



HAL
open science

Public perception of geothermal projects in Alsace: between energy transition and territorial rooting

Philippe Chavot, Anne Masseran, Cyrille Bodin, Christine Heimlich, Yeny Serrano, Jean Zoungrana

► To cite this version:

Philippe Chavot, Anne Masseran, Cyrille Bodin, Christine Heimlich, Yeny Serrano, et al.. Public perception of geothermal projects in Alsace: between energy transition and territorial rooting. European Geothermal Congress 2019, European Geothermal Energy Council (EGEC), Jun 2019, La Haye, Netherlands. hal-02157107

HAL Id: hal-02157107

<https://hal.science/hal-02157107>

Submitted on 15 Jun 2019

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Public perception of geothermal projects in Alsace: between energy transition and territorial rooting

Philippe Chavot¹, Anne Masseran², Cyrille Bodin¹, Christine Heimlich³, Yeny Serrano¹, Jean Zoungrana⁴.

¹ University of Strasbourg / LISEC / 7, rue de l'Université, 6700 Strasbourg – France

² University of Strasbourg / CREM, Île du Saulcy, 57045, Metz Cedex 01, France

³ University of Strasbourg / IPGS-EOST/ Strasbourg – France

⁴ University of Strasbourg / SAGE, 5 allée du Général Rouvillois, 67083, Strasbourg, France

philippe.chavot@unistra.fr

Keywords: public perception of geothermal project, Alsace, public understanding of science, public engagement.

ABSTRACT

Deep geothermal energy was introduced to France in the 1980s in the Paris region. High-energy geothermal energy (>150°) has been entering its industrial age since the early 2010s. Several projects, aimed at the production of geothermal heat and electricity, are located in Alsace, and some of these have been quite controversial since 2014, when the setting up of legal public enquiries was announced. This paper focuses on a study of public perception of deep geothermal energy (the European Union's Horizon 2020 DESTRESS project, grant agreement 691728) that we carried out in 2017. This research looks at several territories belonging to the Eurometropolis of Strasbourg (EMS) – where several projects are being challenged – and Northern Alsace – where deep geothermal energy seems to be fairly well accepted. It combines a quantitative survey using questionnaires with a qualitative approach using focus groups (881 people were interviewed by questionnaire and about 50 participants participated in the focus groups). We make the following assumption: perceptions of the risks and benefits of geothermal energy vary depending on the way people experience and give meanings to their territory. In this context, the way in which local authorities invest in the field of renewable energy, notably through their climate plan, may play an important role in acceptance of deep geothermal projects by the public. Only the quantitative survey will be presented as part of this paper. It will account for three issues that may affect the shaping of public perception of deep geothermal energy: individual knowledge of techniques and of the local projects,

perceptions and appropriation of information on geothermal energy, and perceptions of the local project and its risks and benefits.

1. INTRODUCTION

1.1 Development of deep geothermal energy in France

In France, the production of heat has been the primary driving force towards the development of geothermal energy. In the 1980s, in the context of the oil crisis, low-temperature geothermal projects were developed as a lower-cost solution to heating homes and businesses. As a result, around thirty low-energy geothermal plants were built in the Paris Basin and Aquitaine between 1980 and 1985. High-temperature geothermal energy plans emerged with the implementation of the Soultz-sous-Forêts pilot project in 1985.¹

The development of low- and high-temperature geothermal energy in the 2010s is supported by various provisions made within the framework of the national climate plan (2004) and the Grenelle 1 and 2 laws (2009/10). First, the Renewable Heat Fund helps operators to produce heat at a competitive price compared to the use of fossil fuels. Its institution in 2009 has led to a revival of low-temperature geothermal energy in the Paris Basin and has also encouraged provincial cities to integrate the development of geothermal energy into their territorial climate plan. Second, the re-evaluation of Electricité de France's electricity purchase tariffs in 2010, setting the price per kWh from geothermal energy at 20 cents, ensures the economic viability of cogeneration projects and has led several companies to favour this option rather than heat production alone. This has important

¹ The plant became an industrial site in June 2016. Inspired by the Soultz-Sous-Forêts model, many projects have been launched since 2000 in the German, Swiss and French regions of the Rhine basin. On the

French side, in Alsace, the Rittershoffen geothermal power plant was inaugurated in 2016 and supplies heat to a starch factory.

consequences for the way geothermal energy is locally perceived by elected representatives and residents.

The governance of deep geothermal energy demonstrates the flexibility of energy technologies (Akrich and Méadel 1999; Christen and Hamman 2015). When the drilling project is built into a local territorial plan to supply heating networks, the prime contractor is often a local authority or an inter-municipal grouping calling on the services of a company to carry out the deep drilling work. Meanwhile, as a result of State subsidies introduced to support the energy transition, a geothermal sector has developed with investment from the leading companies in the field of energy generation and distribution and from specialist green energy start-ups (Chavot et al 2019). This new industrial sector's ambition is to develop deep geothermal energy (DGE) projects to produce heat (distributed locally) and generate electricity (sold to national operators at a price set by the State).

