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Environmental conflict and Contingent Valuation method: setting up a pilot study on biogas plants acceptance in Emilia Romagna

By

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Abstract

Environmental conflict is growingly being integrated into the method of contingent assessment, especially in presence of non-use values. This work aims to investigate how environmental conflict influences environmental projects' assessment. Using the theoretical backgrounds of the Prospect theory, that shows the formal inequality between Willingness to pay and Willingness to accept, we will set up a pilot study to investigate the biogas acceptance in the Emilia Romagna region. The pilot survey is deployed with a referendum format, integrating negative WTP. The results show a widespread support for biogas in the region, nevertheless the spot 'losers' counterpart asks for an economic compensation. Some insights for further research are also provided, especially focusing on how to correctly scale a contingent assessment, based on the results of the pilot study.

Keywords: Biomass, Social acceptance, Local Acceptance, Local public goods, Waste Management, Renewable Energy, Circularity

1. Introduction

One of the main aims of the economic analysis is explaining and evaluating the meaning of market transactions. Notwithstanding, several public goods, such as environmental assets, lack of direct form of transaction, hence it is difficult to economically express which is their perceived value for a community, especially in situations in which non-use values are at stake. Examples of non-marketed commodities and services could be clean air, natural sites, wildlife areas, endangered species. Nevertheless, the aforementioned absence of a direct transaction does not imply the absence of value, as non-marketed goods are likely to have a high social value that enhances the people's well-being (S. Saz-Salazar, 2018)

Against this background, this research will examine the importance of the environmental conflict as a socio-economic matter. By specifically focusing on the Emilia Romagna (ER) case, we will identify the drivers influencing the acceptance of biogas in ER. To this scope, we will, firstly, introduce the concept of environmental conflict and main behavioural insights of the prospect theory, in order to explain why is there a substantial inequality between Willingness to Pay and the Willingness to Accept. Especially, we will highlight how environmental projects may be seen as positive for some agents and negative for others, depending on different reasons. Our analysis of theoretical insights regarding environmental conflicts, winners and losers in environmental evaluation applied to Contingent valuation methodology, will be our theoretical foundation to set up a pilot study in order to identify an upper and a lower bond of the Willingness to pay with respect to biogas projects in the region. This last consists in an ad-hoc web-survey and it is aimed at investigating, in a small scale context, which variables may explain biogas acceptance.

This paper is structured as follows: Section 2 provides the theoretical background, Section 3 presents the material and methodology resorted and describes the setting-up of the pilot study. Section 4 presents the results of the pilot survey and Section 5 will lead the conclusions.

2. Theoretical background

2.1 The definition of environmental conflict

Environmental conflicts manifest as political, social, economic, ethnic, religious, territorial based phenomenon characterised by some form of environmental degradation. We acknowledge from political geography literature that since the 1990s it was detected a strong relatedness between environmental degradation, renewables, resource scarcity and environmental conflict. After 2007 the main topic of contention for environmentalists, and in the wider sense the social concern, moved on climate change reflections and the related conflicts. This new environmentalism is rooted in the concept of environmental justice, which is simultaneously an interdisciplinary field of research, a political claim and a widespread international movement. In the idea of environmental justice, environmental risk factors are considered as elements of social justice, relevant and necessary for human rights. (Centro Documentazioni dei Conflitti Ambientali, 2019)

In the light of the above, environmental conflicts are characterized by the overexploitation of resources, typically in conditions where the environmental capacity is exceeded and the reproduction of life is threatened. Following the approach of CDCA, we can distinguish two typical aspects recurring in environmental conflicts:

1. "A qualitative or quantitative decrease in natural resources, or public goods in the specific territory (agricultural fields, water, biodiversity, flora and fauna, minerals ecc.)

2. The presence of contrasting/resistance activities enacted by the civil society (damaged communities, social organisations, social movements, active citizenship associations, stakeholders ecc.) which organise and mobilitate in order to protect the environment, the public goods and their rights on the territory (CDCA, 2011, .p12).

Another category which is going to be deepened in this analysis relates to those situation in which the information of individuals regarding some environmental concern, makes the difference. For example, it may happen that some conflict disrupt because of the reaction of a community against a future project or policy. It is possible to see various forms of reaction before, during, and after the realisation of a project, which is perceived harmful or useless by a community. There are at least three relevant aspects pointed out by De Marchi et al., (2010) each of them regard specific situations in which environmental conflict emerges:

1. Civil society enacts a preventive reaction in order to prevent a damage that might result from a territorial modification.

