Gemini

Geothermal Energy Momentum

Report: Public perception of geothermal energy on the island of Ireland

PEACEPLUS
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Executive Summary

The GEMINI Project, Geothermal Energy Momentum on the Island of Ireland, will deliver Geothermal energy demonstration projects on the island of Ireland to help decarbonise our energy sector. The project is supported by the Northern Irish and Irish governments in their bid to reduce carbon emissions, create secure, local energy options and improve our environment.

> "Decarbonisation is a cornerstone of my economic plan. As an alternative to fossil fuels, geothermal energy has a pivotal role to play in decarbonising heat. The Gemini project will demonstrate and promote the benefits of geothermal across the island."
> *Conor Murphy, Minister for the Economy, Northern Ireland (2024)*

IN addition to the physical demonstration of geothermal energy system in the partner sites, the project will deliver a series of complementary project outputs, toolkits, reports and recommendations to support both the roll out of geothermal energy on the island and to build capacity in the sector through professional training and education.

> "Importantly the GEMINI project will do more than just deliver infrastructure in the short term. It will also build essential capacity in our planning, education, research and energy design systems, along with best practice for community engagement."
> *Eamonn Ryan, Minister for Climate, Energy and the Environment (2024)*

However, to ensure the medium and long term impact of the project, the technical and scientific work must be support by appropriate and effective communications. To inform this work, a survey of the general population, North and South, was conducted in 2025. This collected opinions and feedback from 1,300 individuals representing all adult demographics across the island.

Key results can be summarised as follows:

- >40% of people do not understand what geothermal energy is, or how it works as a renewable energy source
- >50% do not know anything about geothermal energy for residential use
- >60% do not know anything about geothermal energy for non-residential use
- 94% would participate in public engagement activities
- Over half of people who do not support a local geothermal project (i.e. 10% of overall respondents) would participate in activities opposing development
- Trust is greatest in researchers/academics and geological surveys

- Different demographics prioritise different aspects (price, environmental impact etc)

The survey data has been used to inform the overall GEMINI Communications Strategy, and to help shape and design the materials and activities supporting the implementation of the strategy. It is intended that this survey will be repeated at the end of the project to help assess the effectiveness of the project communications and engagement work undertaken throughout the four years of the project by the GEMINI project team.

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The survey was completed in February 2025 and report prepared in June 2025.

Report authors: Dr Aoife Braiden & Nicola Noller, RML

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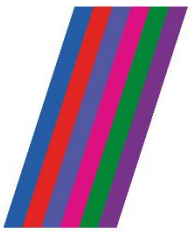
The views and opinions expressed in this report do not necessarily reflect those of the Special EU Programmes Body (SEUPB) or the Programme funders.



1. Introduction

The GEMINI project, Geothermal Energy Momentum on the island of Ireland, is a four year project aims to develop and support the nascent geothermal energy sector in Ireland and Northern Ireland. The project is primarily a demonstration project that will invest in four physical geothermal energy system. These will be supported by a series of activities and research elements that will provide data, guidelines and recommendations to further develop the sector. A key component of this work is understanding stakeholders' behaviours and attitudes towards geothermal energy and how we can provide clear and accessible knowledge to support more informed decision making. Stakeholder groups include politicians, civil servants, educators, media, researchers (particularly those in related areas such as engineering, energy and economics), and, the largest group, the broader public - which can include many of the other stakeholders. To assess the attitudes and level of understanding of geothermal energy, a survey of the broadest public group was commissioned by GEMINI. The goal was to gauge the current level of knowledge and acceptance of this technology, and the level of potential engagement in GEMINI activities (e.g. public engagement). The intention is to repeat this survey at the end of the project to assess any possible increase in understanding and acceptance.

Note: The survey fieldwork took place three weeks after a record-breaking extratropical cyclone, Storm Eowyn, caused damage to power lines throughout Ireland and Northern Ireland. Many network customers were without power for days, some for weeks, and this may have influenced responses by some around reliability of supply – particularly those relying on electricity for heating and hot water.

1.1 Survey design and demographics

Two identical surveys were conducted on the island of Ireland between 13th and 24th February 2025 amongst a sample of 1,000 adults in Ireland (Ire) and 300 adults in Northern Ireland (NI). This total sample of 1,300 was weighted to match the population breakdown between Ireland (74%) and NI (26%) and quotas were placed on the number of interviews achieved in each demographic grouping (age, gender, region and social class) to ensure that it reflected the adult population in both jurisdictions.

Respondents were instructed to complete the survey online and provide information about their understanding and perception of geothermal energy, and its use as an energy resource in Ireland and Northern Ireland.

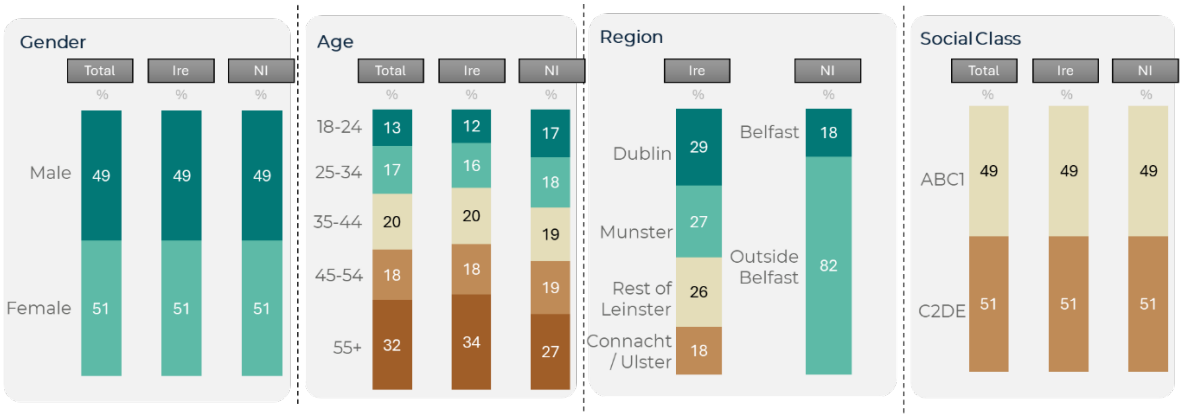


Figure 1 Demographic groups included in the questionnaire.

The total respondents included 49% male and 51% female with 49% from professional, managerial, and administrative workers (class ABC1) and 51% from semi-skilled and unskilled manual workers (DE), casual workers, pensioners, and the unemployed (class C2DE). In Ireland 29% of respondents were from the Dublin region (the most populous area) with 26% from the rest of Leinster, 27% from Munster and 18% from Connacht and Ulster; in NI 18% were from Belfast and 82% from outside Belfast.

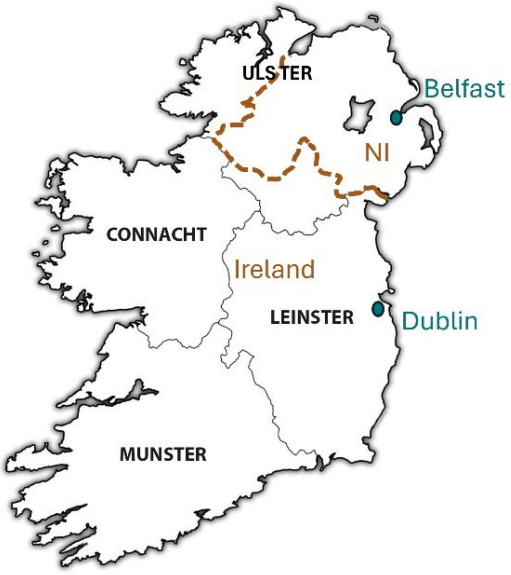


Figure 2 Map of the island of Ireland indicating Ireland, Northern Ireland and the four provinces (Ulster includes counties to the South and West of the Ireland-Northern Ireland border).

There was a slightly younger sample in NI compared to Ireland. In Ireland respondents comprised 15% Generation Z (18-27 years), 31% Millennials (28-43 years), 26% Generation X (44-59 years) and 28% Baby Boomers (60+ years). In NI respondents comprised 22%, 30%, 26% and 22% respectively.

Research suggests that individuals with a stronger, and/or longer, connection to place will have a stronger response to a potential change in the area (Devine-Wright, 2013), (L. Susskind, 2022), for example the development of a community geothermal installation. Therefore, respondents were asked to state their level of connection and attachment to their area. 62% had been living in their current location for ten or more years, 13% (12%/15% : Ireland/NI) between 5-10 years, 13% (14%/11%) between 3-5 years, 7% for 1-3 years, and 5% were living in their current location for less than one year.

72% of total respondents considered themselves attached or very attached to their local area with 11% (12%/10%) feeling they were not attached to the area. 17% (16%/20%) felt neither attached nor not attached. Respondents were also asked if they

lived in a rural area or village (26%; split 27%/23%), small town (22%; split 20%/27%), suburban (25%; split 24%/27%) or an urban area (27%; split 29%/23%).

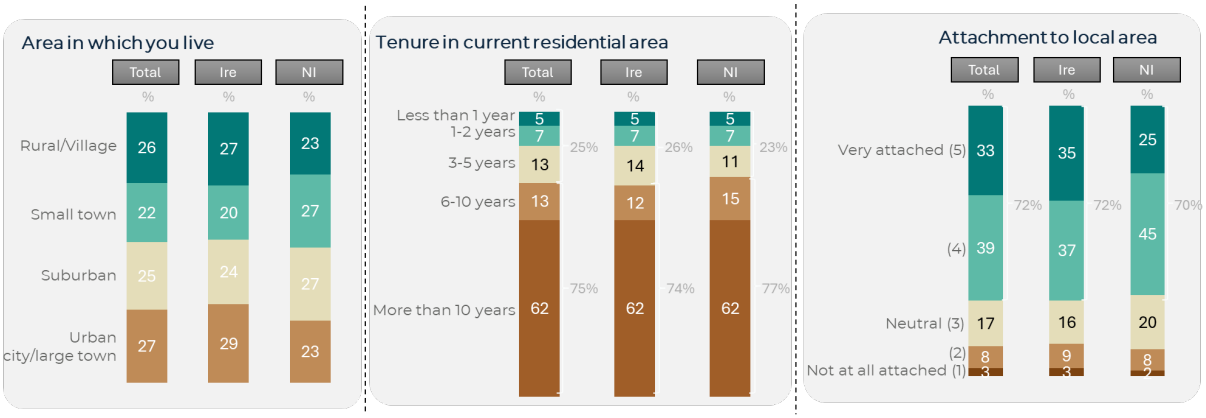


Figure 3 Geographical locations of respondents and sense of attachment.

