

## Social Acceptance of Geothermal Energy in Southern Italy

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### ABSTRACT

Although Italy has any possible reason to be considered a geothermal country, there appears to be little knowledge or understanding of the potentials of this energy source and its implications for the general society. This paper presents the results of a cultural and social acceptability assessment of geothermal energy exploitation in southern Italy (Palermo, Sicily). This study had two primary objectives: (1) to explore the views and opinions of local communities regarding the potential and real exploitation of geothermal energy; and (2) to contribute to the growing scientific and social-scientific literature of the social acceptance of geothermal energy.

To explore attitudes and public views towards geothermal energy technologies, we performed a case study using a mix of qualitative and quantitative methods. Our case study has two basic components: (1) Focus Group studies were conducted on four different groups of citizens and stakeholders from the selected area. (2) A survey was conducted on a sample of 400 citizens calibrated by gender, age, education, job condition, and residence.

The results show that a public dialogue on geothermal energy exploitation should be based on and accompanied by a communication action strategy

### 1. INTRODUCTION

Italy was the first country to exploit geothermal energy, back in 1904, and ranks five in the world for geothermal power production. Balneological uses have been rooted in the Italian culture since the roman time, and thermal uses of geothermal energy in Italy are among the largest in Europe. In spite of the geothermal Italian highlights and although over the last decade there has been an increasing interest in the use of geothermal technologies exploiting low temperature resources, there appears to be little knowledge or understanding of the potentials of this renewable energy source and its implications for the general society.

Renewable energy exploitation is in general well supported by the public; however, studies on the social acceptance of these technologies have been substantially excluded from energy innovation programs.

Renewable energy facilities (e.g. wind, solar, biomass, and geothermal) affect local and regional communities in several ways by influencing matters such as land management, distributional and procedural justice, public governance, and economic opportunities. It is increasingly recognized that low levels of social acceptance of energy innovation programs may be a constraining factor to increase the share of renewables.

In the last decade, it has become the European Union's ambition to encourage scientific development and to develop a knowledge-based innovation society that creates new jobs and prosperity preserving the environment and meeting societal needs (van den Hoven, 2013).

Key enabling technologies can provide tools that strongly influence lives of citizens and open ethical and social dilemma, leading to the need to improve the incorporation of societal needs and ethical concerns within research programs.

The approach elaborated by the European Union to fix this goal is termed Responsible Research and Innovation (RRI) and consists in an "upstream" engagement of stakeholders (politicians, manager, citizens, associations...) in an early stage of the innovation process. This way of proceeding allows all stakeholders (1) to be aware on the consequences of the outcomes of their actions and on the range of options open to them and (2) to evaluate outcomes and options of every possibility in terms of ethical values (including equality, autonomy, sustainability, democracy and efficiency) and (3) to use these considerations (under A and B) as functional requirements for the design and development of new research, products and services (van den Hoven, 2013).

Social acceptance investigation is an essential step to prepare meaningful public participation in the innovation process and green technologies, i.e. renewable energies, make no exception for this rule. Moreover, social acceptance is increasingly recognized as being of primary importance for the successful implementation of renewable energy policies (Pellizzoni, 2010).

This paper presents the results of a cultural and social acceptability assessment of geothermal energy exploitation in southern Italy (Palermo, Sicily), carried out in the framework of the VIGOR Project, a three-year program dedicated to a comprehensive assessment of geothermal energy potentials and applications in four regions (Apulia, Calabria, Campania, Sicily). VIGOR aims to study a wide array of geothermal applications, from low to high enthalpy, depending on the natural resources and the economic and social aspects of the reference territories.

Consistently with the RRI approach, the VIGOR Project has investigated the geothermal potential of southern Italy adopting a comprehensive approach that includes social studies.

