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How to promote community social acceptance of solid biomass in Europe? Identifying firms' best practices

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Abstract

The siting of solid biomass energy plants can be conceived as a transaction process taking place between two specific economic agents, the investor and local community. The investor is interested in obtaining the use rights for local resources (e.g., area for setting; natural resources to feed the process, release of pollutants into the environment) while the community expects an increase in net benefits (e.g., job opportunities, induced industrial development). This transaction process has been analyzed according to the typical transaction costs theory, where the economic activities are conceived as the result of transactions among economic agents, which are hindered by three main obstacles: i) bounded rationality, ii) opportunism, iii) asset specificity. By applying the New Institutional theory approach, we treat the issue of social acceptance as a transaction cost problem. The aim is to identify the best practices adopted by biomass firms' managers in order to enhance the social acceptance of solid biomass plants at the local community level. In this paper, we conduct a positive analysis where the methodological approach is based on the comparison of six successful study cases. This allowed us to identify twelve measures capable of fostering social acceptance and consequently of reducing the costs related to the investment.

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1. Introduction

In recent years, the renewable energy sector has grown more and more and has developed a very wide variety of technological possibilities. Among renewable energy, bio-energy, i.e., all forms of energy produced from biomass, is the sector with the greatest potential for development. This is due to the abundance of resources available almost everywhere and the possibility of exploiting economies of scope, where biomass is a co-product of the main productive activities. In addition, given the stage of maturity now reached by renewable energy such as solar and wind energy, bio-energy is booming. The growing interest in biomass is probably due to several coincidental factors, including rising prices of conventional sources (fossil hydrocarbons), awareness of the phenomena related to climate change and the resulting institutional commitments aimed at reducing greenhouse gases, as well as the needs of the agricultural sector for promoting activities for income diversification.

However, the renewed economic interest in biomass energy contrasts the behavior of society that is not always clearly and unequivocally favorable. According to Rakos (1998), the social resistance encountered by investors in certain phases of project implementation can lead to an overall increase in investment costs that can reach 30%. The social acceptance (SA) of the use of biomass and related technologies for the production of energy appears to be, therefore, a key factor in the development of this renewable energy sector. The design and construction of plants for the production of biomass energy depends on the type of consent obtained from the company and, in particular, from the local community.

There are many factors that may affect social acceptance. According to the classification proposed by Jobert et al. (2007), they can be grouped into two main categories: 1) institutional conditions, such as economic incentives and regulation, and 2) site-specific conditions, such as local economic conditions and modalities for the actual development and management of the project. As pointed out by some authors (Wolsink, 2007; Jobert et al., 2007; Breukers and Wolsink, 2007), the latter and in particular the criterion by which decisions are made regarding the project, or the method by which it is developed, plays a decisive role in its success.

This last statement provides the rationale for the basic hypothesis of this study: the behavior of investors is not neutral regarding project acceptance by the local community. The demand for research that follows is therefore the identification of managerial choices taken on a voluntary basis by investors to promote social acceptance of their projects by the local community. To do that, firstly a framework for the investor' behavior analysis is proposed; then, six successful case studies of biomass power plants for the production of electricity and heat built in Italy and Spain in recent years (2001-2010) are analyzed. A survey was conducted by means of structured interviews with managers and directors of the plants. The work is divided into sections, with the next section introducing the state-of-the-art of SA and the third describing the paradigm and assumptions of the research. Specifically, the neo-institutional paradigm through which the phenomenon of SA can be interpreted as a problem of economic transaction costs between two partially rational agents was adopted. The fourth section presents the methodological approach adopted in the research work, which has discussed the identification of variables that most influence the SA of the local community. The methodology is then applied to the six biomass power plants described in the fifth paragraph of the research work. The results are reported in the sixth paragraph. Some concluding remarks are, finally, presented in the last section.

