg 1999). Krohn and Damborg (1999), Söderholm et al. (2007) and Wolsink (1996, 2000, 2007) argue that when local communities resist wind power installations, they actually express their disapproval either of the top-down decision making procedures used by the developers and policy makers or of the incentives of the prospective developers. Further, resistance is also associated with the fact that emphasis is often laid on large-scale development, rather than local concerns over wind power projects. Numerous authors emphasise that cooperative, conciliatory and transparent decision making processes are likely to increase the local acceptance of wind power projects (Devine-Wright et al. 2001; Gross 2007; Jobert et al. 2007; McLaren Loring 2007 and Söderholm et al. 2007). Moreover, Söderholm et al. (2007) and Toke et al. (2007) claim that the direct or indirect ownership of wind power installations by local cooperatives, farmers, companies or citizens is very likely to enhance the local acceptance of wind farms and is among the most important factors which have led Denmark and Germany to be among the world leaders in the exploitation of wind energy.

Although Devine-Wright (2003) reports the willingness of local people in several European countries to be involved in the decision-making procedures concerning the development of a wind farm in their community, Wolsink (2007) emphasises the dominance of inadequate communication between the involved parts during the planning procedures. Thus, it is suggested that conciliatoriness, transparency and openness from the developers and decision makers' side and allowance for participation and involvement of the locals in the planning and decision making procedures could considerably contribute in the prevention of local resistance towards wind power investments.

3. Wind power in Greece: possibilities and limitations

As noted in Section 1, the Hellenic Ministry for Development has laid particular emphasis on wind farm investment. The country aims to be producing over 10% of its gross domestic electricity consumption from wind by 2010 and over 50% of its EU Green Paper mandatory targets for renewable energy by 2010. This focus on wind power has been made on the basis of the country's noteworthy wind energy potential, the perceived cost efficiency of the wind power technology, the fact that large-scale hydro capacity has already been almost fully exploited, the particularly strong aversion of the Greek public towards nuclear power (European Commission 2006) and the considerable number of developers who have expressed an interest in investing in this technology (Hatziargyriou et al. 2006; Kabouris and Hatziargyriou 2006 and Kaldellis 2004, 2005).

Furthermore, policy makers in Greece have been developing a legal framework[3] that aims at providing a combination of incentives to the prospective developers of renewable energy projects akin to that successfully implemented in Spain, Germany and France (Kabouris and Hatziargyriou 2006; Lazarou et al. 2007; Jobert et al. 2007; and Toke et al. 2007). This includes a system of feed-in tariffs[4], guaranteed and quick connection to the grid, ten-year contracts with the option of an equal renewal period if requested by the producer, substantial subsidies which may even reach 50% of the required capital investment and tax breaks and exceptions. Moreover, the developers of wind power projects are not legally required to provide any offsetting benefits to the local communities near the areas where the turbines are installed, apart from granting three percent of the annual gross revenues to the local authorities.

However, despite the urgency implied by EU energy targets as well as a favourable set of take up incentives, actual wind power development and investment is still relatively slow in Greece (Wolsink 2007) with only 24% of its 2010 target having been achieved by the end of 2007.[5] This has been attributed to three main factors:[6] a) technical obstacles, such as the restricted transmission network, b) remaining complex bureaucratic procedures that developers have to address in order to be granted the production, installation and operation licenses and c) strong opposition from local communities towards the installation of wind farms. Although recent legislation and ministerial decisions[7] have aimed at addressing the first two of these problems, little emphasis has been afforded by policy makers on the identification and analysis of the reasons which frequently motivate the resistance of Greek local communities to wind turbine installations.

It is noteworthy that, according to a recent Eurobarometer survey[8], the Greek public appears to strongly favour wind power. This divergence between public attitudes at the local and national levels in the context of wind power is often attributed to the Not-In-My-Backyard (NIMBY) syndrome whereby though an individual may be generally in favour of wind energy, he/she is opposed to the installation of wind turbines in one's own community (Bosley and Bosley 1988; Kaldellis and Kavadias 2004). However, this approach has been criticised as rather over-simplifying and may be masking other more significant determinants of local community opposition (Johansson and Laike 2007; Krohn and Damborg 1999; Van der Horst 2007; and Wolsink 1996, 2000).

Factors, such as visual intrusion or noise, affecting local community resistance to wind farms were identified in Section 2 and these would apply to the Greek context as well. Yet, some of these determinants have been identified as being potentially more significant for the case of Greece. Most notably, particular emphasis is laid on the environmental impact of the infrastructure projects preceding the building of a wind farm which are expected to gravely change the landscape of the area and affect the ecosystem, especially in the case of large wind power installations. Another very important concern of Greek local communities confronted with projects in their vicinity is the possible neglect and abandonment of the wind turbines at the end of their lifespan, which usually lies between 15 and 20 years. Several examples of insufficient maintenance of turbines are apparent in the Aegean Sea islands and the perception that turbines will not be removed or replaced after their lifetime ends is not uncommon (Kaldellis and Kavadias 2004). Finally, local communities are usually poorly informed and excluded from the decision making and planning procedure of these projects. Developers normally inform local communities only after considerable opposition has been voiced while municipal consent is usually requested after the project has already been planned and central government approval has been sought. These factors coupled with the scepticism over the incentives of prospective developers, has led local communities to perceive the wind farm planning processes as both socially unfair and economically unsound and are thus at the core of local opposition. In the next section we turn to present the steps undertaken to design the CE study that was used to further assess these determinants.

4. Study design

The design of the study was undertaken between October 2006 and July 2007 following an extensive literature review, focus group sessions and pilot testing. Here we present a summary of the main design steps undertaken.[9]

4.1. Study Location

The study location had to be first identified. We chose to implement the study in two regions so as to account for regional heterogeneity. We then had to choose the specific locations and choose to focus on the islands of Naxos, the largest island of the Cyclades complex, located in Southern Aegean Sea, and Skyros, the largest island of the Northern Sporades complex, situated in Central Aegean Sea.

