D 5.1

Engagement Strategy

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D 5.1 Engagement Strategy

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Partners short names

APRE	AGENZIA PER LA PROMOZIONE DELLA RICERCA EUROPEA
UNIFI	UNIVERSITA DEGLI STUDI DI FIRENZE
COSVIG	CONSORZIO PER LO SVILUPPO DELLE AREE GEOTERMICHE
SDU	SYDDANSK UNIVERSITET
GU	NGO GEOTHERMAL UKRAINE
SINTEF	SINTEF AS
SINTEF ER	SINTEF ENERGI AS
RIVACOLD	RIVACOLD SRL
NEO ECO	NEOECO DEVELOPPEMENT
S.M.F.	FORMAGGERIA TOSCANA S.R.L.

Abbrevations

CA	Consortium Agreement
EC	European Commission
EU	European Union
GA	Grant Agreement
HTTP	High-Temperature Heat Pump
KER	Key Exploitable Result
KPI	Key Performance Indicator
TRL	Technology Readiness Level
SRL	Societal Readiness Level

Executive Summary

This deliverable (5.1) presents the GEOSYN Stakeholder Engagement Plan, outlining the project's strategy to build awareness, trust, and acceptance of geothermal energy technologies among the project's diverse stakeholder groups. This engagement strategy is designed to ensure that the technical achievements of GEOSYN are effectively translated into societal as well as market impact.

The stakeholder engagement plan supports the objectives of Work Packages 5, with support from Work Packages 1 and 6, which together address the social dimension of geothermal technology adoption. Its primary aim focuses on increasing awareness and understanding of geothermal heating and cooling solutions, to foster trust and social acceptance through transparent communication and participatory engagement, while effectively demonstrating the societal and economic benefits of GEOSYN technologies for both local communities and industry.

GEOSYN identifies and categorises stakeholders into key groups including policy and regulatory bodies, industry representatives, academia, citizens and local communities, students and young women as well as other EU-funded initiatives. The GEOSYN engagement approach follows evidence-based and transparent communication principles, supported by tailored methods such as:

- Workshops and Mobilisation & Mutual Learning (MML) events online and in presence Italy and Ukraine.
- Online campaigns, info-sessions, and webinars, including infographics, podcasts, and videos.
- Surveys and continuous feedback collection loops through digital channels.
- Collaborations with advisory boards and partners to co-create practical recommendations.
- Clustering workshops with other projects and initiatives.

The engagement strategy deploys a progressive, multi-channel communication plan, aligning activities with project milestones. Early efforts focus on raising awareness, followed by participatory workshops and policy dialogues and recommendations to embed geothermal technologies within regional and European frameworks. All engagement activities are documented and evaluated through defined KPIs and feedback loops, ensuring alignment with the broader communication strategy under WP6 (detailed in Deliverable 6.1) and contributing directly to the Deliverable D5.2 – Report on Social Engagement which will give an account of the effectiveness of this plan when implemented.

Stakeholder engagement is a core pillar of the GEOSYN project, bridging the gap between technical innovation and societal acceptance. This deliverable positions WP5 as a key interface between the project's technological development and its social impact, enabling geothermal energy to move from awareness to trust, and hopefully support future widespread adoption and replication. Thus supporting Europe's collective transition toward clean, sustainable, and socially inclusive energy systems.

1 Introduction

1.1 GEOSYN project

The GEOSYN project contributes to the decarbonisation of industrial energy systems by advancing the use of geothermal energy as a sustainable and reliable resource. GEOSYN is developing an innovative high-temperature steam heat pump, integrated with a heat-powered refrigeration cycle using water as a natural working fluid. This technological approach enables a more efficient and flexible use of geothermal energy for industrial heating and cooling applications.

Despite geothermal energy offering significant environmental and economic advantages, its uptake in industry remains limited due to technical, social, and awareness-related barriers. GEOSYN is addressing these challenges through both technological innovation and stakeholder engagement, ensuring that the project's technical outcomes are supported by social awareness with the aim of increasing social acceptance.

This deliverable (5.1) outlines the GEOSYN Stakeholder Engagement Plan, which defines the strategy for engaging with policymakers, industry representatives, researchers, and citizens throughout the project's implementation. The plan will be executed by Work Packages 1, 5, and 6, which collectively address the social, communicative, and policy dimensions of the project. It aims to increase awareness, trust, and understanding of geothermal heating and cooling solutions, both in general and specifically for the GEOSYN system, as well as to ensure that stakeholder perspectives inform project development and dissemination activities.

By integrating engagement activities with research and innovation processes, GEOSYN seeks to foster collaboration, improve social acceptance, and facilitate the wider deployment of geothermal energy technologies in general and the wider exploitation of the GEOSYN solution in particular.

1.2 Purpose of this deliverable

This deliverable will outline the Stakeholder Engagement Plan for the GEOSYN project, defining the objectives, methods, and activities designed to involve the identified key stakeholder groups throughout the project's duration. It aims to increase awareness and trust in geothermal energy solutions, both in general and specifically in relation to the GEOSYN solution for industrial heating and cooling applications. The deliverable provides a framework for structured engagement aligned with Work Packages 1, 5, and 6, ensuring that stakeholder perspectives inform the project's technical and societal outcomes. Engaging stakeholders is essential to building confidence in geothermal technologies, addressing social and perceptual barriers, as well as fostering collaboration between the GEOSYN stakeholders including policymakers, industry, researchers, and local communities, thereby supporting the wider acceptance, deployment, and long-term sustainability of the GEOSYN solution.

1.3 Structure of this deliverable

Going forward this deliverable is structured as follows:

Section Two discusses and reviews existing research on public perceptions and trust in geothermal energy, identifying barriers to social acceptance and draws on lessons from previous Horizon projects.

Next in section three the Stakeholder Mapping and Identification section describes the approach used to identify and categorise relevant stakeholder groups, outlining their roles and levels of engagement within the project.

The Engagement Strategy and Plan in section four sets out the objectives, guiding principles, and communication tools, including workshops, online campaigns, and awareness activities.

The Methods, Tools, and Toolbox outlined in section five summarises the methodologies and instruments supporting stakeholder engagement, such as surveys, participatory workshops, and online platforms, and explains how feedback will be collected and integrated into project activities.

Section six outlines the next Steps by Stakeholder Group and Impact Pathways outline tailored engagement actions for each stakeholder category and the expected outcomes.

Next in section seven Monitoring and Evaluation defines the indicators and reporting mechanisms for assessing engagement effectiveness and ensuring alignment with the project's communication strategy (outlined in Deliverable 6.1) and Deliverable D5.2.

Finally, the Conclusions section summarise the engagement actions undertaken and planned, highlighting the iterative nature of the process and its role in connecting the technical development of GEOSYN with societal acceptance.