2. Social Acceptance: A Short Review

The emergence of movements aimed at hindering the development of investment projects by the resident population in the sites concerned is widely reported in literature in the category of studies that deal with the so-called NIMBY[1] syndrome. It is reported in the work of Quah and Tan (2002), which analyzes the opposition on behalf of local communities toward facilities that impact negatively on the environment, public health and the landscape. Evidence of the NIMBY syndrome in the case of renewable energy plants (mainly wind farms) are given in the work of Devine-Wright (2005) and Wolsink (2006), who analyzed the problem of opposition of the local community.

A comprehensive framework that allows for setting the various elements of the phenomenon in a rational manner is offered by Wüstenhagen et al. (2007), who propose a subdivision of SA into three categories: i) *sociopolitical acceptance*, which concerns consensus expressed by institutions, local authorities and public bodies in relation to project management; ii) *market acceptance*, concerning the market acceptance of a technology for renewable energy production, which results from the perception that economic actors (consumers, investors) gain advantages from project implementation; iii) *community acceptance*, based on procedural justice, trust and distributive justice as perceived by local residents or social partners involved in making decisions about the project.

In this paper, we will focus only on one of the three categories of SA identified by Wüstenhagen, namely community acceptance, while we will not keep account of the other two aspects. As claimed by Lopolito et al. (2012), the intensity of the resistance of local communities may vary depending on the sociocultural and economic conditions of the communities concerned. As a consequence, it is assumed that local resistance is everywhere, with higher or lower intensity. In this context, this research is aimed at identifying successful actions implemented by investors in order to minimize the costs of resistance encountered during the design and construction of biomass plants for energy production. In particular, this article proposes an institutional approach as shown in the following section which assumes the existence of two negotiators, that is, an investor and a local community. The analysis focuses on a frame period between t1 (siting of the plant, where it is assumed that the NIMBY syndrome begins) and t2 (commencement of operations, when local residents display their strongest opposition) (Wolsink, 2007).

3. Theoretical Approach

The theoretical approach which this research is based on is the paradigm of New Institutional Economics, which shows the existence of so-called transaction costs, that is, the costs inherent to the realization of transactions between different economic agents and arising from the need to define, initiate, monitor and complete settlement activity (Williamson 1985, Dudek and Wiener 1996). The reasons for transaction costs are basically i) *bounded rationality* (due to lack of information or the changing expectations

[1] NIMBY is an acronym that stands for Not In My Back Yard.

and objectives of the counterparts), ii) *opportunism* (concerning the natural tendency of economic agents and institutions to meet their own interests) and iii) *asset specificity* (some resources are highly specific, making it impossible or extremely expensive to replace them with other inputs). The approach of New Institutional Economics emphasizes the importance of reducing transaction costs, typically through an appropriate contractual scheme aimed at "…organizing transactions so as to economize on bounded rationality and at the same time protect the latter from the risk of opportunism (and the constraints of resource specificity)" (Williamson 1985, p. 32).

The theoretical model used in this paper considers the interaction between two economic agents, the investor (of the biomass plant) and the local community. The first is interested in acquiring the right to use local resources (e.g., areas for the location of industrial plants, the right to release some pollutants, the right to use certain infrastructures for transportation, etc.), while the local community expects an increase in economic benefits resulting from the plant installation (e.g., job opportunities, spin-offs, revitalization of the local economy). In this case, the specific sources of transaction costs can be identified in the lack of information about the negative effects of biomass plants such as the amount of pollutants, impact on the landscape, fall in price of property values, etc. (*bounded rationality*); in the fact that some members of the local community could take advantage of the NIMBY syndrome in a deceptive way in order to gain popularity and political power (*opportunism*); in the need for minimizing transportation costs of raw materials and optimizing the distribution network (e.g., heat or power production) (*asset specificity*).

In order to have an analytical operating framework, we are referring to a simple contractual scheme proposed by Williamson (1985, p. 33), which assimilates negotiation between two economic agents into a situation of bilateral monopoly where the break-even price of the property involved in the transaction (p) is the result of their negotiation that takes into account eventual transaction costs (k) and safeguard measures[2] (s). Two scenarios are possible.