Though there are several cases of opposition towards specific wind power projects throughout the Greek territory we chose to focus on these relatively small Aegean islands, for four main reasons. First, they exhibit noteworthy geographical and cultural differences. Secondly, there are several technical factors resulting in the distinctiveness of the small Greek Aegean islands. Most notably, they exhibit excellent wind potential, especially during the peak-load summer periods (Hatziargyriou et al. 2006 and Kaldellis 2004, 2005). Thirdly, they display an annual increase of the electricity consumption at a rate of 8%, almost double the mainland rate (Hatziargyriou et al. 2006). Due to geographic, technical and financial reasons, they have not been interconnected to the mainland grid yet. Hence, they base their electricity supply on small autonomous power stations and a medium voltage transmission network, the combination of which restricts the wind power penetration limit to 20-30% of the maximum instantaneous electricity demand[10]. Thus, the potential number and total power of turbines that can be installed is gravely decreased, reducing therefore the financial attractiveness of wind power investments. Lastly, the islands had witnessed a considerable share of applications submitted by developers to the Regulatory Authority for Energy (RAE) for the installation of new wind turbines.[11]

Furthermore, the relative small size of these islands raises the issue of the possible impact of wind farms on tourism. Although it is not adequately proven that turbines have a negative impact on tourism, locals are seriously concerned that they are likely to alter the island's landscape which they consider one of the main touristic attractions.

4.2. Design of choice experiment

As we aimed to assess the welfare impacts of a development project, namely a wind farm, which has both public good and bad characteristics, we employed a stated preference non-market valuation approach. In particular, we used the choice experiment (CE) method as it allows for assessing welfare impacts that result from changes *in more than one* dimension or characteristic of a project. In our case, a wind farm investment project would affect the welfare of a local community via various factors, including the direct benefits received by locals, as well as the institutional features of the planning process.

The CE method is a survey based method that is conceptually grounded in welfare economics, while econometrically it is based on random utility theory. As such it provides for a more structured and incentive compatible way of assessing determinants of local community resistant to wind farms as compared to simple qualitative survey approach. For reasons of brevity we only provide an intuitive account of the CE method. Details can be found in Hensher et al (2005).

CE surveys present respondents with a set of two or more policy or project options (*profiles*) that are characterised by different *attributes* which take on various levels. The method generates data such that an individual's utility over different profiles can be estimated as a function of attributes as well as characteristics of the individual decision maker. The method allows for the estimation of individual welfare associated with a particular profile (relative to the status quo) as well as welfare from marginal changes in the profile attributes themselves. This latter feature of the method allows policy makers to gain a sense of the relative importance of a project's characteristics, something which was of particular interest to this study as we aimed at understanding the relative significance of the factors affecting local communities' resistance to wind-farm investment plans.

The most crucial step of the CE design concerns designing the choice profiles. This process includes selecting the attributes and their levels that characterise the choice profiles and then generate the universe of all possible profiles. This is then followed by an experimental design stage whereby advances form statistical combinatory science are used to select a subset of profiles that will make up the final choice sets that will be presented to respondents.

The attributes that are to be chosen should be relevant to the problem analysed, realistic, believable, and easily understood by the average respondent (see Bergmann et al. 2006). In accordance with these requirements, the authors chose four project attributes plus a monetary one to be included in the choice experiment design. An unlabeled choice experiment was preferred to a labelled one, since in the current case the latter could introduce more sources of correlation and anchoring.

The selection of the attributes was based on an extended review of the existing literature and newspaper articles concerning the reactions of Greek island communities to several planned wind power projects, along with the outcome of two focus group sessions and one pilot study. The attributes included aimed to capture four distinct factors influencing the local acceptance of prospective wind farms. These are the physical characteristics of a wind farm, the environmental characteristics of the area where the siting is planned to occur, the pattern in which the decision-making and planning processes would be carried out and the direct monetary benefits for the local societies. A brief description of the attributes employed, the levels associated with them, their coding and their expected impact (positive or negative) on utility) is presented in Table 1.

[INSERT TABLE 1 ABOUT HERE]

The size of the wind farm, described by the number of the wind turbines installed and the height of each turbine are the two physical attributes of a wind farm taken into account[12]. The size of the wind farm attribute is associated with four levels. The average wind farm size for the proposed plans in the Aegean Sea islands is within the second category and thus, this was named 'medium'. Concerning the height attribute, this takes two levels.[13] These were chosen in accordance with the primary types of wind turbines employed in the new installations of mainland Greece.

According to current Greek legislation[14], wind farms are allowed to be installed in regions which are classified as a protected site in the Natura 2000 network, provided that the relevant government ministries jointly approve the project. However, in several cases[15] the opponents of specific wind farm investment proposals have based their objections on the basis of the environmental impacts that the wind turbines are likely to cause.[16] We, thus, also included in the design the conservation status of the area where the turbines are planned to be sited. This attribute takes two levels, namely whether the installation would or would not take place in a protected site of the Natura 2000 network.

The governance characteristics of the planning procedure were also assumed to play a critical role in the attitude of locals towards a prospective wind farm. Currently, wind farm developers are not explicitly required to cooperate with the local communities during the planning procedure of a project. Hence, an attribute indicating if the municipal authorities and other local representatives would be involved in the planning process or not, was also included in the design of the project profiles.

Finally, a monetary attribute was included both because this was rendered as an important determinant of people's preferences toward alternative wind farm projects but also because it is required for the estimation of welfare estimates. In contrast to past valuation work on wind farms that has opted for estimating willingness-to-pay welfare measures (e.g. Álvarez-Farizo and Hanley 2002; Bergmann et al. 2006; Douglas et al 2008; Hanley et al. 2005; Ladenburg and Dubgaard 2007) we have adopted the willingness to accept compensation welfare measure. Several reasons support this choice. First, throughout this study it is assumed that wind farms have predominately public bad characteristics at the local level (i.e. the overall net benefits to locals are negative). Secondly, local communities usually have the property rights of the municipality's land where wind turbines are sited. Thirdly, local people consider the prospect of having to pay to avoid the perceived visual intrusion, noise, environmental degradation and other wind-farm related problems in their neighbourhood as being unfair, particularly when their opinion has not been ascertained during the planning procedure.

In terms of the institutional context for framing the monetary attribute (the so called "payment vehicle") various options were considered before the selection of an annual, inflation-adjusted, subsidy per household granted by the developer of the project for the entire lifespan of the installation. The subsidy attribute takes four levels, the values of which were selected on the basis of three elements: a) the expected revenue of the developers, b) the population of the examined municipalities and c) the average household income of the examined prefectures.

