GABI – European Network for Shallow Geothermal Energy Applications in Buildings and Infrastructures

Summary

The increased need for renewable energy sources has led to expansion of shallow geothermal applications for heating and/or cooling of buildings. The integration of heat exchangers in those elements of the structure that interface with the ground, such as foundations, tunnels and diaphragm walls, is particularly attractive because of the inherent cost saving involved in combining a required structural component with the harvesting of geothermal energy.

Thermoactive geostructures present the additional benefit of relying on localized resources (the ground) and therefore do not need additional infrastructural investments. By providing an alternative to fossil fuels and reducing peak demand from the grid, they also provide an attractive tool towards energy independence and distributed generation with no adverse impact on the environment. However, the widespread application of this sustainable technology is currently hindered by the large heterogeneity in the development and regulatory framework in European countries.

By sharing knowledge and experiences, the use of thermoactive geostructures will increase, especially in countries with less experience. This newly created network will ensure an inclusive and open platform for scientific discussion to define European best practice rules for geothermal applications, promote public awareness and confidence in this technique, and foster advancement in knowledge through collaboration.

Working Group 1 – Ground investigation methods

Overview: This WG addresses task 1 through reviewing and comparing existing ground investigation methods for the assessment of thermal properties and hydro-thermo-mechanical behaviour of soils.

Data and information required for this review and this comparison are provided by COST Partners and a review of literature and possibly by carrying out some studies in the aim of the Action.

Comparison of methods will be achieved through STSMs testing common datasets and workshops in which different methods will be presented and discussed. Constitutive modelling with the purpose to reproduce the observed behaviour on laboratory will be carried out.

WG Lead: Dr Ana VIEIRA, LNEC, Portugal

Vice Lead: Prof Frédéric NGUYEN

Working Group 2 – Energy performance assessment

Overview: This working group addresses task 2 through evaluating the energy performance of several buildings and infrastructure components where thermoactive geostructures have been implemented and results from numerical modelling studies. Different numerical and analytical approaches can be utilised and compared.

Factors that affect the performance and lead to differences in overall response of similar systems will be determined: energy needs of the buildings and the infrastructures, ground conditions, execution, etc. The relative importance of ground properties (water content, saturation, mineralogical content, grain size distribution, and water flow) in determining the thermoactive geostructure behaviour will be identified.

This WG will also collaborate with WG1 for the in situ thermal characterisation of thermal geostructures to establish heat transfer requirements for meeting building energy performance needs. Another objective, in collaboration with WG3, is technical assistance in devising methods for optimal heat transfer between structure and ground, in terms of materials, geometries and layouts.

WG Lead: Dr Alice DI DONNA, Grenoble, France

Vice Lead: Dr Apostolos MICHOPOULOS

Working Group 3 – Sustainability and urban planning

Overview: This WG will address task 3 by sharing the available data and experiences across Europe. This will help to define best practises for minimising interferences between adjacent thermoactive geostructures and their potential influence on the surroundings.

WG3 will investigate the feasibility of the proposed city-scale geothermal systems – the thermoactive geostructures, their energetic and economic potential. This will be achieved by ensuring a multidisciplinary membership in WG3, including specialists from fields such as engineering geology, geotechnical and structural engineering, urban planning, thermodynamics together with invited key experts from the construction and geothermal energy industry and representatives of municipalities.

WG Lead: Dr Marco BARLA, Turin, Italy

Vice Lead: Mr Grzegorz RYZYNSKISARCOS

Project Reference

COST Action TU1405

Leading Institution

IFFSTAR – French Institute of Science and Technology for Transport, Development and Networks (France)

Partners

From 28 countries

CERIS Principal Investigator

Peter Bourne-Webb (peter.bourne-webb@tecnico.ulisboa.pt)

CERIS Research Team

Teresa Bodas Freitas

Funding

COST – European Cooperation in Science and Technology

Period

2015-2019

Total

500 000.00€

CERIS

-

Project Website

www.cost.eu/actions/TU1405

www.foundationgeotherm.org

Working Group 4 – Thermoactive geostructure design

Overview: This WG addresses task 4 by comparing and harmonizing design methods of thermoactive geostructures. Temperature variations in piles, diaphragm wall and tunnels induce contractions and expansions which have to be considered during the design.

Three benchmarks (piles, diaphragm walls, tunnels) will be organized to compare the design methods.

Common design methods will be developed and promoted to the CEN, especially the technical committee in charge of Eurocodes.

The three examples will be provided by the COST Partners. Results from thermoactive pile in situ tests or from instrumented bulidings will be analyzed to justify the design methods which will be proposed.

WG Lead: Mr Hussein MROUEH, Lille, France

Vice Lead: Prof Josif JOSIFOVSKI

Working Group 5 – Communication and dissemination

Overview: Task 5 will be carried out by WG5 and will include the preparation and maintenance of the Action website and web services for delivery of output. WG5 will include members experienced in editing and publishing scientific books and papers. Social media activity of the Action will be coordinated by WG5. Web based reports from workshops and WG meetings will be uploaded on the Action website. WG5 will also include experts with experience in delivering web services and training packages. A milestone will be a major international conference in the final year of the Action. The final conference will provide a forum for presenting the latest developments and advances concerning thermoactive geostructures and disseminating the COST Action findings to a wider audience and engaging with the international research community.

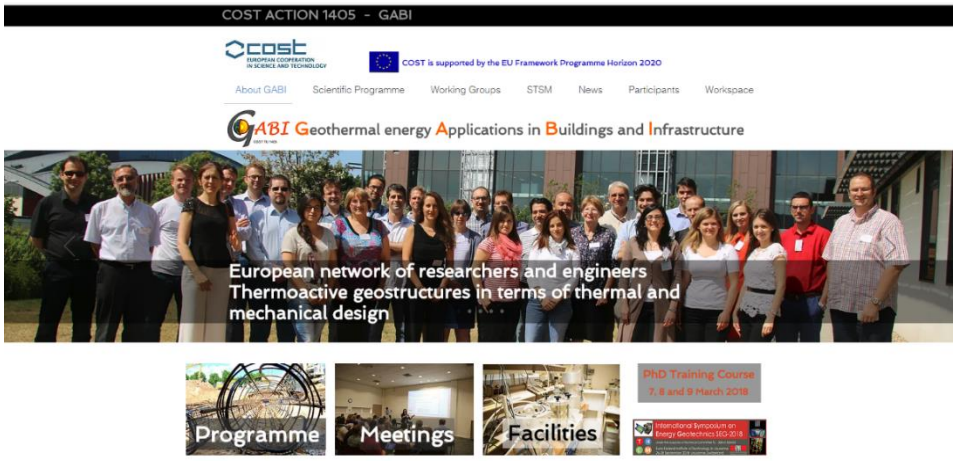

Figure 1. Screen shot of GABI website.