I.2. DGE in Alsace in the 2010s.

There was firm local resolve to introduce DGE in Alsace in the early 2010s. The projects formulated by local institutions aim to use wells with depths of 3,000-4,000 metres to produce heat and supply urban heating or generation networks. However, this commitment does not always coincide with the objectives of companies in the sector.

First, the operators' interests conflict with local authorities' projects over the preferred economic model. To achieve financial equilibrium, project owners can make use of the aid introduced by the Grenelle Acts², most notably the heat fund managed by the ADEME (the French Environment and Energy Management Agency). However, drilling in the geological context of Alsace costs several tens of millions of euros. In addition, when fossil fuel prices trend downwards, geothermal heat production becomes as expensive as conventional energy, despite State subsidies. As such, some operators are opting for more ambitious heat and electricity co-generation projects: the project's profitability is thus guaranteed because the electricity is purchased at an attractive price by Électricité de France (EDF). When this happens, the logic underpinning geothermal production is radically changed. Instead of medium-depth wells that would contribute to the local energy mix by supplying the heating networks, very deep wells – sometimes at depths of more than 4000 metres – are preferred for power generation. In such cases, the local authorities' intentions are not taken into account.

This shift in priority leads to another sticking point. When the energy is produced as heat, community support is vital because the heat generated can only be consumed locally. However, for 'high-temperature'

projects where the primary output is electricity, local support is secondary. The exploitation of underground resources is governed by the Ministry in charge of mines, the only authority apt to grant or refuse an exploration permit. As such, operators are able to elaborate their projects with no particular regard for local policies. In some such cases, local authorities therefore only express their opinions towards the end of the decision-making process, when the exact location of the wells is being defined. Local residents will only be involved once the exploration permit has been obtained from the Ministry and validation from the DREAL (Regional Directorate for the Environment, Development and Housing). Consultative public inquiries are then held as part of the application for permission to conduct exploration work, administered by the prefecture.

I.3. Analysis of the public controversy surrounding DGE in Alsace

Controversy broke out when four public inquiries concerning projects planned within the boundaries of the Eurometropolis of Strasbourg (EMS) were announced. Previous work on this controversy allows us to test some hypotheses in order to understand the attitude of the inhabitants towards geothermal energy (Chavot et al 2019):

Hyp. 1. Perceptions of the risks and benefits of geothermal energy vary depending on the way people experience and give meanings to their territory. Indeed, during the 2015 public inquiries, the most contested project was the one to be set up on a Seveso-classified industrial site, where residents had been fighting for a long time to reduce the dangerousness of the area. Conversely, geothermal energy projects have been introduced with little opposition in Northern Alsace (in Soultz-sous-Forêts, and later on in Rittershoffen). This is a region where many oil wells have been drilled in the past. In addition, residents and elected officials see the exploitation of mineral resources as a real source of economic development.

Hyp. 2. The way in which local authorities invest in the field of RES, notably through their climate plan, plays an important role in of the favorable reception of deep geothermal projects. Thus, in the south of Strasbourg, one project appears to have been well integrated into local politics and there is little controversy, similarly to projects located in Northern Alsace.

Hyp. 3. More generally, the local roots of a project influence how it is perceived by inhabitants (Chavot et al 2018). We can therefore make the distinction on the one hand between projects that are locally "anchored" or rooted in their territory, which are the outcome of a long period of consultation between the different stakeholders, and "off-ground" or unrooted projects on the other hand. With respect to the latter, projects are

² A package of environmental measures adopted in 2008-10 after the 'Grenelle roundpublic table' consultation process initiated in 2007.

developed with economic advantages and/or national political programmes in mind, and often ignore the specificities of the local territory. It is very often these unrooted projects that prove to be the most contested. This type of project may be viewed by people in terms of costs and benefits: the local residents consider that the risks incurred are higher than the benefits they could obtain from such projects.

2. METHODS AND TERRAIN

In the context of the DESTRESS project, we are interested in the formation and circulation of views on deep geothermal energy in urban and rural contexts. In particular, we conducted a survey using questionnaires to determine the opinions and perceptions on deep geothermal energy in urban and rural areas. This was complemented by the setting up of focus groups with local residents.

2.1. Areas of investigation

Four areas were investigated (Figure 1), three within the EMS and one in northern Alsace. Each are locations where deep geothermal projects at various stages of development are being implemented.