Consequently, in total we had selected for the CE design two attributes with four levels and three attributes with two levels which resulted in a maximum of 128 possible combinations (project profiles). An orthogonal fractional factorial design was used to reduce the number of possible profiles confronted by each respondent. SPSS (Version 14.0) was used to generate a set of 16 optimal choice profiles, which were then combined to construct the 32 choice sets used in the experiment. These were then blocked into four groups of eight choice sets which were presented to four sub-samples of respondents.

Each choice set included two alternatives and a status quo option, stating that no new wind power installation would be built in the municipality (which also implied no subsidy being received). This last "opt-out" option was included in order to make the decision making less contrived or forced (Hensher et al. 2005). An example choice set is presented in Figure 1.

[FIGURE 1 ABOUT HERE]

4.3. Questionnaire design

The final questionnaire comprised of four parts. The first part aimed to explore respondents' attitudes towards wind power and wind farms in the Greek Aegean islands, as well as to assess their level of prior knowledge on issues related to wind power. The second part described the decision setting which the respondents were asked to confront. This was then followed by the presentation of the eight choice sets, each consisting of three alternatives. Respondents were asked to choose their preferred option, focusing only on the presented attributes of a wind farm. The third part of the questionnaire ascertained respondent socio-demographic information, such as age, level of education, household income and membership in (non-sport related) societies or associations. The final part of the questionnaire asked respondents to rate their agreement with six statements on a scale from 1 to 7. Two of these sentences aimed at exploring the sensitivity of respondents towards global environmental issues such as climate change and biodiversity preservation, while another pair of questions aimed at investigating interviewees' perceptions towards the impact of wind farms on tourism. The remaining two statements attempted to assess people's perceptions towards institutions in Greece and their preferences between local and central decision making.

5. The implementation of the survey

The survey was implemented using face to face interviews, in the islands of Naxos and Skyros during July-August 2007. Naxos covers 430 km² of land and comprises two municipalities, the Drymalia municipality and that of the town of Naxos. Two small wind turbines are the only wind power installations on the island, while another small wind farm of nine turbines is currently being built. To the best of our knowledge, no active opposition has been reported either in relation to the existing turbines or to the wind farm currently under construction. Moreover, numerous interviewees in Naxos were even found to be unaware of the latter project. In addition to the existing small scale wind farms, three larger wind farms (of a capacity of 36 MW each) are planned to be developed in the two municipalities, raising the planned installed capacity of the island to 115.65 MW. However, the vast majority of the people surveyed in both municipalities were ignorant of these plans.

The island of Skyros covers an area of 210 km² and comprises of solely one municipality. Although there are currently only two non-functioning wind turbines installed on the island, the Skyrian community is confronted with an extremely large project. Ten wind farms, totalling 333 MW are planned to be installed in the mountainous area of Kochylas, located at the Southern part of the island. The size of this project exceeds even the one of the Whitelee project, currently being built in Scotland, which, when completed, will constitute the largest onshore wind farm in Europe[17]. It is also noteworthy that Kochylas Mountain in Skyros is among the protected sites of the Natura 2000 network (GR 2420006)[18], designated as a Site of Community Importance (SCI) and as a Special Protection Area (SPA), due to its high levels of biodiversity and number of endangered species (including the unique Skyrian horse[19]). Two (75 MW total) out of the ten proposed wind farms were granted production permission[20] in August 2006. The Skyrian community is aware of the planned installations and has been divided in two camps with the majority of the inhabitants perceiving the project as unfair and actively opposing it.

The survey resulted in 212 usable questionnaires being collected, 108 in Naxos and 104 in Skyros. Both samples were highly representative of the island population when examining key socio-economic variables such as income and education levels. It should be noted that the Greek public is not that accustomed to being asked to give its opinion for policy and planning issues, so the authors were concerned about addressing any possible hypothetical bias. Effort was put both at the design stage, by trying to make the decision setting as realistic as possible, and at the fieldwork stage, by laying emphasis on carefully training interviewers in order to address such biases. Emphasis was also placed on avoiding any action that could lead to interviewer bias.

6. Survey results: attitudes towards wind farms

Table 2 presets average results from responses to attitudinal questions related to wind farms. We see that inhabitants of Skyros seem to be more concerned about climate change (CLIMCHAN), which, nevertheless, does not entail that they are more enthusiastic towards the use of wind power. This divergence might also be partly driven by the opposition of numerous Skyrians to the proposed plans for Mount Kochylas. On the other hand, citizens of Naxos regard wind farm technology more environmentally friendly (FRIENDLY) and they appear considerably more supportive of wind power installations (WPOWER). However, in both cases there is stronger support for wind power installations at the national level rather than in the Aegean Sea islands (WFISLAN). Finally, the average respondent appears almost equally informed about renewable energy in both islands (INFORMED).

[INSERT TABLE 2 ABOUT HERE]

Moving further down the table it is worth noting two significant differences between the islands. First, there is a considerable divergence in the perceptions of the inhabitants of the two islands with respect to the impact of wind farms on tourism (WPVSTOUR). Respondents in Naxos seem to perceive that wind farms in their vicinity will not likely influence tourism, while interviewees in Skyros argued that the installation of turbines would have a significant and negative impact. Second, inhabitants of Naxos appear more positive towards the central planning of renewable energy policy (RESCEN), even if local interests are harmed, while respondents in

Skyros seemed fairly more cautious. Both these differences are in line with impeding plans in Skyros that will affect Mount Kochylas, while respondents in Naxos were most likely considering a quite smaller installation. Indeed, it has been suggested by some authors that local communities appear much more sceptical during the planning phase of a project than before or after its execution (Douglas et al. 2008; Van der Horst 2007; Wolsink 2007).

Furthermore, respondents were asked in an opened manner to state the most significant benefits and drawbacks of wind-power, according to their opinion. The results of these questions are summarised in Table 3. Concerning the perceived environmental benefits, there is great dissimilarity between the two islands. We believe that this could be attributed to the proposed plan for Skyros, which the locals perceive as being environmentally quite detrimental. This provides a good case study example whereby flawed decision-making and siting procedures can even lead to local communities opposing not only the project but also the technology itself (Van der Horst 2007). Moreover, almost 5% of the Skyrians (compared to nil in Naxos) appear to feel that wind power has no benefits at all. Concerning the perceived drawbacks, there is a noteworthy percentage in Naxos claiming that there are no disadvantages in relation to wind farms. This could be attributed to the fact that the majority of the locals in Naxos are not aware of the exact development planned for their area and thus, are less likely to have scrutinized this form of technology and its potential disadvantages. By contrast, this proportion is less than 6% in Skyros. The dominance of the perceived visual impact is apparent in both cases, confirming the findings of the existing literature (Kaldellis et al. 2003 and Wolsink 2000, 2007). In Naxos, the perceived supply insecurity related to wind power and the noise come second and third respectively, whilst inhabitants of Skyros are much more concerned about the environmental and land use impact of wind power. It is also noteworthy that more than 7.5% of the respondents consider the possible health hazards related to wind farms as the greatest problem, while equally important appears the local concern about what will happen at the end of the turbines' lifespan, when they have to be removed or replaced.

