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Exploring the Local Sustainability of a Green Economy in Alpine Communities

A Case Study of a Conflict Over a Biogas Plant

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This article aims to contribute to the analysis of the complex relationship between sustainable development and green economy in mountain areas by focusing on a conflict over the building of a centralized biogas plant to produce renewable energy from livestock manure in an Italian Alpine valley. The case study shows that the project for a large-sized biogas plant promoted by the local political institutions as environmental modernization of local agriculture, and supported by the most important professional organizations, became increasingly controversial at the local community level and was eventually abandoned. By drawing in particular on the literature concerning the social acceptance of renewable energies, the article highlights how this conflict raises issues of distributional justice and procedural justice with regard to the implementation of the green economy model, and it points out the need to embed green economy technologies in the local context and conditions. These concerns should be given primary consideration if the green economy model is to contribute to the sustainable development of marginal areas.

Keywords: *Green economy; renewable energy; biogas; sustainable development; social acceptance; procedural justice; distributional justice; Alps; Alpine communities; Italy.*

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Introduction

The present article aims to contribute to the analysis of the complex relationship between sustainable development and green economy in mountain areas by focusing on a case study of a conflict centered on the building of a large centralized biogas power plant to produce renewable energy from livestock manure in an Italian Alpine valley.

The production of renewable energy is one of the key pillars of green economy as defined by the United Nations Environment Programme (UNEP 2011). In the new global run for renewable energies, rural areas—and especially mountain areas—play a central role (Kitchen and Marsden 2009). In principle, the richness of their natural resources (eg land, water, woods) in the green economy model can afford them new developmental opportunities and help them counteract the process of marginalization and decline that they have undergone as a result of industrialization and the development of the service economy. However, whether and to what extent the push towards green fuels and green technology can promote actual sustainable development paths for marginal areas and populations, from the economic, environmental, and social points of view, is contested (Boehmer-Christiansen 2003; Kitchen and Marsden 2009; Le Blanc 2011). In general, as highlighted by Boehmer-Christiansen (2003), green technologies cannot be defended on grounds of equity. Rather, they rely on commercial expectations and promises of secondary benefits, which in many cases end up serving the interests of technical, commercial, and political elites.

Moreover, as emphasized by research on social acceptance of renewable energy facilities (Bell et al 2005; Van der Horst 2007; Wolsink 2007; Wüstenhagen et al 2007; Aitken 2010), the implementation of green economy at the local community level is often characterized by limited attention paid to central concerns of sustainable local development (Marsden 2006; Wright and Kurian 2010), such as distributional justice (Gross 2007), concerning the way in which the costs and benefits (financial as well as environmental) associated with a certain infrastructure are spatially distributed, and procedural justice (Woods 2003; Jobert et al 2007), concerning the provision in the planning process for a fair decision-making process giving all relevant local stakeholders an opportunity to participate and to express different views on the problem and the solution.

Furthermore, with regard to rural communities, and especially mountain areas, as highlighted by Osti (2011) in

relation to the exploitation of renewable energy sources, their vulnerability in terms of small and old populations, and often a lack of cultural and social capital, may result in a sort of colonization by external powers and actors, which does not create opportunities for local development.

On these premises, this article analyzes the limits of the green economy approach in promoting effective sustainable development in mountain areas by focusing on an empirical case study concerning renewable energy production from biogas. The focus on this energy source is particularly important because, as highlighted by Toke (2011:72), in rural areas biogas "is now becoming a major renewable energy technology with many European countries expanding their biogas programs." As far as Italy is concerned, since the end of the 1990s the number of biogas plants has rapidly increased from a dozen to more than 300 in 2010 (Carrosio 2011).

In what follows, the characteristics of the local agricultural system of the Italian Alpine valley where the biogas plant was to be built will be described. This will be followed by highlighting the characteristics of the biogas project, the main stakeholders involved, and the way in which the decisional process was managed by local political institutions. Finally, the focus will be on the emergence of a local opposition movement to the biogas plant. The goal is to explore why the biogas project was contested by the local community and why it was eventually abandoned by the local institutions.

Methodology

Following Woods (2003), a methodology based on a discourse/narrative analysis was adopted. According to Woods (2003), rural conflicts over renewable energies need to be analyzed as processes of confrontation between broad visions concerning nature and the rural, rather than as results of controversies between selfish locals attached to their "backyard" and developers, as argued by the "not in my backyard" (NIMBY) syndrome explanation (Van der Horst 2007). Linked to these broad visions there are narratives and discourses that enable nature and the rural to be represented by social actors (Woods 2003: 273).