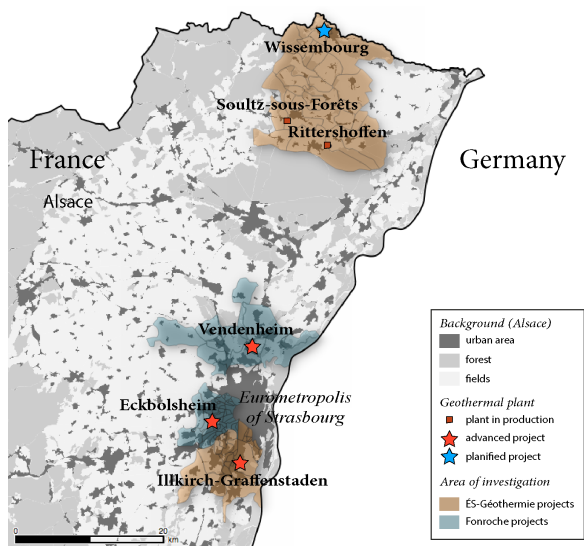


Figure 1: Location of the survey areas and the four deep geothermal projects in Alsace (source: IGN, INSEE). The survey areas were defined in order to take into account people living in host and neighbouring municipalities. The quota method was applied for each area and questionnaire interviews were conducted face to face (n = 881).

Two projects that could be qualified as ‘rootless’ (i.e. with no real local ties) are being run by the operator Fonroche. Their main objective is to generate electricity but there are plans to use the residual heat. A first project, located at the outskirts of the villages of Vendenheim and Reichstett, will be built on the site of a former oil refinery that is currently being converted into an eco-industrial park (EIP). The geothermal power plant will provide heat for the industries that

move into the industrial park, and for a housing estate and horticultural greenhouses. The second project is the Eckbolsheim project, and will be built on agricultural land on the borders of three villages: Eckbolsheim, Obberhausbergen and Wolfisheim.

There was no consultation with local politicians and residents prior to these two projects and communication on them has been very limited. Residents were only informed a few months ahead of the mandatory public inquiries, during which the population are called upon to give their opinion and comment on the projects before the prefecture signs the decree authorizing drilling work. However, while the public inquiries were going on, there were strong protests from local residents and associations, orchestrated by the municipalities. The prefecture nonetheless authorized the work. At the time of our research, drilling work had just begun at Vendenheim.

The other two projects can be seen as better rooted in the local territory. The initiative comes from municipal stakeholders and the projects are led by the local operator Electricité de Strasbourg (ES). The first is located within the territory of Illkirch-Graffenstaden (Illkirch), south of the EMS. The primary purpose of the project was to supply heat to urban networks dependent on the EMS or Illkirch. The project was first introduced in the late 2000s and the municipality has regularly communicated on it since. This project received a favourable opinion (subject to reservations) from the investigating commissioner following the 2015 public inquiries. The second project is located in northern Alsace near Wissembourg, a few kilometres from the two DGE power plants already operating in Alsace. It aims to build a power plant that would attract a group of companies likely to benefit from energy sold at an attractive price compared to fossil fuels. It is backed by the Outre-Forêt community of municipalities and the département of Bas-Rhin. Although still at the project definition phase (the public inquiry has not yet been conducted and the location has not yet been decided), the project has been the subject of communication by the municipality of Wissembourg for some time now. In addition, a budget has been voted locally to reach out to companies that could be interested in creating an industrial park around the future power plant.

2.2. Selection of respondents and questionnaire administration

For our questionnaire, the different areas of study were defined as follows: for our sampling, we took the municipality in which the project is located and extended the area to neighbouring municipalities. Given its rural nature, the area around Wissembourg was subject to less strict geographical demarcation to extend the surface area studied (Figure 1). Our choice of territorial scope means we are able to compare local public opinion from several perspectives, for example: do the municipalities support projects? does deep geothermal energy have historical roots in the territory?

To conduct this quantitative study, we sampled potential respondents using the quota method. To this end, we used the statistics from the last French population census conducted by INSEE in 2013. This database allowed us to determine the main socio-demographic characteristics of the populations residing in the four areas and implement quota sampling. Our study can thus claim a certain ‘representativeness’ of the populations studied with regard to the parent populations living in the four areas. Three socio-demographic criteria were chosen to attain this ‘representativeness’: age, socio-professional category and gender, as defined by INSEE. For each of our four areas, we determined a sample size of $N = 220$ individuals, so $N_t = 881$ for our four areas. The questionnaire was administered face-to-face, on the street. The sample interviewed can thus be described as semi-random.