The majority of respondents had lived in their local area for over 5 years with three-quarters feeling attached to their area. Most lived in a town or city or suburban environment with just over one-quarter in rural areas.

Three in five of respondents had children, half of which were over 18.

2. Results

The respondents were asked a series of questions to establish their level of knowledge about geothermal energy in general, and its uses. The survey included six sections with a number of questions in each.

- Section 1. Your views on heating and energy supply
- Section 2. What do you think about geothermal energy in Ireland?
- Section 3. What are the likely benefits/risks from installing and using geothermal energy systems?
- Section 4. Exploring for geothermal resources
- Section 5. Regulation of geothermal activities
- Section 6. Demographics

Some sections included information, diagrams or confirmation of answers before to proceeding to the next section in order to provide clarify and information for the next section.

2.1 Views on Heating and Energy Supply

In this section the survey respondents were asked for their views about their own energy supply at home and their feelings on different energy resources generally. Respondents were asked to rank a list of four factors relating to home energy supply in order of importance.

The most important factor in terms of energy supply at home was cost of energy, with 66% of total respondents stating it as the most important; it featured in the top 3 for 94%. This was followed by reliable energy source (top answer: 18%) and energy efficiency (9%). Only 7% stated that energy produced from renewable energy resources was important to them for home energy supply. There was little difference between Ireland and NI responses, although there was less support for renewables resources as a top three ranking in NI.

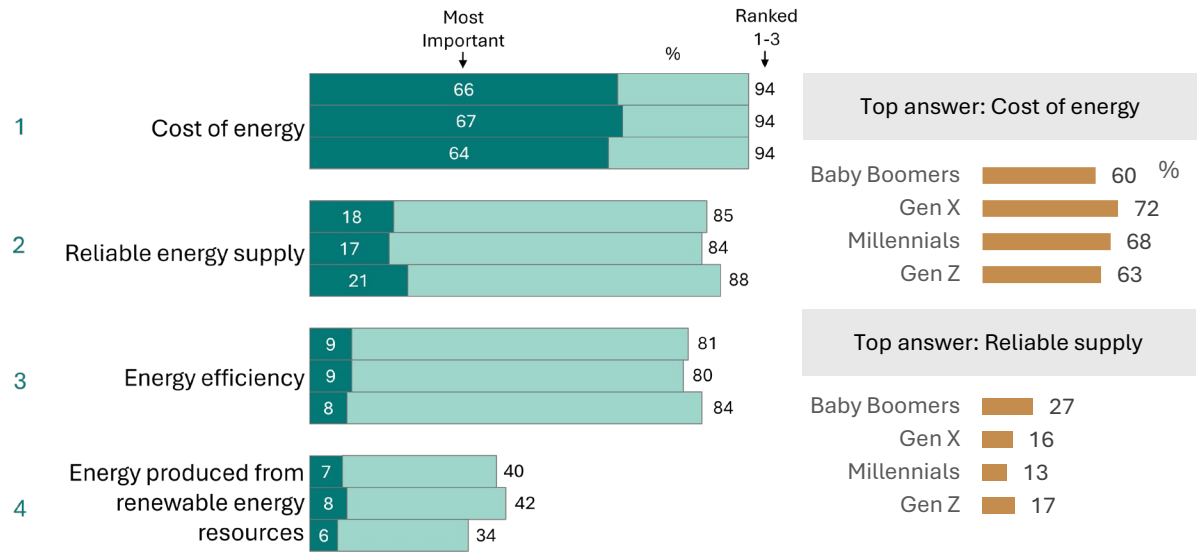


Figure 4 Most important factors in terms of home energy supply.

There was some variation between age categories, with Generation X placing more importance on cost of energy (72%) and Baby Boomers placing more importance reliability of supply (27%).

Respondents were asked to rate their feelings about different sources of energy used for heating – biofuels, oil, coal, gas, solar, wind, air-source heat pumps (ASHP), geothermal.

Solar and wind were most favourably regarded, with 70% of answers rating them positively and 7% negatively. By contrast, coal, oil and gas were regarded most negatively by 35%, 29% and 20% respectively; interestingly, however, gas, oil and coal were rated positively by 44%, 37% and 35% of respondents. Regarding geothermal energy for heating, most respondents (53%) had a neutral view, whilst 38% had positive feelings and 9% negative feelings.

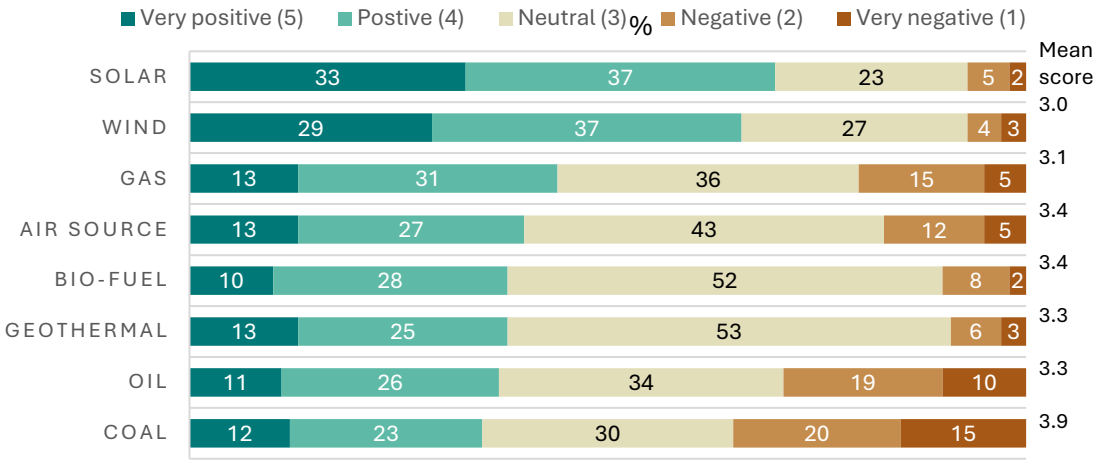


Figure 5 Preferences towards renewable energy sources

There were some slight differences in views from north and south of the border, with biofuel, coal and geothermal energy viewed more positively in Ireland, and oil more positively in NI. Both coal and oil attracted polarising sentiments.

Overall, younger generations felt more positive towards geothermal energy than older generations.

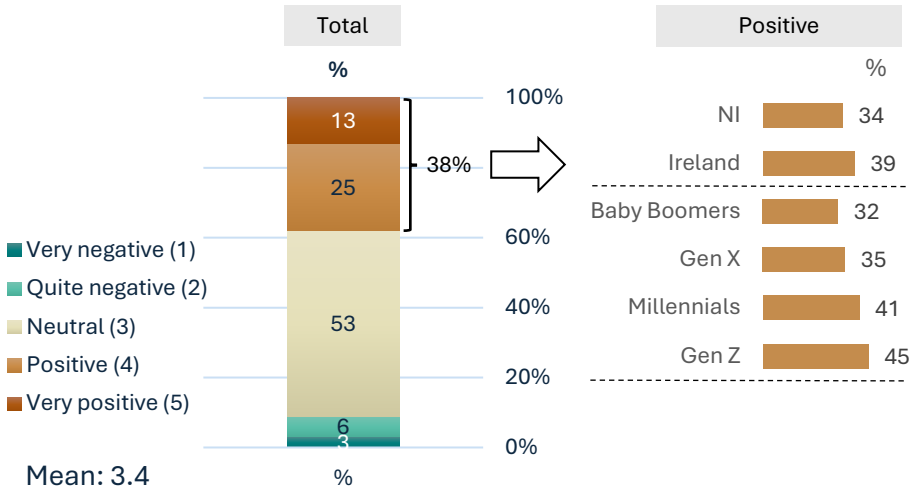


Figure 6 Sentiment towards geothermal energy for heating

2.2 Knowledge about use of geothermal energy for heating

Asked to select statements (more than one possible) best describing 'geothermal energy', 45% of respondents selected the correct definition – *Energy obtained from Earth's crust, often used for heating and electricity generation* ; 10% selected the second correct definition - *Energy derived from the sun's rays that heats soils, which can be used for heating buildings*. Of all participants, 28% (27% Ireland, 31% NI) selected 'don't know'.

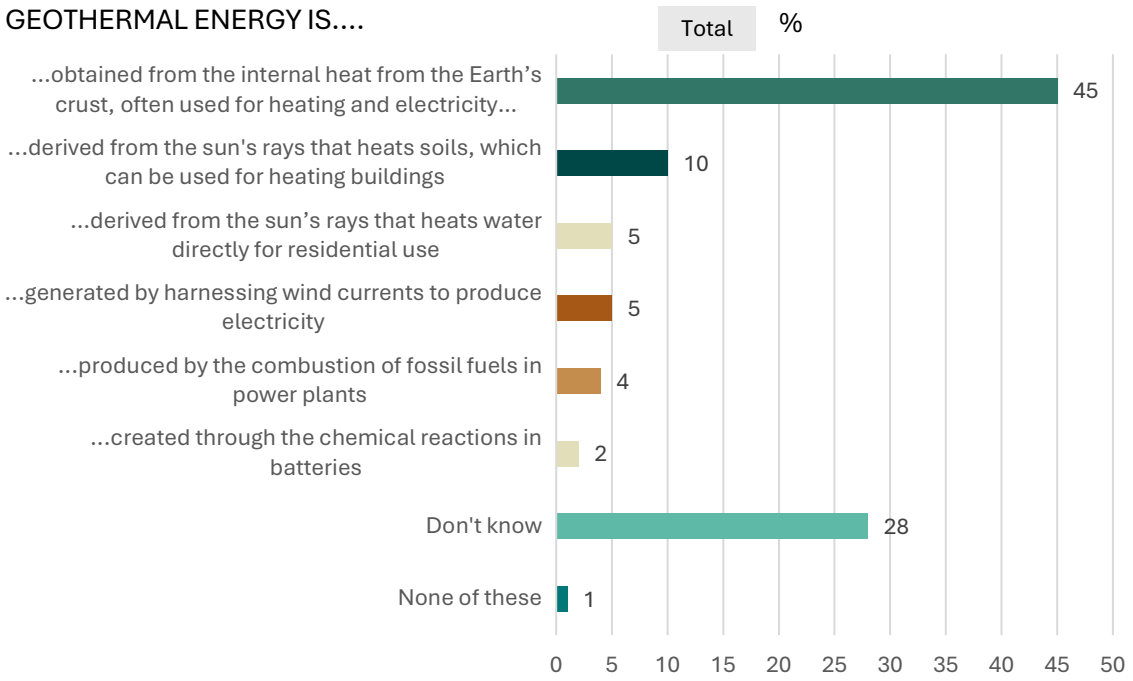


Figure 7 Understanding of the term 'geothermal energy'.