On the basis of this methodological approach, the emergence around the biogas project of 2 divergent visions and discourses about agriculture and rural development in mountain areas is traced. In order to do this a qualitative analysis of a variety of texts—from official documents concerning the biogas project and gray material either against or in favor of the biogas plant, to local newspaper reports—was undertaken. Moreover, a number of semistructured interviews were conducted with key stakeholders from the local civil society as well as from local political institutions.

The local case study: the valley of Giudicarie Esteriori, Province of Trento, Italy

The valley of Giudicarie Esteriori, where the biogas plant was to be built, is an Alpine valley located in the autonomous Province of Trento, in Northeast Italy (Figure 1). It covers an area of about 22,000 km^2 with an altitude ranging from 300 to 3160 m. Agricultural activity in the valley mainly consists of dairy farming and is concentrated in a plateau area belonging to 4 small municipalities.

In the valley, the average animal stocking rate is 2.45 livestock units/ha. This apparently satisfactory rate in fact reflects very different situations among the local farms with regard to the number of cows and available land. Indeed, although 50% of the farms in the valley have a value below 2 livestock units/ha, 31.15% have a value between 2 and 3, and 4.92% have a value above 4. The picture that emerges from these data is that of a mountain area where a large number of small rural farms coexist with a number of medium-sized farms and a minority of very large intensive farms, which can reach 700–1000 livestock units/ha.

Intensification of the dairy farming industry in the area is linked to the production of the local dairy cooperative, which, with about 100 workers and 3 factories, is the biggest and most important cooperative in the dairy sector of the Province of Trento. The local dairy cooperative has progressively specialized in the production of 2 kinds of cheese for large-scale retail. The quality of this production has been recently put under scrutiny because of some food safety incidents, which negatively affected the image of the dairy cooperative (L'Adige 2010).

The most evident consequence of the intensification of local agriculture has been exacerbation of the manure problem and—as a consequence—the worsening of the relationship between farmers seeking land on which to dump their waste, sometimes breaching municipal regulations on manure management, on the one hand, and local municipalities, rural communities, and the tourist sector worried about the impact on the environment and economic development on the other hand (Magnani and Struffi 2009).

The project for the centralized biogas plant

The origin of the biogas project can be traced back to an environmental emergency that occurred in 2002, when traces of fecal microorganisms and fertilizers were found on the beaches of Lake Garda, one of the most renowned tourist destinations in northern Italy. It was soon discovered that they originated from a river that—before debouching into the lake—passes through the valley of Giudicarie Esteriori. Faced with the risk of damaging the

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FIGURE 1 The valley of Giudicarie Esteriori, Province of Trento, Italy. (Photo courtesy of CIGE)

flourishing tourist industry on the lake, the provincial administration decided that something had to be done about the environmental pollution due to the local intensive dairy farming.

The building of a large biogas plant was already foreseen by the provincial administration as the preferable solution. Indeed, the large incentives for the production of renewable energy in general, and from agricultural biomasses in particular, which the national government had started to offer at the end of the 1990s, made the biogas solution a particularly attractive business proposition (Carrosio 2011).

In this context, in 2004 the 4 municipalities of the valley commissioned the local agricultural school and research center to draw up a feasibility study. The agronomists at the local agricultural school envisaged the creation of a centralized biogas plant for the cogeneration of heat and power, through the burning of biogas in an internal combustion engine. The biogas plant would be able to treat about 90,000 tons of agricultural biomasses and would have a capacity of 997 kW. The facility proposed by the experts at the local agricultural school was of an extremely large size for an Alpine valley, if compared with the existing biogas plants in the nearby Province of Bozen, which treated a quantity of agricultural waste amounting to between 8000 and 20,000 tons (Provincia Autonoma di Bolzano 2011).

Sixty-eight farmers, with a total of about 3847 livestock units (ie all the farms in the area), were identified as possible users. The creation of a new cooperative structure among them to collectively manage the new technology was suggested as the most appropriate organizational solution.

The study foresaw the building of 2 anaerobic digesters by which the biomass would be processed to produce biogas, and 7 storage tanks 33 m long and 6 m high in which the digested manure would be stored.