2 Societal Impacts of Geothermal Heating and Cooling Technologies

2.1 Setting the Scene –A short review of outcomes from other European Research Projects

Geothermal energy is recognised as a stable and sustainable renewable energy source in Europe, offering substantial potential for decarbonising industrial and residential heating and cooling systems. To date its levels of deployment and social acceptance have varied considerably across European regions which can be thought to be influenced by differing levels of public awareness, perceived risk, and trust in the available technologies. Research from recent EU and Horizon projects suggest that technological excellence alone is not sufficient for adoption. In addition to technological advancements, they found that social acceptance, transparent communication, and inclusive engagement are essential elements for success. As highlighted by Bonciani et al. (2023), effective communication of geothermal science must move beyond technical dissemination, adopting participatory engagement and clear, non-technical language to foster public trust, inform policy, and increase social acceptance.[1]

The GEOENVI project identified that geothermal energy, while technologically mature, still faces significant social and regulatory challenges comparable to those experienced by other renewable technologies. Public trust depends strongly on how information is shared, whether data are accessible, and how local benefits are communicated and delivered[2]. At the same time their deliverable recommends not overloading the public with information and finding the delicate balance of adapting the communication to the target audience while remaining transparent. Similarly, the COMPASS project stresses the importance of clear, audience-specific communication strategies and participatory methods for building legitimacy and trust around geothermal projects[3]. Research from W4RES demonstrates that inclusive communication and the active involvement of women and underrepresented groups improve project credibility and innovation in renewable heating and cooling[4].

Heating and cooling technologies offer particular potential to strengthen social trust in geothermal systems because they deliver visible and tangible outcomes. Stakeholders can directly experience the benefits for example reduced bills/ costs, and cleaner air, which reinforces the perceived value and reliability of the technology.

[1] Bonciani, D., Barich, A., Vichi, M., Pippucci, A., & Torsello, L. (2023). Communicating geothermal geoscience results to improve public policies and social acceptance of geothermal energy. European Geologist Journal, 56, 17–23. DOI: 10.5281/zenodo.10463544

[2] GEOENVI (2021). Public Engagement Policy Brief – Recommendations on environmental regulations / public engagement. Horizon 2020, Grant No. 818242.

[3] COMPASS (2023). D7.3 – Best Practices and Geothermal NIMBY Interventions. Horizon Europe, Grant No. 101084623.

[4] W4RES (2022). D4.1 – Report on Awareness Campaigns for Renewable Heating and Cooling. Horizon 2020.

Energy poverty is a widespread problem across Europe, as between 50 and 125 million people are unable to afford proper indoor thermal comfort. This is due to a mix of energy inefficient buildings and appliances, high energy expenses and low incomes. But energy poverty is also related to the energy sources used in buildings. Installing renewables systems – such as geothermal heat pumps and geothermal district heating & cooling – could greatly contribute to tackle this serious issue. The reasons are multiple. Renewables technologies for heating and cooling have low operational costs in the long run. They improve air quality and cut pollution coming from fossil sources. They are secure as they do not have to be imported from third countries. They are available all year around.

2.2 Existing Trust Levels and Challenges to Social Acceptance

Despite increasing familiarity with renewables, trust in geothermal energy remains uneven. Public hesitancy often stems from perceived environmental and safety risks as well as limited understanding of geothermal processes. The GEOENVI policy brief notes that in some European countries, data on geothermal operations are fragmented or not easily accessible.

The COMPASS D7.3 report identifies communication gaps, inconsistent local involvement, and a lack of early engagement as recurring barriers to trust. Communities frequently report feeling informed only after key project decisions are made, leading to NIMBY responses and reduced willingness to participate. Projects who adopt proactive engagement, publish accessible environmental data, and demonstrate community benefits early in development tend to experience higher acceptance and fewer conflicts.

The CROWDTHERMAL project complements these findings, introducing the concept of the Social Licence to Operate (SLO) to geothermal contexts. Originally used in the mining sector, SLO frameworks promote long-term community trust through transparency, participation, and benefit-sharing mechanisms[5]. The findings from these projects argue that when citizens are empowered through local investment schemes or direct monitoring roles, perceptions of fairness and control improve markedly.

For GEOSYN, where industrial-scale heating and cooling are central, building trust means not only communicating technical performance but also connecting both project outcomes and the benefits of geothermal energy to broader community values including energy security, cost stability, and local economic growth.

2.3 Analysis of Existing Experiences

Evidence from prior Horizon projects provides a solid foundation for the design of GEOSYN's stakeholder engagement strategy. The COMPASS deliverables D7.3 and D7.4 both underline that communication is essential as is framing geothermal energy around shared local values such as sustainability, local pride, and economic benefit. In their experience it is more effective than depending solely on technical arguments.

[5] CROWDTHERMAL (2021). Social License and Public Acceptance Framework for Geothermal Projects. Horizon 2020.

A further outcome of the COMPASS project that is relevant for GEOSYN comes from their social engagement activities t[6]o understand local perceptions of geothermal energy and strengthen social acceptance. Their research revealed that while geothermal energy is generally seen as beneficial for decarbonisation and cost reduction, concerns persist regarding environmental, health, and landscape impacts. Interviews and a community workshop in Piancastagnaio highlighted the importance of clear, transparent communication, ongoing dialogue, and co-designed engagement approaches. The COMPASS findings confirm that social acceptance must be actively built through trust, tailored engagement, and visible local benefits.

In addition, GEOSYN is building on the experience of initiatives such as the GEOFIT Project's "Women in Geothermal" series[7], GEOSYN recognises the importance of gender inclusion in driving innovation and societal impact. Drawing lessons from these efforts, GEOSYN integrates targeted actions to engage young students (high school and university) including communication campaigns, podcast episodes and informational events. These are designed to promote visibility, inspire participation, and support gender-balanced engagement in the geothermal and broader clean energy sectors.

2.4 Best Practices Identified by Other Projects

Cross-project analysis reveals a consistent set of best practices for fostering acceptance and trust in geothermal energy solutions:

- Engage early and maintain continuous communication channels.
- Prioritise transparency and accessibility. Sharing updates, open data and relevant information through user-friendly portals, dashboards, and reports increases accountability.
- Adopt participatory and co-creative approaches. Tools such as Mobilisation and Mutual Learning (MML) workshops, participatory mapping, etc enhance understanding and inclusivity.
- Communications should be tailored to audience type, effort should be made to ensure technical content is accessible.
- Build on trusted intermediaries. Collaboration with municipalities, local NGOs, and academic partners can increase credibility.
- Integrate feedback loops early.