## 2. TERMINI IMERESE

Termini Imerese is one of the 8 sites chosen as a case study within the VIGOR Project to assess the geothermal potential of four southern Italian regions (Manzella, 2013). The occurrence of two main hot springs, "Bagni Vecchi" and "Bagni Nuovi", with flow rates between 5 and 15 l/s and temperatures around 42°C prove hydrothermal circulation in the area. Based on the geothermal potential defined by geological, morphological and hydrogeological analyses, as well as geochemical sampling and geophysical investigation, some innovative solutions have been suggested, including the traditional touristic and therapeutic sector (thermal baths), district heating, and desalination of sea water.

Socially, politically and economically speaking, the various parties (stakeholder, citizens, young generations) of the citizens of Termini Imerese were particularly sensitive to issues regarding innovation and energy policies at the moment of fieldwork (October 2012). The social and economic fabric of the area has been hard hit by rapid de-industrialisation and diffuse unemployment, the economic crisis and the impending regional elections made the poignancy of the situation very accentuated.

The social condition of the area made Termini Imerese a very interesting case study to investigate the attitude of citizens and other stakeholders towards new technologies that may impact their daily life. We selected this area as a step towards designing approaches for "upstream" public engagement, i.e. engaging citizens in the early steps of eventual energy technology developments and particularly geothermal.

## 3. METHODS

Social acceptance of geothermal energy has been investigated in very few cases (in Europe: (Polyzou, 2010, Lagache, 2013); in the US: (Canan, 1986), in Australia: (Dowd, 2011)). To explore the social attitude towards geothermal energy technologies, we opted for a case study in Termini Imerese (Sicily), using a mix of qualitative (focus group) and quantitative methods (surveys).

### 3.1 Focus groups

Focus groups were conducted with 4 different groups of citizens and stakeholders from the selected area (Palermo): a total of 32 people attended the focus groups, recruited by a survey agency.

The four focus groups comprised a homogeneous sample of university students (Students Focus Group), members of the general public of Termini Imerese (Citizens Focus Group), stakeholders of the energy sector (Stakeholders Focus Group), and ex-workers of the Fiat plant of Termini Imerese (Fiat workers Focus Group).

Each focus group was conducted by a facilitator and an observer and lasted an hour and a half.

### 3.2 Questionnaire

A sample population of 400 citizens living in the Palermo Province was recruited by a survey agency and was calibrated by gender (52% female/48% male); age (27% between 18 and 34 years, 36% between 35 and 54 years, 37% 55 years and above); education (22% low levels of schooling, 35% middle school, 43% high school/university); size of the town of residence (28% up to 20 thousand inhabitants, 32% living in a town of between 10 thousand and 100 thousand inhabitants, 40% living in town with more than 100 thousand inhabitants); job condition (entrepreneur, retailer/artisan, employee, student, unemployed).

All questions on the survey (except one) were ranked on a six-point scale ranging from 1 (very low level of agreement/acceptance) to 5 (very high level of agreement/acceptance), and including 0 for agreement/acceptance of uncertainty. The survey was administered by phone using CATI (computer assisted telephone interviewing) method.

## 4. SALIENCE OF ENERGY QUESTION AND GEOTHERMAL ENERGY

The feedback from the questionnaire results show that the energy question is perceived in general as a salient issue by a large majority of respondents: 35% of interviewed perceived it as urgent, 16% as very urgent and 26.5% as partially urgent.

Solar and wind energies are perceived as valid sources for energy supply. When asked if technologies would improve our standards of life in the next 20 years, 54% of the respondents answered that solar power would have a positive impact and 46% answered the same for wind power. Respondents show a very different attitude towards nuclear power: only 8.3% of them think that it would have a positive impact, while a large majority (68.3%) thinks that its impact would be negative. Public resistance to nuclear power appears to be deeply entrenched by now.

Views on geothermal energy technologies are clearly much less formed than views on solar, wind and nuclear energy. 17.5% thought that geothermal energy will have a positive effect and the same percentage thought that its impact would be negative. A relevant data for geothermal is the high percentage of uncertain ("I don't know"): 42% of respondents can't say if this energy would have a positive or negative effect on its daily life (Figure 1).