As for the majority of existing biogas plants in the lowland areas of Italy (Carrosio 2011), the feedstock included not just slurry and manure, which amounted to 68.2%, but also around 30% corn and 6% unspecified other materials.

The planning process and the vision of the local institutions

Following the delivery of the feasibility study in 2005, a commission was created to evaluate the project, define the organizational setup for the biogas plant, and identify its possible location. The commission consisted of political officials from the 4 local municipalities, representatives of the ad hoc-created "cooperative of the local dairy farmers for the management of the biogas plant"—formally comprising the large majority of the

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dairy farmers in the valley but actually led by a few intensive farmers—and the managers of the electricity cooperative of the valley (Consorzio Elettrico Industriale di Stenico [CEIS]), which was going to manage the production and distribution of electricity generated from biogas. The CEIS was an old energy cooperative dating back to 1905, created with the aim of contributing to the economic and social improvement of the population living in the valley through the production and distribution of electricity mainly derived from local hydroelectric sources (for other information on this type of energy cooperative in Italy, see Spinicci 2011). Since its creation the CEIS had become a quite large organization, counting in 2009 about 3159 members—about 70% of local families—and 6227 customers. The electricity produced by the CEIS had become increasingly insufficient to cover local needs. Looking for new and highly subsidized energy sources had thus become a priority. In addition, the managers of the CEIS were themselves intensive farmers, thus they were highly interested in solving the problem of excess of manure.

Adopting a corporatist and technocratic model of decision-making (Wolsink 2007), the local civil society was not directly involved in the work of the commission. Nor was any action taken at the time to inform the general population directly about the feasibility study and the biogas project.

Only in 2006, after the commission had definitively approved the project, did an information campaign aimed at the local population begin. The booklet distributed to households by the local municipalities stressed that the biogas plant was the only technological solution that was able to solve the environmental problem of manure, while also producing economic benefits for local agriculture and the local community.

As regards the first aspect, it was argued that the final output from the anaerobic digestion process was odorless matter devoid of its pathogen charge, which could thus be more easily absorbed by the land. The improved agronomic quality of the manure resulting from treatment with the biogas facility would in turn result in a reduction of the total quantity of nitrogen used in the valley, and reduce the risk of water pollution.

With regard to the economic advantages, the pamphlet stressed that the recent development of a market for green certificates made the production of power from biomasses particularly interesting in that it could be sold to energy producers and importers. This was an important opportunity to supplement the local farmers' incomes, which had been progressively reduced by declining milk prices (Huttunen 2009). In particular, the financial plan approved by the commission estimated a profit of 1,300,000 € (US$ 1,691,000) from selling the energy produced from biogas.

It was also emphasized that the biogas project could generate benefits not only for the farmers but also for the local community as a whole. Indeed, it was stressed that the profits earned from exploitation of the energy would be used to the advantage of the various cooperative organizations on which the local society was based. In particular, it was planned that the heat generated burning biogas to produce electricity would be used to heat the local dairy cooperative and other public buildings. Furthermore, thanks to the surplus of energy generated by the biogas facility, the local electricity cooperative would be able to expand its social base to all the families residing in the valley, so that the economic profit resulting from the energy business would be shared by a larger part of the local community.

It was emphasized that these economic benefits would largely compensate for the costs of the construction of the plant. In particular, the total amount needed to build the centralized plant was estimated at 7,200,000 € (US$ 9,364,000). However, it was stressed that 50% of this sum was going to be directly financed by the province. The remainder would be paid through a bank loan by the 4 municipalities, the CEIS, and the cooperative of dairy farmers.

As for the location of the plant, the commission decided that the 2 digesters were to be built in the main municipality of the valley (Fiavè) where the dairy cooperative was located, whereas the storage tanks were to be built in various locations near the farms. In particular, the site chosen for the digesters was an abandoned area about 1.6 km from the main village and in a barycentric position with respect to the farms that were going to be served by the biogas plant. The project received public support from the most important local professional organizations, namely the Provincial Federation of Cooperatives and the Provincial Federation of Cow Breeders.

The local community's opposition to the project

However, between 2005 and 2006 a group of citizens belonging to a local environmental organization founded a committee to oppose the biogas project. The committee, which took the generic name of Committee for the Valley of Giudicarie Esteriori (CIGE), defined itself as a nonpolitical group of citizens united by attachment to their valley and by the need to ensure its sustainable development from the environmental, economic, and social points of view (see the committee's website: www.cige.altervista.org). The main goal of the committee in relation to the biogas project was to create the public debate, which until then had been rejected by the political institutions.