2.5 Existing Issues and Challenges

Even with these frameworks, geothermal projects continue to face persistent engagement challenges. Across case studies reviewed in COMPASS, GEOENVI, and CROWDTHERMAL, low awareness remains a common barrier. Public understanding of geothermal systems is limited, and public perception of environmental concerns typically centres on issues such as seismicity; groundwater pollution; air emissions; surface disturbance (including noise, vibration, dust, odour, land occupation, and visual impact); ground elevation changes; and radioactivity. As outlined by

[6] COMPASS (2025). Deliverable D7.5, Report on Social Engagement, Horizon 2020 Europe, Grant No. 101084623.

[7] https://geofit-project.eu/category/women-in-geothermal/

the GEOENVI project deliverable[8] public concern over induced seismicity is high, driven by fear of unpredictable geological impacts, especially when past accidents or media coverage have amplified risks. Groundwater contamination is consistently perceived as one of the greatest risks, particularly where there is a lack of clear information or past negative associations with water safety. Although often overlooked, air emissions can become a major source of opposition when tied to local health concerns or pollution incidents, as seen in controversial geothermal sites. Noise, vibration, visual impact, and land occupation are commonly cited nuisances that significantly influence public attitudes, especially in densely populated or protected areas. While less frequently mentioned, ground uplift events—however rare—can quickly raise alarm if widely reported, contributing to broader fears of uncontrolled subsurface activity. Though rarely discussed in depth, the potential for radioactive upwelling has surfaced during public consultations, becoming a symbol of mistrust and prompting strong local reactions.[9]NIMBY dynamics continue to emerge, particularly where engagement is reactive or overly technical. As highlighted by COMPASS, opposition is mainly due to a general lack of awareness on geothermal technologies and resulting risks/benefits, as well as a perceived exclusion from decision-making. Communication of subsurface technologies face challenges linked to their perception of something out of sight and out of mind, an unfamiliar realm and therefore a source of concerns[10,11]. In addition, engaging with local communities reduces the gap between citizens and project developers and operators, to develop a project more integrated into the territory and its needs. For GEOSYN, which operates in two geographic contexts with the case studies in both Italy and Ukraine, this underlines the need for tailored engagement approaches that recognise local realities, address specific concerns, and highlight tangible community advantages. In addition, the five virtual case studies under GEOSYN—spanning industries in Italy, Ukraine, Croatia, and France—serve as important tools to raise awareness and foster stakeholder understanding of geothermal-based heating and cooling solutions. By simulating real industrial scenarios, these studies will provide accessible examples of the GEOSYN concept's potential benefits, helping to bridge technical insights with public and industrial perception and strengthen trust and visibility around geothermal innovation.

[8] Voirand, A., Maury, J., Blanc, I., Dumas, P., Garabetian, T., Ravier, G., Aksoy, N., & Delvaux, S. (2020). Report on perception of environmental concerns and strategies/recommendations to deal with biased perception (Deliverable D2.3). GEOENVI Project. Horizon 2020. Grant Agreement No. 818242. Available at: https://www.geoenvi.eu

[9] Manzella, A., Pellizzone, A., Allansdottir, A., & Röhrkasten, S. (2020). Report on environmental concerns (Deliverable D2.1). GEOENVI Project. Horizon 2020. Grant Agreement No. 818242.

[10] Stewart, I. S., Lewis D. (2017). Communicating contested geoscience to the public: Moving from 'matters of fact' to 'matters of concern'. Earth-Science Reviews, 174, 122-133. https://doi.org/10.1016/j.earscirev.2017.09.003.

[11] Kluge, J.; Ziefle, M. (2016). As Simple as Possible and as Complex as Necessary. In HCI in Business, Government, and Organizations: Information Systems; Nah, FH.; Tan, CH., Eds. Springer Cham: Cham Switzerland, Volume 9752, pp. 171-182. https://doi.org/10.1007/978-3-319-39399-5_17.

2.6 Areas for Potential Improvement

Building on lessons from the reviewed projects, several areas for potential improvement in stakeholder involvement can enhance the societal acceptance and trust in geothermal heating and cooling technologies:

- Demonstrate clear local benefits. Use transparent indicators e.g. energy cost savings, information impacts, measures for their mitigation etc and communicate these through accessible messaging (both via text and visuals).
- Embed social-science expertise and social researchers into geothermal consortia to analyse community dynamics, perception trends and plan awareness raising and engagement campaigns.
- Promote inclusivity and diversity. W4RES shows that gender-balanced participation and engagement with youth and entrepreneurs amplify innovation and acceptance.
- Strengthen transparency and feedback. Site visits, information desks, regular reporting, consistent communication, and post-event summaries demonstrate accountability and help maintain long-term trust.

For GEOSYN, these findings translate into a practical roadmap: the communication campaigns are designed for specific stakeholder groups with transparent messages across all phases, embedding social science expertise and researchers within the consortia and basing the path forward on their research. GEOSYN has a focused task on empowering students and female entrepreneurs. GEOSYN is linking technical developments with social benefits and will ensure that engagement outcomes, created through participatory mechanisms, feed into policy recommendations which will be developed in the course of the project.

Within Work Package 1 and 5, a "Survey on the Perception and Social Impacts of Geothermal Heating & Cooling Systems in Industrial Sectors" is being conducted in Italy and Ukraine within the GEOSYN project. This study explores the current public perception of geothermal energy as a means to meet heating and cooling needs in production processes focusing on specific areas in both countries: Geothermal Areas in Tuscany, Italy and Lviv, Zakarpattia and Ivano-Frankivsk regions in Ukraine. Answers are collected anonymously and concern citizen's awareness on geothermal technologies, risk/benefit perception, local expectations and positions on communication and engagement strategies. This information will be used for activities in Project Work Package 5, to improve communication strategies and enhance community engagement in geothermal-related public initiatives. Quantitative information collected through questionnaires, have been complemented by participatory sessions during a webinar in Ukraine and a workshop in Italy that involved local communities and notably representatives of the civil society, citizens, local authorities, NGOs, potential H&C end user companies and the tourism sector.

As detailed in Project Deliverable 1.3, the analysis of surveys and workshops in Italy and Ukraine identifies specific opportunities to strengthen communication, community engagement, and the overall perception of geothermal technologies, including opportunities for H&C integrations in local production processes.

In both territories, public awareness of geothermal energy is limited and often linked exclusively to electricity production, while the potential of geothermal H&C applications is not yet fully

understood. This, despite the study areas in Italy already hosts 34 geothermal powerplants, geothermal district heating systems and production processes using geothermal heating. Communication efforts should therefore prioritize simple, evidence-based messages clarifying the environmental benefits, reliability and economic advantages of these technologies.