High levels of uncertainty for geothermal energy is also apparent in answers to the question "Have you ever heard about geothermal energy?", where only 17% of respondents answered positively and was confirmed by focus group discussion. This finding is all the more striking taking into account that the area has benefitted from geothermal resources throughout the centuries, public hot spring baths being the best known example.

In the general focus group, participants were optimistic about geothermal energy and considered its exploitation with keen interest, because of potentially positive consequences on employment, environment, advancement of innovation in Sicily, independence in energy supply from other countries and reduction of energy costs.

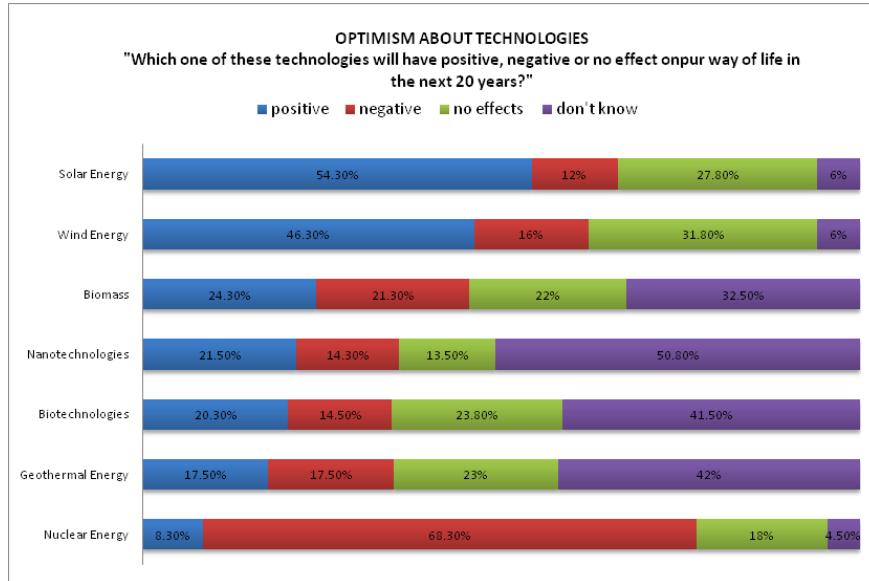
Nevertheless the level of uncertainty due to a lack of knowledge is high and more information about this technology is clearly needed and explicitly requested by our subjects:

*"We need more information. I work in the schools and we never talk about renewable energies. School goes on by single projects, we miss a long term plan on environmental education". (Stakeholders focus group)*

*"We lack public information, which is different from marketing information" (Citizens focus group)*

*"To say if we are in favor to this kind of energy exploitation, we need to have all the information to balance pros and cons" (Students focus group)*

*"If geothermal energy is good, why not? First, to reduce health risks, second to save money from the bill" (citizens of Termini Imerese).*