To this end, the committee distributed leaflets and organized information meetings and a conference. On these occasions a variety of experts—economists, agronomists, engineers and farmers union leaders—recruited not only at local level but also from national

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FIGURE 2 Local people attending the conference organized by the committee against the biogas project. (Photo courtesy of CIGE)

trade union organizations and social movements were invited to discuss the environmental and social effects of producing energy from agricultural biomasses by means of a large, centralized biogas plant in a mountain valley (Figure 2).

An alternative view emerged that challenged the environmental, economic, and social sustainability of the biogas project relative to local mountain agriculture and the local society. Firstly, the view that the biogas plant was a solution for the ecological problem caused by intensive agricultural activity in the valley was contested by raising the issue of the energy efficiency of the feedstock used to produce the biogas. In particular, it was stressed that manure is the least efficient of biomasses in terms of energy production. It was pointed out that running a large-sized biogas plant in a small Alpine valley inevitably also required the processing of a large quantity of more energy-efficient matter, such as corn. The cultivation of corn in order to feed a digester for the production of bioenergy was profoundly antiecological, given the amount of natural resources and fertilizers required.

Moreover, the committee raised the issue of distributive justice (Gross 2007) in regard to the biogas project. It emphasized in particular that, far from being a real community project, the advantages of the centralized biogas plant would accrue only to a few powerful actors. The large biogas plant would enable the few large-scale farmers in the valley to solve their problem of excess manure without having to reduce their livestock. By contrast, smallholder farmers, with a balanced relation between number of cows and land, would have no environmental advantage. Indeed, as a result of the use of a centralized plant—where a large quantity of high-nitrogen manure would be conveyed by intensive farmers—smallholder farmers would find themselves with digested matter of environmentally lower quality to spread on their land.

Furthermore, the risk that the building of a large biogas plant might result in radical transformation of farming activity in the valley—that is, conversion to the production of energy crops, as had happened on many lowland farms (Carrosio 2011)—was also highlighted by the national small farmer union leaders invited by the committee. In addition, with the help of an economist from the local university, the committee pointed out that the profits for the farmer cooperative and for the whole community were indeed uncertain, because they depended on increasingly variable factors such as the continuation of large national incentives to renewable energy production, the price of agricultural products (eg corn) needed to feed the large plant, and the cost of transportation. All these factors would negatively affect

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the management costs of a large centralized plant. The tourism economy would also be damaged by the building of a large waste infrastructure and by the consequent increase in truck traffic.

Finally, the issue of procedural justice (Jobert et al 2007) was raised by highlighting the lack of involvement of the general local community in the planning of the biogas facility and the secrecy surrounding all key aspects of the project, namely its characteristics, the farmers involved, and its risks.

The local committee's alternative vision of sustainable rural development

Accordingly, the committee asked the local municipalities to suspend the decision on the biogas project and to create a forum for discussion in which citizens, associations, economic actors, and politicians in the valley could analyze other approaches to the environmental problems caused by local agriculture in the context of a shared long-term plan for sustainable rural development. The core of the committee's opposition to the waste facility was not the selfish protection of their "backyard" traditionally denoted as the NIMBY syndrome (Van der Horst 2007), but rather a different vision of the way forward to sustainable development of the local mountain agriculture. In the leaflets distributed by the committee, this was not identified with implementation of innovative technology for the production of "renewable energy" that would enable the survival of the existing intensive dairy farming industry, but with deeper social and ecological restructuring of the local agriculture.

As emphasized by one of the leaders of the committee:

> *The goal of our committee is not exclusively to fight against the building of an oversized biogas plant but to promote more ambitious ideas. We make a claim for radical change in the development strategy of the valley. We ask local institutions to put under discussion the entire productive system, to promote research with the aim of overcoming the present model of industrial agriculture and to embrace a new productive model that is more sustainable for a small Alpine valley such as our own. This means overcoming the concept of quantity, and the idea of competing on the basis of lower prices, and endorsing the concept of quality (interview with the leaders of the committee, 30 April 2011).*