Respondents in both countries expressed the need for clearer and more transparent information. In Italy, citizens requested accessible explanations of environmental and landscape impacts and continuous feedback from local authorities and operators. This trend is also confirmed by a round of semi structured interviews conducted within the Horizon Europe COMPASS project. In Ukraine, participants of the GEOSYN webinar appreciated the inclusion of local experts and the emphasis on community-level benefits, confirming that trust increases when communication is locally anchored and interactive. Future actions to improve geothermal communication should then include:

- Simplified, visual communication materials tailored to non-technical audiences;
- Regular information sessions and webinars co-hosted by municipalities and experts;
- Clear messaging on the economic and environmental returns of geothermal investments.

In addition, the Italian Workshop revealed that citizens appreciate direct participation but often prefer mediated engagement through trusted institutions such as local governments or schools. In Italy, proposals included open seminars, co-design meetings and education activities in school to enhance intergenerational awareness. Engagement strategies should thus combine participatory tools with institutional partnerships to ensure continuity, credibility, and inclusion.

The margins to improve acceptance and trust should rely on geothermal initiatives linked to local benefits (e.g., job creation, improved infrastructures and air quality). Geothermal solutions in the reference region in Ukraine are perceived as a means to support post-conflict recovery and community resilience. In Italy, participants associated geothermal with economic revitalization of rural areas and reduced energy costs.

Besides, a significant opportunity lies in promoting the integration of geothermal H&C systems within local industries and productive sectors is a significant opportunity for local development and acceptance improvement. Survey and workshop participants in Italy highlighted the potential of using geothermal energy in agriculture (e.g., greenhouses), food processing and artisanal or small-scale manufacturing. Applications can foster industrial competitiveness, lower operational energy costs and enhance the environmental sustainability of local supply chains. The industrial use of geothermal heat in Ukraine is still emerging, but stakeholders expressed strong interest in exploring synergies with district heating networks and industrial clusters, notably in energy-intensive sectors. Communicating these economic opportunities could increase both public and private sector engagement in geothermal deployment, especially if supported by case studies and pilot projects.

Communication strategies should therefore integrate clarity, transparency and proximity, while engagement activities should promote collaborative participation and demonstrate tangible socio-economic outcomes. The GEOSYN Project can strengthen the perception of geothermal energy by highlighting industrial and economic integration pathways. This will contribute to

improving the perception of geothermal not only as a sustainable technology but also as a driver of local innovation, competitiveness and socio-economic development, with positive consequences on public trust in both regions.

3 Stakeholder mapping & identification

3.1 Stakeholder Categories

The GEOSYN project engages a diverse set of stakeholders whose participation is essential to achieving the technical, societal, and policy objectives of the project. The engagement strategy ensures that each stakeholder group is involved in a manner that reflects its role in supporting the successful development, demonstration, and deployment of the GEOSYN solution or, of geothermal energy in general.

Industry stakeholders represent a primary target group, as they stand to benefit directly from the adoption of GEOSYN's high-temperature geothermal technology for industrial heating and cooling applications. However, many industries remain unaware of geothermal energy as a viable option; therefore, awareness-raising campaigns and targeted communication activities (as will be outlined in Section 4) are essential to inform and encourage this group's participation and interest. The physical Case Study of the Monterotondo Marittimo Dairy Factory and Virtual Case Study of the Neo-Eco Green Cement Plant in Ukraine will be largely directed towards this stakeholder group to demonstrate the benefits and potential positive impacts of Geothermal Energy adoption as will the additional selected virtual case studies in WP1. These case studies represent industries from Italy (geothermal brewery), Ukraine (paper and dairy), Croatia (food), and France (cement). In addition for this stakeholder group we will engage with specific clusters and associations for example the Agrifood cluster as multipliers.

Regional authorities and policymakers at European, national, and local levels are equally crucial. Their engagement ensures that the project's outcomes align with existing regulatory frameworks and contribute to the development of supportive policy and permitting environments. Their feedback will inform the GEOSYN policy recommendations and promote the integration of geothermal technologies within regional and European energy strategies.

Citizens and civil society representatives, including local authorities, NGOs, potential end users, and community organisations, are key to building public trust and social acceptance. Their inclusion allows the project to understand local perspectives (such as for the GEOSYN case studies in Italy and Ukraine), address concerns, and demonstrate the tangible benefits of geothermal energy for communities.

In addition, GEOSYN is dedicating specific efforts to engaging young women from high school and university to inspire them in studying, embark on a career or being an entrepreneur, through communication campaigns and informational events. This approach promotes diversity, inclusiveness, and innovation, ensuring that the transition to sustainable energy systems is socially equitable and reflective of a broad range of perspectives.

Finally, the GEOSYN Advisory Board and representatives from other EU-funded projects and initiatives are integral to ensuring knowledge exchange, cross-project collaboration, and long-term impact. Their involvement supports the transfer of best practices and strengthens the project's contribution to Europe's wider clean energy transition. In line with this GEOSYN has initiated the Geo-Cluster which is a collaborative cluster of EU-funded geothermal energy projects to strengthen the innovation ecosystem in the sector.

The Geo-Cluster includes sister projects such as GEOS-TECHIS and GEOFLEXheat, alongside others like USES4HEAT, FlexGeo, CoolLIFE, RE-WITCH, HOCLOOP, URGENT, TREASURE, and INTERSTORES. Together, these projects work to generate synergies that support innovation, knowledge exchange, and cross-project learning. A key objective of the cluster is to coordinate dissemination and communication activities, enhancing the visibility, uptake, and replication of project outcomes at both European and international levels.

Collaboration within the cluster is fostered through joint Mobilisation & Mutual Learning (MML) workshops, shared event participation, co-authored scientific outputs, and coordinated social media outreach via dedicated Geo-Cluster communication channels. This initiative reinforces the collective contribution of geothermal research projects to Europe's clean energy transition.

3.2 Stakeholder Database

As part of the process to identify potential industrial applications (D1.1), real industry candidates were mapped under WP1 across the 15 EU and associated countries to integrate GEOSYN technology to cover their heating and cooling needs. In total, 200 industry players were identified from Denmark, France, Italy, Norway, Ukraine, Austria, Croatia, the Czech Republic, Finland, Germany, Poland, Portugal, Romania, Spain, and Sweden. The mapped stakeholders cover 13 industrial sectors (food & beverages, paper, pulp & printing, chemical, pharma, cement, wood, iron & steel, manufacturing, glass, paint & coatings, energy (oil refinery), construction, textile), along with data centers and supermarkets. In WP5, dedicated activities are planned in GEOSYN partner countries, primarily in Italy and Ukraine, to engage the public and policymakers through info-sessions and workshops, followed by the development of policy recommendations for the implementation of geothermal solutions. In addition, 49 key national and international industry associations within the GEOSYN partner countries have been identified as key stakeholders in advancing industrial decarbonization strategies.