For subsequent opinions to be valid, at this point the survey included a short paragraph of factual information on the source of geothermal energy and the methods used to access it.

Participants were asked how much they knew about using geothermal energy for residential uses via ground source heat pumps. Over 90% of respondents stated they knew either nothing (50% Ireland; 57% NI) or 'a little' (43% Ireland; 35% NI). Responses were similar for knowledge of using geothermal energy for non-residential heating use: nothing (61% Ireland; 65% NI); little (31% Ireland; 29% NI).

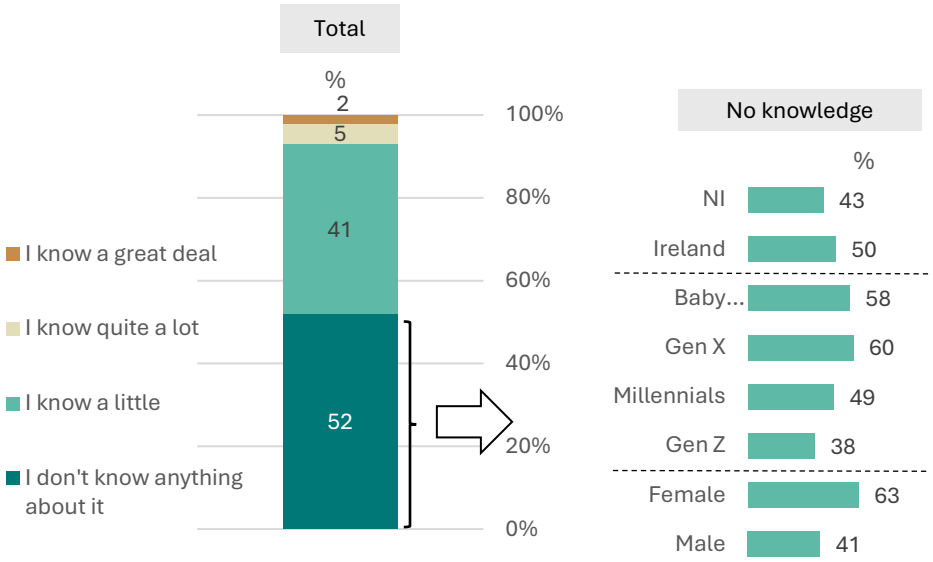


Figure 8 Knowledge about using geothermal energy through GSHP for residential heating.

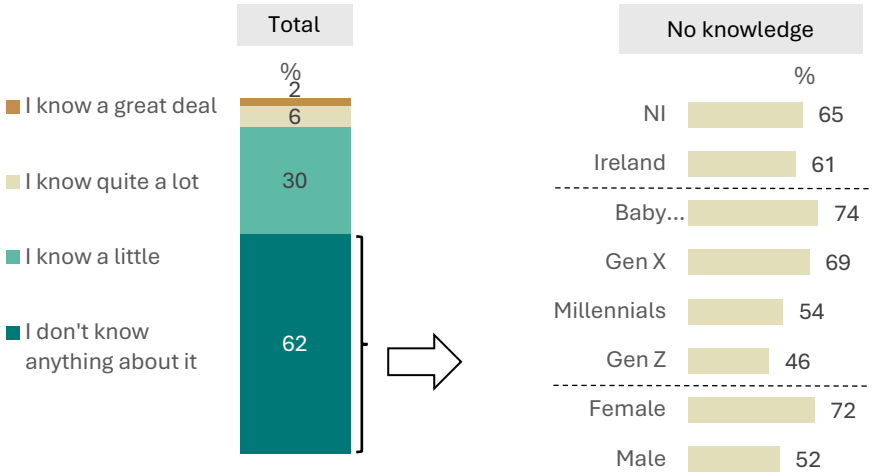


Figure 9 Knowledge about using geothermal energy for non-residential heating.

Gen Z and males were roughly twice as likely to have knowledge of these methods of heating as Gen X and females.

Respondents were then asked to select the three highest and three lowest users of geothermal energy from a list of 10 European countries; a 'don't know' option was included. For highest users, Iceland was correctly ranked top, but otherwise results were extremely mixed and did not match European rankings where UK and Ireland would rank in the bottom three of the list provided. In fact, the UK was ranked in the top three highest users by 23% of respondents, and Ireland was ranked similarly by 17%. For perceived lowest users of geothermal energy, Ireland and the UK were correctly

placed in the bottom three by 65% and 53% respectively of all respondents. There was a distinction by country of residence: Ireland was ranked in the top three lowest users by 67% of Irish and 61% of Northern Irish respondents; UK was ranked in top three lowest users by 51% of Irish and 62% of Northern Irish respondents.

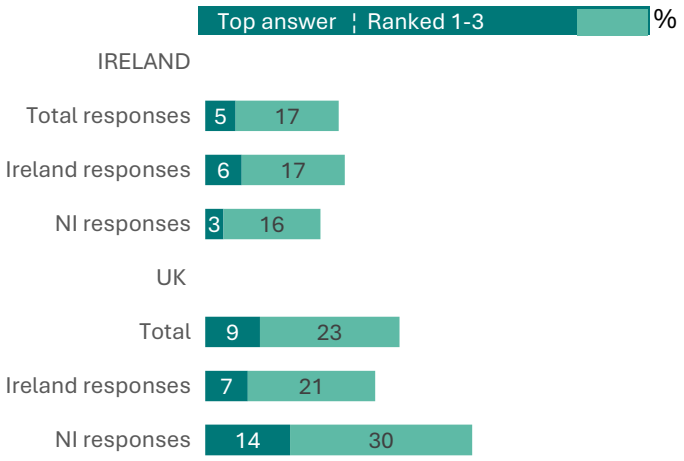


Figure 10 Perceived highest users of geothermal energy in Europe.

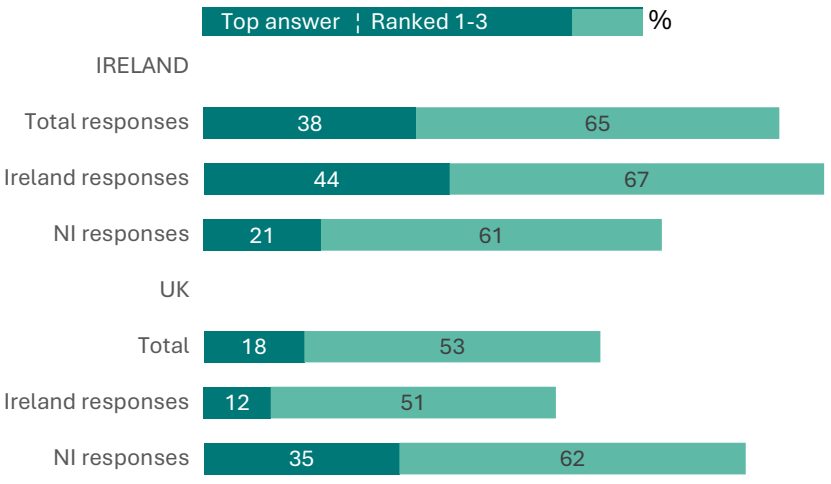


Figure 11 Perceived lowest users of geothermal energy in Europe.

The island of Ireland's low take-up of geothermal energy was confirmed in a short statement and then respondents were asked for their views on why this might be. They were asked to rank the most likely reasons (1-5) from a prepared list of 13 statements. The most popular reasons were thought to be high cost (in top five for 75% of all respondents), lack of infrastructure, not enough data on whether a location is suitable, other sustainable options being easier to install/maintain and there being insufficient regulation and legislation (for 54%). Potential physical or environmental barriers – such as there being not enough warm rocks at depth (in top five for 33%), damage to the environment (22%), or provoking earthquakes (16%) – were viewed as less consequential. Results between respondents from Ireland or Northern Ireland were very similar.

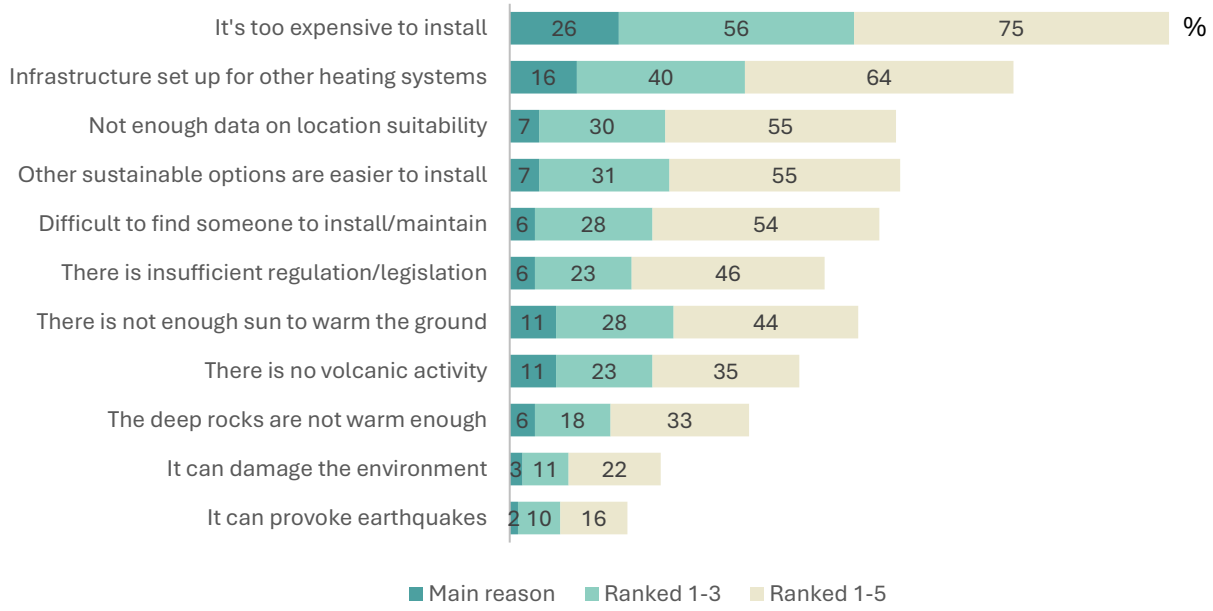


Figure 12 Perceived reasons why geothermal energy is not commonly used on the island of Ireland

2.3 Benefits and drawbacks of geothermal energy systems

Participants were asked to read a short piece of illustrated text on how a geothermal energy resource is supplied using 'shallow' (<500m depth) and 'deep' (>500m depth) geothermal systems. This background clearly described drilling activities and showed installations from 200m to depths up to 6km.

