DEMONSTRATION SITES

- **2 FIELD TEST SITES** to validate and improve the drilling methodology and machine components.
- **3 PILOT CASE STUDIES** in existing infrastructure, to check and validate two types of innovative co-axial heat exchangers, two very shallow heat exchanger solutions, a new plug and play heat pump with advanced controls.
- **4 REAL DEMONSTRATION CASE STUDIES** (1 civil and 3 historical) in different built environments, undergrounds and climatic conditions will be used to test the shallow geothermal system with the innovative drilling machine, new ground heat exchangers and the novel heat pumps.
- **12 "VIRTUAL" DEMONSTRATION CASE STUDIES"** where the decision support system and design tools will be applied.

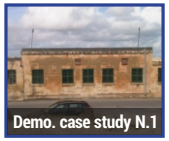
PILOT CASE STUDIES

CNR: Novel heat pumps and innovative co-axial heat exchangers

TECNALIA: Plug & play heat pump coupled with other renewable sources and an advanced Building Management System

UPV: Very shallow heat exchangers

REAL DEMONSTRATION CASE STUDIES



Malta (warm climate)
New co-axial heat exchangers and low temperature dual source heat pumps

Italy (mild warm climate)
New co-axial heat exchangers and high temperature dual source heat pumps

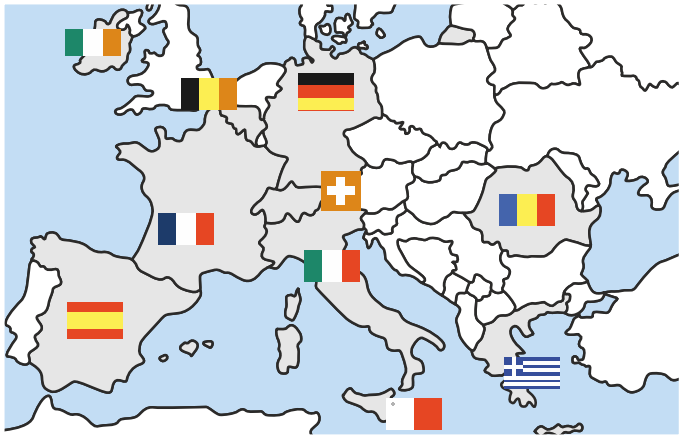
Belgium (mild cold climate)
New co-axial heat exchangers and two levels temperature water to water heat pump

Ireland (cold climate)
New co-axial heat exchangers and high temperature water to water heat pump

VIRTUAL DEMONSTRATION SITES

1	Museum of Natural History of Alexandroupolis - Greece Leader: CRES
2	Administrative building "Palacete de la Cruz Roja" – Spain; Leader: UPV
3	Residential building Avangarde Forest 2 – Romania; Leader: PIETRE
4	Residential building in Bucharest – Romania; Leader: RGS
5	University building "Ex Ospedale Geriatrico" – Italy; Leader: UNIPD
6	Historical building in Split – Croatia; Leader: UNESCO
7	University Building in Erlangen – Germany; Leader: FAU
8	Historical building "Castle of Attre" – Belgium; Leader: GEOGREEN
9	Carnegie Clondalkin Library - Ireland; Leader: GEOSERV
10	Administrative building"AIL (Aziende Industriali di Lugano)"–Switzerland;Leader: SUPSI
11	Residential Building Mariënheuvel Soest (Soest – Netherlands); Leader: CNR-ISAC
12	Residential Building La Vall 09, Bellpuig (Lleida – Spain); Leader: CNR-ISAC

PARTNERS



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GEO4CIVHIC

2018 - 2023

MOST EASY, EFFICIENT AND LOW COST GEOTHERMAL SYSTEMS FOR RETROFITTING CIVIL AND HISTORICAL BUILDINGS

Acronym	GEO4CIVHIC	Start date	01/04/2018
Website	www.geo4civhic.eu	Duration	68 months
Topic	LCE-17-2017	Coordinator	CNR – ISAC
Type of action	IA	Contact	Adriana Bernardi
Call	H2020-LCE-2017-RES-IA		a.bernardi@isac.it

Total project budget: 8,143,120.97 €
EU funding: 6,841,960.75 €

GEO4CIVHIC Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 792355

www.geo4civhic.eu

PROJECT'S TECHNOLOGICAL APPROACH

The main goal of GEO4CIVHIC is to develop and demonstrate easier to install and more efficient ground heat exchangers, using drilling machine innovations tailored for the built environment & developing or adapting heat pumps and other hybrid solutions in combination with renewable energy sources for retrofits through a holistic engineering and controls approach improving the return of investments.

GEO4CIVHIC's target will accelerate the deployment of shallow geothermal systems for heating and cooling in retrofitting existing and historical buildings by using innovative technological solutions, improvements and enrichment of results obtained from previous EU projects.