2.3. Structure and organization of the questionnaire

In order to study the general question of social representations of deep geothermal energy in local living environments, we divided our questionnaire into six distinct parts (Figure 2): 1) initial contact with filter questions (village/town of residence, socio-demographic criteria), 2) knowledge and perception of deep geothermal energy in general and its main characteristics (economic, energy, environmental), 3) the perception of information concerning the local project and its debate (sources of information and their ranking, participation in public inquiries, acceptance of the local project), 4) knowledge and perception of deep geothermal energy within the local project (energy and geographical characteristics of specific projects), 5) perception of risks (risks related to drilling and exploitation of deep geothermal energy, potential technical control of risks), and 6) further sociographic details on the individuals interviewed, then taking leave.

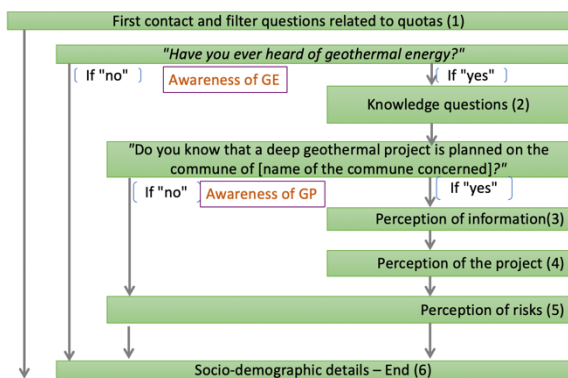


Figure 2: Presentation of the questionnaire structure

This organization and prioritization of the themes addressed gives the questionnaire a ‘funnel’ type structure: when the respondent demonstrates more specific knowledge of deep geothermal energy and potentially of its local developments, more precise and/or more territory-relevant questions can be asked.

Hence, using the various filter questions, the questionnaire may take three different ‘paths’ and may take anything from approximately two to 15 minutes to complete. Incidentally, this questionnaire makes it possible to measure both awareness of DGE in general (with the response to Q1), and of the projects (with the response to Q2)

3. MAIN RESULTS

3.1. Awareness of DGE and projects

There is relatively high awareness of DGE in all four territories: 57.3% of respondents have heard of it (Table 1). However, in many cases where people are aware of this form of power generation, it does not always go hand-in-hand with knowledge of current projects being run within the vicinity of the respondents’ home town or village. In fact, only 30.8% of respondents said that they were aware of a local project.

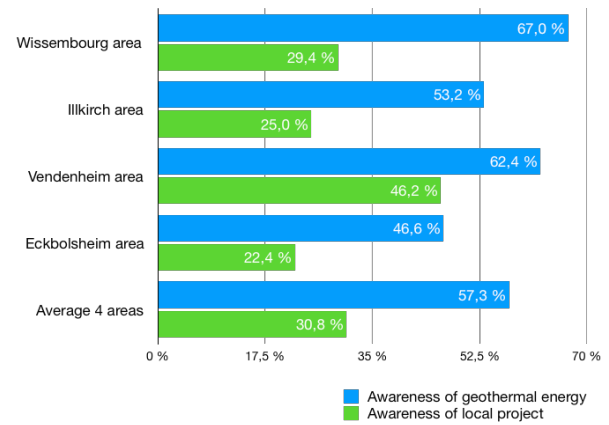


Table 1: Awareness of DGE in general and of specific DGE projects in the four areas studied (n=881). Awareness of DGE is measured using the rate of positive responses to the question, ‘Have you heard of deep geothermal energy?’, while awareness of the specific projects is based on the question, ‘Do you know that a DGE project is planned for the town/village of [name of town or village for which the local project is planned]?’

In addition, there are significant variations from one area to another. Awareness of DGE is very high in the Wissembourg area (around 67%), which may be linked to the long-established presence of two power plants at Soultz-sous-Forêts and Rittershoffen, and regular media coverage of their activities. However, knowledge of a project is not necessarily dependent on its local ‘roots’. Somewhat paradoxically, the Illkirch project benefits from a very low level of awareness compared to the Vendenheim project (25% versus 46.2%). As such, even though the project was subject to upstream consultation, that consultation does not seem to have affected a large part of the population. Conversely, the high level of awareness (62.4%) of DGE in the Vendenheim area seems to be quite directly linked to knowledge of the project (46.2%). This

project was widely discussed and criticised in the public arena in 2015-16, resulting in the operator rolling out a number of strategies to improve acceptability (media relations, set-up of a local monitoring committee, public meetings, etc.)³.

Finally, age and degree of connection with their place of residence appear –quite naturally –to have a positive impact on knowledge of DGE. Only 27% of respondents aged under 30 know what the DGE refers to and only 6.4% of them are aware of local projects. However, awareness of DGE exceeds 50% in the next age group up, and reaches more than 80% among respondents aged over 60. DGE and the local projects benefit from greater awareness among executives and senior professionals (80%) and retirees (79%), and among people who own their own home (75% versus 45% of people who rent).