Absence of transaction costs. The parties negotiate in the condition of the absence of transaction costs ($k = 0$). They are able to find an agreement that sets a price that the investor will pay to the local community, on a yearly basis, for the entire duration of the investment. In this case, the two parties do not have to adopt any safeguard measure ($s = 0$) to preserve the agreement. A break-even price equal to p_0 will emerge from negotiation. The benefit function of the investor is described as a net private benefit (i.e. profit) *NPB* resulting from the difference between the return from sales (R) and the total costs of operations (C), and the price to be paid to the local community p_0 to obtain their consensus:

$$NPB = R - C - p_0 \tag{1}$$

On the contrary, the net benefit function of the local community (excluding the investor) *NCB* is given by the economic growth induced by the investment at community

[2] We keep consistency with Williamson's terminology, although it might contain a broader range of activities such as design, process and strategy aimed at ensuring the investment achievement.

level (i.e. the increase in terms of value added) ΔVA, augmented by positive externalities Ext_p, reduced by negative externalities Ext_n, and increased by the price p_0 paid by the investor:

$$NCB = \Delta VA + Ext_p - Ext_n + p_0 \tag{2}$$

Presence of transaction costs. The parties perceive the possibility that information asymmetry, opportunism and investment specificity may lead to a decision that could harm them (lack of information and risk of sit-ins, demonstrations, petitions, etc.) with consequent arising of transaction costs ($k > 0$). In this case, if the investors do not implement any safeguard measures ($s = 0$), they have to pay a price (p_1) higher than in the previous case ($p_1 > p_0$), considering that $p_1 = p_0 + k$. In this case, it is advantageous for the investor to implement some safeguard measures ($s > 0$) aimed at reassuring the local community about the consequences of the investment, only if they will determine a reduced break-even price p'_1 (with $p'_1 < p_1$; $p'_1 < (p_0+k)$). In other words, the investor will implement safeguard measures only if $s < (p_1 - p'_1)$.

Under these circumstances, (1) will be modified as follows:

$$NPB = R - C - (p'_1 + s) \tag{3}$$

Regarding the local community perspective, the benefits are determined by a modified notation of (2):

$$NCB = \Delta VA + Ext_p - Ext_n + p'_1 \tag{4}$$

It is worth pointing out that in this case the local community will get a lower price due to the stronger guarantee provided by the investor.

In this analytical framework, the mandatory requirements (i.e. standard emission, buffer zone, etc.) provided by law, in addition to being instruments for the protection of environmental assets, can also be conceived as compulsory safeguard measures aimed at facilitating the negotiation process between the two parties (we characterised these as institutional). On the other hand, the voluntarily safeguards implemented by investors are considered as good practices and are the object of the study presented in the following paragraphs. To do that, we consider only successful cases. Hence, it might be objected that there is selection on the dependent variable which could potentially bias our results. We focus on the relative importance of different practices in contributing to cases of successful negotiation. There may, however, be cases where safeguards were offered but failed to secure the project. This latter possibility falls outside of the current scope of this research. For the reader who wants get more insight into this, an example of the failed development of a biomass electricity plant in UK is analyzed by Upreti and van der Horst (2004).

4. Methodology

The methodological approach consists of a survey carried out for underlining the safeguards adopted by investors on a voluntary basis in order to promote investment success or minimize the cost of possible resistance of the local community toward biomass power plants. Measures can be classified as 1) actions aimed at improving the transparency and safety of the project (e.g., technological solutions to reduce the levels of externalities such as environmental and noise pollution); 2) strategies adopted to minimize possible opportunistic behaviors or to prevent opposition from other parties (e.g., creation of local stakeholder networks, vertical integration, potential biomass supplier research, etc.); 3) actions intended to achieve technical optimization of industrial activity (e.g., sizing, logistics, technology, integration with existing plants).