[INSERT TABLE 3 ABOUT HERE]

7. Econometric analysis and welfare estimation

The data generated from the CE can be analysed using multinomial choice models. The specific model employed for the analysis of the data was the random parameter logit (RPL) model which allows us to account for preference heterogeneity across households within a random utility modelling framework (McFadden and Train 2000). The random utility function with random parameters is given by:

$$U_{jtn} = V_{jtn} + \varepsilon_{jtn} \equiv \beta'_{nk}\mathbf{x}_{jtnk} + \delta'_{k} z_{n}\mathbf{x}_{jtnk} + \varepsilon_{jtn} \quad (1)$$

Where household n (n=*1…N*) obtains utility *U* from choosing alternative j (*j=A, B, C*) in each of the choice sets *t* (t=1,…,8) presented to them. The utility is decomposed into a non-random component (*V*) and a stochastic term (ε). In its most simple form the non-random component is assumed to be a function of the vector of *k* choice specific attributes $\mathbf{x}_{jtnk}$ with corresponding parameters β_{nk} which, due to preference heterogeneity, may vary (randomly) across respondents in accordance to some joint density function with mean β_k and standard deviation σ_k.[21] The household will choose the policy option, *j,* which yields a higher utility compared to any other option in each choice set.[22] In our case, the vector $\mathbf{x}_{jtnk}$ includes five attributes (WFS, NATURA, DELIBERATION, HEIGHT AND SUBSIDY) as well as an alternative specific constant (ASC), which takes on the value of 1 when the individual chooses a program over the status quo option (no wind farm). The ASC captures all other attributes erroneously omitted from $\mathbf{x}_{jtnk}$ and also reflects the utility derived from not choosing the status quo.

The *sources* of preference heterogeneity can be explored by introducing household specific characteristics, z_n. As these variables do not vary across choices they would drop out of the probability so their inclusion into the model can be made possible by interacting them with the choice varying attributes $\mathbf{x}_{jtnk}$. In our case we interact z_n with the ASC of the model. By including such interaction terms we can examine the household characteristics that affect the likelihood of participation in the new program.[23] Hence, the RPL model specified in equation (1) will be able to pick up two types of variation in preferences. A systematic *conditional* type of preference heterogeneity, the source of which can be identified in household characteristics, z_n, and a random, unconditional and unobservable type of taste heterogeneity as captured by σ_k of the distribution of each random parameter β_{nk} . Note that when $\sigma_k = 0$ for all choice attributes then the model is reduced to the simple multinomial choice model that assumes homogeneity in preferences across all respondents.

For the purposes of this study, this multinomial choice model will be used to derive two pieces of policy relevant information. First we will assess which socio-economic characteristics impact choice (through $z_n \cdot \mathbf{x}_{jtnk}$) and secondly we will attempt to estimate the WTA for marginal changes in each choice attribute (β_k). The latter will provide evidence of the relative significance of project characteristics in forming local community support or resistance towards wind-farms. These welfare measures can be derived by using the expression $MWTA = -(\beta_k / \beta_{subsidy})$ where $\beta_{subsidy}$ proxies for the marginal utility of income.[24] A negative WTA for attribute *k* would imply that the individual would be willing to forego compensation in exchange for the improvement in that attribute.

7.1. Coefficient estimates

Table 1 had described the attributes used in $\mathbf{x}_{jtnk}$ while Table 4 describes the variables used in z_n. Table 5 presents the results of the econometric analysis from five different specifications. These are the basic multinomial logit model (model 1) included only as a benchmark comparison and then four RPL models (models 2-5). These are the 'best-fit' specifications as suggested by sequential log-likelihood ratio tests between numerous other specifications.[25]

[INSERT TABLE 4 ABOUT HERE]

[INSERT TABLE 5 ABOUT HERE]

Looking briefly at the multinomial choice model we see that all the coefficients are statistically significant at the 1% level and have the expected signs. The coefficient of the ASC is negative reflecting a decrease in the overall utility of the respondents when accepting to have a wind farm installed in their municipality without any offsetting benefits. The WFS coefficient[26] shows the change in household utility when an additional turbine is installed and was expected to be negative, while all the other attribute coefficients were anticipated to be positive as they captured changes from a hypothetically worse to a better situation.

Turning next to models 2-5 in Table 5, these represent a RPL model including only the choice attributes $\mathbf{x}_{jtnk}$ in equation (1), an augmented (best fit specification) that includes interacted several socio-demographic and attitudinal variables and two additional augmented RPL models, one for each island separately. Interestingly, the last two models appear to describe the data more elaborately. The reported coefficient estimates, β_k, represent the means of the random parameter distributions while the column next to the coefficient estimates displays the standard deviation σ_k.of the same distribution. As such where a parameter is set to be non-random, no σ_k is estimated.

Treating the parameters of the HEIGHT and SUBSIDY attributes as random did not appear to improve the fit of any of the models tested, despite exploring various distributional assumptions. Moreover, the standard deviations for both of these attributes were not significantly different from zero. Regarding the coefficients of the other attributes various distributional assumptions were tested before concluding that the triangular distribution best fitted the parameter of WFS attribute, the uniform the NATURA attribute and the normal the DELIBERATION attribute.