4 Engagement strategy & plan

The GEOSYN engagement strategy is a structure to build trust and increase both the awareness, and active participation among stakeholders throughout the project's lifecycle. The strategy connects the technical development of the GEOSYN solution with its social, industrial, and policy dimensions, ensuring that stakeholder inputs and feedback directly inform the project's implementation and long-term impact.

4.1 Objectives of Engagement

The core objectives of the GEOSYN stakeholder engagement plan are to:

- Increase trust and awareness of geothermal energy solutions, both broadly and in relation to the GEOSYN technology for industrial heating and cooling.
- Demonstrate the tangible benefits of geothermal energy, including economic savings, reliability, and environmental sustainability.
- Encourage participation and co-creation by stakeholders through transparent, evidence-based, and inclusive communication.
- Support knowledge transfer and capacity building through training, events, and digital tools.
- Integrate stakeholder perspectives into the project's technical, policy, and communication outputs to enhance adoption and acceptance.

To guide the process, the engagement approach draws inspiration from the Engagement Ladder model, progressing from information and consultation to collaboration and empowerment as the project evolves.

4.2 Steps to Contact and Engage with Stakeholders

Engagement within GEOSYN follows a staged approach aligned with the project timeline. Early actions focused on raising awareness and introducing key messages, followed by participatory activities such as workshops, surveys, and webinars designed to gather feedback and build up the GEOSYN stakeholder database.

Each engagement activity is guided by principles of transparency, inclusivity, and mutual learning. Stakeholders are contacted through targeted outreach, partner networks, professional associations, and online channels. Information sessions, project website and social media channels as well as direct communication ensure that stakeholders are kept informed of project progress and opportunities to participate.

4.3 Challenges and Proposed Solutions

As discussed in section 2.5 and 2.6 of this deliverable, several potential challenges have been identified in engaging stakeholders effectively. These include low awareness of geothermal technologies, limited public understanding of technical concepts, and varying national or regional policy contexts. In some cases, local resistance (NIMBY effects) and lack of interest from communities may also hinder participation.

To address these challenges, GEOSYN is:

- Using clear and accessible communication materials (infographics, videos, podcasts, and case studies etc) via multiple channels to make information understandable to non-experts.
- Promoting early involvement of stakeholders.
- Applying participatory tools in workshops to facilitate dialogue and co-create solutions that reflect stakeholder perspectives.
- Leveraging success stories to illustrate real-world benefits and build acceptance.

4.4 Channels and Tools

A combination of traditional and digital channels are already in use by GEOSYN to reach diverse audiences and ensure continuous engagement. These include:

- Workshops and participatory events (e.g. Mobilisation and Mutual Learning Workshops, project webinars).
- Online platforms such as the GEOSYN website, and social media accounts (LinkedIn, Facebook, Bluesky & YouTube) and Zenodo.
- Advisory Board meetings to facilitate strategic input from experts.
- Surveys to collect structured stakeholder feedback.
- Communication materials including infographics, podcasts, video testimonials, and fact sheets.

Engagement activities are designed to build progressively over the project's duration. Early actions focus on visibility and awareness, mid-phase activities prioritise collaboration and interaction, and final-phase activities focus on policy uptake and dissemination. Outputs such as policy reports, training materials, and webinar recordings will remain publicly accessible beyond the project to ensure long-term impact.

4.5 Events and Activities

GEOSYN's engagement activities are organised into several key components:

Awareness Campaigns: Three campaigns will be conducted (co-ordinated by WP6 informed by the work of WP1 and WP5) one targeting citizens, another focusing on the industrial sector and a third addressing young women. These campaigns will use infographics, fact sheets, and video testimonials shared across digital platforms to highlight the benefits of geothermal energy and showcase project achievements.

Mobilisation and Mutual Learning (MML) Workshops: Four participatory workshops to improve trust and acceptance levels targeted at GEOSYN stakeholders to identify barriers, co-create recommendations, exchange knowledge and develop solutions tailored to local contexts and needs. The workshops will be held in one Italy and one Ukraine. Additionally, the MML approach will be used for three workshops involving the HORIZON projects funded in the geothermal sector.

Informative sessions: A series of targeted online sessions (≥ 10) will be organised to reach key stakeholder groups. These will include briefings for regional and national policy makers and authorities in Italy and Ukraine (at least 25 individuals) under T5.4, as well as an "Industry Engagement Café" in each partner country to strengthen dialogue with industrial actors under

T5.2. In addition, a minimum of three virtual meetings with female high-school and university students will be held, featuring role models to inspire and promote interest in the sector as part of T5.2.1.

Stakeholder Surveys (Task 1.3): Surveys will complement qualitative engagement by collecting quantitative data on stakeholder attitudes, awareness levels, and expectations both in Italy and Ukraine. Results will guide communication activities and contribute to monitoring engagement effectiveness. and in T5.1 iii) Survey with questionnaires at M32 to assess the new level of acceptability and trust (both industries and citizens), whose results will be included in D5.2

Over the lifetime of GEOSYN, these activities will move from informing to collaborating, ensuring that engagement evolves alongside technological development. A dedicated newsletter survey will be conducted to gather stakeholder perspectives, creating a feedback loop that supports continuous learning and adaptation throughout the project.

The stakeholder engagement strategy is closely aligned with the broader communication and dissemination activities under WP6 to ensure coherence, consistency, and mutual reinforcement between engagement and outreach efforts. It is built upon much of the work being done in WP1 which is collecting insights gathered through workshops and surveys. These work packages are interlinked, and their interactions will feed directly into GEOSYN communication materials and ongoing awareness campaigns, ensuring that messages remain evidence-based and stakeholder-informed. In parallel, the outcomes and lessons learned from engagement activities will form a key input to Deliverable D5.2 – Report on Social Engagement, where the results of stakeholder interactions and engagement will be analysed. Through this integrated approach, GEOSYN ensures that engagement is not a standalone activity, but a continuous process that supports the project's long-term impact and contributes to the wider acceptance and deployment of geothermal energy in general and the GEOSYN solution in particular.

5 Activities to Date and Emerging Insights

5.1 Activities to date

The first GEOSYN webinar held in February 2025 attracted interest from both European and international participants. A total of 94 people registered, with 60 actively participating, including speakers. While the majority of attendees came from partner countries, the event also attracted a notable global audience, with attendees from India (11), the United States (4), Singapore (3), and many more, demonstrating a wide interest in geothermal energy solutions. A closer look at the stakeholder breakdown reveals a strong engagement from Research and Academia (44 attendees) and Industry professionals (22 attendees). This aligns with the observation that most participants identified as Engineers during the interactive session held during the webinar via mentimeter. Additionally, Technology Innovators (8), Citizen Scientists (5), and Sustainable Energy Policy Advocates (2) also contributed to the discussion. The webinar successfully facilitated knowledge exchange, and many of the attendees agreed to be contacted by the project going forward. The project is preparing a first project newsletter that will be distributed in M14 containing a questionnaire both for those who have attended the GEOSYN project events and those who have signed up via the project website.