3. 2 Knowledge and representation of geothermal energy

As we have seen, the results on awareness of geothermal energy and knowledge of local projects are diverse and vary from one area to another. A project may benefit from high visibility either because it is rooted in the area’s history (as in the Wissembourg area) or because the project is the subject of discussion and controversy in the public arena (as in the Vendenheim area). It is therefore important to understand what exactly contributes to awareness.



Table 2. Perception of geothermal energy. Answers to the question, ‘In three words or qualifiers, what does the geothermal energy mean to you?’ have been coded to take into account the neutral, positive, negative, or mixed character of all the words and qualifiers put forward (n=492).

When asked, ‘What does geothermal energy mean to you (in three words or qualifiers)?’, one third of respondents (32.1%) made neutral comments, referring to technical aspects or the principle of geothermal energy (Table 2). The others expressed positive (for 24.4%), negative (21.5%) or mixed (7.1%) views. There was a higher rate of positive remarks in the Illkirch and Wissembourg areas: there, for example,

geothermal technology is seen as a step forward that would enable savings while offering a more environmentally friendly alternative, limiting the use of fossil fuels and so on. In contrast, the most negative reactions were found in the Vendenheim area. For example, respondents consider that the technology is not yet mature and point out certain risks that come with this type of project (e.g. ground movement, seismicity, damage to buildings). In this case, criticism of geothermal energy is multifaceted, echoing the observations we made during the 2015 public inquiries (Chavot et al 2016).

Alongside these diverse views of geothermal energy, we can see that residents are not always aware of the power-generating potential of geothermal energy or of the additional costs incurred by the production process.

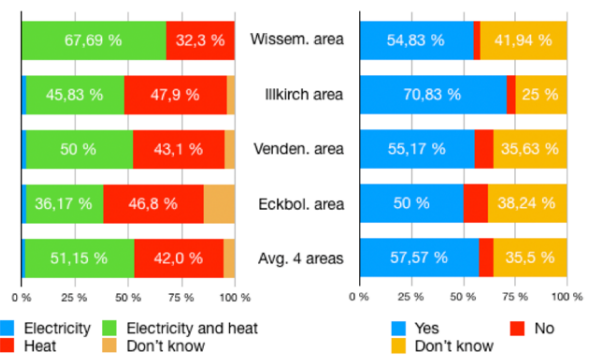


Table 3. Comparison of responses to two questions about the use of geothermal energy. Left side, answers to the question (from people knowing about the project): ‘Is geothermal energy used to produce heat (Yes/No/Don’t know) /electricity (Yes/No/Don’t know)’ (n=262). Right side, answers to the question ‘Will the energy produced by the geothermal plant will be used to generate electricity?’ (Yes/No/Don’t know)’ (n=231).

When we address geothermal energy in general in the question, ‘Geothermal energy is used to produce heat (Yes/No/Don’t know), electricity (Yes/No/Don’t know)’, residents who know about the local project are not always aware of the power-generating potential. The answers that can be deemed ‘correct’ vary from 36% (Eckbolsheim area) to 68% (Wissembourg area). However, when participants answer a question concerning the local project, 50-71% of them, depending on the area, think that the energy produced by the geothermal plant will be used to generate electricity. The gap between the relative lack of awareness about this potential use of geothermal energy in a general sense, and knowledge of a local project can be explained by the fact that respondents draw on more specific knowledge, reflecting the communication

³ It should be noted that we conducted our survey in this area shortly after the start of drilling, an event that received extensive press coverage.

efforts made by the operators. It is also conceivable that respondents feel more concerned by a local project and are thus more open to information circulating in the public arena.

Finally, a small proportion of respondents believe that it will be more expensive to generate electricity (13.7% of respondents) and heat (9.7%) using geothermal energy than using other means (nuclear or fossil fuels), and a quarter of respondents have no opinion on the issue. This seems to suggest low awareness of the cost of the energy transition and the existence of state subsidies. Moreover, there was little public discussion on this point in France until 2018.

3. 3. Risk perception

Several questions in our survey concerned risks. A first open-ended question, ‘What are the risks associated with the exploitation of deep geothermal energy?’, garnered some fairly spontaneous comments about risks. The residents mentioned cracks in dwellings (14,5%), seismicity (11,1%) and slow ground deformation (10,5%). They also referred to incidents that occur during drilling (8,7%). Finally, and to a lesser extent, they mentioned potential groundwater pollution (7,5%) or other types of pollution (4%). These risks were most often mentioned in the Wissembourg (where projects are fairly well accepted) and Vendenheim (where the local project is controversial) areas. Opposition to geothermal energy is not therefore necessarily connected to a knowledge of risks, although this is sometimes the case.