A questionnaire based on this classification has been distributed to the management of the plants. Face-to-face interviews were conducted. After having a first telephone conversation, the authors personally arranged each meeting with the management. The questionnaire consists of four parts: 1) general data on the technical and engineering aspects of the power plant; 2) formal procedures for the issuance of planning permissions, expected timing, and the criteria for site selection; 3) information on actions of local communities (e.g., actions determining delays, requests for additions to the project, specific impact analysis, moving siting, other obstacles); 4) safeguard measures adopted by the management. Indeed, interviewees were asked to indicate the measures adopted in their cases among a list of 10 measures based on literature review. They were also asked to indicate any other safeguard measures adopted (even if it was not included in the list). In this way, overall actions undertaken by the surveyed cases were included. Concerning this latter issue, the interviewees were asked also to express a judgment of the effectiveness of the measures adopted. This was made according to a 5-point Likert scale ranging from "not effective" to "very effective." The interviews were conducted in the spring of 2012. In the next section, there is a description of the cases that are the object of the empirical case studies.

5. Empirical Application

The survey was conducted on six power plants that produce electricity and heat through direct biomass combustion processes. The cases were selected in order to embrace a variety of plant-related features, such as power size, biomass feedstock, location, and funding (public or private). We chose Italian and Spanish cases and the Mediterranean climate condition because the development of the biomass sector for energy purposes has been only growing there recently. Indeed, all sampled plants were built within the last decade. Finally, budgetary constraints limited the number of cases. Three of these are cogeneration plants (heat and power) and are located in Northern Italy, while the other two plants produce only electricity and are located respectively in Italy and southern Spain (Table I).

Table I: Description of the case studies

Case study	Size (MWe)	Cost (M €)	Raw Material	CHP (a)
Puente Genil (Spain)	9.8	46	Olive pomace	No
Bagnolo di Po	4.5	16	Chips, hay	Yes
Asiago	0.9	11	Chips	Yes
Calimera	0.9	5	Chips, pruning residues	No
Vigliano Biellese	0.250	2	Residues of maintenance of public parks	Yes
El Tejar (Spain)	25	n.a.	Olive pomace, pruning residues	No

Main features of each system are listed below:

A. **Valoriza plant in Puente Genil - Andalusia - Spain**. The project was approved in 2006 by the competent authorities and took 18 months to complete construction. It has a 9.8 MWe steam turbine, a 13 MWe gas turbine, and a recovery boiler fueled primarily by olive pomace and pruning residues of the region. The plant had an investment cost of 46 million EUR.

B. **Bagnolo di Po Plant - Rovigo - Italy.** The plant consists of a boiler with a 4.5 MWe cogeneration steam turbine. It is owned by a private company. The plant is fueled with by-products from forestry and the agro industry. The heat is used to provide heating to the hospital in Trecenta (RO) via a district heating network 1 km away from the central hospital. The cost of the plant was about 16 million EUR.

C. **Asiago Plant - Vicenza - Italy**. The plant was built with public funds under the project Demeter and is owned by the municipalities of Asiago and the Province of Vicenza. The plant consists of a combustion boiler and a 1 MWe turbine which produces electricity. Cogeneration has enabled the creation of a district heating network of 11 km that allows the distribution of heat to the final users (hotels, houses). The cost of the plant was about 11 million EUR. The plant uses biomass from the scraps of sawmill adjacent to the site.

D. **Calimera Plant - Lecce - Italy**. The power plant is located in the Apulia region and is managed by a private company. It consists of an organic Rankine cycle turbine of 1 MWe and produces electricity that is sold to the public network. The cost incurred for the construction of the plant was 5 million EUR. The plant uses biomass from the pruning of local olive groves.

E. **Vigliano Biella Plant - Biella - Italy**. The plant was built by a private company operating in the textile sector of Vigliano Biellese. The plant consists of a 2 MWt boiler and two ORC turbines with a rated power of 125 kWe each. The biomass used is from the cleaning of public parks. The plant cost 2 million EUR. The plant produces electrical energy that is supplied to the public network and heat that is distributed within the company through a district heating network.

F. **El Tejar - Andalucia - Spain.** This is the greatest plant among the ones considered in this study. It has been running since 2001 and uses 1000 tons of exhaust olive pomace and 10-15 tons of pruning residues to produce 25MWe. It is run by an agricultural cooperative company.