The Italian engagement workshop was held on 30 June 2025 in Piancastagnaio (Italy), in collaboration with the Horizon Europe COMPASS Project. This location was strategically chosen due to its proximity to an active geothermal power plant and ongoing plans to expand geothermal energy production for both electricity generation and direct heating and cooling applications. The area is also known for hosting diverse public opinions, including local groups that express opposition to geothermal developments, making it a particularly relevant setting for open dialogue.

The event, titled "Imagining Geothermal: Experiences, Perceptions and Community Perspectives," aimed to:

- Inform local stakeholders about geothermal technologies and their interactions with the environment, landscape, and local context;
- Engage the public in a dialogue around the perceived impacts, risks, and benefits of geothermal energy;
- Collect input on strategies for effective communication, public engagement, and the integration of geothermal energy into local production systems.

Participants were invited to share their views through questionnaires completed during the workshop, providing valuable qualitative insights into community attitudes and concerns. The event contributed to GEOSYN's broader efforts to ground technological innovation in social understanding and inclusivity. Further information about this event can be found in GEOSYN Deliverable D1.3 Report on the acceptability of geothermal H&C applications.

An online stakeholder engagement workshop was held in Ukraine on 29 May 2025 which attracted 63 registered participants, with 33 individuals attending, including three presenters. The session aimed to inform stakeholders about the GEOSYN project, its objectives, and the role of geothermal energy in industrial decarbonisation, while also gathering feedback and perspectives

relevant to the Ukrainian context. This workshop marked an important step in engaging local stakeholders in Ukraine, raising awareness, and building dialogue around geothermal heating and cooling solutions in one of GEOSYN's key partner countries.

GEOSYN led the organisation of the first GEO-CLUSTER 1st Joint mobilization and mutual learning (MML) online workshop in collaboration with the GEOSYN synergy partner projects, namely GeoS-TECHIS, GEOFLEXheat, FlexGeo Project, TREASURE project, HOCLOOP Project, USES4HEAT Project, INTERSTORES, URGENT project, CoolLIFE, and RE-WITCH. The workshop attracted a good audience with 129 people registering for the event of which 101 attended (including speakers). In addition 115 attendees gave consent to be contacted about future cluster activities, indicating sustained interest in continued collaboration and knowledge exchange. The geographic diversity was comparable with the first GEOSYN webinar with attendees joining from India (19), Italy (14), Belgium (11), Norway (8), Spain (8), and Denmark (7), alongside others from countries such as Pakistan, USA, Luxembourg, Ukraine, Indonesia, and Tunisia. The professional background of participants reflected the cross-sectoral relevance of the webinar's content. The largest group identified as Professors or Researchers (49), followed by Industry Professionals (34) and Students (16). The event also engaged Consultants (12), Policymakers (7), Communication Specialists (3), and representatives from NGOs, RTOs, and financial institutions.

5.2 Existing Experiences of Heating and Cooling integrations

The GEOSYN project launched a survey on existing geothermal H&C integrations to increase awareness and trust of energy intensive companies on potential benefits and opportunities offered by geothermal energy through showcasing real case studies. Indeed, entrepreneurs require reassurance about the real opportunities in terms of initial and operational costs before committing to investments. They also need information on how geothermal energy can enhance the environmental credentials of their products. To address these needs, it is essential to develop effective tools that provide easy access to information on the benefits and challenges of geothermal H&C.

Evidence collected within the GEOSYN project across various industry sectors will be compiled into a database, with public data available on the GEOSYN project website, demonstrating the affordability of geothermal solutions with concrete case studies.

Thus far, the research mapped 52 cases of geothermal H&C integration in production lines in Europe, with more examples expected to be identified before the project's completion. Most of these cases are in the agrifood sector, with greenhouses being the most common application, followed by hydroponics, biomass drying, fish farming and distilleries, as shown in Figure 1a. Although fewer in number, geothermal energy is also being used in energy-intensive activities such as clothes washing and drying, chemical and pharmaceutical industries, data centre cooling, cosmetics, automotive manufacturing, and food processing. Moreover, additional geothermal H&C integrations are planned or under construction for new applications, including the pulp and paper industry, as well as other sectors[12]. The distribution of case studies by country, shown in

[12] EGEC (2025). Geothermal in industry and agrifood – case studies from Europe.

Figure 1b, indicated that most of geothermal applications in industry are in Iceland and Italy, reflecting the geothermal expertise of these two countries. However, geothermal H&C is also being applied in thirteen other European countries, including France and the Netherlands.