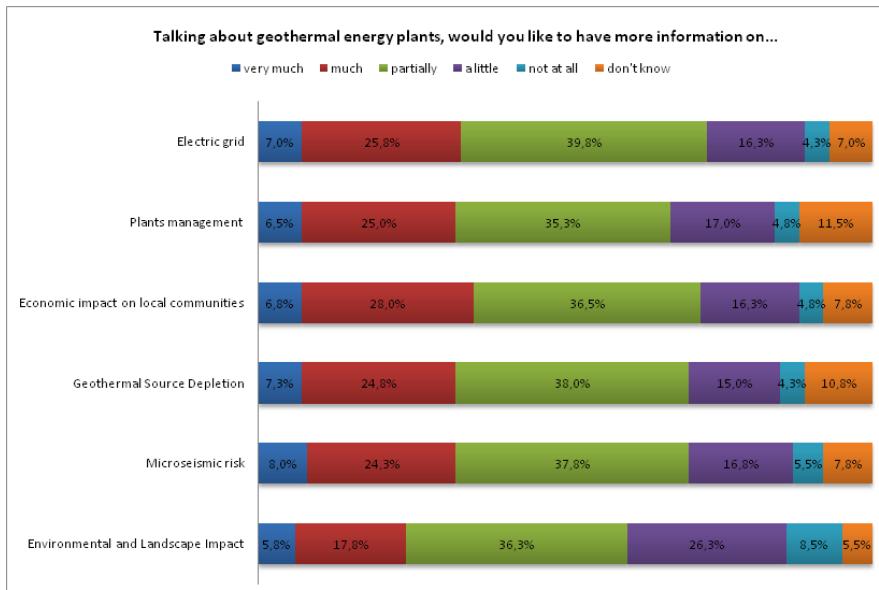


**Figure 1 – Optimism about technologies**

When asked what kind of information about geothermal energy would be primary, the interviewees of the survey showed more interest for the economic impacts on local communities than for environmental consequences. Considering focus groups discussion, the reasons for low level of concerns could be the general perception of geothermal as a low emission and green technology and the presence in the area of Termini Imerese of a great automobile industrial area that was abandoned.

*"The damage on the land has already been done... Since the industrial area is there, we could use it to develop new social opportunities". (Students focus group)*

*"Termini Imerese has already an industrial area which is becoming a ghost town. We should convert it instead of leaving it empty" (Citizens focus group)*



**Figure 2 - Information required on geothermal plants**

## 5. ENERGY POLICY AND TRUST IN PUBLIC INSTITUTION

The construction of facilities like power plants is very onerous for land use and for economic investments (Wolsink, 1994). Site location, public money investments, land management and profit distribution strongly deal with social, political, environmental and ethical questions and calls for citizens' participation.

Focus group discussion clearly showed that energy management is strongly perceived as very politicized and major concerns to a fair development of power plants rise from a lack of confidence towards public institution. The great business and the economic interests opened by the energy sector are perceived as inevitably and strongly connected with financial speculation, corruption and mismanagement. Focus group participants cited the past experience of wind plants construction as examples of bad administration, intricately interrelated with Mafia and crime in general and far removed from beneficial effects for citizens.

In this scenario, focus group participants called for greater involvement of Sicilian citizens on land management and energy policy decision-making. Moreover, we observed a strong Sicilian identity: many participants mentioned local interest in contrast to national ones and ask for direct benefits for Sicilian people as an essential condition for the exploitation of geothermal energy on their land.

*"We are badly administrated". (Citizens focus group)*

*"We miss a culture of common goods". (Fiat workers focus group)*

*"Bureaucracy is too slow". (Fiat workers focus group)*

*"We have two kinds of problems: one is bureaucratic and the other one is political". (Stakeholder focus group)*

*"There are too many interests of political and Mafioso order". (Citizens focus group)*

*"Geothermal heat exploitation is a good idea, but we saw how it worked for wind farm: they took money from energy subsidies but many plants are not working". (Citizens focus group)*

*"Politic depends on excise tax on fossil fuels". (Citizens focus group)*

*"Sicily is under the heel of Italy. We are considered as a holder of votes". (Fiat workers focus group)*

*"The problem is that Sicily has always been a land where people speculated. Where in every possible way the Sicilian citizens have been cheated." (Citizens focus group)*

*"It is better to exploit renewable resources than the fossil fuels. What is important is that Sicily has its return. The geothermal energy of Sicily belongs to Sicilians". (Student focus group)*

*"It's good, but we need it to be different from wind farms, which here in Sicily have become a shame, because we have many plants, but they are not working" (citizens of Termini Imerese).*

The reliability and the proficiency of public institutions concerning energetic choices were also explored in the survey. When asked about the competent energy policy, respondents indicate scientists and researchers as more competent actors (54.3% of respondents think they are competent or very competent). Lower levels of competence are attributed to energy companies and national governments (34.3% and 39.5% of respondents think they are competent or very competent).

## 6. PUBLIC PARTICIPATION AND INFORMATION

Scientist and researchers are clearly perceived as the most reliable informational sources. The percentage of survey respondents that show a high level of confidence in researchers and universities is 37%, while the lowest rates of trust are associated with local administrations (24%) on the one hand and the European Union (25%) on the other.