Respondents were asked how many deep geothermal boreholes over 500 metres were in use in Ireland today - there are currently none. Twelve per cent (12%) of all responses selected this option; a third of respondents recorded 'don't know'.

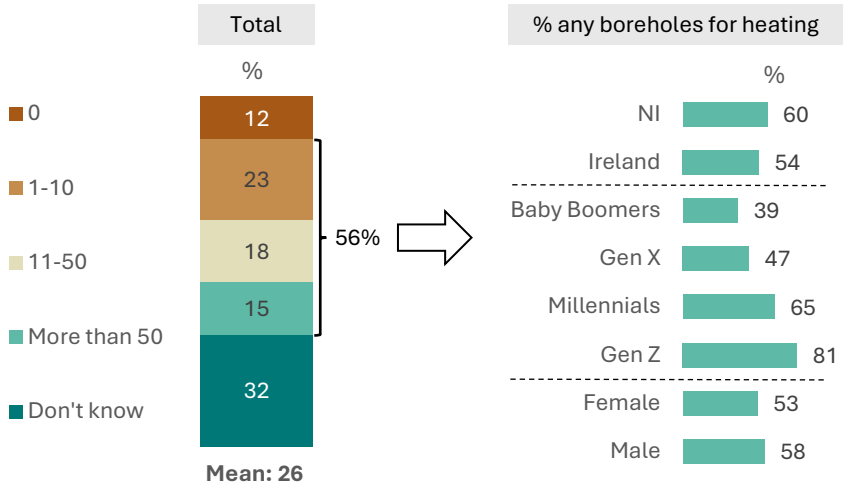


Figure 13 Estimated number of deep boreholes on the island of Ireland. The correct answer is zero

There was a significant difference among generational responses, with over 8 in 10 Gen Z and 65% of Millennials believing that deep geothermal boreholes are used for heating in Ireland; fewer than 4 in 10 of Baby Boomers and 5 in 10 of Gen X believe this.

In order to gauge whether there would be support for a deep geothermal well, respondents were asked how supportive they would be towards the development of one in their local community, for example, to heat a swimming pool, library or social club. Of all respondents, 51% were supportive or very supportive; 39% neutral; 10% not, or not at all, supportive. Northern Ireland respondents were slightly less supportive, but felt neutral rather than not supportive (mean scores: Ireland 3.6; Northern Ireland 3.4).

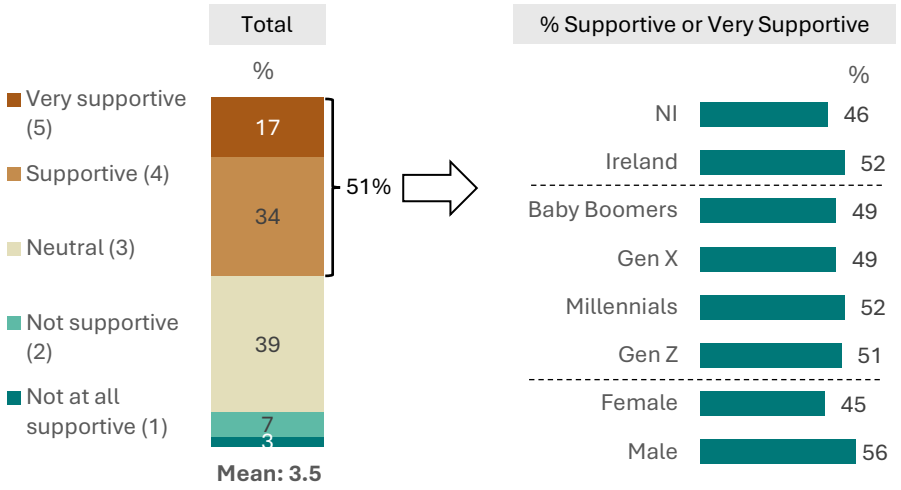


Figure 14 Percentage of respondents who would support a new deep geothermal well being developed in their community.

Of the unsupportive respondents (Ireland 10%; Northern Ireland 12%) 55% were women. The unsupportive cohort were then asked if they would engage in any activities opposing the development of a new deep (over 500m) geothermal energy system: 54% indicated they would engage in activities such as signing a petition, contacting a local politician or participating in a social media campaign. Some examples of their reasons for their stated opposition included:

> *"As so little is known, I feel damage to our grounds to harvest this heat outweighs any benefits"*
>
> *"Because enough research is not available on the long-term effects of this form of heating"*
>
> *"Disagree with the depth of digging/disrupting the land when alternatives in heating can be used at much less invasive techniques"*
>
> *"Don't feel comfortable with entering into the earth crust and dealing with the unknown, what happens if earthquakes result from the interference, I believe there is more planet friendly options available out there".*

Regarding direct and indirect benefits of geothermal energy from heating, when asked to rank top three from eight options, 60% selected reduced dependency on fossil fuels and 55% selected cheaper energy. These two perceived benefits were supported more by Gen X and Baby Boomers and less by the younger generations. Energy independence ranked third, and contribution to meeting climate and greenhouse gas emissions targets was fourth most popular (although less than half included this statement in their top three, and 10% as their top answer). Gen Z respondents ranked improved air quality and national economy and job support more highly than other respondents.

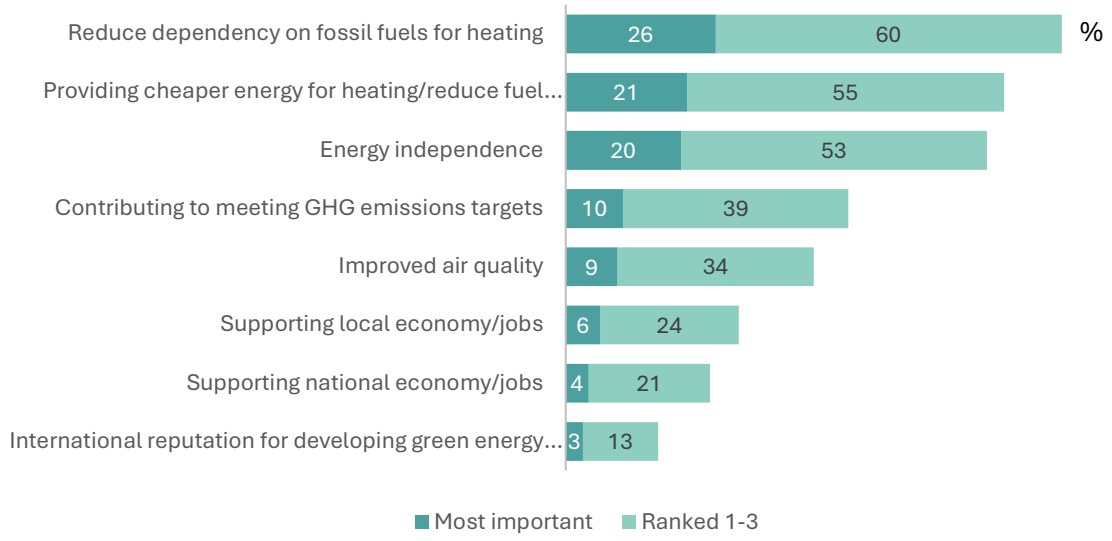


Figure 15 Top three principal benefits of using geothermal energy for heating.

Respondents were asked how they felt they might personally benefit from a community-scale geothermal scheme, such as through local employment, training, or community ownership. Overall, 2 in 5 felt they would benefit, though in NI, this feeling dropped to 1 in 3. There was a correlation between those who supported geothermal wells and those who claimed to be more likely to experience the benefit of community-led schemes, and those who didn't support them and who claimed that they wouldn't experience the benefits.

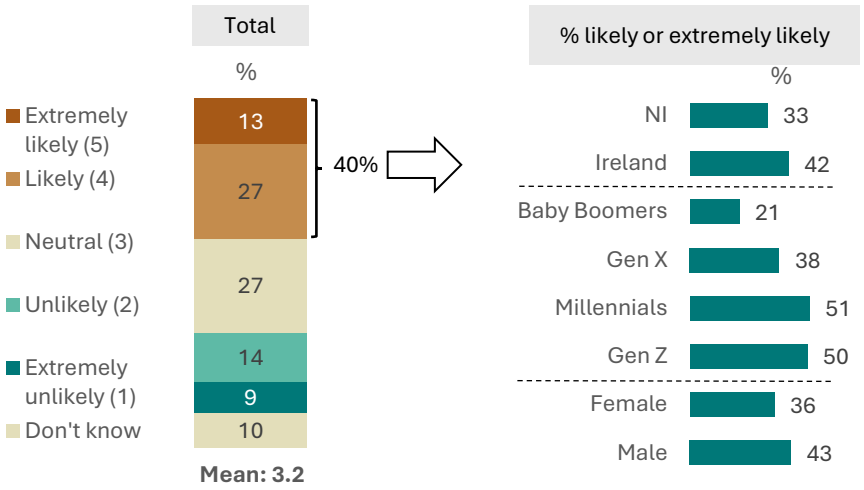
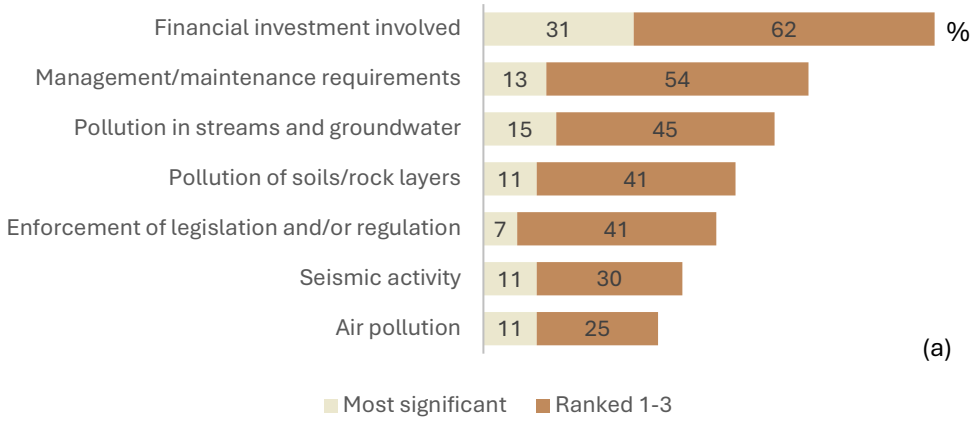
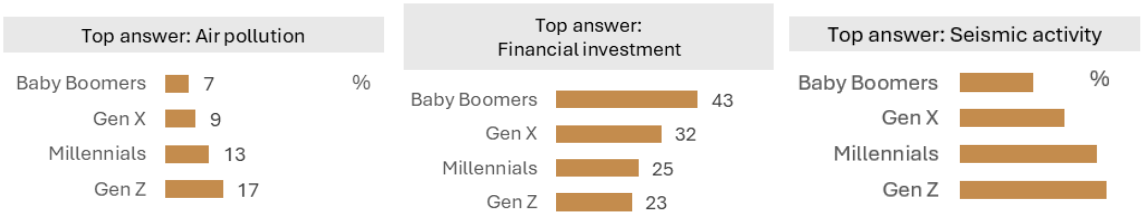


Figure 16 Perceived likelihood of personally experiencing the benefits of community-scale geothermal energy schemes.