6. Results

Structured interviews have allowed us to reconstruct project history. They have found different paths of development and implementation according to the context and the size of the projects. Differences in the authorization requested and the length of the authorization process are partly due to the different sizes of the plants. Beyond these technical elements, structured interviews made it possible to discern between the mandatory activities, namely the ones imposed by law and the voluntary ones taken by strategic investors (see Table II).

Table II: Voluntary Safeguard Measures

S1 Networking with local institutions	S8 Siting in industrial area
S2 Siting in areas with no alternative economic planning	S9 Siting in public areas
S3 Siting in brownfields	S10 Networking with local stakeholders
S4 Job offers to residents	S11 Vertical integration with suppliers of biomass (e.g. supply chain agreements)
S5 Siting in private property areas	S12 Information campaigns
S6 Voluntary mitigation measures	S13 Consultative meetings designed to identify and improve any critical aspects of the project
S7 Voluntary compensation measures	S14 Open investments

This has allowed attention to be paid to the behaviors identified as best practices and investigation of the link between them and the social acceptance of projects.

Indeed, the diffusion of voluntary practices, according to the number of cases in which they were implemented and their perceived effectiveness in terms of social acceptance, was also obtained from the survey results. The latter was made possible assuming the self-evaluation about effectiveness of the safeguard measures undertaken by the investors. The 5-point Likert scale gives us an *ex-post* evaluation of their relevance to social acceptance. This allows two rational criteria to identify best practices: 1) how widespread is the practice; 2) which is the average score investors assigned them. This information is reported in Table III. The safeguard measures have been ordered based on their effectiveness (mean of the single measures—columns 3-8). In addition, for each measure, the table also reports the kinds of transaction costs addressed (column 2) and their diffusion (last column).

Although the ordering of the measures on the basis of these two criteria represents a good starting point in order to select the best ones, specific considerations are needed. Some measures, in fact, while considered very important, have been adopted by only one investor; alternatively, others are more widespread and with scores ranging from very high to medium. This means that some measures have a general value and are very effective. The former show a specific relevance under certain conditions and were selected by the investors in accordance with the conditions of project context.

6.1 Popular safeguards

Among the most common safeguards within project management decision making, there are S2 concerning the choice of *sites with no alternative economic planning* (implemented in all cases), S1 *networking with local institutions*, S10 *networking with local stakeholders*, and S12 *information campaigns* (implemented in five out of six cases). Similar facilitating factors have been recognized in Jobert *et al.* (2007) applied in the case of wind energy in Western Europe.

The most widespread measure (S2) is directed at reducing the transaction costs of type *ii* (opportunism), since it helps in preventing conflicts with the local community which should be more willing to allow the siting of a facility in areas with no commercial and/or residential alternatives. The adoption of this measure requires time and resources in order to acquire relevant information on the area identified for the siting, but it seems to be a must for the success of the project.

Table III: Identification of the Best Practices

Safeguard Measures	**Nature of TC addressed***	**Effectiveness Perceived in each case**						**Effect. (mean) [0-1]**	**Diffusion 1-6**
		A	***B***	***C***	***D***	***E***	***F***		
S1 - Networking with local institutions	*i, ii*	5	5	5		5	5	5.00	5
S4 - Job offers to residents	*ii*				5	5		5.00	2
S5 - Siting in private property areas	*ii*	5				5	5	5.00	3
S6 - Voluntary mitigation measures	*ii*				5			5.00	1
S8 - Siting in industrial area	*ii*			5	5	5		5.00	3
S9 - Siting in public areas	*ii*		5	5	4			4.67	3
S10 - Networking with local stakeholders	*i, ii*		5	5	3	5	5	4.60	5
S7 - Voluntary compensation measures	*ii*				5		4	4.50	2
S2 - Siting in areas with no alternative economic planning	*ii*	4	5	5	4	5	3	4.33	6
S11 - Vertical integration with suppliers of biomass (e.g. supply chain agreements)	*i, ii, iii*		3	5		5		4.33	3
S12 - Information campaigns	*i, ii*	3	5	5	5	3		4.20	5
S13 - Consultative meetings designed to identify and improve any critical aspects of the project	*i, ii*					3	4	3.50	2
S3 - Siting in brownfields	*iii*							0.00	0
S14 - Open investments	*ii*							0.00	0