A chi-squared of 950.245 with 10 degrees of freedom indicates that the basic pooled RPL model is statistically significant. All the attribute coefficients exhibit the expected signs. The superiority of its performance in comparison with the MNL model is not only reflected in the improved log-likelihood function and pseudo R-squared[27], but also in the fact that all standard deviations of the parameters selected to be random are significantly different from zero. This indicates that the selected parameters indeed vary across households and choice decisions. The augmented pooled RPL model (model 3) provides an improved fit compared to model 2 as indicated from the improved adjusted pseudo R-squared and the log-likelihood ratio test between the models. Sixteen additional parameters are added in this model, six of which capture the interaction between socio-demographic and attitudinal variables and the alternative specific constant and another ten demonstrate their interaction with the choice attributes (See Table 4). Moreover, the standard deviations of all the random parameters are statistically significant at the 1% level suggesting again that allowing for preference heterogeneity improves the overall performance of the model. It is also worth noting that in this pooled specification the number of wind turbines appears to be insignificant though its standard deviation is significant at the 1% level. This indicates that the significantly heterogeneous preferences among the respondents for the size of wind farms cancel out across the sample (Hanley et al. 2005). Also, we se that, the respondents of Skyros generally exhibit a more negative attitude towards wind farms, as expressed through the interaction of the island dummy with the WFS, HEIGHT and NATURA attributes. The stability of this result across various specifications that were examined suggests that the estimation of two separate models, one for each island, is warranted. The results from these estimations are presented as Models 4 and 5 in Table 5.

Both models are overall significant. The one for Naxos displays an adjusted pseudo R-squared of 0.22489, while the one for Skyros describes the data somewhat more accurately with a pseudo R-squared of 0.37261. Several differences appear to exist between the two islands. First we see that different 'best fit' specification were derived for each island with respect to how $z_n \cdot \mathbf{x}_{jtnk}$ was parameterised. Secondly, we see that models differ in their best-fit coding of the WFS attribute. Effects coding seemed to describe better the choice of alternatives of the respondents in Skyros, while in Naxos it did not appear to improve the performance of the linear coding. In the model for Naxos, only the parameters of the conservation status and the institutional attribute were considered as random, while the wind farm size, the height of the turbines and the level of subsidy were treated as fixed. All the means of the random parameters and the other attribute coefficients exhibit the expected signs. Furthermore, it is worth noting that the coefficient of the SUBSIDY variable exhibits remarkable stability taking a range of values between 0.001 and 0.002 across all models.

Lastly, in terms of the effects of the socio-economic variables on individual choices, it is worth noting that in Skyros the respondents who stated economic benefits as the primary benefit of wind power and the ones who favour the central planning of renewable energy policy exhibit a more positive attitude towards new wind farm installations in their vicinity, while the opposite is the case for the ones who are cautious about the potential negative impact of wind farms on tourism. On the other hand, in Naxos we see that respondents who are more educated and who also appear more concerned with climate change expressed more negative preferences towards wind-farm investment.

7.2. Welfare estimates

Finally, Table 6 displays the marginal willingness to accept compensation (MWTAC) measures for each attribute in all five models presented in Table 5. As noted above, a negative sign of the MWTAC would imply a reduction in the level of subsidy which the representative household would accept if a marginal beneficial change in that attribute were to occur. Presenting an example from the simple MNL model, the average household would be willing to accept a subsidy reduction of 854.5 €, if the municipal authorities and local representatives were involved in the planning process. Several observations are noteworthy from this Table. First, the DELIBERATION attribute appears to exhibit a fairly stable MWTAC, between 800-1056 € in all models. Secondly, the mean MWTAC for the conservation status attribute varies remarkably, from 719 to 2,090€, which should be probably attributed to its great divergence between the two islands. We suspect that the higher MWTAC for Skyros is strongly related to the existing plan for the protected area of Mount Kochylas.

[INSERT TABLE 6 ABOUT HERE]

This plan might have also induced the divergence between the two islands with respect to MWTAC for the WFS attribute. Comparing only the last two models, a reduction in the number of turbines from 30 to 4, would imply a decrease in the required subsidy of 1128 € in Skyros, while only of 282.23 € in Naxos. Moreover, a move from 90 meter to 50 meter wind turbines appears to significantly affect the willingness to accept compensation only of the respondents in Skyros. Most notably, perhaps, the DELIBERATION and NATURA attributes appear to be of considerable importance ranking as the most significant determinants (in relative terms) of local community preferences towards wind-farms in all models. The results clearly suggest that the siting and institutional factors of the wind-farm project were perceived to be more important than the physical attributes of the wind farm. Documenting this result through a structured CE study makes a valuable contribution to the literature on local acceptability of wind-farm installations.

Finally, it should be acknowledged that the monetary measures provided in this section might appear inflated to the reader. This should be mainly attributed to the adoption of the willingness to accept instead of the willingness to pay welfare measure. However, the values provided primarily aim to capture the relative magnitude of the impact that changes in the levels of the project attributes have on household utility as well as the implicit ranking of these attributes.

8. Conclusion

The aim of this study was to identify, analyse and evaluate the factors influencing the local acceptance of wind farm investments in the small Greek Aegean islands. A survey was carried out in the islands of Naxos and Skyros during the summer of 2007. The choice experiment method was used to elicit the preferences of the local communities with respect to installing new wind farms in these islands. The attributes which were assumed to affect the willingness of the locals to accept new wind power projects were the number of the turbines, their height, the conservation status of the site where the turbines are planned to be installed, the institutional structure adopted during the planning of the project and the annual subsidy received per household as compensation.

The outcomes of five estimated models were presented, one multinomial logit and four random parameter logit models. In three of the estimated models the samples from the two islands were pooled, while in the last two models the data from each island were estimated separately. The marginal utilities and implicit prices of the attributes across all five models suggest that the siting and institutional factors were perceived as more important than the physical attributes of the wind farm by the majority of respondents. This would imply that policy makers should be more cautious when planning or accepting projects which involve wind turbine siting in wildlife conservation areas or other sites of special environmental interest. For example, the 181-wind-turbine project on the Island of Lewis[28] (SPA UK9001571[29]), which was recently rejected by the Scottish government, due to its likely impact on the unique birdlife of the island, is in line with our findings. Similarly, the intentions of the proposed planning law in Greece[30] which aim at prohibiting the construction of wind farms in Natura 2000 Sites of Community Importance (SCI) appear to be welfare enhancing in that be associated with projects that would require a lower level of local community compensation. Accordingly, our results suggest that Greek authorities could be justified (on welfare enhancing grounds) to expand this restriction to include Natura 2000 Special Protection Areas (SPA) as well. The benefits of installing wind farms in such locations should outweigh not only the installation and operation costs but also the external environmental costs, an indicative estimation of which was derived in this study.

