Combining Choice Experiments with Psychometric Scales

to assess the social acceptability of wind energy development projects

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Abstract

A choice experiment approach is combined with the use of psychometric scales in order 1) to identify factors that explain support/opposition toward a wind energy development project; and 2) to assess (monetary) trade-offs between attributes of the project. A Latent Class estimator is fitted to the data, and different utility parameters are estimated, conditional on class allocation. It is found that the probability of class membership depends on specific psychometric variables. Visual impacts on valued sites are an important factor of opposition toward a project, and this effect is magnified when identity values are attached to the specific site, so much that no trade-off would be acceptable for a class of individuals characterized by strong place attachment. Conversely, other classes of individuals are willing to accept compensations, in form of private and/or public benefits. The distribution of benefits in the territory, and preservation of the option value related to the possible development of an archeological site, are important for a class of individuals concerned with the sustainability of the local economy. Finally, it is found that attitudes towards wind energy do not explain in a significant way the heterogeneity of preferences on wind farm developments.

Keywords: Wind Farms, Social Acceptability, Choice Experiments

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1. Introduction

In 2010 green energy technologies have registered a record of investments in the world: 243 billion dollars, a 30% increase with respect to 2009, as reported by Bloomberg Energy Finance. Two technologies are mainly accountable for this success: solar roofs (particularly in Germany, United States, Czech Republic and Italy), and large scale wind energy plants, especially off-shore plants in Northern Europe. Yet, much more should be done to facilitate investments in green energy in Europe, if the 20-20-20 European directive (2007, and following documents: COM(2008)0019 – C6-0046/2008 – 2008/0016 (COD9; EC No 663/2009); COM(2010)265) is to be addressed. The directive posed ambitious targets for development of an energy-efficient, low-carbon economy: greenhouse gas emissions in EU should decrease of at least 20% below 1990 levels, a 20% reduction in primary energy use compared with projected levels should be achieved by improving energy efficiency, and renewable sources should account for at least 20% of EU energy consumption. In 2008, last available data, the share of renewables in final energy consumption in the EU27 countries was about 10%, the most part being “traditional” hydroelectric power; however the wind power generation has shown its great potential, especially in countries such as Germany and Spain, where it accounts for, respectively, 4.4% and 7.2% of the national gross energy production.

Wind energy, at the present level of technology, is most effectively produced by large scale wind plants. Unfortunately, the social costs associated with wind farms development projects may be relevant, as much to offset, in some circumstances, the social benefits generated by the production of green energy. In general, there are many factors that may determine the successful implementation of renewable energy technologies, one of which is widely assumed to be ‘public acceptance’ (Ekins, 2004; Longo et al., 2008; Krohn and Damborg, 1999; Bergmann et al., 2008), given that in many cases renewable energy developments face strong opposition from local populations. Visual impacts on the landscape are only a part of the problem related to the installation of a wind plant. However, it is not clear in many situations what is the real reason behind such opposition. As put forward by Devine Wright (2007), "we need to better understand the dynamics of public engagement in renewable energy technological development. This can be facilitated by inter-disciplinary research using innovative qualitative and quantitative social research methods with a greater emphasis upon the symbolic, affective and socially-constructed nature of beliefs about renewable energy technologies". This is the attempt of the present paper, where a social-psychological analysis is combined with an econometric approach that uses the choice experiments method in order to identify the factors influencing the social attitudes toward a renewable energy project (a wind farm), and to measure, also in monetary terms, the trade-off between attributes of the project.

2. Background

Choice modeling analyses of public acceptance of wind farm projects have typically focused on technological and environmental impacts (see Appendix, Table A1): dimension and density of turbines, their location (e.g. on/off shore, on mountains, hills, or flat land, etc.) and related impacts; impacts on wildlife; and economic impacts (employment, financial costs/benefits). However, the social psychology literature in this field has identified many other elements that should be taken into account: in an extensive review of environmental psychology studies, Devine-Wright (2007, henceforth DW) analyzes several factors driving public attitudes and public acceptance of renewable energy technologies into three main categories: a) personal (demographic and socio-economic) factors; b) social-psychological factors; c) contextual (technological, institutional, spatial) factors.

The effect of *demographic and socio-economic* characteristics such as gender, age, education, income, has been examined in several studies (for example, Borchers et al., 2007; Ek, 2002; Ek and Söderholm, 2008; Krueger, 2007; Longo et al., 2008) with mixed results about the effect of income, education or gender, while there seems to be empirical evidence that young people are more favorable toward renewable energy projects. Demographic and socio-economic covariates are used in most stated preferences studies; in the following, we dedicate some more space to the description of the other two classes of factors.

The *social-psychological* elements include *awareness*: more informed individuals may be more favorable toward green energy technologies, although there is limited empirical evidence in this sense; and *environmental concern*, which may play a role on both sides of the conflict. People concerned about the environment may be supportive of wind farms because they generate clean energy; on the other hand, environmentalists may also be concerned of the environmental impacts of technologies in valued localities (Warren et al., 2005). Therefore, it is important to identify the specific nature of the environmental concern. Another important socio-psychological variable is the *place attachment*: people who feel an emotional attachment and *identification* with some place may oppose the construction of green energy plants in that location, if the project is perceived as being a threat to the integrity of the local environment (Cass and Walker, 2009). In a case study on the development of an off-shore wind farm in UK, DW (2009) found that citizens' negative social representations and strong opposition was due to the perception of a sense of threat related to the loss of place *distinctiveness* and the creation of *dis-continuity* in the familiar physical shape of the landscape. The horizon alteration (horizon "becomes vertical" because turbines are seen like "a fence") modified the place characteristics and its health benefits perception (*restorativeness*: natural places are capable to produce restore of attention fatigue and psycho-physiological well-being, as postulated by the Attention Restoration Theory: Ulrich, 1991; Korpela and Hartig T., 1996; Korpela *et al*., 2001.). Moreover, opposition was related with negative economic consequences for the tourism industry.

On the other hand, place attachment may play a positive role if the project is perceived as an opportunity of economic development (McGowan and Sauter, 2005). It is important in empirical studies to understand how the positive and the negative perception interact in the proposed scenario.

This is a path of research that has been scarcely pursued in previous works, and the present paper will attempt to fill this gap.

