The GRETA Project

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ABSTRACT

The Alpine region community is facing rising energy consumption with impacts such as increasing CO_2 emissions, related mostly to heating needs. To decouple CO_2 emissions from increasing energy demands, the project GRETA (Near-surface Geothermal Resources in the Territory of the Alpine Space) is aiming to improve the energy efficiency and sustainable production of renewable geothermal energy in the Alpine region. GRETA is built on three specific objectives:

- Increase the knowledge of the spatial distribution of Near-Surface Geothermal Energy (NSGE) in the Alpine region.
- Exchange knowledge and best practices for the utilization of NSGE transnationally.
- Develop a knowledge base for the inclusion of NSGE in planning tools.

The objectives will be accomplished by creating and providing geothermal potential maps to support the integration of NSGE information into policy instruments such as energy supply and demand plans and strategies, e.g. for the spatial planning of geothermal installations by public and private stakeholders.

In addition, guidelines will be developed to encourage the harmonization of regulations, authorization procedures and operational criteria for NSGE utilization in the Alpine region. Strategies for the inclusion of NSGE in policy instruments will also be formulated, thus contributing to a growth of NSGE utilization.

1. INTRODUCTION

All Alpine countries are facing the same challenge: to plan for and meet an increasing energy demand. At the same time, a reduction in CO_2-emissions and self-reliance in energy are needed in this area, which is possible only by fostering the implementation of low carbon and renewable technologies – among them Near Surface Geothermal Energy (NSGE) systems and underground heat storage.

NSGE is one of the most abundant reliable renewable thermal energy sources: it is widespread and available in remote mountain areas, it requires no transport of energy products and it has no direct emissions to air. However, knowledge of NSGE, country-specific regulations, practices and the integration of NSGE usability in energy plans show huge deviations. These hampered the consideration of NSGE in policy instruments and therefore limited its expansion across the Alpine Space.

In particular, these issues affect the substitution of fossil fuels with NSGE and make it necessary to develop harmonized cross-border strategies. Among others, specifically the tourism sector calls for an Alpine integrated approach to NSGE development.

Therefore, the EU Interreg Alpine Space Programme is funding the project GRETA (Near-surface Geothermal Resources in the Territory of the Alpine Space) with 2.3 M €. GRETA consists of 12 partners of recognised institutions in six countries of the Alpine region.

2. OBJECTIVE

The objective of the GRETA project is to demonstrate the potential of NSGE in the Alpine Space and to foster its integration into future energy plans at different administrative levels. For this purpose, a catalogue of transnational-congruent criteria will be defined for the efficient implementation and operation of NSGE systems. The same criteria will also be used to develop a spatial assessment of the potential of these systems, considering technical, economical, environmental and social issues deriving also from field observations. Country-specific regulations and practices will be reviewed and best-practice specifications will be summarized into guidelines through close interaction and continuous feedback with relevant stakeholders. The outputs of the project will serve to promote and guide the implementation of shallow geothermal energy into policy instruments, e.g., the energy plans of municipalities or planning bureaus.

Practical instruments as outputs of the project will therefore be provided for the regulation, planning and implementation of shallow geothermal energy into policy instruments at different administrative levels and to disseminate the knowledge about this technology. They will raise the awareness of the potential of this low carbon energy source among different stakeholders.

The innovation represented by the approach of GRETA is the adaption of a low carbon technology, well-established in lowland areas, to the energy needs of the Alpine environment. The project aims to impact the implementation stage of the policy cycle and the integration of NSGE into energy planning procedures.

3. PROJECT WORK

The main outcomes of the project consist of decision support tools including geothermal potential maps, transnational applicable guidelines for energy planning as well as legal and technical guidelines for the utilization of Near-Surface Geothermal Energy, based on an exchange of best practices. To achieve these results, work is carried out in five work packages (WP) and focusing on six pilot areas as outlined in the following sections.

3.1 User Interaction

The main goal of the WP User Interaction is to promote knowledge sharing and dialogue with stakeholders involved at different phases and levels in the use of NSGE, such as policy makers, public administrations, energy planners or private firms.

Accompanying the analysis and assessment of regulations, technical criteria, energy potential and integration into energy plans in the other workpackages, a cross-cutting approach ensures a constant feedback exchange among project partners, observers and stakeholders in order to tailor all project actions and outputs to the stakeholders' needs.

3.2 Pilot Areas

Data collection is conducted on a regional level as well as in six local pilot areas. The pilot areas are situated in Cerkno (Slovenia), Aosta Valley (Italy), Graubünden (Switzerland), Zell am See (Austria), Oberallgäu (Germany) and Bauges natural park (France). They provide examples of best-practice and detailed data of regulations, technical criteria and for the mapping process.