2. Public institution is trying to spur environmental protection or restoration, in turn causing some form of limitation to socio-economic activities.

3. The conflict is caused by a project that provides something mainly positive for the environment, even though it has some negative externalities for some groups of the society.

Fig.1: Map of environmental conflicts in Italy
Source CDCA

As in the case of renewable source power plants, concerns usually emerge in relation to aesthetic reasons. It is well known in the literature that these conflicts represent a large portion of overall environmental conflicts and we are going to deepen particularly the latter category.

It emerges that a broader definition of the environmental conflict's concept should consider environmental contrasts as something that disrupts as a social willingness of active participation to establish changes, to take part to the development and the environmental decision making process. An interesting contribution brought by CDCA (2015) highlights the importance of looking at the conflict not just considering the ecosystem, but rather taking into account the very and specific territory, including territorial, labour and political consequences. Hence, environmental conflicts develop in time and result out of many, and sometimes opposite, territorial projects with a specific local connotation.

We acknowledge that these kind of concerns changed in time also in terms of triggering causes and related reactions. If initially the reaction dimension was mainly based on catastrophes, we experienced growing concern towards sustainability issues for both policymakers and civil society. Nowadays the approach is not simply reactive but rather related to planning activities. This means that individuals are increasingly involved in the participatory process of decision making with respect to environmental goods and assets. On the one hand, the spread misinformation, does not allow for the proper understanding of some projects, even if they have lighter environmental impact than the alternatives. On the other hand it is fundamental to consider also how public institutions act and relate with such a changing society. In these concerns, there exist different mechanisms which can be considered to incentivise pro-environmental behaviours, consisting in monetary and non monetary incentives. This second category is relevant also for behavioural economics, since we assume that the overall utility outcome computed by individuals in their choices, might also be built on "irrational" preferences. Thus the drivers like social recognition or rewarding, as mechanisms based on punishment or disapproval of harmful actions, are peculiar factors to understand how environmental attitudes are triggered, and how they do displace. As a consequence, in the next section we are going to report some insights from the social dilemmas literature to understand the complexity of the relations an individual might have with a specific environmental concern.

2.2 Prospect theory (PT)

The standard economic theory considers homo oeconomicus as an agent that is too selfish and too rational. The first claim comes out from the Social Preferences Theory (Fehr & Fischbacher, 2002, p.5) while the rationality assumption will be the object of analysis of this section.

A rational individual has a set of preferences that maximise the utility function that represents preferences, namely choses always the alternative which leads to the maximum utility. Indeed we find two main assumptions in standard models of decision making. In first instance, preferences are independent from current assets. Secondly, preferences do not depend on the initial reference point with respect to current holdings

The experiment of (Kahnemann et al,1990) led to peculiar results. Their Prospect Theory shows that individuals start their evaluations from different reference points, resulting in a higher Willingness to accept (WTA) with respect to Willingness to pay (WTP). It also shows the cognitive dissonances depending on the role of a subject, stressing that emotional biases are also very relevant. The extent of such results is even more evident when decisions are relevant, for example in the evaluation of environmental decisions regarding costs/benefit analysis. Loss aversion is one of the most relevant variables used to explain the gap in many contingent valuations between WTP and WTA for non market goods such as environmental damage. Empirically, subjects require from 2 to 10 times as much money to bear an environmental damage with respect to their WTP to avoid the same harm. Theoretically this two items should be equal following Coase Theorem. Practically Michell and Carson (1989) noticed that many studies with WTA were characterised by a high number of protest answers such as refusing to accept some money to bear environmental degradation or huge amounts of money, to be compensated for the damage. The protest rates often exceeded 50%, noticing that often respondents had feelings of rage and so protested, to bear the negative externalities of the construction of a waste disposal site or even more when exposed to potential risky projects, as the installation of nuclear power plants. The exposure to potential risks it's the key point to better investigate the widespread avoidance of accepting those projects which seem risky and harmful for the environment. Clearly, the case-study of biogas acceptance has significantly lower environmental risks, nevertheless the analytical framework to analyse reluctancy and protests in this field also mirrors risk perception linked to individual choices.