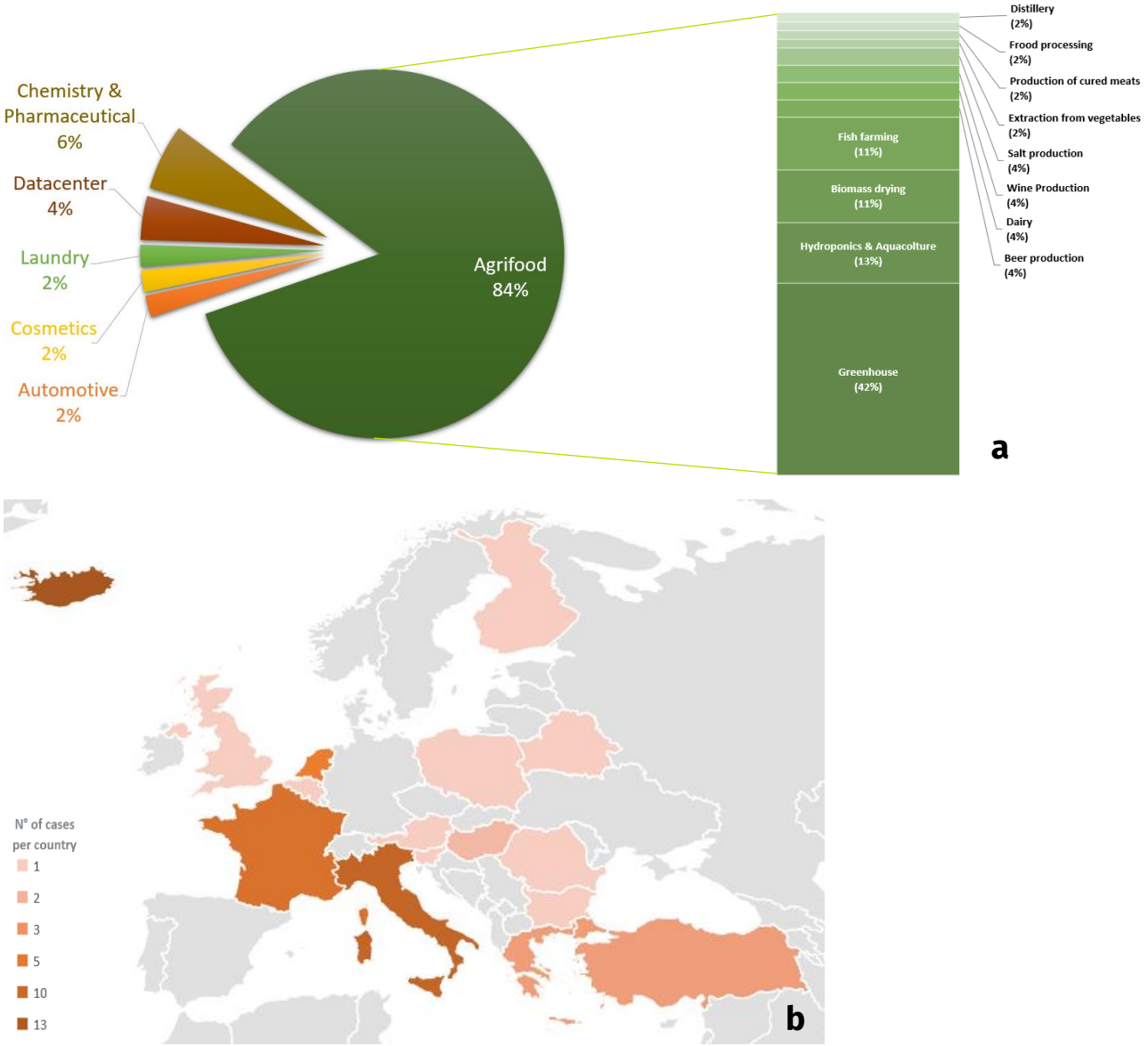

Figure 1. distribution of geothermal H&C integration in industry and production processes in Europe, by sector (a) and country (b). These are the interim results of ongoing research of the GEOSYN project[13].

[13] Bonciani, D., Talluri, L., Milazzo, A., Rocchetti, A., Sannan, S., Moen, O. M., Somasundaram, V., Gasperini, G., Pocaterra, C., Ahern, J., Torsello, L., Hoang, H.N., Demchuk, Y., Popadynets, T., Gullo, P., Vichi, M. (2025). Enhancing geothermal energy in industry: Technical synergies in heat and cooling systems and stakeholder engagement in the Horizon Europe GEOSYN project. Proceedings of the European Geothermal Congress 2025.

Besides, the project will continue the survey and interview a selection of most interesting case studies to further investigate economic, social and environmental aspects, as well as their satisfaction degree in using geothermal energy, barriers and challenges they are facing.

6 Next steps by Stakeholder Group and Impact Pathways

This section outlines the ongoing and planned engagement activities with GEOSYN's key stakeholder groups and the expected outcomes and impacts of these interactions. The aim is that the GEOSYN engagement with its stakeholders will progress from awareness and mobilisation to deeper collaboration during the course of the project.

Industry stakeholders, particularly companies interested in adopting GEOSYN technologies for industrial heating and cooling, are a primary focus. Initial actions include targeted communication campaigns and webinars to raise awareness of geothermal opportunities. The next steps will involve participation in Mobilisation and Mutual Learning (MML) workshops and technical training sessions to facilitate knowledge exchange and support adoption. These activities aim to reduce energy costs and fossil fuel dependency, cut CO_2 emissions, and promote the integration of geothermal systems within broader renewable energy strategies for industry.

For regional authorities, including local governments and policymakers in partner countries, engagement began with the project webinars and targeted communication introducing the project's objectives and the potential of geothermal energy at the local level. The next phase will include collaborative workshops and consultations to inform the GEOSYN policy recommendations and identify best practices. These activities aim to strengthen development strategies, inform evidence based policy, and contribute to decarbonisation and energy security goals.

At the European, national, and local levels, policymakers play a key role in creating the enabling frameworks needed for geothermal deployment. Early engagement will include online information sessions presenting the project's objectives and initial outcomes. The next steps focus on delivering policy recommendations, case studies to demonstrate the GEOSYN solution in action, and data-driven recommendations to inform the Policy Recommendations Document. These efforts aim to support regulatory development, foster long-term energy transition planning, and promote equitable access to sustainable energy.

Citizens, students and civil society participants are essential for building public trust and social acceptance. Awareness campaigns and public webinars have been initiated to increase understanding of geothermal benefits and address misconceptions. The next steps involve participatory workshops in person in Italy and online in Ukraine as well as surveys that invite citizen input. These actions aim to foster trust, create local employment opportunities, and support cleaner, more sustainable energy use at the community level.

GEOSYN also places specific emphasis on engaging young women and female entrepreneurs to promote inclusivity and innovation within the geothermal sector. Communication campaigns have already begun to highlight opportunities in renewable energy and innovation. The next steps include podcast episodes to interview women in renewable energy and highlight the career opportunities and pathways available to demystify the opportunities available such as mentorship schemes, and networking events. These actions aim to enhance gender diversity in STEM, strengthen innovation, and ensure fair participation in the green transition.

The Advisory Board (AB) provides expert guidance and ensures that GEOSYN is strategically aligned with European and industrial priorities. Members are regularly updated through newsletters and briefings. Moving forward, they will participate in strategic meetings and provide recommendations on technical and policy aspects. This continued engagement supports technological innovation, economic sustainability, and the long-term applicability of project outcomes.

Finally, GEOSYN collaborates with other EU-funded projects and initiatives to exchange knowledge and create synergies across the renewable energy landscape. Initial outreach has established contact with complementary Horizon Europe projects and has already organised a first webinar together. The next steps will include joint dissemination, more shared webinars workshops, and coordinated policy dialogues. These activities aim to strengthen European cooperation on geothermal innovation, align policy efforts, and contribute to the EU's broader clean energy transition.

Together, these engagement activities ensure that GEOSYN's work is grounded in collaboration, transparency, and social relevance. By combining technological innovation with proactive stakeholder engagement, the project will help build confidence in geothermal energy and accelerate its integration into Europe's sustainable industrial future.