* *i) bounded rationality; ii) opportunism; iii) asset specificity*

The other three measures (S1, S10 and S12) are devoted to addressing the transaction costs of types *i* and *ii* (bounded rationality and opportunism). S12 reduces bounded rationality, avoiding misunderstandings between management and the local population, and dispelling false beliefs about the plant. For instance, providing technical information, such as type of boilers used, filters applied, quantity and quality of emissions, potential increase of local traffic, health effects, etc., reduces the concerns of the population that are at the basis of the opposition. At the same time, economic information on contracts for the supply of biomass, employment opportunities, potential industrial development and eventual mitigation and compensation measures has the effect of reducing opportunism, by assuring residents about the "justice" of the project and by building their consensus.

The spread of S1 and S10 indicates how important the networking activities are. In fact, the development of the project is not only a matter concerning the technical-economic engineering system and optimization of logistics, but also a matter of building a rich relational capital that allows a co-design process with the local community. Usually, the mayor, opinion leaders and other local influential people are involved. The expected benefits of these measures are the improvement of information flows within the networks[3] and the creation of a climate of trust between investors and the local community. This is crucial in reducing opportunism, since trust implies the sharing of behavioral norms and moral sanctions for free-riding (Bromiley and Cummings 1995). Networking with institutions will be discussed below, because it represents the peak of best practices in terms of the criteria adopted for dissemination and effectiveness.

6.2 Safeguards considered more effective

Considering only the score obtained in terms of effectiveness, five measures are considered very effective. The first of these is widespread and it is the aforementioned S1 *networking with institutions*, which will be discussed shortly. The remaining four measures have an economic or technical nature and all face the transaction costs of type *ii* (opportunism). In particular, two measures relate to the technical choice of site location, namely S8 *site selection in areas of industrial use* and S5 *siting in privately owned areas*. Once again, the choice of the site is of prime importance and should be performed in accordance with the criteria of transparency and justice. In particular, the previous destination site for industrial use is considered, at least in the three cases, as a winning choice for the acceptance of the project. The presence of abandoned industrial facilities has a positive effect on the level of acceptance. In two cases, the chosen site was privately owned. Although this choice was considered successful by investors, this measure should be considered with caution. Private ownership of the site allows for speeding up project management takeover; however, the implication is that in the eyes of the community its use could easily seem unprotected, not having been granted by the local authorities (local administration). The overall effect on reducing the opposition to the project is therefore doubtful for this measure; this conclusion is strengthened by the fact that half of the projects examined (three out of six) preferred, however, locating a *site on public property*.[4]

Two measures are markedly economic and concretize a form of redistribution of benefits arising from the project: S4 *jobs for residents* and S6 *voluntary compensation measures*. All managers who have adopted such measures have regarded them as successful for the acceptance of the project. This also applies to the last issue now under consideration, concerning voluntary actions to mitigate air pollution. All measurements quoted in this section are designed to ensure a framework of procedural and social rules in which the project is included. This aims at ensuring that the community is not forced to suffer unacceptable levels of externalities generated by the project itself.

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[3] With a consequent reduction of bounded rationality problems deriving from asymmetric information.

[4] *Site on public property* is the safeguard measure S9. It could seem contradictory that, as reported in Table III, both S5 and S9 face the same type of transaction cost (type *ii,* opportunism). The reason for this apparent contradiction lies in the fact that the investors opt for these alternative strategies with two diverse time horizons of reference, that is: siting on private property area (S5) guarantees the speeding-up of the process in its early stages, allowing investors to reserve some strategic information on the specific use of the area, but it opens windows for opposition in the successive stages; to the contrary, the adoption of S9 requires a longer period of implementation, due to the bureaucratic process of administrative grants, but should guarantee the transparence and sustainability of the project, reducing the risk of future opposition.