In order to promote this discourse of structural change, the committee extended its network beyond the local community and connected the local fight against the biogas project with the national movement for sustainable alpine agriculture, known as *Ruralpini*. The leader of the movement—an agronomist working at the University of Milan—was promoting a campaign against the widespread use of large biogas plants in lowland areas of northern Italy. Invited to the public meetings organized by the committee, he emphasized that a structural change in local agriculture was made increasingly necessary by the evolution of the Common Agricultural Policy as well as by international factors. It was stressed in particular that the forthcoming liberalization of milk prices would increase the disadvantage of mountain agriculture and lead to a growing concentration of milk production on a few lowland intensive farms. Moreover, the rising costs of farm animal feed and transportation were further damaging mountain agriculture and the industrial system of big dairy cooperatives producing cheese for large-scale retail. If mountain agriculture was to survive it would have to be downsized and converted to small-scale, high-quality production (Fleury et al 2008). The building of a large centralized biogas plant in a small mountain valley was *de facto* inconsistent with this goal.

The impact on the larger community and on the small dairy farmers

By organizing a public and expert-informed debate on the biogas solution, and by articulating a different view of the environmental problem of local agriculture, the committee managed to mobilize the great majority of the local population against the biogas project. In 2007 the committee collected more than 400 signatures (in a population of fewer than 1000 inhabitants) for a petition asking the municipality supposed to host the biogas plant not to issue a permit for the building of any centralized biogas plant in the area.

Eventually, the small dairy farmers also withdrew their support for the project. There seemed initially to be general consensus among the local farmers on the biogas solution. Lacking detailed knowledge of what the biogas plant would entail, the local farmers at first saw it as yielding significant agricultural benefits, such as centralized storage of manure, and hence lower investment costs and reduced transport miles for the individual farmer, together with possible economic benefits linked to the energy business (Raven and Gregersen 2007).

However, it became increasingly clear that the farming community was far from united in its attitude to the biogas project. In particular, as a result of the action of the committee, growing concerns emerged among the smallholder farmers, who represented the majority of farms in the area, about the advantages of the project for their work and livelihoods as well as for the future of local agriculture. These farmers soon realized that, unlike the intensive farmers faced with the problem of a large manure surplus, they would not have any environmental advantage from the new facility. Moreover, unlike the intensive farmers, they did not conceive of the transformation of their activity into an energy business as a possible and acceptable solution for their livelihoods. Following their withdrawal, the municipalities also recognized that a centralized biogas plant was not a sustainable solution for

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the valley, with the consequence that the centralized biogas project was definitively abandoned.

Conclusion

This article has addressed the issue of the complex and controversial relationship between the green economy and sustainable development for mountain areas by focusing on a case study of the projected building of a centralized biogas plant in an Alpine valley. As highlighted above, the project, initially promoted by regional and municipal political institutions as the best way to foster the environmental and economic sustainability of local agriculture, and supported by the most important local farmer organizations, grew increasingly controversial at the community level. As the local committee opposed the biogas project by fostering an open, expert-informed critical debate on the long-term local effects of a new and relatively unknown so-called green technology, it revealed the contradictions of the proposed project for the local mountain agricultural, ecological, and social systems. Moreover, it showed that the valley's real sustainable development could come about only via a deeper organizational and social restructuring of local agriculture and a shared bottom-up approach. As a result of the public and critical debate, the majority of the local population and farmers decided to withdraw their support for the project.

Eventually the conflict resulted in the promotion by local municipalities of a more open and constructive debate with the local community to look for socially acceptable and more environmentally sustainable solutions to manure management (eg the use of BIO-LIT rock dust as well as the building of small individual farm biogas plants). Moreover, the action of the committee also fostered the diffusion at the local level of greater environmental awareness. In the following years one intensive farmer decided to restructure his activity towards smaller-scale production.

The case presented has important policy implications in regard to the implementation in mountain areas of a green economy model that is also sustainable for local communities. Indeed, in order for the green economy to contribute to mountain development, it must be embedded in local socioecological systems and be shaped in accordance with their characteristics and needs. With particular regard to the exploitation and production of renewable energy, this means that at the local level attention should be paid to the following key aspects: information and transparency from the outset in the relationship between local institutions and local populations with regard to renewable energy projects and technologies; fair participation in the planning process by representatives of the various local stakeholders, namely farmers, political representatives, citizens/consumers, environmental associations, and the tourism sector; inclusion of different information and viewpoints, lay and expert knowledge, and different kinds of expertise; and access to direct benefits for the local population through the bottom-up creation of extensive cooperative structures and networks including all the local community stakeholders.

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