The *contextual factors* listed by DW refer to the perception that individuals have about the fairness of the development program: *Procedural justice and levels of trust*, i.e. how people perceive that the decision process has been fair, and in the interest of the community, rather than a top-down decision, possibly made in the interest of few stakeholders (Gross, 2007; Zoellner et al., 2008). The level of trust, or lack of it, towards political decision makers may have a significant influence on the attitude toward a renewable energy project, as shown by Zoellner et al. (2005), and Upham and Shackley (2006); information should be clear and detailed (Kaldellis, 2005; Dimitropoulos and Kontoleon, 2009; Jones, 2009). A related issue is the *Fairness in the distribution of benefits:* depending upon the ownership structure, the benefits of the green energy project will be distributed to private companies, to public organizations, or, in the case of social enterprises, to the community. This is another line of research which is worth to explore further: do citizens care about a fair distribution of the profits, so that the whole community can benefit from the development, or are they mainly interested in monetary compensations obtained at individual level? Jobert et al. (2007) and Warren and McFadyen (2010) find that community ownership leads to higher social acceptance of wind power installations; this result is confirmed by Maruyama et al. (2007), and Walker et al. (2010).

Finally, *Spatial factors* are relevant in explaining a community's attitude toward a specific renewable energy development. The relationship between proximity to a plant and opposition to new developments (NIMBY –not in my backyard) has been investigated, with mixed results (Wolsink, 2010; Devine-Wright, 2005a and 2005b; DTI, Scottish Executive et al., 2003; Braunholtz, 2003; Warren et al., 2005). With respect to existing wind farms, Swofford and Slattery (2010) give evidence that those living far away from wind turbines are more favorable to wind energy than people living nearby wind farms; however, other studies find the opposite (Braunholtz, 2003; Krohn e Damborg, 1999; Warren et al. 2005), or no significant effect of the level of proximity (Johansson and Laike, 2007). Van der Horst (2007) comments that "on aggregate, proximity does have strong influence on public attitudes to proposed projects, but the nature, strength and spatial scale of this effect may vary according to local context and value of the land".

A more promising approach would be to investigate what type of "backyard" is involved in the project: for example, depending on the geographical areas, an off-shore site could be preferred (for example, Ladenburg, 2008; Krueger, 2007; Ek, 2006; Bergman et al., 2008) to in-land alternatives, but in other geographical areas exactly the opposite may hold (McCartney, 2006). In some studies significant effects are found for impacts on animals, especially birds (Alvarez-Farizo and Hanley, 2002; Mayerhoff et al., 2010). Technological features, such as the dimension of the turbine, noise, etc. seem less important (Ek, 2006; Dimitropoulos and Kontoleon, 2009; Mayerhoff et al., 2010).

3. The case study

The research has been conducted in two counties located in the South-West of Sardinia: Sulcis-Iglesiente (SI) and Medio Campidano (MC). Both areas are characterized by critical socio-economic conditions, due to de-industrialization processes and loss of economic value of agricultural products. Both counties have been important mining areas since the Roman era; the mining activity being replaced by energy intensive industry (mainly smelters and manufacturers of aluminum, lead and zinc) in the past 40 years. Global competition, and high costs of energy in Italy, are now leading the holding companies to disinvest and relocate in more favorable economic environments. This would lead to a loss of thousands of jobs (direct and indirect) in the area, especially in the SI county. A possible, although partial, solution, has been envisaged in the development of a wind farm which would provide low-cost energy for the industry. This would be a new development project for the SI county, which has raised some opposition from local stakeholders (various administrators, environmentalist groups) because a number of windmills will be located in proximity of an archeological site. In the MC county already operates a wind farm, with 35 turbines and 70 MW of power capacity; a new development is planned, which would add 13 turbines in a close-by area.

The present research project was set up in order to understand the acceptability by the local populations towards a hypothetical new wind farm project, located across the two counties. The aim was to analyze the impact of different social-psychological and contextual factors, as described in the review section, in shaping acceptability toward such a project; to identify the main drivers of support or opposition; and finally, to assess the trade-offs between different elements (attributes) of the project.

4. Methods

4.1 *Choice Experiments Models*

The CE approach draws from the Lancaster's theory of value (Lancaster, 1966) and the Random Utility Model framework set up by McFadden (1974). If a decision maker i has to choose among n alternatives, deriving a given amount of utility from each of possible choices, he or she will choose the alternative that provides the greatest utility, so that individual i chooses alternative j among n alternatives if and only if $U_{ij} > U_{in}$. But since it is not possible to directly observe all the determinants of individual utility, the utility function is built up with two components: an observable or deterministic part and a stochastic or random component, and can be written as follows:

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

where V_{ij} is the observable component and ε_{ij} represents the random component. Therefore, since the decision process of the (assumed utility maximize) individual involves unobservable pieces of information, it is necessary to model the decision in probabilistic terms. Assuming for simplicity, as presented above, that the error component is defined as the difference between the true utility, U_{ij}, and the observed utility V_{ij}, the probability that individual i prefers alternative j over alternative n can be expressed as follows:

$$P\left[\left(V_{ij} + \varepsilon_{ij}\right) > \left(V_{in} + \varepsilon_{in}\right)\right] = P\left[\left(V_{ij} - V_{in}\right) > \left(\varepsilon_{ij} - \varepsilon_{in}\right)\right] \quad (2)$$

The probability that individual i chooses j instead of alternative n is equal to the probability that the utility provided by option j is greater than the utility provided by the other alternative; in other words alternative j is preferred over n if the difference between the deterministic components is greater than the difference between the random components. Estimation of (2) entails some assumptions about the random component. Assuming that the error terms are independently and identically distributed (IID) with a Gumbel distribution leads to the multinomial logit model, sometimes also called conditional fixed effects logit model. Under this assumption, the probability that individual i chooses alternative j, in a choice set made up of n alternatives, is given by:

$$P(U_{ij} > U_{in}) = \frac{\exp(\mu V_{ij})}{\sum_n \exp(\mu V_{in})} \quad (3)$$

where μ is a scale parameter, inversely related to the standard deviation of the error term. The deterministic component V_{ij} can be written as:

$$V_{ij} = \beta X \tag{4}$$

where X is a vector of attributes (in different levels), while β is a vector of utility parameters to be estimated. Moreover it is possible to include into the X's vector various socio-economic characteristics and respondents' attitudes, as interactions with the attributes.

Given (4) we can rewrite (3) in this way, dropping out for simplicity the scale parameter:

$$P(U_{ij} > U_{in}) = Pr_{ij} = \frac{\exp(\beta_1 x_{i1j} + \beta_2 x_{i2j} + \cdots + \beta_k x_{ikj})}{\sum_{n=1}^{N} \exp(\beta_1 x_{i1n} + \beta_2 x_{i2n} + \cdots + \beta_k x_{ikn})} \tag{5}$$

Once the coefficient estimates have been computed it is possible to compute the marginal rates of substitution between the attributes. Given the utility function (4), if a cost or monetary attribute has been included, the WTP for a change of level of another attribute is calculated as follows:

$$WTP = -\frac{\beta_{non\ monetary\ attribute}}{\beta_{monetary\ attribute}} \tag{6}$$

The conditional logit model assumes independence of irrelevant alternatives (IIA) and taste homogeneity across respondents. The former follows from the assumption of independent error terms and it postulates that adding or removing any alternative from the choice set will not change the relative probability of the choice made by individual i over any other alternative. In pair-wise choices this is not an issue, even though panel effects may arise because of repeated observations for the same individual. The utility parameters are estimated as fixed coefficients, hence the homogeneity restriction; however, it is possible, through interaction-terms with socio-economic characteristics or other covariates, to take account of some (observed) source of heterogeneity. Other models have been proposed in order to relax the homogeneity assumption across respondents to account for unobserved heterogeneity: two examples are the Random Parameter Logit model (RPL) and the Latent Class model (LCM).