From a list of seven, respondents were asked to rank their top three risks related to installing geothermal energy heating systems. The financial investment involved was regarded as the most significant risk (62%), followed by management and maintenance (54%), and pollution of streams and groundwater (45%), or of soil and rock layers (41%). Seismic activity and air pollution were each selected as the highest risk by 11% of total respondents. Of all generations, Baby Boomers were most worried about the financial investment, with this being less of a worry for younger generations. Gen Z were most worried about the risk of air pollution and seismic activity.





(b)

Figure 17 (a) Highest ranked perceived risks of installing a geothermal energy heating system and (b) top ranked risks by generation

When asked if these risks decrease or increase for deep geothermal energy projects, 54% of total respondents believed they increased. This was split between 52% in Ireland and 60% in NI.

2.4 Exploring for Geothermal Resources

To investigate whether trust in, and support for, geothermal energy might be related to feelings around control of such activities, this section focused on questions relating to the community voice.

Respondents were asked to what extent the local community should have a say in estimating whether geothermal energy might be a suitable heating option in their area. 40% considered local groups should have some say in these aspects; 6% said not at all and 19% only a little. Over 43-year-olds were more likely to agree with greater input.

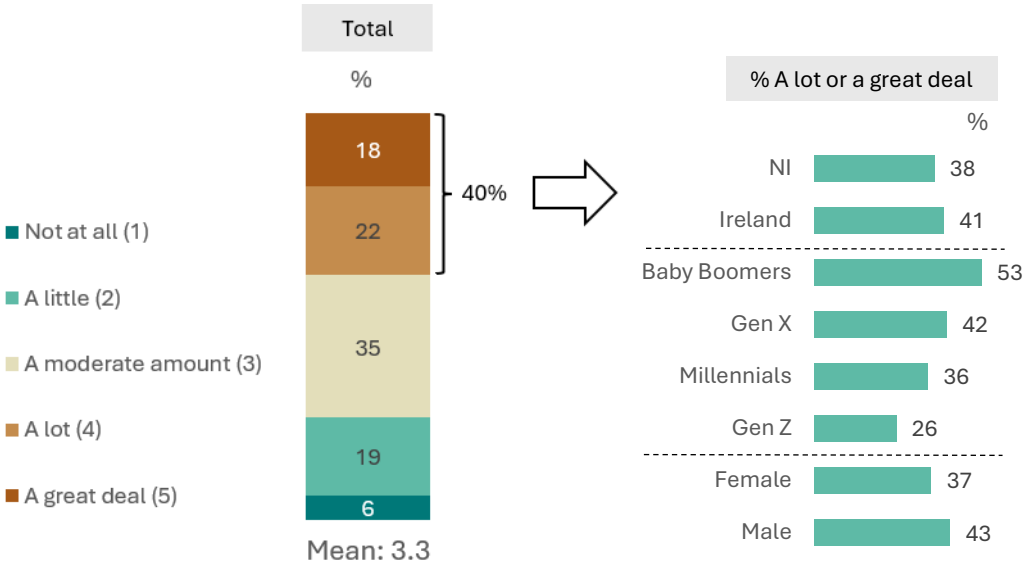


Figure 18 Extent to which the local community should be involved in determining whether geothermal energy might be a suitable heating resource.

Respondents were asked about their experience of exploration activities: about 10% claimed to have experienced soil surveys, drilling or geophysical /seismic surveys in their local area, with half of respondents not having experienced any such activities and 27% not knowing if they had. Those who had experienced these activities were asked to report whether they felt positively or negatively about them. Although overall experiences were positive or neutral, a total of 24% of that cohort felt negatively towards drilling in their local area, with lower figures for geophysical surveys (14%) and soil surveys (9%).

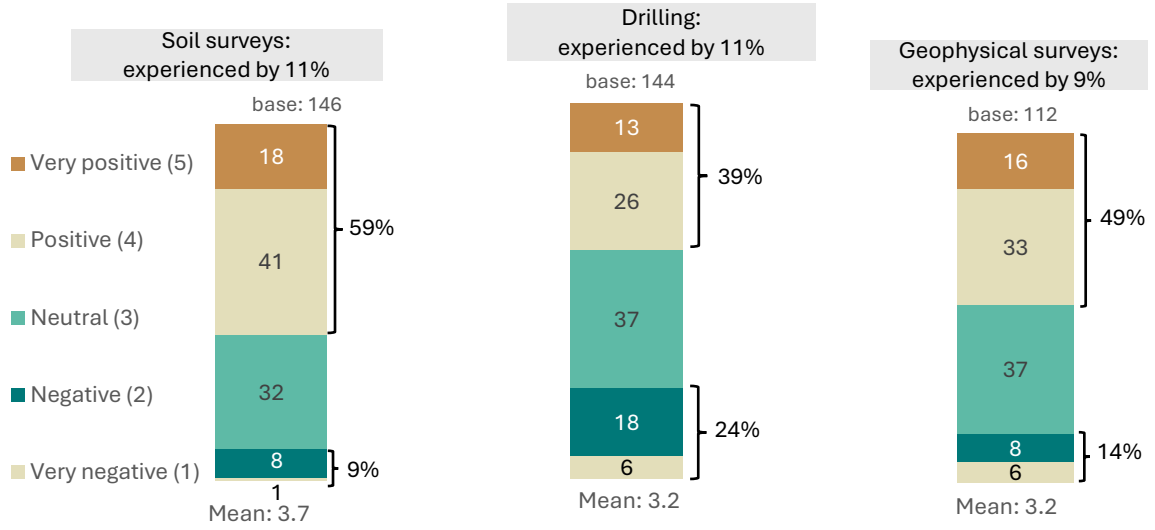


Figure 19 Experience of exploration activities in local area

Although more positive and neutral feelings were recorded overall, drilling was regarded negatively for 1 in 4 respondents.

Regarding how a new geothermal resource might be managed, half of respondents believed the local community should have a say. This changed little between Ireland and NI. Older generations were most keen on the community being involved.

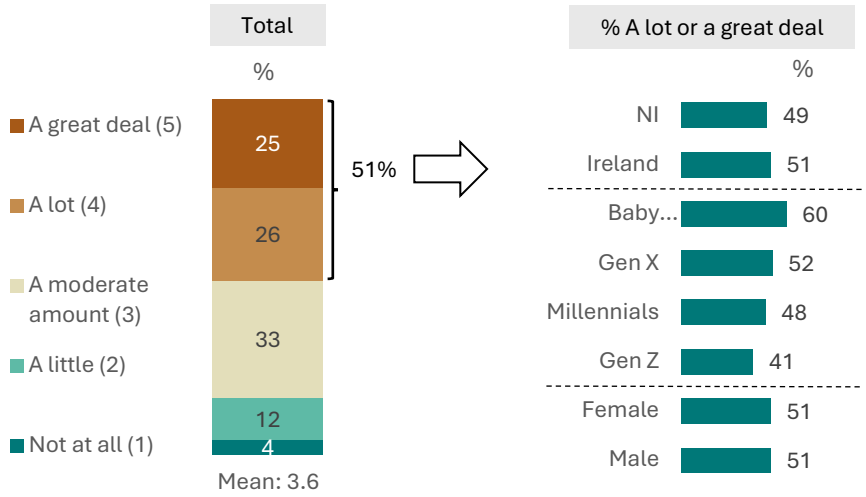


Figure 20 Extent to which the local community feel they should have a voice in how a new geothermal energy resource is managed.

Respondents were asked if their community had a meaningful voice in how a new geothermal energy resource is eventually approved and managed, to what extent they would support a new deep (over 500 metre) resource being developed for their local community facility. Broadly half were supportive or very supportive, with differences between Ireland (51%) and NI (40%). 11% of respondents from Ireland were not supportive; 14% from NI were not supportive. The most substantial segmental difference in expression of support was between male and female respondents, 56% and 41% respectively.

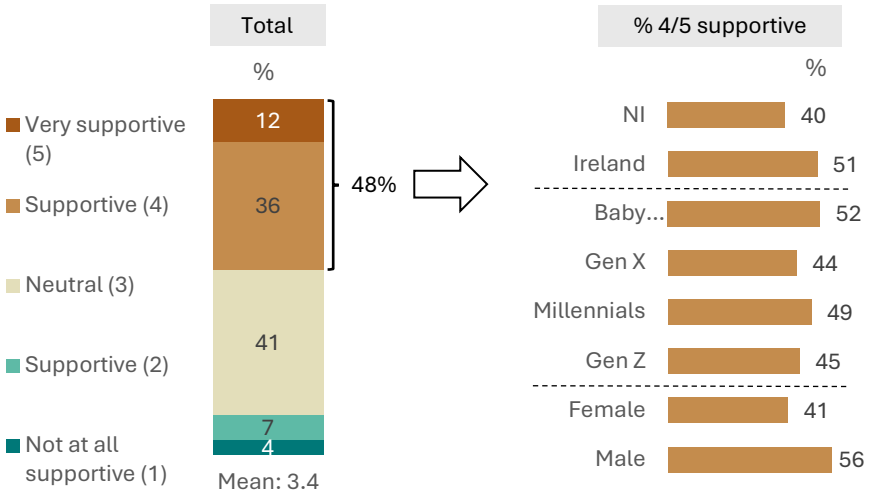


Figure 21 Supportiveness for a deep geothermal well being developed for a community facility if the local community has a meaningful voice in its approval and management.