Moreover, our results appear to verify several findings from other qualitative studies that lay particular emphasis on the institutional factors affecting local acceptance of wind farms (Devine-Wright et al. 2001; Gross 2007; Krohn and Damborg 1999; Söderholm et al. 2007; and Wolsink 1996, 2000, 2007). Indeed, the deliberation and cooperation of the prospective developers with the municipal authorities and other local representatives during the decision-making and planning processes were valued highly by the respondents, considerably increasing their willingness to accept compensation. This outcome supports the suggestion by Wolsink (2000), Douglas et al. (2008) and others that the public and private stakeholders involved in promoting wind energy should move away from the top-down model of developing new installations and towards a more conciliatory, cooperative, and participatory mode that involves local communities. Our results suggest that, if such a planning path is not adopted, there are unnecessary external costs imposed to the advance of wind technology, which might even lead to its underexploitation. This could be argued to constitute a waste of a promising avenue for dealing with the challenges of climate change and dependency on non-renewable sources of energy.

The results also revealed noteworthy differences between the two study site locations, mainly concerning the effects of a change in the physical attributes of the wind farm. The willingness to accept compensation of the citizens of Skyros appeared remarkably higher than the one for those in Naxos when the number of turbines or their height was reduced. This also indicates that policy makers and developers should carefully consider the distinctive characteristics of the regions which exhibit high wind potential before proceeding with planning wind power installations.

An interesting issue for future research in this context would be to investigate the effect of the top-down decision making and planning procedures on each of the examined attributes. Another avenue for further research would explore further institutional attributes such as the ownership structure of the installations, the origin of the developer as well as a scheme which would guarantee the replacement or removal of the turbines after their life-span. As the EU is making increasingly higher commitments to reduce GHG by adopting a larger share of renewable energy in its portfolio of energy sources we feel that such questions over the determinants of local community acceptance of investment in such renewable power plants becomes increasingly important.

9. References

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Table 1. Attributes and levels of wind farm project profiles

Attribute [Expected Impact on Utility]	***Description***	***Number of levels***	***Levels***
WIND FARM SIZE (WFS) [-]	Number of wind turbines comprising the wind farm	4	Small (2-6 Wind turbines) Medium (7-13 Wind turbines) Large (14-20 Wind turbines) Larger (21-40 Wind turbines)
HEIGHT [+]	Height of the tower of the wind turbine	2	50 meters *(coded as 1)* 90 meters *(coded as -1)*
NATURA [+]	Installation of the wind farm in or out of a Natura 2000 network protected site	2	Out of a Natura 2000 protected site *(coded as 1)* In a Natura 2000 protected site *(coded as -1)*
DELIBERATION [+]	Planning of wind farm carried out with or without the cooperation of the municipal authorities and local representatives	2	With their cooperation *(coded as 1)* Without their cooperation *(coded as -1)*
SUBSIDY [+]	Level of annual subsidy per household	4	€ 50 € 100 € 200 € 300

Note: Unless otherwise stated the WFS attribute was coded as linear (using the mid point values of each of the four ranges).

Table 2 – Responses to attitudinal variables towards wind power and climate change

Variables	*Description*	*Naxos*	*Skyros*
		Average Values	*Average Values*
CLIMCHAN	Concerned about climate change	5.81	6.13
WPOWER	Attitude towards the use of wind power in Greece	6.39	5.43
WFISLAN	Attitude towards the use of wind power in the Greek Aegean Sea islands	6.00	4.13
FRIENDLY	Wind Power perceived as environmentally friendly	6.17	4.85
INFORMED	Informed about issues concerning wind power	3.98	3.94
WINDMILL	Ever seen a wind turbine?	94.44%	98.08%
CLCHPRI	The confrontation of climate change should be a first priority for the national environmental policy	6.31	6.07
LANDPRO	The touristic development of the islands is mainly dependent upon the protection of the cultural heritage and the island landscape	6.33	6.48
MANVSNAT	The development of tourism and agriculture in Greece must not harm wildlife at all	6.31	6.52
RESCEN	The policy for the renewable energy sources in Greece must be determined and implemented by the national government even if it sometimes harms the interests of the local communities	4.64	3.66
WPVSTOUR	The installation of wind turbines on the islands of the Aegean Sea will have a negative impact on tourism	3.09	4.83
UWTOCOOP	One of the main reasons that many infrastructure schemes are delayed or even cancelled in Greece is that the	6.09	6.00

	involved parts are not willing to cooperate during the designing procedure of these schemes	

Note: The scale for the first five variables is from 1 to 7. Number 7 indicates the maximum, concern or agreement, affinity or level of information.

Table 3 Most significant benefits and drawbacks of wind farms (summary of open-ended responses).

Description	*Total*	*Naxos*	*Skyros*
Benefits			
Environmental Benefits *(Natural and Renewable Energy Source, No GHG emissions, Environmentally Friendly)*	60.38%	66.67%	53.85%
Economic Benefits (ECONBEN) *(Free Resource, Autarchy for the islands, Benefits for local authorities and companies, Jobs)*	26.42%	25.00%	27.88%
Safety *(No Black-outs, 24hour service, Silence)*	3.77%	3.70%	3.85%
Do not know	7.08%	4.63%	9.62%
No Benefit	2.36%	0.00%	4.81%
Costs			
Visual Intrusion	28.77%	29.63%	27.88%
Ecosystem related issues *(Environmentally harmful, Annoyance to flora and fauna, Microclimate change)*	11.79%	3.70%	20.19%
Noise	8.49%	5.56%	11.54%
Land Use and Economics related issues *(Size and land devoted to the installations, Impact on tourism and agriculture, Reduction in the value of land)*	8.02%	4.63%	11.54%
Health Hazards *(Electromagnetic Fields, Possible cause of accidents)*	6.13%	4.63%	7.69%
Maintenance and Removal/Renewal issues *(Doubt that they will be removed/renewed after 20 years, Insufficient maintenance of the existing ones)*	4.25%	0.93%	7.69%
Insecurity of supply *(Wind Dependency, Increased possibility of Black-outs)*	3.30%	6.48%	0.00%
Other	1.42%	1.85%	0.96%
Do not know	8.02%	9.26%	6.73%