Thus in reality we see that theory states some equalisation between WTP and WTA, while reality reveals a divergence between this two values. Therefore, it is of our interest to consider this aspect in our analysis, and to consider the use of WTP to appraise values also for the compensation objective, referring this topic to the literature about practical best practices to conduct a reliable CV (Arrow et al. 1993)

2.3 Non-negative willingness to pay

In this sub-chapter we will address why we will integrate positive and negative bids in the pilot study, which can be accomplished using a dichotomous choice format.

The work of Clinch and Murphy (2001) stressed one particular aspect, not well considered until that moment, that is to work with negative willingness in order to integrate and evaluate potential losers of specific projects. In other words, they are questioning the assumption of a strictly positive WTP. Following Arrow et al. (1993) it is considered the use of binary (or referendum) choice elicitation format of stated WTP for individuals. The outcome is to ask individuals for 'pricing' a positive variation in the provision of a public good, i.e. environmental, being asked to express if they agree or not to pay a stated sum of money. If the specific public good presents also features of a public bad, it is necessary to use an appropriate consumer's surplus measure in order to integrate the loss of utility for some individuals, if the provision of the public good is increased. The most frequently used approach to integrate welfare losses in CV was to include negative bids into the survey set, in order to get how the provision of a public good or bad is perceived by respondents. In turn a valuation functional form is chosen for the parametric estimators, for example making assumptions about the negative tail of the WTP distribution. Anyway this approach may be inappropriate if respondents are not directly allowed express a negative preference.

Describing a change on the landscape, for example caused by some project, might be posed as something good or bad depending on one's preferences. It might seem peculiar therefore for a respondent to pay for something he or she considers good or bad respectively if they pay for the realisation or the avoidance of the project. It is needful indeed the application of specific methods in order to integrate winners and losers in environmental appraisal, explicitly considering the quantification of negative bids (Kristrom, 1997, pp. 1013±23).

3. Materials and Method

For the scope of this paper, will refer to the work of Mazzanti Rampa and Modica (2019), in order to have an empirically working framework to better investigate our research question. The *Green on Green* case is evident; we refer to a situation of community opposition against the development of an energy source, which is normally considered environmental friendly and positive. Thus our empirical framework has to reflect the inclusion of winners and losers in the setting up of the pilot study (Warren, C.R., C. Lumsden, S. O'Dowd, and Birnie V.B., 2005, pp. 853–875).

We will follow a model à *la* Clinch and Murphy, as a tool to integrate the possible irrational aversion of local communities, which are sometimes external reasons of social groups, such as historical, cultural reasons, or that have a pre-condition related to another indirectly affected sector (e.g. agricolture). As previously mentioned we will refer to Soland's work regarding the analysis of biogas social acceptance and the power of inclusivity of participatory processes held by public institutions (Soland, M., N. Steimer, and W. Götz, 2013, pp. 802–810). Despite Soland experiments were performed on ex post valuation, and in Modica research, focusing on the relative difference of acceptance before and after a participative process, we will consider a running procedure of public inclusion. Rete Emergenza Climatica Emilia Romagna (RECER) is having a direct relation with institutions. The impact of this huge networking activity is giving an singular result: enclosing institutions and active citizenship, in decision making, reviewing and monitoring procedures to concretely aim at the sustainability goals of the region. On one hand what we propose is to integrate in the further research part a qualitative analysis among the territorial committees and environmental associations, likewise we will consider a random sample to set up a lower and upper bound for expressed citizens WTP.

The main goal is to obtain an upper and lower limit for WTP regarding biogas in ER region, according to the consideration we made on negative bids. The setting in which we are operating is a 'Green on Green' case, in which we know that, hypothetically there should be some knowledge regarding the positivity of

biogas plants and in general of renewables. The survey is based on WTP of individuals for the construction of a new biogas plant in the area. The further step is to divide the overall sample in subsamples basing the division on the amount of money sub-groups are willing to pay, in our case following Mazzanti Rampa and Modica [5€-10€-20€-50€].

One of the most relevant aspects is the division of the population into two macro categories, winners and losers, depending on their answer on the acceptance of having a new biogas plant built in their area. Since the possible donation amounts are four it is possible to define a Likert scale, in order to match the single answers and respective amounts with individual's preferences and so acceptance. Hence we are going to match the positive or negative WTP with the respective levels of a Likert scale, integrating those respondents who see investments in new biogas plants as something detrimental for their territory.