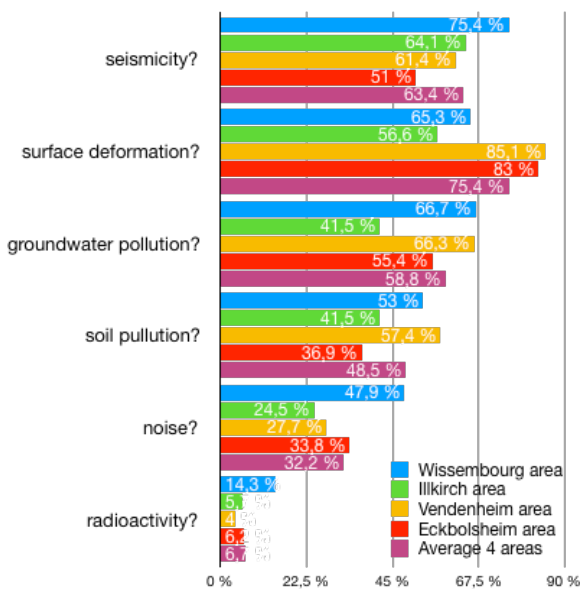


Table 4. Risk perception among people who are aware of local projects. Question: ‘According to you, can exploitation of geothermal energy cause...?’ (n=268).

We then asked respondents a set of closed-ended questions to find out whether they believe that deep geothermal energy can cause ‘seismicity’, ‘ground deformation’, ‘noise’ and different types of pollution

(groundwater pollution, soil pollution, radioactive pollution). A majority of local residents responded positively to ‘Surface deformation’ (62–84% depending on area), ‘seismicity’ (50–69%) and ‘groundwater pollution’ (47–62%). It should be noted that seismicity was most often mentioned in the Wissembourg region (69%).

The importance given to a particular risk sometimes varies significantly from one area to another. In addition, people who are aware of the projects place more importance on certain risks (Table 4). For example, ground deformation is mentioned more often by these people in the Vendenheim and Eckbolsheim areas (85.1% and 83% of respondents respectively mention the risk), likewise seismicity in Wissembourg (75.4%). As we can see, these variations do not seem dependent on whether a project has local roots or not. They may be explained by information circulated locally or by people’s own experience of geothermal drilling (some inhabitants of the Wissembourg area may have experienced micro-seismic events related to activities carried out in Soultz-sous-Forêts).

3. 4 Information and opinions on the project

As mentioned above, only one third of respondents are aware that a project is set to go ahead near them. We used a set of questions to identify the channels through which this segment of the population was informed about the projects. The traditional media are the main source of information: 41% of respondents indicated that they learned about the project via traditional local media (newspaper, radio and local TV); 28% via municipal information sources, 15% via associations and 23% in discussions with friends or colleagues. In this respect, the Illkirch area stands out as an exception, with 72% of respondents indicating that they were informed by the municipality (among other sources of information). Despite these diverse sources, respondents often feel insufficiently informed (61%, compared to 22.7% who feel sufficiently informed). In addition, a majority (59.2%) would have liked to have been consulted. It should be noted that only ten or so people among those interviewed within our study framework took part in the 2015 public inquiries.

With the exception of Illkirch, where the municipality appears to play a significant role in communication on the project, there is no significant variation from one area to another that can be correlated to fact that a project has local roots or otherwise.

This is not the case when we ask about opinions on the project (Table 5). While an average 45% of respondents are generally in favour of the project (compared to 18.8% against it), there are clear variations from one area of study to another. In the two areas concerned by locally rooted projects, the attitude is the most positive (with a rate of 75% of favourable opinions in the Wissembourg area and very few negative views). However, somewhat paradoxically, almost a quarter of the people who answered this question in Illkirch said

they opposed the project, although few of them rallied against it when the public inquiries were held in 2015.

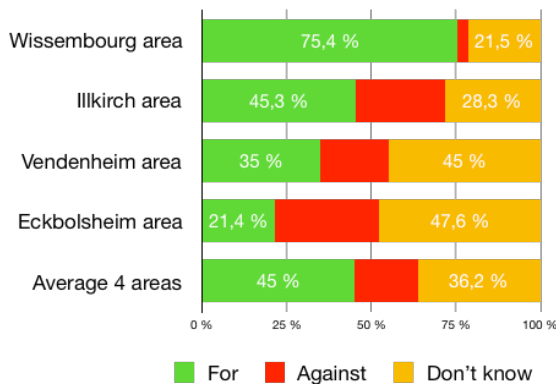


Table 5. Opinion on local projects according to study area. Question: ‘Are you for or against the geothermal power plant project?’ (n=195).