Respondents were asked to select from a list of five activities which public engagement initiatives around geothermal energy they would be willing to participate in. 94% would participate in some form of initiative, with surveys (85%) and education (75%) the most popular. Generational spread was fairly consistent except for in response to an option

to be active on platforms to provide continuous feedback, where 40% Baby Boomer respondents responded favourably compared to an overall proportion of 60%.

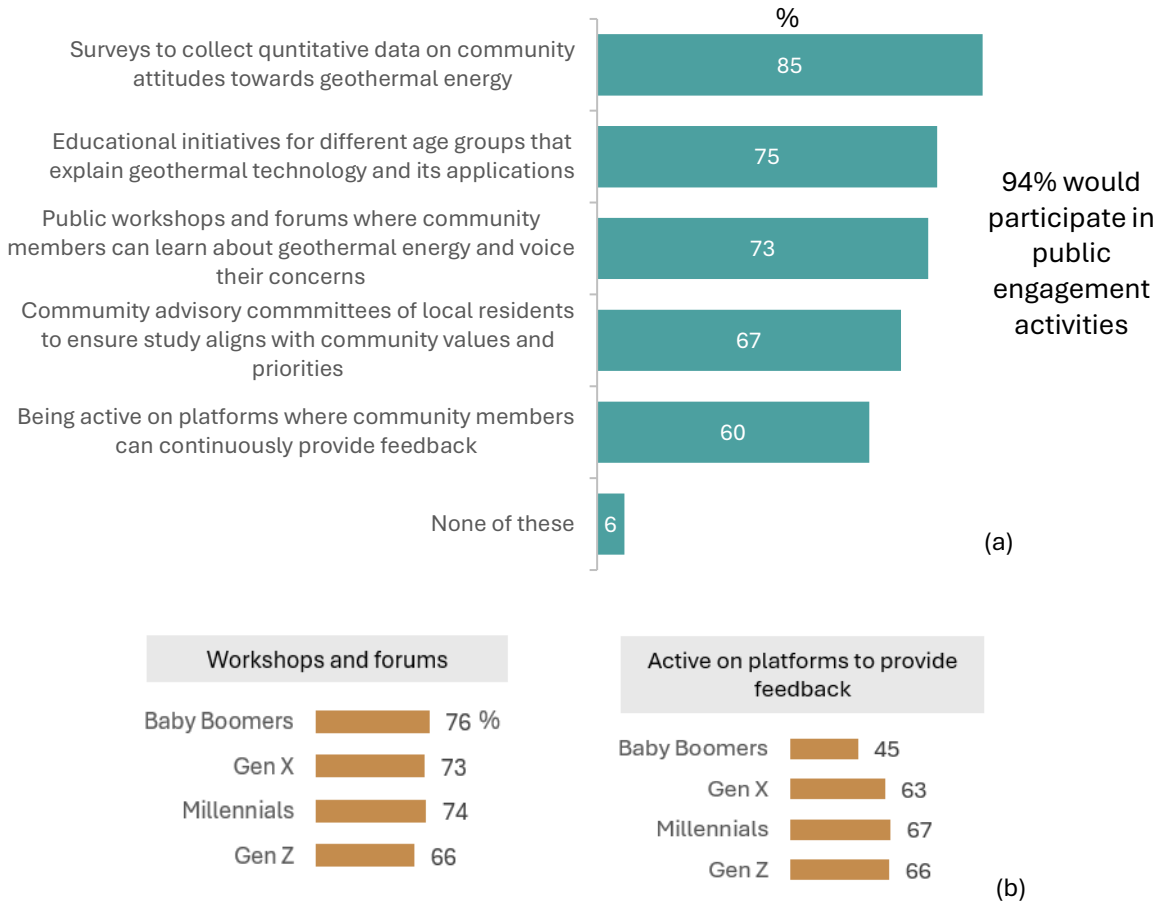


Figure 22 (a) Participation in public engagement initiatives (total respondents) and (b) preferred activities by generation.

Respondents were asked to state the level of trust in a range of organisations that provide information about science and exploration activities. 50% trusted researchers and academics completely or a lot. 47% trusted the national geological surveys completely or a lot and environmental and environmental advocacy groups 31%. National government was trusted a lot by 22% and local government by 19%, with traditional media (radio, television, newspapers) trusted by 18% and social media sources trusted by 9%.

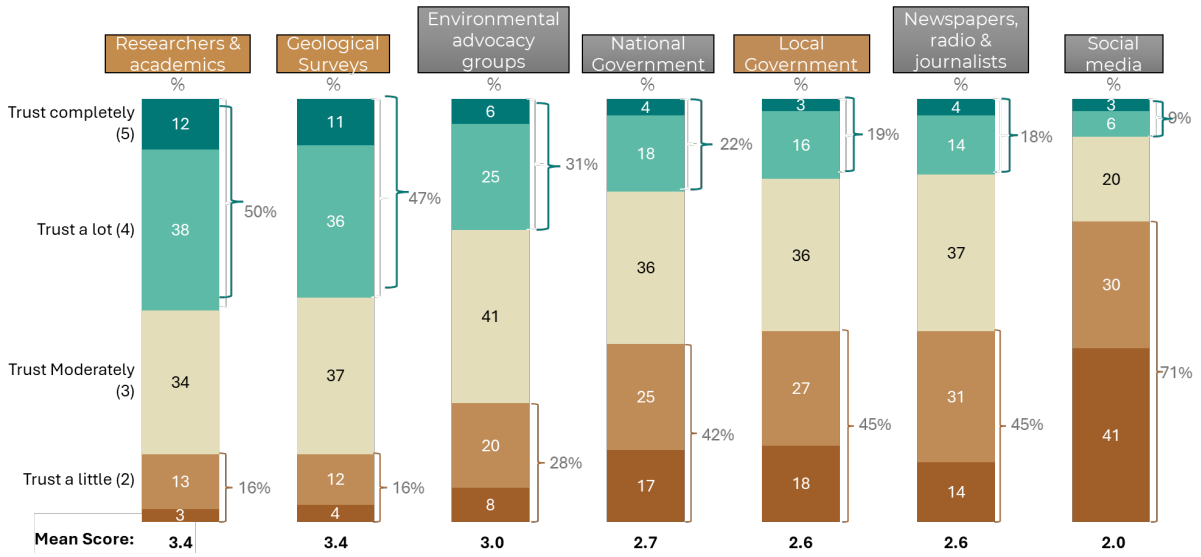


Figure 23 Trust in groups to provide accurate, objective information regarding geothermal exploration.

There were some distinctions between Ireland and NI, with little or no trust higher in NI respondents compared to Ireland for national government (50% vs 39%), local government (54% vs 41%) and traditional media (58% vs 40%). 12% of Gen Z more likely to trust social media than older generations (3-4%)

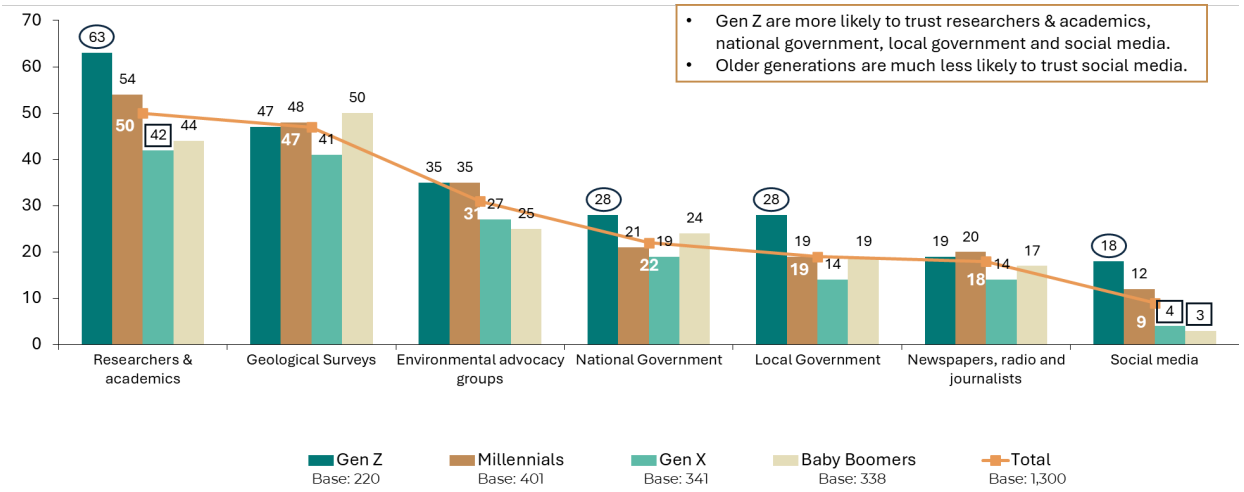


Figure 24 Trust in information sources. Numbers in circles are highest, numbers in squares are lowest per source.

In response to the final question 'If available and cost effective, how likely would you be to install/use geothermal energy to heat your home?', approximately half responded positively (Ireland 53%, Northern Ireland 47%), with more males and younger generations being in favour than females and the older generations.

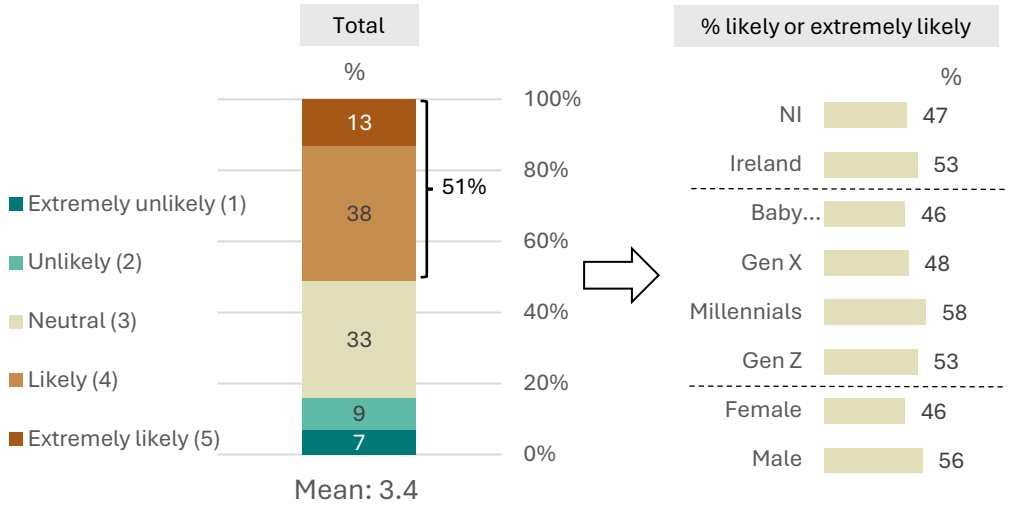


Figure 25 Likelihood of respondents installing geothermal energy to heat their home.