Both the RPL and the LCM models address the issue of heterogeneity, since in these two models we do not assume $\beta_{ik} = \beta_k$ for each individual i as postulated in the Conditional Logit model, allowing instead for some degree of variation among individuals. The difference between RPL and LCM is that the former assumes a continuous distribution for the parameters vectors, while for the latter the distribution is discrete, with individual parameters clustered in classes.

Going now into details, considering the RPL specification first, we have that the utility for individual i opting for alternative j, in a context with k attributes and n alternatives, depends now also on a random component introduced in the parameters:

$$U_{ikj} = \tilde{\beta}_{ik} x_{ikj} + \varepsilon_{ik} \qquad (7)$$

with

$$\tilde{\beta}_{ik} = \overline{\beta}_k + \eta_{ik} \qquad (8)$$

where $\overline{\beta}$ stands for the population mean and η_{ik} is an error term with distribution $f(\eta_{ik})$ characterized by zero mean and variance φ^2. This is the reason why β is random, following a certain distribution to be specified by the researcher, such as normal, lognormal or triangular. Furthermore it worth noting that it has to be established how many parameters are believed to be random too; given this, the unconditional choice probability is the weighted average of all possible $\tilde{\beta}$: this leads to a multidimensional integral that does not have a closed form, so that simulation techniques are needed in order to carry out estimation.

The integral takes this form:

$$P_{ij} = \int L_{ij}(\beta) f(\beta;\, \theta) d(\beta) \tag{9}$$

where $L_{ij}(\beta)$ is the kernel logit, as in eq.(5), of individual i choosing alternative j, evaluated at parameters β, and $f(.;\, \theta)$ is a density function, with parameters θ over the population, chosen by the modeller. In the random parameters model, one or more individual preference parameters can be modelled as random variates, with possibly different distribution functions, in order to account for preference heterogeneity across individuals. As demonstrated by McFadden and Train (2000), the RPL model can approximate any discrete choice model at any desired level of accuracy. All the econometric models described above are usually estimated through maximum likelihood (ML) or maximum simulated likelihood (MSL).

When a random parameters model is applied, the WTP is a random variable. A simple case is obtained when the cost attribute is held fixed: in this case, the resulting WTP for an attribute with random coefficient follows the same distribution of the random coefficient . For example, if the attribute random coefficient is distributed as a Normal, the resulting WTP estimate for a random parameter is a random variable, which follows a Normal distribution, with mean given by the ratio of the mean estimated coefficient and the price coefficient; and the standard deviation is the ratio of the standard deviation of the estimated coefficient, and the price coefficient (Revelt and Train, 1998).

Moving to the LCM, in this case β_k can take up to a finite number of values, depending on which class the individual belongs to, with respective membership probabilities: in fact we now have $\beta_{k|s}$, meaning that each segment s has, for each attribute k, its particular parameter estimate β_k. The unconditional probability of individual i choosing alternative j is again a weighted average of all the $\beta_{k|s}$:

$$Pr_{ij} = \sum_{s=1}^{S} h_s Pr_{j|s} \tag{10}$$

where $Pr_{j|s}$ is the probability of choosing j conditional on membership in class s , that takes an analogous form of equation (5) and (9), being:

$$Pr_{ij|s} = \frac{\exp(\beta_{i1|s}x_{i1j} + \beta_{i2|s}x_{i2j} + \cdots + \beta_{ik|s}x_{ikj})}{\sum_{n=1}^{N} \exp(\beta_{i1|s}x_{i1n} + \beta_{i2|s}x_{i2n} + \cdots + \beta_{ik|s}x_{ikn})} \qquad (11)$$

Finally $h_1 \ldots h_s$ are the segment membership probabilities; these are unknown but can be computed by means of a multinomial logit model. It is also possible to condition h on covariates such as socio-economic variables and/or psychometric variables, available in this study.

So h_s can be thought to be given by:

$$h_s = \frac{\exp(\gamma_s Z_k)}{\sum_{s=1}^{s} \exp(\gamma_s Z_k)} \qquad (12)$$

where Z_k is a vector of k covariates and γ_s is the respective coefficient: these covariates can help us characterize the groups, something that is not possible in the RPL context.

4.2 Principal Component Analysis

The Principal Component Analysis (PCA)[1] is a statistical technique used to reduce data dimensions, while finding meaningful patterns in the data. It is often used in the analysis of data resulting from multiple Likert-scale like questions.

Let X be a vector of n data values with corresponding population variance-covariance matrix ∑. By the Spectral Decomposition theorem, ∑ can be written as follows:

$$\Sigma = \sum_{i=1}^{n} \lambda_i e_i e_i' \qquad (13)$$

where λ_i are the eigenvalues and e_i are the corresponding eigenvectors. The principal components are defined as the following linear combinations:

$$Y_1 = e_{11}x_1 + e_{12}x_2 + \cdots + e_{1n}x_n \quad (14)$$

$$Y_2 = e_{21}x_1 + e_{22}x_2 + \cdots + e_{2n}x_n$$

…

$$Y_n = e_{n1}x_1 + e_{n2}x_2 + \cdots + e_{nn}x_n$$

If all the n components are taken, there will be no amount of variance unexplained, but also no data reduction; however, if the X variables are correlated, a good proportion of variance can be explained with only k<n components, and data dimensionality can be reduced.

In order to find the principal components the eigenvectors are selected so that $Var(Y_i)$ is maximized, subject to two constraints: the sum of squared eigenvectors must add to 1 and the covariance between the component Y_i and all the previously defined components must be equal to zero, so that the components are unrelated.

The selection of components is based on statistical criteria: eigenvalues greater than a certain threshold, additional variance explained by an extra component (the amount of variance explained is decreasing in the number of principal components).

5. The qualitative study

The first part of the research involved a qualitative study, with in-depth interviews to selected stakeholders (administrators, policy makers, energy company executive officers, academic experts, environmentalists) and four focus groups (two for each county) conducted with lay people. The interviews were mainly aimed at obtaining information about technical and economic aspects related to wind farms in general, and the proposed projects in particular, and about the socio-economic conditions, and development options, in the two counties.