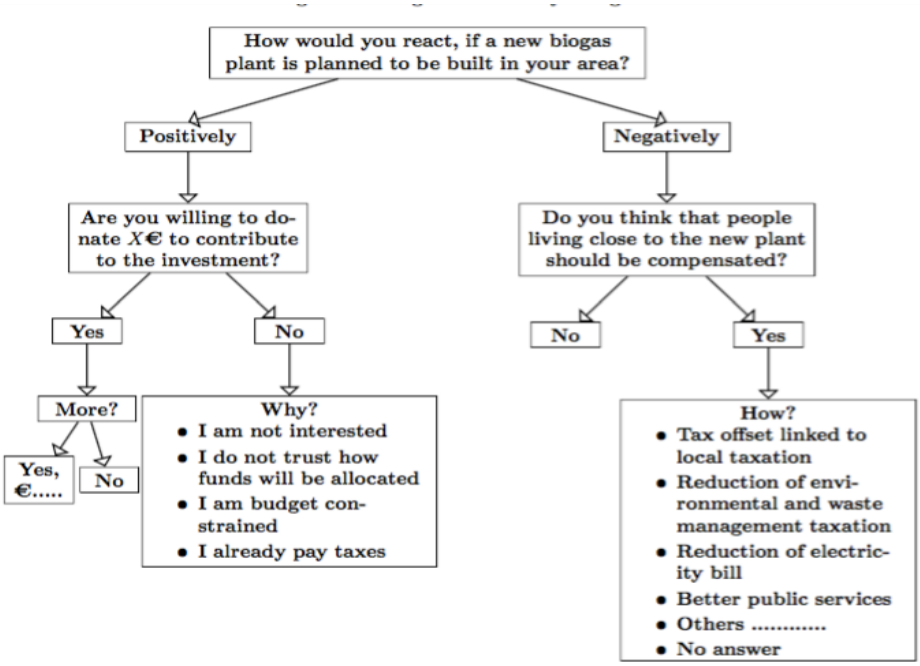


Table 1: Usual Likert Scale

Strongly Agree	6
Agree	5
Slightly Agree	4
Slightly Disagree	3
Disagree	2
Strongly Disagree	1

Fig. 2 : Acceptance of biogas in Italy an analysis of social approval of new plants
Source: M. Mazzanti , M. Modica, A. Rampa (2019)

The key aspect of this approach is that it is possible to define the WTP of individuals which positively perceive the biogas investment for the community, as well as the willingness to accept, in terms of negative WTP for those individuals which instead perceive these investments as a problem, or simply as a cost for society. Such approach is meaningful because it is able to overcome and integrate the cognitive dissonance effect that displaces in the case of environmentally positive projects, which have some negative spillover on some communities, or at least it is so perceived (Akerlof and Dickens, 1982). The format of our study will follow the framework of Mazzanti, Rampa and Modica and Figure2 graphically represents how the survey will work, considering the referendum format used by Clinch and Murphy.

3.1 Questionnaire and Survey presentation

The survey was administered as a web-survey via social platforms. 121 people were interviewed as the population of the pilot study, during the period between the 15th of September and the 15th of November 2020. A sample of 111 respondents was drawn from the population, evenly distributed by gender and age.

The questionnaire was divided in two sections: a socio-demographic and the core one related to the experiment. The core part was realised with a referendum format following Clinch and Murphy's elicitation method. The main difference in our survey format is that we wanted to create a direct method of counterpayment in case the individual has a negative perception regarding the development of biogas plants in their territory. In fact, the individual is not asked to choose which form of economic compensation he or she considers most appropriate, but is asked which energy bill discount range he or she would accept. This is relevant because our study, since the pilot phase, highly considers the compensation mechanisms in case of negative WTP, so that subjects can easily understand and perceive the counterpayment. So instead of asking about the mean of compensation, we will use the question: "What range of energy discounts should people living near a biogas plant receive?".

Hence we will match in a Likert perspective all the possible answers with a level of the scale. “Strongly disagree” or level 1 of the scale is relative to the individuals who answer negatively to the main question of the survey, namely if the perception of new biogas plants in the area is perceived as something negative, and they would require an economic compensation for bearing such project development. Following we will consider individuals who “disagree” those who answer negatively to the key question and negatively also to the question regarding economic compensation. Instead those who answer positively to the key question but are not willing to pay nothing to finance the biogas investment, will be considered individuals who “slightly disagree”. The rest of the possibilities will regard positive answers to the key question and to the question related to economic compensation, clearly with different bid levels, so a donation of 5€ will be matched with “slightly agree”, 10€ with “agree” 20€or 50€ with “strongly agree”. Our analysis will take into account also other relevant factors such as age, energy consumption, living area and transportation means normally used by respondents.