The discussions in the focus group really resonate with survey results and calls for information from areas where geothermal is already exploited:

*"We can meet and talk about it, but we are not experts. Researchers should find the right place for development and go there and illustrate opportunities". (Citizens focus group)*

*"If in Tuscany they already have these kind of plants, Sicily could be inspired by the experience of that area". (Citizens focus group)*

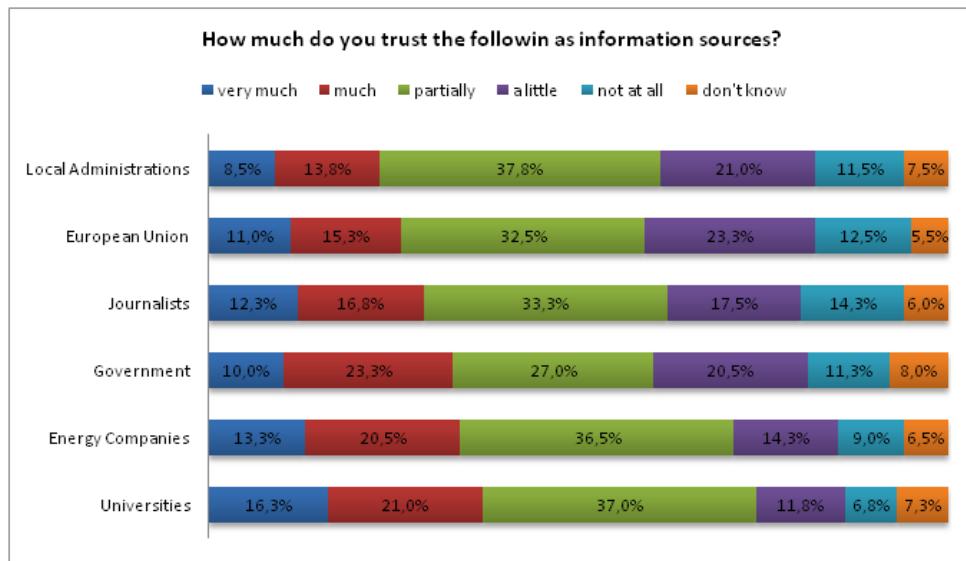
Participants call for more efforts also in education programs, from primary school, to universities.

*"We need more information. I work in the schools and we never talk about renewable energies. Schools go on by single projects; we miss a long term plan on environmental education". (Stakeholders focus group)*

*"Environmental law is not included in the programs of Sicilian law faculties". (Stakeholders focus group)*

*"What I see is a diffuse ignorance and no efforts to overcome this ignorance. In my opinion, politics works better in ignorance and that's why they want to keep this situation". (Stakeholders focus group)*

Information and communication is perceived in general as a primary condition to enhance public awareness and encourage public participation.



**Figure 3 – Trust in information sources**

## 7. CONCLUSIONS AND FURTHER RESEARCH

In this paper we have reported on research on social and cultural acceptability of potential exploitation of geothermal resources in the south of Italy as an integral part of a wider study into the feasibility of developing geothermal energy technologies in that area. Our results show that in Termini Imerese there is considerable optimism about geothermal energy exploitation. Nevertheless, levels of uncertainty amongst the general population are high and relates to a substantial lack of knowledge and information on the subject. At the same time, citizens clearly ask for major public participation in energy policy, land management and public fund allocation.

Taken together, these findings suggest the need for more information and educational activity in order to increase public awareness on geothermal energy and to reduce citizen uncertainties and ease public concerns.

Successful implementation of geothermal exploitation strongly needs public participation to manage the energy innovation process on a socially sustainable path. Apparent contradictions between different stakeholders views and needs strongly ask for the construction of a public debate able to involve all stakeholders from the very early stage of the innovation process.