THE PROJECT WILL APPLY A DUAL APPROACH TO ACCELERATE THE PENETRATION OF SHALLOW GEOTHERMAL ENERGY PLANTS IN RETROFITTED BUILDINGS

Reduce cost, increase efficiency and ease of installation of each of the main components of the value chain of the geothermal plant by developing technical innovations in drilling, borehole heat exchangers, heat pumps, integration of other renwable energy sources, controls.

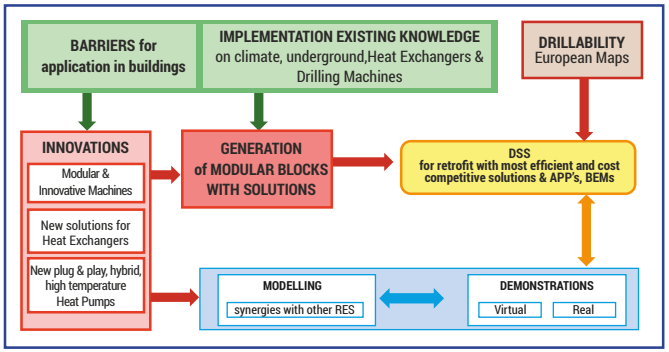
Develop engineering and decision support tools in a holistic approach to identify the most appropriate solutions, followed by actions raising awareness, increasing credibility and supporting implementation.

The overall methodology of GEO4CIVHIC follows a holistic approach with the activities grouped by type and organized in a logical sequence from research over innovation to demonstration and evaluation. The communication, dissemination and exploitation runs in parallel over the four other phases. First, the basis for driving these innovations and for monitoring the project progress and results is researched. The innovations are developed in the second phase. Once the developments have been realized the project moves into an extensive demonstration phase. Field tests of the key innovations are followed in a third phase by pilots, full case demonstrations and virtual case studies. Upon results evaluation, a solid basis is built for market exploitation supported by training events, workshops and dissemination activities.

Meanwhile, the GEO4CIVHIC partners, present in standardization committees, ensure the innovations' integration in the new standards.

PROJECT'S WORK PACKAGES

WP NO.	WORK PACKAGE TITLE	LEADER
1	Barriers identification, case study modelling and preliminary feasibility studies to define key performance indicators and the basis for the innovations	UNIPD
2	Powerful vibration-rotation drilling head mounted on compact drilling machine to install the improved co-axial heat exchangers	FAU
3	Innovative Heat Pumps for Civil and Historical Buildings & NZEB	GALLETTI
4	Decision Support System with design tools, Building Energy Management System and Apps	TECNALIA
5	Demonstration of efficiency of installation of shallow geothermal and heating and cooling in individual retrofitted installations	RED
6	Environmental impact, Risk assessment and Standard Regulations	GEOSERV
7	Demonstration of cost-effectiveness and efficiency for the systems, exploitation and market	SOLINTEL
8	Training, education, dissemination and knowledge sharing (clustering)	RGS
9	Project and consortium management	CNR-ISAC



PROJECT'S OBJECTIVES

OBJECTIVES OF THE TECHNICAL BLOCK

OBJECTIVE 1– to identify the main gaps and barriers to deploying shallow geothermal systems in the built environment.
OBJECTIVE 2 – to improve and develop innovative solutions regarding drilling methodologies and machine components as well as ground heat exchangers targeted at the difficult and confined urban settings.
OBJECTIVE 3 - to develop and demonstrate innovative heat pumps for both low and high temperature terminals suitable for all buildings, climates and ground conditions.
OBJECTIVE 4 – develop and make available tools for preliminary feasibility assessment and analysis of different sets of solutions that will achieve user optimized energy management.
OBJECTIVE 5 – to demonstrate the project developments and innovation in a cascade setting at 4 different real case study sites and 12 virtual sites.

OBJECTIVES OF THE ECONOMIC AND MARKET BLOCK

OBJECTIVE 6 - to provide the building retrofit market with a solid economic value basis leading towards to a general acceptance of the ground source heat pumps as a standard renewable energy source in Europe.
OBJECTIVE 7 -to organize intensive teaching, training and dissemination activities to convince stakeholders/users of the value and the performance achieved with the shallow geothermal systems using the **GEO4CIVHIC** innovations.

OBJECTIVES OF THE ENVIRONMENTAL & STANDARDIZATION BLOCK

OBJECTIVE 8 - to enhance the knowledge on recommendations towards common standards & regulation, reduced permitting and awareness of shallow geothermal systems for a more sustainable environment.
OBJECTIVE 9 - to enhance the activity inside the committees working and collaborating in European standards (CEN) for the use of shallow geothermal systems.

PROJECT'S PROPOSED INNOVATIONS

- Vibration-rotation drill head
- Compact, versatile drilling machine
- Semi-automatic feeder for drilling machine
- Co-axial heat exchangers (steel and plastic)
- Adaptation of well point
- Dual source heat pumps
- Two stage heat pump for high temperature terminals
- Low mid-term GWP refrigerant heat pump working at low temperature
- European drilling maps
- Application for on-site drillability assessment
- Decision support system
- Building Energy Management (BEM) control optimization for RES synergies
- Application to guide user towards energy savings actions