No Drawbacks	19.81%	33.33%	5.77%

Table 4 Description of variables used in regression

Abbreviation	*Description*		*Percentage of respondents*	
			Naxos	***Skyros***
MEMBER	Respondent - Member of a (non-sports related) Association or Society	Total (some respondents are members of more than 1 association)	25.93%	16.35%
		Ecology	2.78%	4.81%
		Tourism	2.78%	10.58%
		Culture	15.74%	6.73%
		Other	6.48%	0.96%
EDUC	Respondent's Education	Primary	18.52%	11.54%
		Secondary	36.11%	46.15%
		College	26.85%	21.15%
		University/Masters/PhD	18.52%	21.15%

	Description of Interaction Terms
ATPOLIT	RESCEN with UWTOCOOP (see Table 2)
ATTOUR	WPVSTOUR with LANDPRO (see Table 2)
ISLWFS	WFS with respondent's island
ISLHEIGHT	HEIGHT with respondent's island
ISLNAT	NATURA with respondent's island
LAUCNAT	NATURA with land-use costs
ECOCWFS	WFS with environmental costs
LAUCWFS	WFS with land-use costs
INSNAT	NATURA with insecurity costs
REMDEL	DELIBERATION with maintenance/removal costs
HEIEDUC	HEIGHT with respondent's education
WFSEDUC	WFS with respondent's education
REMWFS	WFS with maintenance/removal costs
NATAGE	NATURA with respondent's age

Table 5 Econometric Results of Multinomial Choice Models

	Model 1			Model 2			Model 3			Model 4			Model 5		
	Pooled Sample Basic MNL Model			Pooled Sample Basic RPL Model			Pooled Sample Augmented RPL Model			Naxos Sample Basic RPL Model			Skyros Sample Augmented RPL Model		
Choice parameters	Coef.	Stand. Dev.	Dist.	Coef.	Stand. Dev.	Dist.	Coef.	Stand. Dev.	Dist.	Coef.	Stand. Dev.	Dist.	Coef.	Stand. Dev.	Dist.
ASC	-0.310*** (-3.060)	NA	NA	0.180 (0.841)	2.269*** (10.074)	N	0.511 (0.536)	1.781*** (9.516)	N	0.912 (0.781)	1.477*** (7.204)	N	-3.230*** (-2.682)	2.197*** (7.706)	N
WFS	-0.020*** (-4.661)	NA	NA	-0.068*** (-6.036)	0.239*** (8.045)	T	0.002 (0.130)	0.157*** (6.226)	T	-0.019** (-2.560)	-	-	-	-	-
WFSLAR	-	-	-	-	-	-	-	-	-	-	-	-	-0.485*** (-2.857)	-	-
WFSSM	-	-	-	-	-	-	-	-	-	-	-	-	1.079*** (4.479)	3.249*** (5.393)	T
WFSMED	-	-	-	-	-	-	-	-	-	-	-	-	0.477*** (3.087)	1.020** (2.515)	U
NATURA	0.391*** (9.727)	NA	NA	0.660*** (7.264)	1.502*** (9.797)	U	1.650*** (6.229)	1.291*** (8.682)	U	0.869*** (7.743)	1.222*** (6.880)	U	1.617*** (5.871)	-	-
DELIBER	0.464*** (11.175)	NA	NA	0.796*** (8.445)	0.953*** (8.943)	N	0.833*** (8.897)	0.877*** (8.630)	N	0.728*** (6.900)	0.716*** (6.253)	N	0.963*** (6.058)	1.063*** (6.022)	N
HEIGHT	0.239*** (5.953)	NA	NA	0.386*** (7.083)	-	-	0.192* (1.909)	-	-	0.111 (1.010)	-	-	0.305*** (3.657)	-	-
SUBSIDY	0.001*** (2.610)	NA	NA	0.002*** (2.719)		-	0.002*** (2.859)		-	0.002** (2.547)	-	-	0.002** (2.156)	-	-
Heterogeneity in mean (interacted variables)															
WFISLAN	-	-	-	-	-	-	0.292*** (3.105)	-	-	0.390*** (2.958)	-	-	0.326** (2.464)	-	-
ECONBEN	-	-	-	-	-	-	0.802** (2.117)	-	-	-	-	-	1.025* (1.819)	-	-
CLIMCHAN	-	-	-	-	-	-	-0.361*** (-3.203)	-	-	-0.336** (-2.424)	-	-	-	-	-
ATPOLIT	-	-	-	-	-	-	0.031*** (2.616)	-	-	-	-	-	0.062*** (3.079)	-	-
ATTOUR	-	-	-	-	-	-	-0.023* (-1.780)	-	-		-	-	-0.062*** (-3.073)	-	-
MEMBER	-	-	-	-	-	-	-0.755* (-1.851)	-	-	-1.052** (-	-	-	-	-	-

										2.449)					
EDUC	-	-	-	-	-	-	-	-	-	**-0.422**** (-2.293)	-	-	-	-	-
ISLWFS	-	-	-	-	-	-	**-0.062***** (-3.979)	-	-		-	-		-	-
ISLHEIGHT	-	-	-	-	-	-	**-0.224**** (-2.118)	-	-		-	-		-	-
ISLNAT	-	-	-	-	-	-	**-0.564***** (-3.451)	-	-		-	-		-	-
LAUCNAT	-	-	-	-	-	-	**-0.984***** (-3.155)	-	-		-	-	**-1.327***** (-4.455)	-	-
ECOCWFS	-	-	-	-	-	-	-	-	-	-	-	-	**0.970*** (1.894)	-	-
LAUCWFS	-	-	-	-	-	-	-	-	-	**-0.074**** (-2.205)	-	-	-	-	-
INSNAT	-	-	-	-	-	-	**-1.068**** (-2.518)	-	-	**-0.910**** (-2.183)	-	-		-	-
REMDEL	-	-	-	-	-	-	**-1.149**** (-2.219)	-	-	**-3.155**** (-2.318)	-	-		-	-
HEIEDUC	-	-	-	-	-	-	**0.202***** (3.737)	-	-	**0.256***** (3.912)	-	-	-	-	-
WFSEDUC	-	-	-	-	-	-	**-0.020***** (-2.713)	-	-		-	-		-	-
REMWFS	-	-	-	-	-	-	**-0.161***** (-2.723)	-	-		-	-		-	-
NATAGE	-			-	-	-	**-0.017***** (-2.869)	-	-	-	-	-	**-0.030***** (-4.332)	-	-
	N=1696; R^2-Adj=0.09 LL=-1699.700			N=1696; χ^2(df)= 950.24 (10); R^2-Adj=0.25; LL=-1388			N=1696; χ^2(df)= 1108.49 (26); R^2-Adj=0.29; LL=-1308			N=864; χ^2(df)= 441.4 (17); R^2-Adj=0.25; LL=-728.498			N=832; χ^2(df)= 694.26 (19); R^2-Adj=0.37; LL=-566.913		

Notes: *significant at 10% level **significant at 5% level ***significant at 1% level

Table 6 Mean Marginal Willingness to Accept (implicit prices) for project attribute changes.