General responses and comments

Respondents were also provided an opportunity to give feedback via free text. Many of these requested more information and interest in the topic or commented on the perceived barriers to uptake (e.g. cost of installation). Some comments included concerns about the environment – although the respondents' understanding of geothermal technologies and their environmental impact is not factually correct, the comments are included here as an example of reasonable concerns arising primarily from a lack of accurate information.

"*A lot more education needed for the general public.*" – Female, Baby Boomer

"*Cheap energy all year long, sign me in.*" – Male, Millennial

"*A lot of education about this is required, particularly with info on how Iceland uses it, although I know they are very volcanic[ly] active.*" – Male, Baby Boomer

"*I'd really love if a cheaper way to heat my home, and power my living space, and be environmentally friendly*" – Female, Baby Boomer

"As long as the right research is done and the public has a say". – Male, Gen X

"I'd like to find out more before fully commi[t]ting to geothermal energy" – Male, Gen X

"Too expensive. Grants needed - before work carried out". - Male, Baby Boomer

"We must stop burning fossil fuels. Geothermal hearing systems could contribute a lot to this". - Male, Baby Boomer

"I would like to know more about the effects of it and exactly what the results are from the current use in other countries and also what are the possibilities that could happen down the line that may not have happened yet in the countries where its being used a lot" – Female, Gen X

"I hope that this information gives insight to regular, average working people's opinions on Geothermal energy. I think if implemented safely, this could be a concept that vastly improves the quality of life of Irish people. I also think that it would contribute well to the job market and provide employment for hundreds, if not thousands of people" – Male, Gen Z

"I would like to know more and how would you find out more about this system". - Female, Millennial

"My local authority owns my house so I couldn't" - Female Baby Boomer

"I would like to be more informed on the topic, re challenges, any pollution and impact on people and society." – Male, Baby Boomer

"Great to see the topic raised, I have been a long time supporter of geothermal energy. Look what Switzerland has done. Solar is now passed" - Male, Baby Boomer

"I intend to find out more about this subject." - Male Baby Boomer

"In which areas of Ireland is this energy available" – Female, gen Z

"Geothermal energy is a highly promising and sustainable source of power that offers a reliable alternative to fossil fuels. It has the potential to significantly reduce carbon emissions, especially in regions with abundant geothermal resources. Aside from electricity generation, its use for heating and cooling (such as through ground-source heat pumps) is an energy-efficient solution that is increasingly gaining attention for both residential and commercial applications." - Male Millennial

"I didn't want to come across as negative on this survey I would need to know a lot more before fully jumping in, up until this survey I had never heard of geo thermal for Ireland" – Male, Millennial

"I now more a little bit more about geothermal energy from the survey. I'd be interested to know the cost of a home system and also how viable it is in the area I live." - Male, Millennial

"I like the idea of it but retrofitting a house and the cost attached are prohibitive." - Male, Gen X

"Being in a dense urban area and living in an apartment complex I am unsure of the viability of geothermal power for me" – Male Millennial

"Interesting I will read more" – Female, Gen X

"It's just too expensive relative to air to water source" – Male Millennial

"When will this be available?" – Male, Gen X

"This idea seems too futuristic to be implemented in Ireland in any reasonable timeline" – Female Millennial

"I do not know enough about this and whether it can be installed to homes already built" – Male Gen X

"If it was a viable, affordable option I would advocate for it" – Female Millennial

"I just need more information about the project, I don't like interfering with the earth's core unless someone can 100 per cent give me a reason that it is totally safe." - Male, Gen X

"Would love geothermal heating in my area" – Male, Baby Boomer

"I cannot see how this can be obtained without harming the environment and surrounding areas for wildlife and natural habitats. It surely would cause more harm than any benefits to the immediate area." - Male, Gen X

"I think it's important that the public are informed about exactly what it is and how it works" - Female, Gen Z

"It seems like a good idea, can i have a job" – Male, Millennial

"People will be all for it if its lowers energy bills, otherwise people will stick to what they know." - Male, Millennial

"I suppose that the general public know very little about geothermal energy. However if its being used successfully in other countries why not Ireland" – Female, Baby Boomer

"*Geothermal energy is a sustainable option, but challenges like high installation costs, lack of infrastructure, and limited public awareness hinder[s] its adoption."* – Male, Gen Z

"*I would love to know the financial implications*." – Female, Millennial

"*Geothermal energy is a clean energy source, producing nearly no carbon emissions."* – Male, Millennial

"*I need more information about geothermal."* – Female, Baby Boomer

"*Any renewable source of energy is welcomed."* – Male, Gen Z

"*From what I can gather and this may be right or wrong, but it takes all day for your home to get up to temperature when you turn it on. The cost is horrendous, and it would need to be significantly reduced before people would be slightly interested."* – Male, Baby Boomer

3. Discussion

Knowledge and attitudes

Overall, there was negligible difference between responses from Ireland and Northern Ireland for most aspects of the survey; this allows for a coherent approach to communications for both jurisdictions. Knowledge of the use of geothermal energy globally was mostly limited to well-known volcanic countries, such as Iceland, and there was a clear lack of awareness of the potential for geothermal energy (for residential heating, but particularly non-residential heating), across the island of Ireland. The level of awareness across segments (age, gender etc) varied slightly, with females and older generations having the lowest levels of awareness.

In this survey, cost was identified as the overwhelming factor influencing respondents' choices of energy sources for home heating and cooling. The second most influential factor was reliability[1]. Given the trend towards electrification of heating (including hot water supplies) this likely impacted people's opinions.

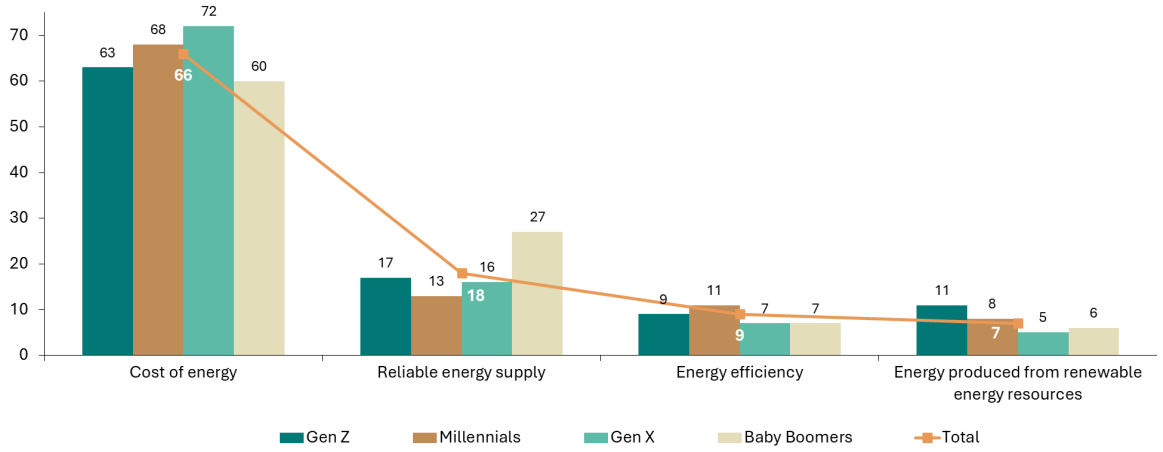


Figure 26 Most important factors in terms of energy supply at home by generation. Mean numbers indicated in white.

The largely neutral view of geothermal energy is most likely due to insufficient or incorrect knowledge; many respondents had not formed a strong opinion either way as they were largely unaware of the technology or assumed it could only be used in e.g. volcanic areas. More than 40% of respondents did not understand what geothermal energy is, nor how it works as a renewable heat resource. More than half were not aware

[1] It should be restated that this survey was carried out immediately after a significant storm which had affected power supplies in many areas across the island. Repeating this survey after e.g. new political instability globally and increased energy prices may produce different results

of the use of geothermal energy for heating for residential use and more than 60% were not aware that it can be used for commercial and industrial use.

On the positive side there was an overwhelming interest in having more information available - this was evident in the willingness to participate in community engagement or information sharing activities, but also in the general comments provided by respondents at the end of the survey. This curiosity is a significant advantage in designing and planning communication strategies. Combined with the demographic information, we can also tailor communications plans for different groupings to achieve even greater impact.

Perceived benefits and barriers to uptake

Respondents selected the perceived principal benefits of community-scale geothermal heating schemes as (i) reducing dependency on fossil fuels for heating, (ii) providing cheaper energy/reducing fuel poverty, and (iii) energy independence. However, only 2 in 5 in Ireland, and 1 in 3 in Northern Ireland, felt such schemes would benefit them personally. This disconnect is difficult to resolve, as it incorporates community challenges as well as geothermal energy knowledge gaps. Supporting community engagement activities are, therefore, important aspects to include when considering stakeholder messaging and to ensure trust and transparency.

Climate and environmental benefits, such as reduced greenhouse gas emissions and improved air quality, were ranked in the top three benefits; only 39% of respondents included emissions reduction in the top three, while only 34% included improved air quality. Only 10% considered either of these as the top most important factor. These results closely correspond to the rating of important factors when considering own home energy supply, supporting the view that the sustainability aspect of geothermal energy is of relatively minor importance to the public.

Financial considerations were perceived to be the biggest barrier to uptake of geothermal energy for heating and cooling. Although there were differences between age groups regarding their priorities (e.g. reduced carbon emissions versus reliability, etc.) when choosing home heating and cooling energy technologies, the cost of energy was by far the most influential factor, with 94% of respondents listing it in their top three. Later responses around perceived risk, and the free text responses, also referred to cost and financial aspects – both the cost of the geothermal technology itself, and the cost of retrofitting homes to meet system requirements and maximise efficiency.