Some correlations appear quite striking when the answers to this question about opinions on the project are crossed with other questions, especially those on the wish to be consulted on projects or on risk perception. For example, 82.1% of those opposed to the projects would have liked to have been consulted (compared to 46.4% of those in favour of the project). Looking at risks, while there are no remarkable differences regarding the risks of seismicity or ground deformation, the people opposed to the project mention pollution risks (noise pollution, soil or groundwater pollution) much more frequently (Table 6).

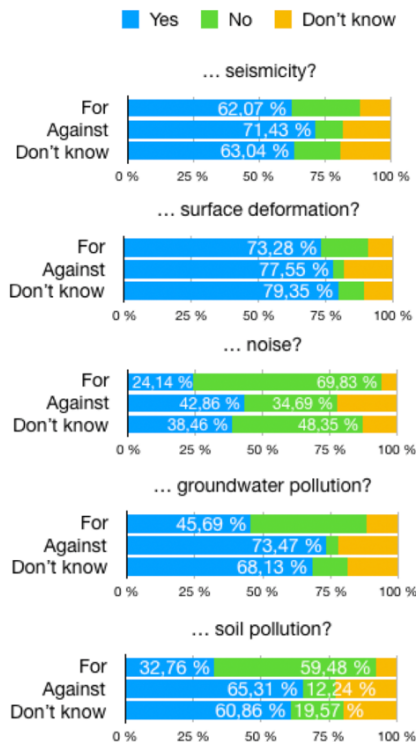


Table 6. Variation in risk perception according to attitude towards the projects (n=195).

3. 5. Perception of information sources

We used a series of questions to assess the credibility of the various stakeholders. We asked people living near the projects to rank the three sources that they would trust most when it comes information on the technical aspects, risks and benefits of deep geothermal energy.

On the subject of technical information, the responses were quite mixed, varying considerably from one area to another. Although scientists are seen as the most trustworthy by the population, in the case of the two locally rooted projects, we can see that industrial stakeholders and municipalities are also widely trusted because they have entered into long-term dialogue on the topic of deep geothermal energy with residents: the presence of the Saultz-sous-Forêts power plant in the Wissembourg area and communication efforts made by the municipality of Illkirch since 2010 have contributed to this tendency (Table 7).

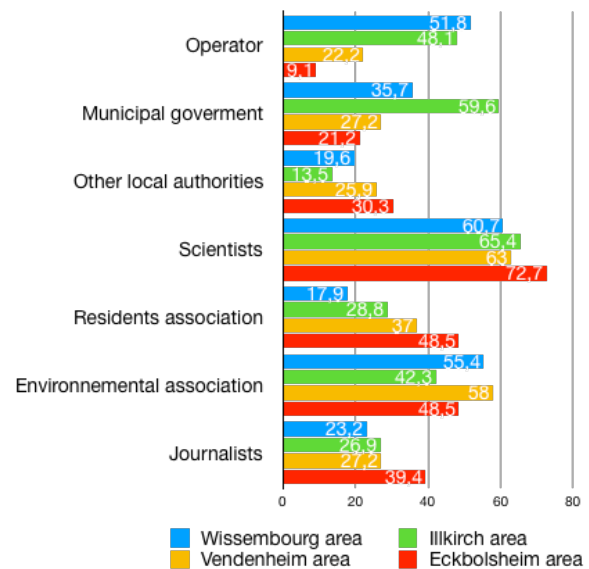


Table 7. Variation in respondents' opinions on information sources, depending on whether the project is locally rooted or not. Question: ‘Who do you trust you most to inform you about the technical aspects of geothermal energy? (Choose the top three)’ (n=221). Locally rooted projects: Wissembourg and Illkirch; projects with less local rooting: Vendenheim and Eckbolsheim.

However, that is no longer the case when it comes to information on risks. Respondents then shift their trust to scientists and environmental protection associations.

IV. CONCLUSION

At the start of this paper, we set out three assumptions:

- Perception of risks and benefits varies according to the way people conceive their territory.
- The way in which local authorities are involved in defining and implementing a project also has an impact on project perceptions.

- A project's local roots influence residents' perception.

The areas covered by this study enabled us to test these assumptions. In two of the four areas studied, there was a relatively marked consistency between the area's history and the introduction of geothermal energy. For example, the links between geothermal energy and oil drilling have often been put forward by political stakeholders in the area around Wissembourg, which can give 'historical' meaning to the deployment of this type of project in northern Alsace while allowing project promoters—industrial concerns or, more significantly, political stakeholders—to compose a narrative for the territory that features geothermal energy. In the area around Vendenheim, the link is less clear and, more particularly, less developed by politicians. However, the location chosen for the project (brownfield land that was previously the site of a refinery) means it remains coherent within the territory: energy production—oil or geothermal—is the focus in both cases and, when compared to oil production, geothermal energy may be seen as a step forward in ecological terms.