The focus groups participants (about 10 people in each group) were conducted by two moderators to discuss issues in five main areas:

1. Spatial factors (visual characteristics: dimension of turbines, number and density; choice of sites: close or far away from urban centers, off-shore, in land: close to the coast, in the interior; on hills or flat land; close to valued environmental or archeological sites)

2. Environmental concerns (climate change and pollution: renewable energy technologies/ other energy sources; conservation/ destruction of landscape)

3. Place attachment (economic development: wind farm helps economy/ hinder tourist development; wind farm spoils emotional and identity feelings for the location)

4. Fairness (fairness in the distribution of benefits: private/public property, economic advantages for the community/private individuals)

5. Procedural justice (Information; trust in political decision makers; participation in planning decisions)

The focus group discussions were recorded and, as a first step, their transcription was examined by means of a text analysis tool (SPAD-T 5.5.), in order to detect the most frequent associations between key words (for example: wind farm /economic development, wind farm / coastal landscape, etc.). These results have been used as a support for a comprehensive qualitative analysis of the discussions, which has produced the following indications:

1. Spatial factors, and more specifically the choice of location for the wind farm, are of paramount importance to explain attitudes toward a project. In particular, off-shore installations are radically opposed if the turbines are visible from the seaside, and acceptance seems to increase when moving inland. The visual impact in inland areas is not perceived as a problem, unless the

plant is installed in proximity of areas of particular interest, such as an archeological site. Elements related to density, dimension, color, number of turbines, hills or valley sites, are not perceived as being much relevant, as long as the location is properly chosen.

2. Environmental concerns for global issues, such as climate change, and the need to turn from grey to green energy are not perceived as urgent as other problems (mainly, the socio-economic problems afflicting the area); while, as said in the first point, there is a deep concern over the conservation of the environmental values of the coastline.

3. Place attachment factors play a fundamental role: on one side, the development of new energy plants is seen as the last chance to maintain the current level of industrialization and employment; on the other hand, if the plant is sited close to locations of environmental or cultural interest, there will be a loss of values: economic values, since these could be very interesting tourist locations (not yet sufficiently exploited) and emotional/identity values (many individuals communicated an emotional relationship to some locations).

4. The perception of Fairness in the distribution of the benefits seems to influence attitudes toward the wind farm development: in particular, the participants in the MC county focus groups, who already had the experience of a wind farm sited in their territory, expressed their strong disappointment that private companies, not located in the area, exploit “their” wind (seen as a natural local resource), only leaving a few crumbs to the community. A fair distribution of profits should involve higher royalties for the public administrations (to be used for welfare expenditures and public goods provision) and private benefits (cheaper energy bills).

5. The issue of Procedural justice is related to the point above: participants in the focus groups in both counties lamented that no information was passed on from the public administrations to the

community, and did not trust the ability or willingness of the political agents to make negotiations with the energy companies fully advantageous for the community.

6. The survey

Based on the outcome of the qualitative stage of the research, a choice experiment was designed in order to assess the trade-offs between relevant attributes of the choice involving a wind farm project.

The most relevant elements were identified as:

1. Visual impact in locations of environmental interest, possibly characterized by attachment /identitarian values

2. Visual impact in a location of archeological interest (not yet excavated: no identitarian values, possible option values)

3. Ownership of the plant, distribution of benefits in the local territory

4. Public benefits

5. Private benefits

These elements have been transformed in the following attributes, summarized in Table 1:

Table 1. Attributes and levels of choice experiments.

Attributes	Levels
Visual impact in the SI county	Installation close to the coast and well visible; far away from the coast and not well visible; far away inland not visible from the seaside
Visual impact in the MC county	Installation close to the coast and well visible; far away from the coast and not well visible; far away inland not visible from the seaside
Visual impact on a generic site of archeological interest	Installation close to the site; installation far away from the site
Property of the plant	Private; Public Regional; Public Local
Public benefits: additional services	No additional public services; training and formation for young residents; training and formation for young residents, plus microcredit to small enterprises
Private benefits: reduction in energy bill	No decrease, 10%, 30%, 50% reduction

1.a. Visual impact on a valuable coastal location in the SI county (three levels of visibility: close to the coast and well visible, far away/not well visible from the coast, inland and far away/not visible from the seaside): see Fig. 1, 2, 3 in Appendix.

1.b. Visual impact on a valuable coastal location in the MC county (three levels of visibility: close to the coast and well visible, far away/not well visible from the coast, inland and far away/not visible from the seaside): see Fig. 4, 5, 6 in Appendix.

2. Visual impact on a generic (undefined location) site of archeological interest (two levels, close and far away from site): see Fig. 7 and 8 in Appendix.

3. Property of the plant (three levels: private, public regional (Regional Administration holding), public local (local towns administrations are the shareholders))

4. Public benefits (three levels: no additional public services, one additional service (training and formation for young residents) two additional services (training and formation for young residents, and microcredit service to small enterprises).

5. Reduction in energy bill (four levels: no reduction, 10%, 30%, 50% reduction).

Attributes, levels and pictorial representations were assessed and revised in a series of pre-tests. It was decided to keep the exercise as simple as possible, to avoid an excessive cognitive burden on the respondents, so we opted for pair wise choices (i.e. two alternative scenarios), and 6 exercises (choice situations) for each respondent. A Bayesian experimental design was adopted, using the software NGene 1.0, generating 48 choice situations, grouped in 4 blocks with 6 choice situations.

Since the aim of this research was to assess the importance of social-psychological factors in shaping the attitudes toward wind energy in general, and the specific project in particular, another important part of the questionnaire was set up to collect information on how the individuals relate to the locations selected for the wind farm installation. This information was collected by means of Identity scales (2 scales: one for the coastal location in the SI county and one for the coastal location in the MC county), with statements that the respondent had to rank in terms of agreement/disagreement on a 7 levels Likert scale (see Table A2 in Appendix). Moreover, information was collected on beliefs about the social, economic and environmental conditions of the place they live in; on beliefs on wind plants, green and nuclear energy; and on specific consumption preferences (aimed at identifying individuals oriented toward green and/or informed consumption). The respondents had to rank statements concerning these issues on a 5 levels Likert scale of agreement/disagreement (see Table A3 in Appendix).

The questionnaire also collected information on the socio-demographic characteristics of the individual and family, on the family's energy consumption and bill payments, on some characteristics of the dwelling and technological equipment used to heat (or cool) water and space. Finally, individuals were asked if they possess any piece of land where turbines had been installed, or could be possibly installed in the future.

The survey was administered, using a face-to-face approach, to a sample of 432 individuals, evenly split between the two counties. The interviews were made in the summer period (July-August 2010) in beaches nearby the locations selected for our choice experiment scenario. The characteristics of the two sub-samples are described in Table 2, along with comparisons with the two relevant populations value.

Table 2. Sub-samples characteristics and comparison with target population[a].