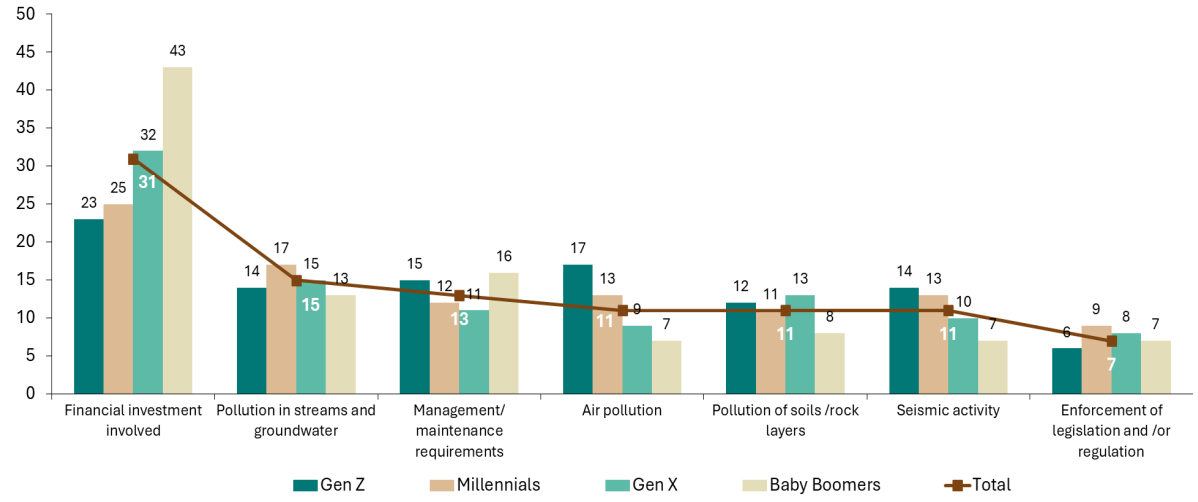


Figure 27 Most significant perceived risks of installing a geothermal energy heating system. Mean numbers presented in white.

Similarly, when asked why geothermal energy has not yet developed at scale on the island of Ireland, the top answer was cost of installation. Also frequently selected were infrastructure being set up for other heat sources, and a belief that there is not enough sun (for very shallow residential systems)/or volcanic activity (deep systems), to provide sufficient resources. These knowledge gaps can be addressed by improved communications at all levels from primary education, through to national policy.

Some comments identified a lack of information about geothermal energy, or data about a location as barriers to uptake. There was also a perception that other types of sustainable systems are easier to install, and those technologies have correspondingly more suppliers/trained professionals to maintain systems. The results of the feedback highlight the importance and role of projects like GEMINI. It is critical that a holistic approach is taken to building knowledge and capacity across the island of Ireland to address not only the information and data gaps but also help to support the training of professionals that can deliver the roll-out of successful and effective geothermal systems. This will require technical skills and training (e.g. for resources modelling, installation, system design, maintenance etc.) but also financial and economic modelling, communications experts, and policy and regulation specialists. However, there is a wealth of information available internationally, in particular across European countries with similar geological settings and resources, and working within similar policy and regulatory frameworks. In particular, countries like France, Denmark, Croatia, Germany and the Netherlands have successfully implemented data sharing, licensing, and financial incentives and risk schemes that have been very effective in supporting the growth of their geothermal energy sectors.

Considering risks, the most significant perceived risks (after financial) were environmental - for example, pollution of streams and groundwater. This is an expected and reasonable perception where energy infrastructure interacts with natural ecosystems. Fortunately, on the island of Ireland we have a good understanding of our

hydrological systems with strong national and European regulation, such as the Water Framework Directive and national regulation implemented by the Environmental Protection Agency and the Northern Ireland Environment Agency. The risks from geothermal energy of interacting with, or negatively impacting, shallow ecosystems are low; closed systems do not directly interact with fluids in aquifers, and open systems typically access deeper aquifers (i.e. several hundred metres) which are not used for drinking water resources. There are also very strict regulations on any chemicals that are used in geothermal energy systems (e.g. to prevent natural scaling of pipes). Implementation of existing regulation will mitigate environmental risks and protect ecosystems. In addition, the roll-out of geothermal energy will likely improve some environmental conditions (e.g. reduce air pollution and particulate matter from biomass). The small footprint and reduced need for visible physical infrastructure also reduces impact on e.g. bird populations. These factors should be highlighted in communications and engagement work, including the positive health benefits, low environmental impacts, and reduction of emissions.

Trust in sources of information, regulation and policy

Trust was greatest in researchers/academics and geological surveys, followed by environmental advocacy groups, national or local government, traditional media and, finally, social media. However, all groups were trusted less in Northern Ireland than in Ireland.

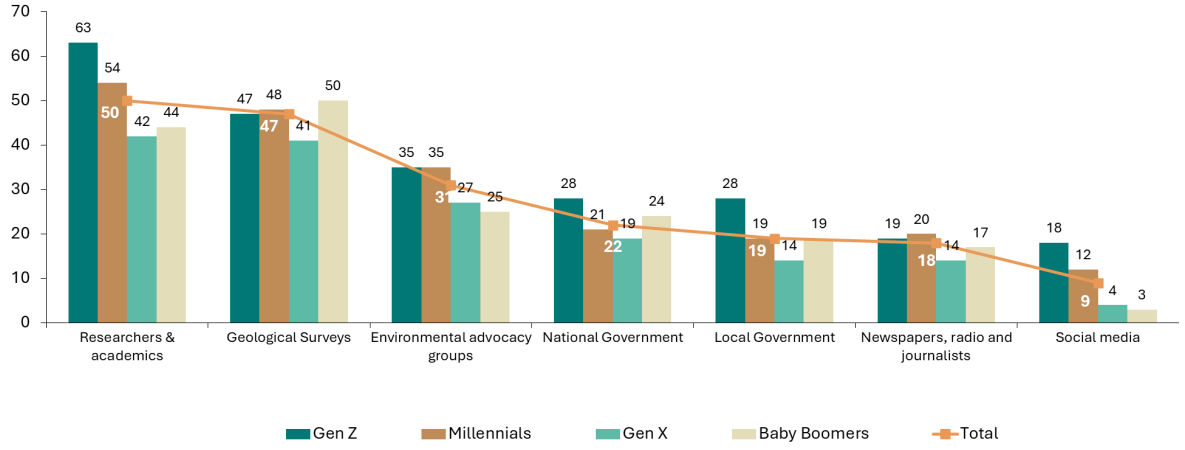


Figure 28 Trust in groups to provide accurate, objective information on geothermal exploration (by generation). While numbers represent the mean.

Identifying the source of 'trusted' information for audiences and stakeholders is fundamental to the GEMINI communications strategy; to reach all stakeholders, a range of traditional and social media platforms needs to be employed, but it is also important to consider who is actively communicating. Material on social media platforms, in

particular, also needs to be monitored to ensure misinformation or disinformation is countered with accurate information made available from trusted sources.

In Ireland, 2 in 5 people believed they would personally benefit from a community-scale geothermal energy system, this drops to 1 in 3 in Northern Ireland (this is particularly strong in Baby Boomers at 39%, and those who do not support geothermal energy generally at 51%). It is not clear why this perception is so low, for example if it is due to more isolated rural homes that in general do not benefit from connected water services, sewage networks etc., or if it is more related to a lack of ownership and input into community level projects and a belief that such projects will only benefit the owner/distributer. This theme will be further explored in GEMINI through the direct community engagement work in Lough McNean, Dublin and Belfast.

A majority of respondents also believed that local communities should be involved to some extent in estimating if geothermal energy resources might be a suitable solution for the community. The group identifying themselves as 'not at all supportive of geothermal energy', wanted the least input into estimating whether geothermal energy might be a suitable heating resource locally. Of those interested in being involved in a community decision, the highest ranking groups were Baby Boomers (53%), men (43%) and Gen X (42%). At the implementation stage of a project, over half believe that the local community should have input into how the geothermal resource is managed and delivered, again reiterating the level of interest from local groups who do want to actively engage - only 1 in 6 believe the local community should not have a say. The most interested groups were Baby Boomers (60%) and Gen X (52%), which may suggest that more targeted information or encouragement to engage may need to be tailors for other demographics. There was no difference between male and female respondents with interest from both groups at 51%.

In Ireland, just over half (51%) of respondents were supportive or very supportive towards the development of a deep geothermal energy project in their community if they had meaningful input. However, this falls to only 40% in Northern Ireland; in Northern Ireland those that are not supportive are similar to Ireland (11% versus 14%, respectively), the greatest difference is in those that are neutral towards the statement with 38% of respondents in Ireland versus 46% in Northern Ireland. The variation in responses it is not immediately and requires further investigation.

Awareness of this interest in community-based, or even community led, projects is useful in designing and developing communications materials to support communities in making decision about local energy decarbonisation solutions. When combined with the overall interest in gaining more knowledge about geothermal energy in general, this data can be upscaled to regional or national campaigns.

4. Conclusion

It is important to note that many responses were neutral/'don't know'. Therefore, it is imperative that GEMINI and similar projects and initiatives, help to provide accurate and useful information to enable informed and clear decision making for all types of stakeholders.

In terms of direct use of the survey results, they have been used to support several elements of the GEMINI project. For example, it is informing the community engagement activities at demonstration sites, the deliberative democracy work and social science research. Specifically, it has been used to (a) help to shape the overall project communications strategy and messaging, and (b) to design direct research and engagement plans for various tasks within the GEMINI project, for example the public engagement work in Dublin and Belfast. At a more practical level, the survey outputs have been used for designing, and choosing the mode of distribution, of materials. For example, short videos describing how geothermal energy works in general have been added to the website and YouTube and included in teacher training materials. For higher level decision makers looking for more information, podcasts and blogs are available on the project website to highlight specific technical elements of the projects. Further details on these research areas are also available in the website publications section. The Frequently Asked Questions have also been designed to address some of the knowledge gaps, concerns and misinformation.

As a final task in the GEMINI project, the survey will be repeated to assess any changes to general awareness, trust, support and information available to broad public group on the island of Ireland.

Results and communications materials will be available on the GEMINI website, highlighted through posting on social media platforms and though content in traditional media, as well as via the GEMINI toolkits and project outputs, and through publications.

www.geminigeothermal.com