The majority of the answers belong to the Bologna and Ferrara areas, with 80,4% of respondents stating that they are residents in the city they live in. An interesting aspect may be related to the degree of rurality, acknowledging that the 41,1 % of respondents stated to live in a central zone of their city. This might be relevant since we know that especially rural areas are affected by the “bads” of biogas project development, hence in a formal study this aspect should be deepened, perhaps creating an ad hoc sample to interview exclusively rural communities and checking for possible different outcomes. In contrast with the study of Mazzanti, Rampa and Modica, we will not analyse the issue by comparing a pre and post policy situation. Being aware of the importance of participatory processes, we will offer an evaluation of pre-policy data, supposing a subsequent development of an active participation policy.

4. Results of the pilot survey

Considering the key question "How would you react to the news about the construction of a biogas plant in your territory" we see that 79.2% of respondents would react positively. Within this subgroup, however, we see that only 31,1% of respondents would be willing to donate a sum of money to finance the sustainability

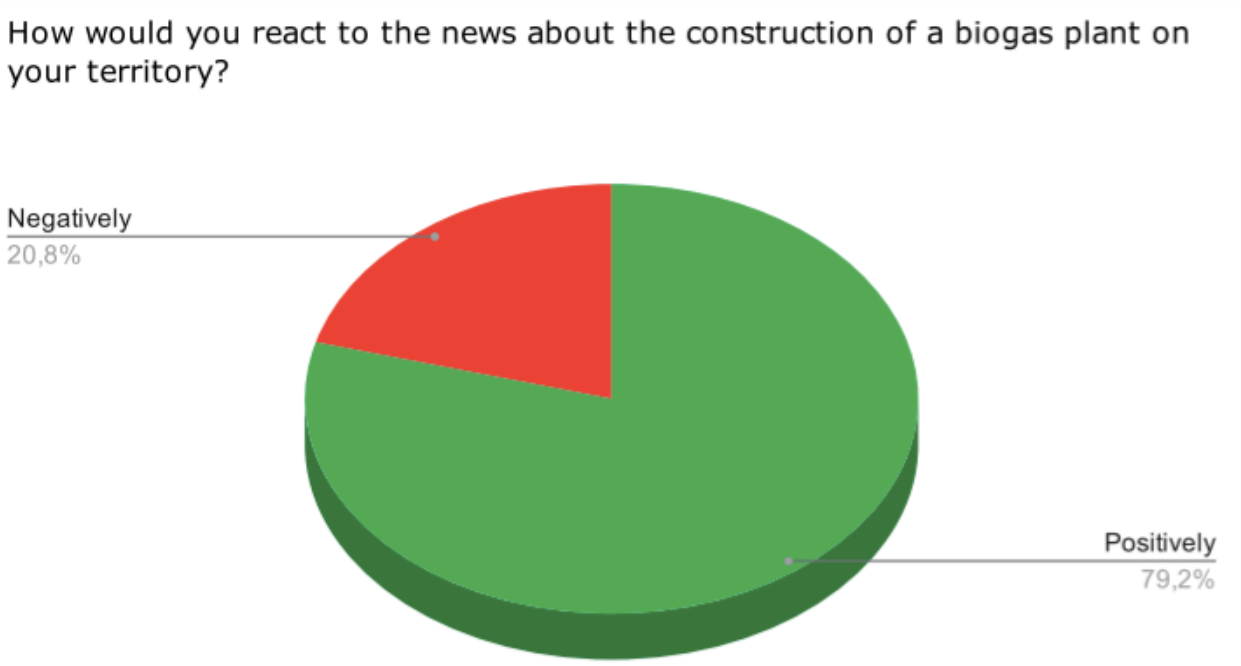


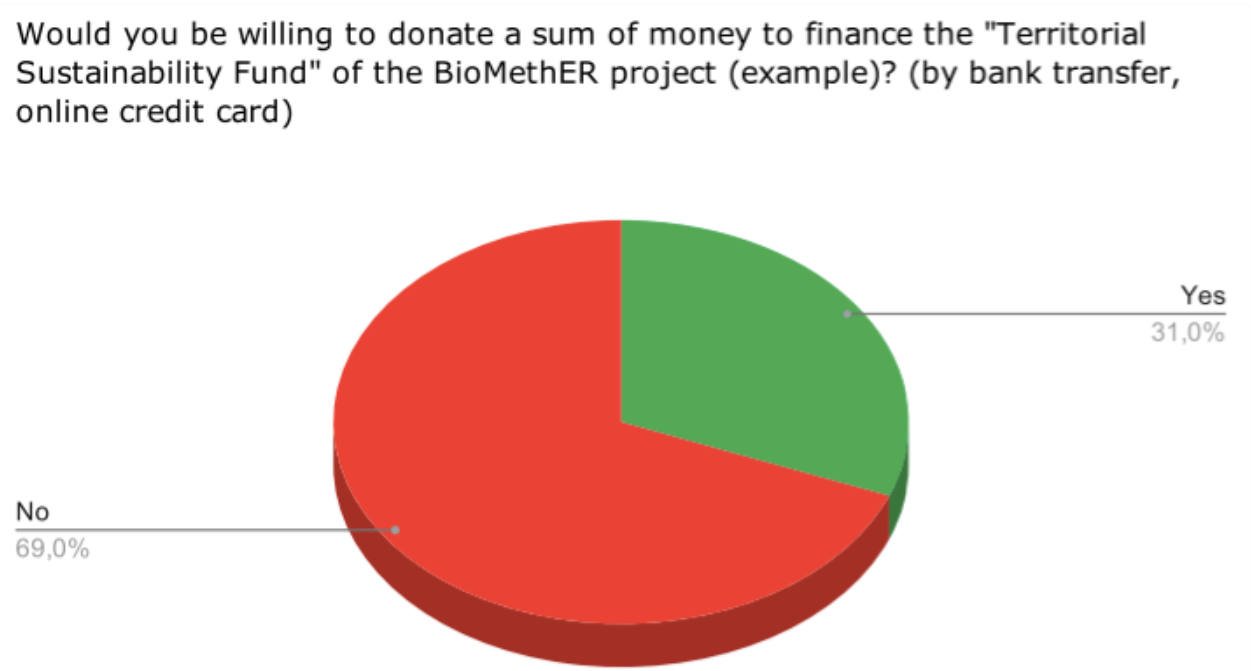
Fig. 3: *"How would you react to the news about the construction of a biogas plant on your territory?*"

fund, with an average WTP of 16,11€. This is particularly significant, and could be influenced by several variables. First of all the reason could be related to the lack of a participatory project with respect to the theme. A second reason could be linked to the fact that our sample, for obvious reasons related to the method of the web survey, involves mainly young people. In fact, the 54% of respondents are not willing to donate because they have no economic availability.