Variable	Population SI	Sample SI	Population MC	Sample MC
Age (mean)	43.76	39.05	43.2	41.13
Household size (mean)	2.63	3.3	2.72	3.56
Gender (% males)	49.08	51.43	49.55	44.22
Education(%):				
Illiterates	2.9	0	3.26	0
Primary school	28.37	1.9	28.96	5.53
Junior high school	38.5	19.05	42.33	19.6
High school	25.76	60.95	21.73	57.79
Higher	4.47	18.1	3.72	17.09

[a]Sample size: 409. 23 individuals not residents in the SI or MC county are excluded from the original sample size (432) for this comparison. Data on age, household and gender are relative to the year 2006 (DEMOISTAT), data on education are relative to the year 2001 (source: ISTAT).

7. Results

7.1 Conditional Logit and Random Parameter Logit choice models

All choice models have been estimated using the software NLOGIT-4. We first analyze a base (main effects) CNL specification: the results are reported in Table 3. The second column reports the estimated coefficients for the utility attributes, the third column the Marginal Rate of Substitution (MRS) between the non-monetary attributes and the monetary attribute (Bill Reduction). The MRS are interpreted as the amount of savings (as a percentage of electric bill) that the individuals would be willing to forsake to assure an improvement of the corresponding attribute (wind turbines far away from the selected sites; profits going to local, or regional, community rather than private companies; level of public benefits to the community). Alternatively, they can be interpreted as the amount the individuals would accept in compensation for a worse level of a given attribute. By applying the estimated MRS to the average electric bill in the sample, we obtain monetary values for the attributes of the project, which are reported in the last column of Table 3.

The Conditional Logit estimates show that the Beach site in the MC county is valued more than the Beach site in the SI county (or, to be more precise, that conservation of its landscape is valued more). Preservation of a (potential) archeological site is also valuable: the monetary amount associated with this attribute can be interpreted as a sort of option value, since it referred to an unspecified site not yet in use, but that could be used in a future time as a cultural and a tourist site. Public benefits and public ownership of the plant seem less relevant than the visual impacts on valued sites in the individual valuations expressed through the choice experiments.

Table 3. Conditional logit model (CNL).

Variable	Coeff.	MRS	WTA (€)[a]
Beach SI	0.340*** (0.027)	- 0.202*** (0.021)	*- 166.45*
Beach MC	0.476*** (0.034)	- 0.284*** (0.021)	*- 233.12*
Archsite	0.339*** (0.046)	- 0.202*** (0.304)	*- 165.91*
Property	0.090*** (0.03)	- 0.053*** (0.016)	*- 44.2*
Services	0.162*** (0.028)	- 0.096*** (0.016)	*- 79.27*
Bill Reduction	1.677*** (0.145)		
Obs.: 2592			
Log Likelihood	**-1583.849**		

[a]WTA computed as MRS*average electric bill.
*** 1% significance, standard errors in parenthesis.

From these results we can infer than on average the population is willing to trade-off between the attributes, and that the damages generated by the wind farm project can be compensated, either in form of private benefits and/or in form of public benefits: for example, the installation of wind mills close to the archeological site, which would be compensated by about 166 Euros in bill reduction, could alternatively be compensated by having the firm owned by a local public holding (level 2 of the Property attribute: 44*2=88 Euros) plus the provision of training and formation to young residents (level 1 of the public Services attribute: 79 Euros).

These are average values estimated for the population of interest. However, it may be worth to see if valuations are approximately the same across the sample, or do they significantly differ: for example, a sub-sample may give a very high positive value to an attribute, while another sub-sample could deem the same attribute not important at all.

In order to see if respondents are sufficiently homogenous in the valuation of the attributes of the choice experiment, we first adopt a Random Parameter Logit specification, where all parameters are assumed to be distributed as a Normal. The estimates are reported in Table 4.

Table 4. Random Parameters Logit models.

Variable	RPL (a)[a]		RPL (b)[b]	
	Mean	St. dev.	Mean	St. dev.
Beach SI	0.563*** (0.588)	0.534*** (0.093)	0.499*** (0.049)	0.500*** (0.074)
Beach MC	0.764*** (0.077)	0.841*** (0.091)	0.654*** (0.065)	0.765*** (0.077)
Archsite	0.617*** (0.089)	0.807*** (0.132)	0.535*** (0.076)	0.715*** (0.115)
Property	0.175*** (0.055)	0.353*** (0.129)	0.159*** (0.048)	0.292*** (0.110)
Services	0.230*** (0.047)	0.417*** (0.085)	0.201*** (0.041)	0.308*** (0.087)
Bill Reduction	2.552*** (0.289)	2.752*** (0.360)	2.197*** (0.208)	--
Choice observations: 2592				
Individuals: 432				
Log Likelihood	**-1497.877**		**-1518.774**	

[a]All parameters assumed to be normally distributed.

[b]Price coefficient held fixed.

*** 1% significance, standard errors in parenthesis.

We also report results from another RPL model, RPL(b), where the Bill Reduction parameter is constrained to be fixed, in order to obtain easy estimates for the Marginal Rate of Substitution (which is the ratio of a random variate and a fixed coefficient, rather than a ratio of two random variables).

The mean coefficient values estimated by the RPL model are not substantially different from those estimated by the CNL, and consequently also the WTA values are quite close (only somewhat scaled up). However, it can be seen that all the estimated standard deviations are significantly different from zero, implying that there is a significant degree of heterogeneity across the sample. A likelihood ratio test between the RPL and the nested Conditional Logit model confirms that the former specification should be preferred (chi-squared statistic= 171.9; 6 d.f., P-value =0.000). In estimating this RPL model we make a normality assumption for the parameters, which implies that for some individuals the coefficient of some attributes can even take a negative sign. A lognormal specification has also been tested, which has proved to be not superior to the normal specification.

Table 5: Random Parameters Logit model (b), marginal rates of substitutions and willingness to accept.

	MRS		WTA (€)	
Attribute	Mean	St. dev.	Mean	St. dev.
Beach SI	-0.227*** (0.025)	0.227*** (0.042)	*-186.47*	*186.75*
Beach MC	-0.297*** (0.028)	0.348*** (0.055)	*-244.51*	*285.70*
Archsite	-0.243*** (0.038)	0.325*** (0.067)	*-200.04*	*267.15*
Property	-0.072*** (0.020)	0.133*** (0.053)	*-59.61*	*109.3*
Services	-0.091*** (0.018)	0.140*** (0.038)	*-75.09*	*115.14*

*** 1% significance, standard errors in parenthesis.

The RPL model is helpful because it detects and accounts for differences in the respondents' preferences; yet it does not provide any insight on the motives behind such differences. The analysis of heterogeneity in the respondents' preferences is useful to better understand the perceptions of the local population, and possibly to address their requirements, so to ease the planning process. In order to identify what kind of motives and attitudes underlie the preferences for the case at hand, we estimate a Latent Class model, where the probability of class depends on specific psychometric covariates.