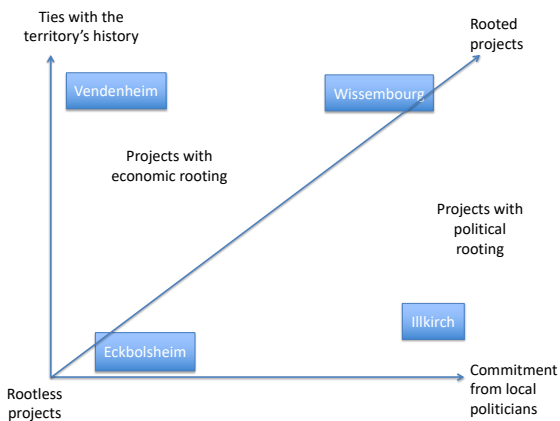


Figure 3. Extent of the economic and political roots of the four PM projects studied.

In addition, the territories of Illkirch and Wissembourg have seen strong commitment from environmentally conscious political stakeholders.

Some projects are thus firmly rooted both in the territory's 'history', and in the process of maturation pursued by local politicians. The Illkirch project also has strong roots but only in the commitment of local elected officials. Compared to these two projects, the Vendeheim project's roots are much weaker, merely drawing on the fact that it is based on a site that has a history of energy production.

Finally, the Eckbolsheim project, which does not tap into any territorial 'history' and which was not sought after or advanced by local politicians, appears 'rootless', with no real local ties. The figure 3 highlights the two levels of project rooting (political and/or economic).

The results of our quantitative survey have enabled us to test our assumptions, at least partially, and to analyse the cross-influence of political, cultural and economic factors. Support for the project is most pronounced in the Wissembourg area (table 5). Likewise, the trust placed in operators and politicians is strongest there, and in Illkirch. Admittedly, this trust is not absolute and respondents remain vigilant, as indicated by the importance they place on the question of risks. Yet ultimately, awareness of the risks does not necessarily lead to an overall negative view or rejection of the projects.

At the opposite end of the spectrum, we have the Eckbolsheim project which was not supported by local politicians and has no ties with the territory's economic and cultural history. According to the results of our study, project acceptance is at its lowest and mistrust of operators at its highest in this area.

The Illkirch and Vendenheim projects fall somewhere between these two extremes. In Illkirch, support for the project has been fostered through the involvement of local politicians. In Vendenheim, the project's roots in the territory's industrial history has been offset by strong opposition from citizens and elected officials, and by communication efforts made at too late a stage. This latter project thus appears somewhat 'rootless' and forced.

However, the view that these quantitative results provide of the mechanisms and processes of project acceptance or rejection remains rather crude and not particularly nuanced. A qualitative study is required to bring to light all the subtleties and diversity of the meaning given to geothermal energy projects by the people living in their vicinity. We will thus continue our study of the perception of geothermal energy by analysing the focus groups we ran in 2018.

REFERENCES

Akrich, M., Méadel, C. : Histoire des usages modernes, in: *Énergie, l'heure des choix*, Beltran, A., Akrich, M., Méadel, C., Duclos, D. (Eds.), 25-91, Éditions du Cercle d'Art, Paris (1999).

Chavot, P., Heimlich, C., Masseran, A., Serrano, Y., Zoungrana, J., and Bodin, C.: Social shaping of deep geothermal projects in Alsace: politics, stakeholder attitudes and local democracy. *Geothermal Energy*, 6:26, (2018), 21p.

Chavot, P., Masseran, A., Bodin, C., Serrano, Y., and Zoungrana, J.: Geothermal Energy in France. A Resource Fairly Accepted for Heating but Controversial for High-Energy Power Plants. In *Geothermal Energy and Society*, A. Manzella, A. Allansdottir, and A. Pellizzone (Eds.), 105–122, Springer International Publishing, Cham, (2019).

Chavot, P., Masseran, A., Serrano, Y.: Information and public consultation exercises concerning

geothermal projects. “The Strasbourg case”. European Geothermal Congress 2016, Sep 2016, Strasbourg, France (2016).

Christen, G., Hamman, P.: Transition énergétique et inégalités environnementales, énergies renouvelables et implications citoyennes en Alsace, Presses Universitaires de Strasbourg, Strasbourg, (2015).

Acknowledgements

This paper is based on research carried out in the context of the activities of the Social Sciences working group of the *Labex G-EAU-THERMIE profonde* (University of Strasbourg, CNRS, Electricité de Strasbourg) and was conducted within the framework of the WG 3.3 “Risk governance” of the H2020 project DESTRESS, Demonstration of soft stimulation treatments of geothermal reservoirs. We warmly thank Andrew Morris for his work on the English version of the text (correction and translation).