Social acceptance investigation represents a first step towards the setting of innovation and politics agenda priorities on mutual responsive concerted actions that consider needs and interests of all relevant actors.

According to the results of our research, public dialogue on geothermal energy exploitation in Termini Imerese should be based on and accompanied by a communication action strategy.

Our results show that geothermal technologies and especially power plants are intimately linked with land management and the identities of communities. We therefore suggest that each territory is very different from the others and necessitates a specific localized analysis. To contribute to the growing scientific and social-scientific literature of the social acceptance of geothermal energy, the scientific community still has a quite a lot of work to do.

To have a more detailed and nuanced picture of geothermal social acceptance in Italy, CNR is now conducting a new case study in an area of central Italy favorable for high enthalpy exploitation and close to an area where geothermal power plants are already operating and organized public protest are present. The case study will follow the same methodological framework as in Termini Imerese in order to have comparable data. This new study will enrich knowledge and understanding of social attitude, concerns and expectations on geothermal exploitation in Italy.

## REFERENCES

- Albanese C., Allansdottir A. , Amato L., Ardizzone F., Bellani S., Bertini G., Botteghi S., Bruno D. , Caielli G., Caiozzi F., Caputi A., Catalano R., Chiesa S., Contino A. , d'Arpa S., de Alteriis G. , De Franco R., Dello Buono D., Destro E., Di Sipio E., Donato A., Doveri M., Dragone V., Ellero A., Fedi M., Ferranti L., Florio G., Folino M., Galgaro A. , Gennaro C. , Gianelli G., Giaretta A., Gola G., Greco G., Iaquinta P., Inversi B., Iorio M. , Iovine G., Izzi F., La Manna M., Livani M., Lombardo G., Lopez N., Magnelli D., Maio D., Manzella A. , Marchesini I., Martini G., Masetti G., Mercadante A., Minissale A., Montanari D., Montegrossi G., Monteleone S. , Muto F., Muttoni G., Norini G., Pellizzzone A. , Perotta P., Petracchini L., Pierini S., Polemio M., Rizzo E., Russo L., Sabatino M. , Santaloia F., Santilano A. , Scrocca S., Soleri S., Tansi C., Terranova O., Teza G. , Tranchida G., Trumpy E., Uricchio V. e Valenti V. (2014). VIGOR: Sviluppo geotermico nelle Regioni della Convergenza. Progetto VIGOR - Valutazione del Potenziale Geotermico delle Regioni della Convergenza, POI Energie Rinnovabili e Risparmio Energetico 2007-2013, CNR-IGG, ISBN: 9788879580113.

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Canan, P.: Rethinking geothermal energy's contribution to community development, *Geothermics*, Vol. 15, Issue 4, p. 431-434 (1986).

Dowd, M., Boughen, N., Ashworth, P., Carr-Cornish, S.. Geothermal technology in Australia: Investigating social acceptance, *Energy Policy*, vol. 39, p. 6301-6307 (2011).

Lagache, L., Genter, A., Baumgaertner, J., Cuenot, N., Koelbell, T., Texier, P., Villadangos, G., et al. How is evaluated acceptability of an EGS project in Europe: the Soultz- Kutzenhausen geothermal project?, *European Geothermal Congress*, Pisa, 2013.

Manzella A. and the VIGOR Team: Geothermal development in southern Italy and the contribution of the VIGOR Projects. *Proceedings EGC - European Geothermal Congress 2013* Pisa, Italy, 3-7/06/2013

Pellizzoni. L.: Risk and Responsibility in a Manufactured World, *SciEngEthics*, 16: 463–478, (2010).

Polyzou, O., Stamataki, S., Geothermal Energy and Local Societies – A NIMBY Syndrome Contradiction?, *World Geothermal Congress 2010* Bali, Indonesia, 25-29 April 2010

van den Hoven, J.: Options for Strengthening Responsible Research and Innovation Report of the Expert Group on the State of Art in Europe on Responsible Research and Innovation, 2013

Wolsink, M.: Entanglement of Interest and Motives: Assumptions