The 24% of respondents answered that they already pay taxes, meaning that the project is perceived as public and therefore already partly financed by tax payers. The BioMethER project is financed by European and regional funds, i.e. public funds, so it may be perceived as unnecessary or inappropriate to make a donation for this type of project. We wanted to specify that the donation was linked to a "Territorial Sustainability Fund", being aware of the contrast regarding biogas in ER region, therefore willing to promote, precisely in the context of public investment, a correction of trajectory, in order to better include the demands of those who perceive this type of investment as harmful.

As previously stated, the flip side regards the 20,8% of people that were not agreeing with the development of a biogas plant on the territory. This subset was asked if people that live nearby the plants should receive an economic compensation in terms of discount on their energy bill. Not surprisingly, 66,7% of the sub-set answered positively. This is very relevant for the purpose of our study since reveals that, within the subgroup we have previously defined as "losers" is highly wanted a compensation mechanism. In our case the mechanism had to be as clear and defined as possible. Through the discount shares on the energy bill it is possible to develop a very interesting discourse on negative WTP, having a way to measure it without directly referring to monetary compensation through some form of subsidy or public incentive. Another information to consider is the fairly direct perception that the interviewees have of the energy impact on the territory and of the inevitable indirect advantage for multi-utility energy companies or distribution companies. Therefore we take note of this awareness and consider this information fundamental in order to represent the negative WTP. Our purpose, indeed, was to create a form of integration of winners and losers, acknowledging that, like it or not, a discrete majority of respondents is in favour of biogas. This integration may happen only if local communities, minorities that

Fig. 4 : *"Would you be willing to donate a sum of money to finance the Territorial Sustainability Fund of BioMether project (example)?"*



suffer some sort of damage caused by the development of projects, have voice in the participatory processes developed and can state claims regarding possible solution to integrate the fact that they are not bettering off.