7.2 Latent Class model with Psychometric variables

We first examine the results obtained from the statistical analysis of the psychometric scales, which was performed using the software SPSS. A Principal Component Analysis (PCA) was applied to the identity scales, and based on standard statistical criteria (amount of explained variance, value of eigenvalues) only one component has been extracted for each scale, which can be easily interpreted as “Identification with site-SI” and “Identification with site-MC”. The score factors pertaining to each individual have been then classified into three categories: low, medium, high identification for each site.

Analogously, a PCA was applied to the attitudinal/behavioral psychometric scale. Based on the statistical criteria cited above, three components have been extracted. The component correlation matrix is reported in Table 6, where stronger correlations with each component are highlighted in bold.

1) The first component accounts for about 24% of the total variance. The elements that are more positively (negatively) correlated with this component are the statements in favor of (against) wind/renewable energy. We define this component as RES-Friends.

2) The second component accounts for about 11% of the total variance. The elements that are more correlated with this component are statements expressing concern over the economic and/or environmental conditions of the territory where the respondents live; concern over possible criminal interests in the wind farms development business; and attention for local products consumption. Individuals with high scores for this factor can be considered as being concerned about keeping sustainable economic conditions in their territory, and we define them as Local Devoted.

3) Finally, the third component accounts for about 7% of the total variance. In this case the elements with relatively higher correlations are the statements about the need of nuclear energy in the region, beliefs on the poor potential of the wind energy technology, attention for cost-effective consumption, no attention for “responsible” consumption. Individuals with high scores on this factor are probably most concerned about individual well-being and we define them as Consumerists.

Also in this case the individual score factors have been classified into three categories: low, medium and high level individual characterization for each variable. These variables are then used to condition class probabilities in a Latent Class logit model.

Table 6. Principal Components: correlation matrix.

Item	*RES Friends*	*Local Devoted*	*Consumerists*
I think wind energy is useful	**0.728**	-0.057	-0.119
Against wind farm	**-0.509**	0.113	0.376
Wish more investments in wind energy	**0.782**	-0.031	-0.050
No benefits to community from wind farms	**-0.501**	0.243	0.331
Wind turbines produce little energy	-0.351	0.174	**0.434**
I like wind turbines	**0.572**	-0.243	0.171
I want wind turbines far away from home	-0.463	0.315	0.148
I'd like more wind farms	**0.828**	-0.050	0.061
My economic conditions may improve with wind farms	**0.650**	-0.043	0.256
The territory where I live is in economic difficulty	0.347	**0.504**	-0.038
Some places of the territory where I live are degraded	0.260	**0.508**	0.011
Economic development of this area depends on energy availability	**0.600**	0.170	0.336
Economic development of this area depends on wind farms projects	**0.648**	-0.010	0.345
I wish more investments on RES in Sardinia	**0.597**	0.251	-0.088
I wish investments on Nuclear energy in Sardinia	0.072	-0.263	**0.520**
I am worried that criminal organizations invest in wind farms in Sardinia	0.099	**0.569**	0.040
I search the market for local products	0.114	**0.655**	-0.014
I search the market for good prices	-0.003	0.014	**0.434**
I always check for the product origin	-0.014	**0.662**	0.053
I like to consume products out of season	-0.022	-0.254	**0.527**

Different specifications have been tested, using socio-economic, demographic and psychometric covariates. Based on standard Wald and Likelihood Ratio tests for nested models, and AIC and BIC criteria for non-nested models, the best specification includes four psychometric variables

(Identification with the SI site, Identification with the MC site, Local Devoted and Consumerists score factors), and only one socio-economic variable (ownership of land where wind mills have been or could be installed). Other socio-economic variables, such as age, education, income, or the amount paid for the electric bills, do not significantly affect class membership probabilities. Surprisingly, it also turns out that the RES Friends psychometric variable is not significant: the implication is that being more or less favorable toward wind energy does not affect the decision on the specific development project at hand, and other elements are more important in determining the respondent's choice.

The Latent Class model has been estimated using different numbers of segments. Table 7 reports statistics for these models, and for the RPL model.

Table 7. Selection criteria for LCM and RPL model.

N. of segments	N. of parameters k	Log-likelihood	AIC[a]	Δ AIC	BIC[b]	Δ BIC
1	6	-1583.85	3179.699	- -	1607.43	- -
2	18	-1513.769	3063.538	-116.161	1584.511	-22.919
3	30	-1458.557	2977.114	-86.424	1576.46	-8.051
4	42	-1430.239	2944.478	-32.636	1595.303	18.843
5	54	-1414.77	2937.54	-6.938	1626.995	31.692
RPL	12	-1497.877	3019.754		1545.038	

Sample size N = 2592.

[a]Akaike Information Criterion = -2*(LL-k).

[b]Bayesian Information Criterion = -LL+[(k/2)*Ln(N).

These are all non-nested models, since it is not possible to obtain any of these models just by imposing restrictions on another one. We can use standard methods for selection of non-nested models, i.e. the AIC and BIC criteria. The best BIC value is given by the RPL model, followed by the three segments LCM; while the best AIC value is given by the five segments LCM, followed by the four segments LCM. Looking at the change in the values of both criteria it seems that the passage from the 3-class to the 4-class LCM is more advantageous than the passage from the 4-class to 5-class LCM. Moreover, the choice of the four class model is supported by the overall significance of the coefficients both in the class membership model, and in the utility model.

The four-class Latent Class model is reported in Table 8. The first class of individuals is characterized by high and significant utility coefficients for the visual impact on the beach sites (especially the MC site) and the archeological site, while for the other attributes the coefficients are not significantly different from zero. The implication is that for this class of individuals there would not be any compensation, in form of either private or public benefits, that would induce acceptance of worse level in the attributes of the proposed project. As shown by the coefficients (and their significance) in the class probability model, this class, which is estimated to be about 25% of the sample, is most probably constituted by individuals who feel a strong sense of attachment and identification to the MC beach site.

Table 8. Latent Class Model.