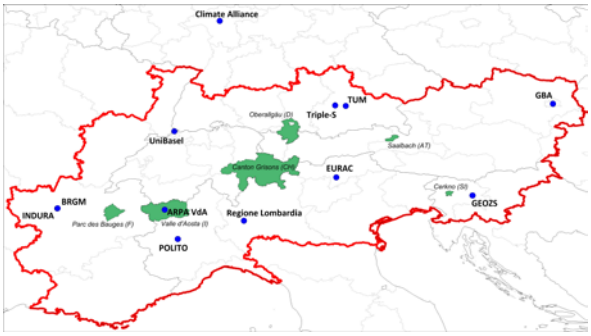


Figure 1: Area of the Alpine Space Programme, depicting the Pilot Areas

3.3 Regulations

To develop and improve transnational guidelines, the WP Regulations crosschecks existing country-specific regulations and reviews best administrative practices for NSGE systems in the Alpine region. In a general analysis of existing regulations, both national and regional approaches are analysed, focusing on main barriers and drivers affecting the regulation of NSGE plants. A congruent criteria catalogue will be identified that promotes best practices for the planning and implementation of NSGE plants**.** In a status-quo analysis of implemented NSGE systems in the pilot areas, existing touristic and residential applications are investigated for reproducibility and transferability into best practice examples. They are characterized by different production technologies (i.e. GSHPs, ATES, BTES) and consumption elements (e.g. tunnels, buildings). These examples are compared and analysed in order to:

- Identify how to effectively distribute regulative procedures between authorities,
- Select best-practice examples to raise public awareness of NSGE potential,
- Harmonize data requirements for Declaration and Licence applications or e-services.

3.4 Technical Criteria

The WP Technical Criteria deals with relevant technical and operational criteria for shallow geothermal systems under typical conditions of the Alpine environment.

Existing techniques of utilization of shallow geothermal energy will be summarised and best-practice examples from existing plants will be analyzed in order to derive a review of the most

important technical and operational criteria for shallow geothermal installations of different kinds, with a transnational validity across the Alpine space.

3.5 Mapping

The NSGE potential, which is the thermal load that can be sustainably exchanged with the ground by a geothermal heat pump, will be assessed and mapped.

Existing methods for the assessment of the NSGE potential are reviewed, combining different technologies and available information. Geological and climatic data for the spatial assessment of the geothermal potential will be collected, measured and harmonized on a regional as well as on a local scale in the six pilot areas. The data processing for the assessment of the NSGE potential will take into account the constraints of the legal framework, the technical and environmental frameworks and the geological and climatic parameters.

3.6 Energy Plans

Procedures and tools are developed to integrate NSGE information into Energy Plans (EP) and are synthesized into guidelines. The work package will focus on the analysis of three selected pilot areas. It will carry out the

- assessment of the economic and financial feasibility of NSGE in the pilot areas,
- integration of NSGE into EPs for the pilot areas by defining tools and methods to
    - balance heating and cooling energy demand and supply in urban settlements using NSGE;
    - highlight possible interactions between NSGE use and other activities such as tourism or agriculture;
    - compare alternatives in legal, technical and financial frameworks to identify scenarios that can boost the substitution of fossil fuel boilers with NSGE plants;
- definition of guidelines and how-to for the integration of NSGE into planning procedures and Climate Change adaptation strategies for different target groups such as policy makers, technicians, etc.

4. MAIN RESULTS

The results of the different work packages within GRETA will be summarized into an online hypertext in which stakeholders can find relevant information according to their needs. This hypertext will help to increase and share knowledge on NSGE among relevant stakeholders, thus contributing to a growth of NSGE utilization. The results consist of

- Maps of the NSGE potential: the spatial assessments of the NSGE potential at regional and local level will be published in seven data layers on a Web-GIS portal;
- Handbook on regulations, authorization procedures and operational criteria consisting of
    - harmonized guidelines of legal and technological procedures set up as a working document for authorities to harmonize and facilitate administrative and technical procedures, including explanations, illustrative examples and recommendations for the implementation of NSGE;
    - catalogue of technical and operational criteria for the use of NSGE in the Alpine environment, including fact-sheets on the state of the art and operational criteria and constraints for shallow geothermal systems, based on best practice examples. It will be available in five languages: English, German, Italian, French and Slovenian.
- Handbook on implementation of NSGE into policy instruments consisting of a set of transnational procedures and open-source tools to integrate NSGE into energy planning procedures as well as guidelines to define and compare scenarios for the sustainable development of NSGE in the Alpine region.

5. OUTLOOK

The participative approach will guarantee the durability of the results due to the number of important stakeholders directly involved in the elaboration and in the review of deliverables. The durability of the project results will also be guaranteed by the project website, which will be maintained for at least five years after the end of the project. Initiatives like the integration of the procedures in existing EC directives, the implementation in the CESBA-Wiki and the development of a “geothermal trail” for the public will remain after the project end.

The project’s methodology assures transferability of the results. The provided criteria and best practices have a general validity and can be applied outside the project consortium and even the Alpine Space area. The NSGE potential assessment and illustrating methods cannot only be adapted to other areas, they can also be useful in other fields of research outside geothermal energy. GRETA’s integrated handbooks will represent a novelty in the framework of policy instruments on NSGE. The guideline on the implementation of NSGE into energy plans comes with an open-source license for the software tools and how-tos customized for different target groups. The methodology for the direct involvement of stakeholders in the NSGE field guarantees tailor-fitted solutions via a feedback loop.

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the Alpine region. It provides a framework to facilitate the cooperation between economic, social and environmental key players in seven Alpine countries, as well as between various institutional levels such as: academia, administration, business and innovation sector, and policy making. In the current programming 2014–2020 period the program is investing €139 million in projects through which key actors develop shared solutions for prevalent Alpine issues.