Within the losers subset we see that 30% of respondents would like a 50% discount on their energy bill, while the 40% would place their discount in the 21%-30% threshold. This figure would suggest that there is a strong need for economic compensation in the losers subset, despite the fact that they represent a minority. At this point it may be necessary to analyse the concrete feasibility of this compensation mechanism. This would be relevant as it would be possible to build a dialogue with the operators of the largest biogas plants on the territory to create these local compensation mechanisms. Nowadays it is possible to require the energy supply companies to source households completely with renewable sources. Therefore, it would not be impossible to think about the creation of purely energy incentives for the territorial realities involved in the projects.

Fig. 5: *" If so, within what range would you place the discount on your energy bill?"*

5. Conclusions and further research

This study aims at understanding and identifying the drivers influencing biogas acceptance in the Emilia Romagna region. The first part of the work introduced the concept of environmental conflict. Following the prospect theory and other behavioural economics insights, we discussed formally the inequality between WTP and WTA. For the purposes of our study, this difference is relevant for the following two reasons. First, it highlights why it is inadvisable to use WTA as a proxy to assess the acceptance of an environmental project. Secondly, the difference, which is deeply linked to the irrationality of individual choices, stresses the need to use a more effective measure of preferences, in order to integrate the negative ones.

Following the framework of Clinch and Murphy (2001), we integrated negative bids in order to set up an experiment which evaluates and measures the reasons of the losers, giving back a form of appraisal of their negative preferences. The survey showed that 79.2% of respondents would react positively to the development of a biogas project in their area. Within this subgroup, however, we see that just the 31,1% of respondents would be willing to donate a sum of money to finance the sustainability fund, with an average WTP of 16,11€. Nevertheless, to make reliable assessments it would be necessary to calculate the whole WTP for Emilia Romagna population using a significant sample size. The 20,8% of people that were not agreeing with the development of a biogas plant on the territory was asked if they should receive an economic compensation in terms of energy bill discount and not surprisingly 66,7% of the sample answered positively. Anyway just the 7% of the overall sample is asking for an energy bill discount between 40% and 50% of the energy bill cost. The discount shares on the energy bill it is a good starting point in order to represent negative WTP. The average WTP, in turn, should be weighted accounting the negative bids in terms of economic compensation. Provided the average WTP of the pilot study it would be interesting to replicate the experiment, enlarging the survey to a wider regional representative sample, asking whether

people are willing to pay the average WTP stated in the pilot study (16..€). This result could have a discrete relevance according to the analysis previously made about the consistency of the CV study, when the setting scenario is modified, perhaps changing the key question, hence the default referendum option. It would be useful to integrate the results regarding 'losers' and the high propensity among this minority to ask for an economic compensation for bearing biogas plants development in their areas. The energy bill discount format in our opinion, is reliable, since it stresses the clear link between the upgraded energy sourcing condition of the territory and the form of compensation that better mirrors a consequential detrimental situation for those who worse off.

The development of a pre and post policy investigation is a must, in order to acquire meaningful information about the relative importance of participatory processes over local acceptance. It would be significant to involve especially those realities which expressed strong contrast against the realisation of new plants. We suggest the realisation of a parallel survey, to integrate local acceptance specifically within rural communities. Following the outcome should be compared with the general regional result, in order to evaluate the potential worsening gap depending on the rurality degree of respondents.

In last instance, it may be relevant to conduct a survey within Rete Emergenza Climatica e Ambientale Emilia Romagna (RECAER) to investigate the biogas acceptance of environmental associations in the region. Of course, in this case it is needful to remodel the experimental framework, deepening the type of project that would be realised, rather than using a generic "territorial sustainability fund". The relevance of the specific kind of project is key since under these conditions, we would deal with informed respondents. Indeed environmental committees and associations may express concerns regarding f.i. the dimension of the hypothetical installed plant. Therefore this further investigation might lead to interesting operative qualitative insights regarding the biogas plants acceptance of informed agents.

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