Variable	Class1	Class2	Class3	Class4
	coefficients			
Utility Model				
Beach SI	0.833*** (0.173)	1.509*** (0.117)	0.581*** (0.116)	0.064* (0.033)
Beach MC	1.961*** (0.262)	0.622*** (0.098)	0.502*** (0.098)	0.176*** (0.038)
Archsite	1.154*** (0.281)	0.006 (0.130)	-0.517*** (0.151)	0.600*** (0.050)
Property	-0.037 (0.158)	0.230** (0.091)	-1.026*** (0.216)	0.277*** (0.035)
Services	0.059 (0.129)	0.475*** (0.073)	1.695*** (0.255)	0.008 (0.032)
Bill Reduction	0.696 (-0.713)	2.609*** (0.434)	11.475*** (1.447)	1.128*** (0.164)
Class Probability Model				
Constant	-0.938 (0.797)	-2.453** (1.119)	-1.702* (1.018)	0
ID_SI Beach	-0.143 (0.211)	0.900*** (0.306)	0.434 (0.268)	0
ID_MC Beach	0.583*** (0.215)	-0.191 (0.264)	-1.008*** (0.326)	0
Consumerist	0.009 (0.207)	0.248 (0.245)	1.153*** (0.307)	0
Local Devoted	-0.302 (0.207)	-0.158 (0.262)	-0.699** (0.272)	0
Land owners	0.526 (0.417)	-0.218 (0.687)	1.721*** (0.521)	0
Average class probabilities	0.256	0.192	0.152	0.4
Choice observations: 2592				
Individuals: 432				
Log likelihood	**-1430.239**			

*** 1% significance.

**5% significance.

*10% significance, standard errors in parenthesis.

Table 9. Latent class model, marginal rate of substitution and willingness to accept.

	MRS				WTA (€)			
Attribute	*class1*[a]	*class2*	*class3*	*class4*	*class1*	*class2*	*class3*	*class4*
Beach SI	→ ∞	-0.578*** (0.083)	-0.050*** (0.008)	-0.057* (0.030)	→ ∞	*-474.79*	*-41.55*	*-46.96*
Beach MC	→ ∞	-0.238*** (0.033)	-0.043*** (0.008)	-0.156*** (0.031)	→ ∞	*-195.66*	*-35.94*	*-128.53*
Archsite	→ ∞	-0.002 (0.049)	0.045*** (0.014)	-0.531*** (0.086)	→ ∞	*≈ 0*	*37.01*	*-436.20*
Property	n.a.	-0.088*** (0.031)	0.089*** (0.010)	-0.245*** (0.037)	n.a.	*-72.37*	*73.42*	*-201.47*
Services	n.a.	-0.182*** (0.031)	-0.147*** (0.007)	-0.007 (0.028)	n.a.	*-149.44*	*-121.23*	*≈ 0*

[a]MRS not computed for Property and Services in class 1, being ratios of not significant coefficients.
*** 1% significance, ** 5% significance, * 10% significance, standard errors in parenthesis.

The second class is instead more probably composed by individuals who are especially identified with the SI beach site. In this case, while we still observe that a high and significant value is attached to the preservation of the beach sites (in this case more to the SI beach than to the MC beach site), a completely different valuation is given for the other attributes. First, the attributes related to the bill reduction, to the public services, and to the public ownership of the wind farm are all significant. It is clear that for this class of individuals, which accounts for about the 20% of the sample, visual impacts on the beach sites can be accepted if adequately compensated in form of public investments and reductions in the electric bills. It is also noteworthy that for this class of individuals the visual impact on the archeological site attribute is not important. This may be due to the fact that old industrial sites (related to the mining activities) are now an element of tourist attraction in the SI beach area; individuals especially identified with the SI beach may think that the presence of wind mills close to a site of cultural interest could not necessarily be a disturbance.

The third class of individuals, which is estimated to be about 15% of the sample, shows another interesting pattern. The coefficients of the beach sites impacts attributes are both significant, but the public services attribute, and especially the private benefits attribute, seem now more relevant in the valuation. Moreover, the two attributes of the impact on the archeological site, and the ownership of the wind farm are now both significant, with a negative sign. For this class of individuals it is better to have private rather than public firms operating in the territory; and wind mills installed near the archeological site. In order to understand what type of individuals belong to this particular class, we can observe the sign and significance of the covariate coefficients in the class probability model: a positive association is observed for Consumerists, i.e. people mainly interested in personal well-being, which explains the high value give to the bill reduction; and for Land owners, which may explain the preference for private ownership (maybe they feel that land leasing would be easier and faster if the counterpart is a private firm, rather than a possibly bureaucratic public organization). On the other hand, Local Devoted, i.e. people concerned about the sustainability of the economy in the territory, and individuals especially identified with the MC site are less probably associated with this class.

Finally, the fourth class, which is the reference class, accounts for about 40% of the sample. For this class the most relevant attributes are the impact on the archeological site, and public ownership of the firm. The Local Devoted individuals are most probably associated with this class, which explains the conservationist attitude for the archeological site (which can produce in the future an economic value for the local economy, if it becomes a tourist attraction, and/or a use value, for recreational purposes). Also, for individuals who are concerned about their territory, it is natural that a local public ownership of the firm, which can use the profits for the benefit of the local territory, is preferred to a regional or a private firm.

Conclusions

Wind energy is at the present state of the technology the most promising renewable energy source, for an effective reduction of CO2 and other greenhouse gas emissions according to the Kyoto protocol and EU Green Paper targets. Unfortunately, large development projects may also determine relevant social costs, in terms of visual impacts, environmental damages, other opportunity costs, and perceptions of social injustice in the local populations. In order to ease the planning process, and to avoid social conflict, it is important to understand what is the acceptance by a local population toward a given wind farm project, to understand the factors behind a positive or negative attitude, and to identify compensating measures, either in form of public and/or private benefits, that can improve public acceptance of the project. Information in this respect is valuable since it reduces the possibility of an unsatisfactory implementation of a development project (as also found by Strazzera et al. 2010).

The present research has been set up to address these issues. A case study was selected, where the local economy could possibly benefit from a wind farm development project, and a choice experiment study was designed in order to analyze social acceptance and to assess possible compensation measures. The attributes of the project, in terms of external (social) costs and public and private compensations, were selected after a qualitative stage. The survey administered for the choice experiment study included a series of psychometric scales, also defined after the qualitative stage results, that could be used in order to better understand the factors behind certain patterns of choice. The results have shown that on average the sampled individuals show acceptance of the project, and that social costs could be compensated by means of private (reduction of the electric bill) or public (distribution of profits in the territory, public services) benefits. However, a deeper analysis reveals that respondents had indeed very different valuations of the proposed project. A Latent Class model was applied to the data, which enabled us to identify different classes of individuals: for a specific class (Class 1, which accounts for about the 25% of the sample) it is found that no compensation, either in form of public or private benefits, would make its members willing to accept the proposed project. This category of individuals would strenuously oppose installation of the wind farm in the selected sites due to its visual impact. Apart from the individuals in Class 1, all others are willing to trade-off some external costs with benefits: especially private benefits for a specific class of individuals (Class 3), mainly composed by individuals that in the analysis have been defined as Consumerists, and by people who own land plots where wind mills are or could be installed. This class of respondents actually do not find that wind mills represent necessarily an external cost (they value positively the installation near to, rather than far away from, an archeological site). Individuals in Class 2, about 20% of the sample, are more interested in public services, while the remaining Class 4, about 40% of the sample, is especially interested in the preservation of the (option) value related to the archeological site, and in a local ownership of the plant, which would imply a distribution of profits in the local territory. They are individuals who showed a particular concern for economic, social and environmental conditions in their territory (Local Devoted individuals have higher probability of membership in this class).