	Model 1 Pooled Sample	Model 2 Pooled Sample	Model 3 Pooled Sample	Model 4 Naxos Sample
HEIGHT	**-439.630*** **	**-509.267*** **	**-243.226* **	**Insignificant**
NATURA	**-718.956*** **	**-870.444*** **	**-2090.402*** **	**-973.829** **
DELIBERATION	**-854.500*** **	**-1050.894*** **	**-1056.075*** **	**-815.790** **
WFS	**18.697*** **	**45.837*** **	**Insignificant**	**10.855** **
WFS SMALL	-	-	-	-
WFS MEDIUM	-	-	-	-
WFS LARGE	-	-	-	-

Notes: *significant at 10% level **significant at 5% level ***significant at 1% level

All figures are in €/Household/year.

Figure 1: Example choice set

	Policy Option A	**Policy Option B**	**None of them**
Wind Farm Size	**7-13 Wind turbines**	**21-40 Wind turbines**	
Wind Turbine Height	**90 meters**	**90 meters**	
Sited in a Special Protection/Conservation Area	**Yes**	**No**	No new wind turbine
Cooperation/Deliberation during the Planning Procedure	**No cooperation with the municipal authorities and local representatives**	**No cooperation with the municipal authorities and local representatives**	
Annual Subsidy per Household	**€ 100**	**€ 300**	No Subsidy
Choose your most preferred option ➔	□	□	□

Endnotes

[1] For instance, Hatziargyriou et al. (2006), Kaldellis and Kavadias (2004), Krohn and Damborg (1999), Wolsink (2000), Söderholm et al. (2007) and Toke et al. (2007)

[2] Examples can be found in Jobert et al. (2007), Söderholm et al. (2007) and Toke et al. (2007)

[3] Greek Parliament Laws 2773/99 and 3468/2006

[4] Under current Greek legislation (Law 3468/2006 and RAE proposal 193/2007, available online at: www.rae.gr/SUB3/3A/RAE_193-07.pdf), wind energy in 2007 was bought by the relevant transmission system operator for 75.82 €/MWh with regard to the grid-interconnected system and 87.42 €/MWh concerning the non-grid-interconnected islands.

[5] Global Wind Energy Council (2008)

[6] For example, Law 3468/2006 and the Joint Ministerial Decision for the "Special Framework of Land Use Planning and Sustainable Development for Renewable Energy Source Applications". See Hatziargyriou et al. (2006), Kabouris and Hatziargyriou (2006) and Kaldellis and Kavadias (2004).

[7] Available online at: www.minenv.gr/4/42/00/KYA.APE.January.2008.pdf

[8] European Commission (2006)

[9] Full details of the study design are found in Dimitropoulos (2007).

[10] Not taking into account the possibility of using hybrid systems. Kabouris and Hatziargyriou (2006) and Kaldellis and Zafirakis (2007)

[11] www.rae.gr/lic/applications.pdf

[12] Indeed, these two attributes were also used by Ek (2002), who considers though different attribute levels than the ones presented here.

[13] A turbine height of 75 metres is assumed to correspond to a 50 metres high tower, while one of 135 metres to a tower reaching 90 metres.

[14] Greek Parliament Law 3468/2006

[15] For example, in the cases of Serifos Island: Giannarou (2007) and news.kathimerini.gr/4dcgi/_w_articles_ell_943545_04/04/2007_221883 and Skyros Island: Haralampakis (2007) and Howden (2007)

[16] Although impeding legislation is being devised to attempt to prohibit the building of wind farms in protected areas, the Regulatory Authority for Energy (RAE) has given its consent to the development of several projects in such areas.

[17] BBC News (2006)

[18] www.minenv.gr/1/12/121/12103/e1210319.html

[19] www.minenv.gr/1/12/121/12103/old2/e12103_2420006.html

[20] www.rae.gr

[21] Not all parameters in β_{nk} are necessarily random but may instead be fixed. In this case, the standard deviation of that parameter will be zero and all behavioural information of that attribute is captured by its (fixed) mean β_k.

[22] By specifying the distributional form of each of the likely random parameters and by assuming that ε is iid distributed extreme value type 1 independent of **x** and **z**, the probability of choosing the option j in each of the eight choice occasions can be estimated as a mixed logit model using a maximum simulated likelihood approach (Hensher *et al.*, 2005).

[23] Other interaction terms with specific attribute could be included but their interpretation is less informative in this context.

[24] An alternative approach for estimation these welfare measures that incorporates the information contained in the distribution of the random parameter β_k is detailed in Hensher *et al.* (2005)

[25] The models were estimated using NLOGIT Version 3.0 econometric software, using Maximum Likelihood and Maximum Simulated Likelihood estimation routines. The later was used to for the estimation of the RPL models as it results in consistent, though not unbiased estimators. Yet, as specified by the literature the bias in the simulated log-likelihood decreases as the number of draws increases and hence 500 Halton intelligent draws were used (see Bhat 2001). Furthermore, we also allowed for preference heterogeneity not only among households, but also between the choices each respondent made in each choice set (i.e. we used the panel version of the model). It should be mentioned that the analysis concerns the utility functions of households and not individuals, while each respondent is assumed to represent his/her household.

[26] We also tested the effects coding of the WFS variable was tested, but both the log-likelihood ratio-test and the Wald-test did not indicate an improvement in model fit at the 5% significance level.

[27] Hensher et al. (2005) argue that pseudo R-squared values between the range of 0.2 and 0.3 can be compared to R-squared values between 0.5 and 0.6 for the equivalent linear model, while pseudo R-squared values between the range of 0.3 and 0.4 to ones between 0.6 and 0.8 for the equivalent linear model. (pp.338-339)

[28] See McCarthy (2008)

[29] www.jncc.gov.uk/default.aspx?page=1872

[30] Titled "Special Framework of Land Use Planning and Sustainable Development for Renewable Energy Source Applications"