6.3 The most widespread safeguard among the most effective

The measure most commonly used among the most effective is *networking with local institutions* (S1). The combination of effectiveness and dissemination of the measure suggests that it is a "must" for proper project management regarding solid biomass plants. Despite being a widely recognized measure, it can be articulated and implemented in different ways depending on the type of management and its vision, the local institutional context and previous relationship between the two parties. In general, institutional networking is an activity aimed at strengthening relations with institutions through a constant dialogue and ensuring the necessary awareness of decision makers to the needs of the project. This measure promotes the acceptance of the project by strengthening the perception of the strategic role of the project in terms of the local development of institutional partners. The importance of this measure lies in its ability to create the conditions for a collaborative planning system in which the requests of both parties are stated, enabling the convergence of their expectations towards a shared vision of the project. The result is the right balance between the needs of industrial development, land protection and respect for local communities. The interaction takes place on a continuous basis and then is intensified in the key stages of the authorization process.

6.4 Siting in Brownfield and Open investment

Finally, *Siting in Brownfield* (S3) and *Open investment* (S14) are mentioned. These are the only two measures quoted in literature that were not activated in any of the cases studied. It is not a sign of ineffectiveness, in the total absence of assessment in terms of strengthening the acceptance of the project. Rather, it is an indication of the reluctance of investors to implement these measures. S14 in particular requires the introduction of a significant organizational innovation. Adopting this investment scheme, investors become partners who influence, exercising their voting rights, the management policy of the company. It represents a kind of social mitigation measure on the basis of which local stakeholders are entitled to take part in the management of the project. The difficulty in implementing such a measure can be explained by the fact that it is incompatible with withholding strategic information often implemented by project management.

7. Conclusions

The SA of the use of biomass and related technologies for the production of energy has not yet been adequately studied. As outlined in many cases, it represents an obstacle to the development of the renewable energy sector. The design and construction of plants for biomass energy production appear to be influenced by the type of consent obtained from the company and, in particular, by the local community.

The study of the SA is difficult due to the intrinsic complexity and interdependence of the acceptance determinants, often linked to contextual elements as well as individual perception of different local participants (Lopolito et al., 2012). In order to take such complexity into account, the phenomenon of SA has been interpreted in the frame of New Institutional Theory, where the negotiation between the firm asking for the permission of the local community to construct a plant is hindered by the existence of transaction costs. Far from being exhaustive in a complete analysis of this kind of costs, this paper focused on the best practices to promote the SA of the solid biomass plants, conceiving them as voluntary safeguard measures aimed at the reduction of the impact of transaction costs. This allowed us to reach the initial objective, the identification of a list of measures for investors or firm's entrepreneurs to implement at the early stage of the plant development and directed at reducing the costs for the opposition of the local community.

Although the sample might be biased according to the successful case plants, in general, the results of the analysis reveal that management is greatly aware of the importance, in economic terms, of adopting safeguard measures in order to facilitate the negotiation with the local community. In addition, initiatives having a wider dissemination and greater importance implemented by management have been identified. The evaluation of economic net benefit in adopting the measures depends on the trade-off between costs and expected benefits, measured in terms of reducing transaction costs. Experience suggests that, unlike the current practice, this aspect should be considered and included in the economic analysis of biomass power plants from the preliminary design stage onwards.

In order to stick to the main objective, in this preliminary result paper we left out the complete in-depth investigation of the socio-economic context and the legislative framework of each site. Therefore, this work does not provide the complete breakdown of the transaction costs and the set of mandatory measures established by local authorities of the different regions and countries examined. For this reason, the limitation of this paper lies in the fact that the comparison of the perceived effectiveness of the various measures could be affected by the different context conditions, since these are not explicated. For example, a central or local government may require a higher emission standard and/or formal local community compensation in the review process, which makes voluntary mitigation and compensation less effective or not viable. Similarly, information campaigns' effectiveness is influenced by the level of information disclosure required from the authorities.

For this limitation to be overcome, it is necessary to completely describe the socio-economic context (in order to trace all the transaction costs) and the legislation requirements in order to map all of the compulsory safeguards. Finally, further research should be carried out with the aim of including even unsuccessful case plants.

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