These findings confirm the incapability of the “NIMBYsm”, as in Devine Wright (2009), to explain social acceptance of wind firms. There is a net of factors affecting social acceptance which are related to the specific contest and to personal attitudes. Information on the distribution of preferences across the local population can help to better calibrate the choice of the sites and the type of benefits better suited to compensate external costs deriving from a wind farm project in specific sites and socio-economic environments.

It is important to emphasize that our research shows that opposition against wind farm – and probably other green or traditional energy farm – can be driven by significant aspects of individuals’ well-being (visual impacts and *restorativeness*, place identity and attachment, economic perspectives, local environment concern) and not merely by the defense of individualistic self-interest.

[1]This paragraph is based on: *Johnson G.,2010. lectures notes from Pennsylvania State University*, available at https://onlinecourses.science.psu.edu/stat505/ .

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Appendix

Table A1. Previous choice modeling studies on environmental costs of wind power[a].

Study	Capacity specified in scenario	Scenario/ attributes	Significant WTP	WTP euro/year		
Ek(2002)		*Location of turbines:*				
		mountainous	+	0		
		onshore	+	12		
		offshore	+	29		
		Noise impacts	not sign.			
		Size of turbine	not sign.			
		Grouping turbines:				
		individual	+	10		
		<20	+	20		
		between 10 and 50	+	0		
Alvarez-Farizo and Hanley (2002)		*Protection of:*				
		Cliffs	+	22		
		Habitat and flora	+	38		
		Landscape	+	37		
Bergmann et al. (2006)		Landscape impacts	-	12		
		Wildlife impacts	+	6		
		Air pollution	+	20		
		Employment benefits	not sign.			
Ladenburg and Dubgaard (2007)	3600 MW	*distance from the shore:*				
		off-shore at 12 Km	+	47		
		off-shore at 18 Km	+	98		
		off-shore at 50 Km	+	125		
Krueger (2007)		N. of turbines	not sign.			
		Location of wind farm		Inland ($ per month)	Bay ($ per month)	Ocean($ per month)
		Inland	+			
		Bay	+			
		Ocean	+			
		distance from shore (base level 0.9 miles)				
		3,6 miles (min)		9.38	16.62	40.83
		20 miles (max)	+	20.98	37.17	91.33
		Environmental conservation/ green Energy programmes	wtp not computed			
Dimitropoulos and Kontoleon (2009)	441 MW	N. of turbines	+	18.69		
		the turbine heights	-	439.63		
		the conservation status of the site	-	718.95		
		participatory planning	-	854.5		
Meyerhoff et al. (2010)		Size of wind farms	not sign.	Westsachsen (Euro per month)	Nordhessen (Euro per month)	
		maximum height	not sign.			
		effect on red kite population	-	-0.52	-0.46	
		minimum distance to residential areas				
		750->1100	+	3.18	3.87	
		750->1500	+	3.81	4.31	

[a]Adapted from Ladenburg, J. and Dubgaard, A., 2007.

Table A2. Identity scales.

Completely disagree	Quite disagree	Disagree	Neither agree nor disagree	Agree	Quite agree	Completely agree
1	2	3	4	5	6	7

STATEMENTS:

I like to spend some time in this place
I feel attached to this place
I wouldn't like to go away from this place
In this place I feel myself at home
When I am away, I miss this place
This is my favourite place
This place is part of my identity
I feel that I belong to this place
This place is really different from other places
I like this place
This is one of my favourite places
I have a lot in common with people coming often to this place
I identify myself with those who come often to this place

Table A3. Statements concerning various issues.

Completely disagree	Disagree	Neither agree nor disagree	Agree	Completely agree
1	2	3	4	5

STATEMENTS:
I think wind energy is useful
I am against wind energy
I wish more investments in wind energy
Wind turbines do not give benefits to community
Wind turbines produce little energy
I like wind turbines
I would like wind turbines far away from home
I'd like more wind farms
I think my economic situation may improve with wind farms
Territory where I live is in economic difficulty
Some places of the territory where I live are degraded
The economic development of this area depends on energy availability
The economic development of this area depends on wind farms projects
I wish more investments on renewables in Sardinia
I wish investments on nuclear energy in Sardinia
I'm worried of criminal organization interests in wind farms in Sardinia
I search the market for local products
I search the market for good prices
I always check the product origin
I like to consume out of season fruits and vegetables

Table A4. Variables' code.

Variable	Code	Min	Max
Choice	1 for the chosen alternative, 0 otherwise.	0	1
Beach SI	1 well visible, 2 not well visible, 3 not visible.	1	3
Beach MC	1 well visible, 2 not well visible, 3 not visible.	1	3
Archsite	0 close to the site, 1 away from the site.	0	1
Property	0 private, 1 public regional, 2 public local.	0	2
Services	1 no services, 2 training, 3 training and microcredit.	1	3
Bill reduction	0, 0.10, 0.30, 0.50	0	0.5
ID_SI beach	1 low level of id_SI, 2 medium level of id_SI, 3 high level of id_SI.	1	3
ID_MC beach	1 low level of id_MC, 2 medium level of id_MC, 3 high level of id_MC.	1	3
Consumerists	1 low level of cons., 2 medium level of cons., 3 high level of cons.	1	3
Local Devoted	1 low level of ld, 2 medium level of ld, 3 high level of ld.	1	3
Land owners	0 not actual nor potential land owners, 1 land owners.	0	1

Figure 1: well visible.

Figure 2: not well visible.

Figure 3: not visible.


Figure 4: well visible.


Figure 5: not well visible.


Figure 6: not visible.

Figure 7: close to the archeological site

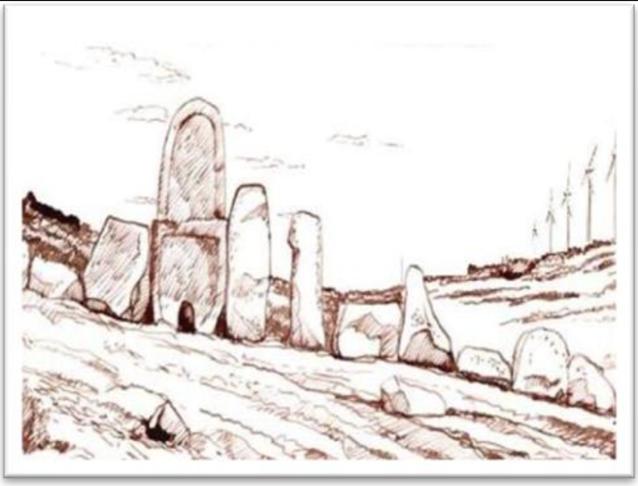

Figure 8: away from the archeological site