7 Monitoring & evaluation of engagement

7.1 Indicators and KPIs

KPI data will be collected continuously throughout the engagement period (M10–M36). Within the project ongoing assessments will inform communication adjustments and stakeholder targeting under WP5 and WP6. The final KPI analysis will be presented in Deliverable D5.2 (Report on Social Engagement), documenting the measurable increase in awareness, trust, and stakeholder participation achieved through GEOSYN's engagement activities. Some of the key GEOSYN KPIs and indicators are outlined in the table below;

KPI	Description / Measurement Method	Target Group(s)	Expected Result / Target
Awareness and Outreach	Number of participants reached through awareness campaigns, workshops, and online channels; website and social media engagement metrics.	ALL Stakeholders	≥ 3 awareness campaigns completed; ≥ 500 stakeholders in database
Stakeholder Engagement and Satisfaction	Feedback surveys and qualitative analysis from events (MML workshops, webinars, Industry Cafés).	Citizens, Industry Stakeholders, Local Authorities	1.000 stakeholders involved in the survey in Italy and Ukraine; participants report increased understanding and trust in geothermal technologies.

Policy and Decision-Maker Engagement	Participation of policymakers and institutions in workshops and policy events; references to geothermal in policy outputs.	Local, National, and EU Policymakers, Regional Authorities	≥ 2 policy events held; ≥ 25 policymakers engaged in GEOSYN dialogues, one policy reccommendations report.
Industry Participation and Replication Potential	Attendance and engagement in Industry Engagement Cafés and training sessions; feedback on feasibility and uptake.	Industrial Partners, SMEs, National and European Associations	≥ 5 Industry Engagement Café total (1 per partner country);
Trust and Acceptability Survey	Comparative survey measuring changes in perception, trust, and acceptability before and after engagement activities.	Citizens, Industry Stakeholders	≥ track % increase in positive perceptions of geothermal heating and cooling.
Women Entrepreneurship Campaign	Number of role-model videos, social media reach, podcast episodes, and participation in online sessions; infographic dissemination.	Female students, Female Entrepreneurs, Female role models from industry and research	≥ 3 video interviews, ≥ 3 online sessions (1.5h each), ≥ 1 infographic published, ≥5 podcast episodes
Mutual Learning and Co-Creation Outcomes	MML workshops in Italy and Ukraine: participation numbers, co-created	Citizens, Local Authorities, Policymakers, European Projects & Synergy Partners, Industry	≥ 2 workshops completed; qualitative outputs integrated into D5.2 and policy recommendations.

	recommendations, and stakeholder feedback.		
Knowledge Transfer and Policy Uptake	Integration of engagement findings into WP6 communication outputs and the GEOSYN policy recommendations.	Policymakers, European Projects & Synergy Partners, Researchers & Academics	Results reflected in D5.2 and D6.3; policy recommendations report; an infographic translated in the 5 languages of the consortium

8 Conclusions

Stakeholder engagement within the GEOSYN project is a continuously evolving and strategic process that underpins the success of the project's objectives, both technical and societal. This Deliverable 5.1 has laid out the framework for how the GEOSYN consortium is engaging with key stakeholders across multiple domains. This plan will be intersecting with and influencing other WPs, the results of which will be discussed in D5.2 Report on Social Engagement (due in M34). We have built the strategy with both partner expertise and insights from prior European initiatives and we have endeavored to incorporate best practices in public engagement, participation, and trust-building within the geo-thermal and renewable energy landscape.

Throughout the project, engagement activities are structured to evolve alongside technical development. Early-stage activities focused on awareness raising with messaging introducing the project's goals, technologies, and potential benefits. As GEOSYN progresses, engagement will continue to deepen through co-creative formats such as the GEOSYN Mobilisation & Mutual Learning (MML) workshops, information workshops, participatory policy dialogues, and tailored communication campaigns. These initiatives not only ensure stakeholders are informed but actively involved in shaping project outcomes that reflect their values, needs, and concerns.

A strong foundation has already been established: from international participation in webinars to local engagement events in Italy and Ukraine, early results show promising signs of stakeholder interest and willingness to collaborate. These activities will expand and intensify through structured steps outlined for each stakeholder group in Section 6, and will continue to work towards building trust, awareness, and ultimately support for the adoption of geothermal heating and cooling solutions.

One of the unique strengths of the GEOSYN stakeholder engagement approach is its integration across the project's technical, policy, and communication work packages. Engagement outputs will directly inform the development of policy recommendations and shape the communication tools designed to increase the visibility and accessibility of geothermal energy. Likewise, feedback collected from engagement activities will be used to refine and inform messaging, ensuring a feedback loop between stakeholders and the project team.

This engagement plan will be further developed and refined over the course of the project, with all activities continuously monitored and evaluated through key performance indicators (KPIs). These results will be documented in Deliverable 5.2, which will provide a full analysis of the effectiveness and impact of the engagement strategy, offering evidence of progress from initial awareness to strengthened trust and acceptance.

The GEOSYN Engagment Strategy and the work of WP5 serve as a vital connection between the technological innovations of GEOSYN and their successful real-world uptake. By aligning communication, participation, and social impact activities with technical development, GEOSYN ensures that the deployment of geothermal energy is not only technologically viable but also socially supported, inclusive, and sustainable.

9 Annexes

9.1 Annex 1a

Invitation Letter to Stakeholders for the Webinar in Ukraine on 29 May 2025

Вих.№ 01/05 від 01 травня 2025 року

Лист-Запрошення

Шановні представники місцевого самоврядування!

ГО «Геотермал Україна» запрошує вас взяти участь у вебінарі **«Геотермальна енергія та її роль у житті громади».**

- **Дата проведення:** 29 травня 2025 року
- **Час:** 11:00–12:30
- **Участь:** безкоштовна онлайн
- **Реєстрація:** обов'язкова за QR кодом або посиланням нижче
  https://forms.gle/zbGssRwRK9jgjb398

Метою заходу є **підвищення рівня обізнаності про геотермальну енергію** та її потенціал у забезпеченні сталого розвитку територіальних громад в Україні.

У програмі вебінару (додається до листа):

- Що таке геотермальна енергія і як її використовувати на місцевому рівні;
- Сучасні технології геотермального тепло- та елетропостачання; теплові насоси;
- Приклади успішного застосування геотермії в містах Європейського Союзу;
- Переваги та виклики впровадження геотермальних рішень;
- Потенціал геотермальної енергії в Україні;
- Презентація проєкту GEOSYN та інновацій у сфері геотермальної енергетики.

Просимо поширити інформацію про цей захід серед представників органів місцевого самоврядування, а також місцевих жителів Вашої громади та заохотити їх до участі.

Вебінар проводиться в межах європейського проєкту Horizon Europe – GEOSYN (ID проєкту 101172812) – Геотермальна синергія: підвищення енергоефективності промислових процесів за допомогою високотемпературних теплових насосів і систем охолодження з використанням гнучких теплових технологій.

З повагою,

Тарас Попадинець

Виконавчий директор

www.geosynproject.eu #GEOSYNPROJECT
info@geosynproject.eu

Funded by the European Union

9.2 Annex 1b

Agenda of the Webinar in Ukraine on 29 May 2025

“Geothermal Heating & Cooling for Industry

APRE

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