Updated extract of the project data from the LIFE KPI webtool

Deliverable D.1.4

Version 1
Date: 03/06/2024
Author: Emil Martini (EGEC) with inputs by all partners

Revised by: Philippe Dumas (EGEC)

GeoBOOST

Co-funded by the European Union

Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

Contents

Introduction

The overall performance and impact indicators of the project include the general impacts that will result from the implementation of the project's recommendations and findings. Although the project is specifically focused on 8 target countries where consortium partners operate (Belgium, Germany, Ireland, Spain, Netherlands, Austria, Poland, Sweden), it has a European wide focus, and its results will be promoted to European policy makers and made easily applicable at the local or national level when and where relevant. This means that the project impacts can be measured at the European scale as well as within the 8 target countries.

Assumptions behind project impacts

- Improve statistical and market data for geothermal heat pump investments.
  First activities in WP2 and WP5 supported this objective for better statistical data.
  WP2/5 web meetings had the goal to define the market topologies with the set-up of the technological portfolio.
  In the framework of the ongoing discussion for the EU Heat Pump Action plan, the JRC highlighted this issue of statistics and proposed actions.

- Business models and financing: practical aids to establish business models for suppliers as well as access to public/private capital for consumers and project developers.
  GEOBOOST project is in the phase of data collection by mapping the business models recently and currently used to install geothermal heat pumps.

- Regulatory framework toolkit that can be replicated across the EU.
  There are two dimensions:
  - The EU frame which recently adopted new regulations and provisions on geothermal heat pump. They will be soon implemented.
  - The national legislations and regulations on geothermal HP.

  The mapping of these regulations was completed by a survey.

- Raising awareness of geothermal heat pumps.
  Increase awareness about this technology is an overall objective. The strategy in WP6 define the target groups, the channels to reach them and the messages to deliver.

- Growing and upskilling the workforce: uniform skilling provision for GHP consumers and service providers.
  First activities in WP5 concentrated on compilation of training material, development of modular curricula, identification of platforms for course deployment and stakeholder engagement. The next phase will target upskilling the workforce.

Indicators value

1 Primary energy savings:

GeoBOOST is expected to contribute to an additional 2 million GHP units to 2025. Currently, over 2 million units are installed. By 2025 this is expected to be 4 in a BAU scenario and an additional 1.5 million units resulting from the project. The increased share of GHP inside the European heat pump market may lead to a significant increase in the efficiency of the heating market of up to 10% less electricity consumption by 2030 without any loss of comfort (referring to the joint position paper of the Interreg Central Europe project CE177 GeoPLASMA-CE in annex). This should be a 17% primary energy savings compared to a baseline. The methodology for calculating the indicators is as follow:

Primary energy savings are obtained connecting final energy savings gains due to efficiency in cooling use, and the supply side gains from renewable cooling deployment, by assuming the following mix of renewable cooling technologies within a market share of 20% (2025) and 60% (2030): 50% air HP EER=6, 20% geothermal HP EER=13, 15% free cooling EER=20, 15% solar thermal cooling EER = 8, compared to a default figure of EER=4, corresponding to inefficient cooling equipment currently mainstream in the market. The electricity PEF is set at 2.1 per the Energy Efficiency Directive.

Table 1: primary energy savings per country based on their Geothermal HP stock (GWh/year)

Country	Percentage of Geothermal HP units stock	Primary Energy Savings (project ends)	Primary Energy Savings (5y after)
Belgium	1.89%	9.45	37.8
Germany	31.17%	155.85	623.4
Ireland	0.42%	2.1	8.4
Spain	0.29%	1.45	5.8
Netherlands	8.54%	42.7	170.8
Austria	8.24%	41.2	164.8
Poland	5.28%	26.4	105.6
Sweden	44.17%	220.85	883.4
aggregated	100%	500	2000
		500	2000

2 Final energy savings:

2% energy savings for the energy demand of buildings for heating and cooling compared to a baseline as of the start of the project. 2030 targe: 3% primary energy savings compared to the baseline. The methodology for calculating the indicators is as follow:

Estimate are for heating and cooling demand in the building sector to increase by 2-300% between 2020 and 2050 – [HotMaps project] an assumption that will be clarified and defined as part of the Task 3.1. Hotmaps has been taken as reference as a EU project on renewable heating and cooling that provides some of the most recent data available.

According to HotMaps project, cooling demand in building sector to increase by 19-23 TWh from 2020 to 2025, for a total of 108-113 TWh. 2% energy savings amounts to (compared to the baseline) around 2 TWh. This is about the amount of heating and cooling needed by 240,000 households equivalent assuming 7kWth cooling capacity and 1,200 cooling load hours. i.e. the deployment of around 500k renewable cooling systems over 3 years assuming a 50% energy efficiency improvement.

Table 2: final energy savings per country based on their Geothermal HP stock (GWh/year)

Country	Percentage of Geothermal HP units stock	Final energy savings (project ends)	Final energy savings (5y after)
Belgium	1.89%	37.8	567
Germany	31.17%	623.4	9351
Ireland	0.42%	8.4	126
Spain	0.29%	5.8	87
Netherlands	8.54%	170.8	2562
Austria	8.24%	164.8	2472
Poland	5.28%	105.6	1584
Sweden	44.17%	883.4	13251
aggregated	100%	2000	30000
		2000	30000

3 Renewable energy generation:

Impact on supply of renewables in the EU: currently, 27 TWh/year is supplied by renewable heating and cooling. This is expected to be 100 TWh/Year in 2025 and at least 200 TWh/year in 2030 in the EU.

Share of renewable energy used for cooling: 1.3 percentage point means alignment with the Renewable Energy Directive Article 23 target - whose achievement is not guaranteed since it is not a binding target today. Assuming Hotmaps data for cooling this represents the addition of around 4,8 TWh of renewable cooling production over three years assuming a 20% market share by the end of the project.

Table 3: renewable energy generation per country based on their Geothermal HP stocks

Country	Percentage of Geothermal HP units stock	Renewable energy generation (project ends)	Renewable energy generation (5y after)
Belgium	1.89%	434.7	2646
Germany	31.17%	7169.1	43638
Ireland	0.42%	96.6	588
Spain	0.29%	66.7	406
Netherlands	8.54%	1964.2	11956
Austria	8.24%	1895.2	11536
Poland	5.28%	1214.4	7392
Sweden	44.17%	10159.1	61838
aggregated	100%	23000	140000
		23000	140000

4 GHG emissions:

Assumption that all energy saved is electricity, considering the impact of electricity consumption reduction against EEA assumption for the EU electricity carbon intensity estimates.

Table 4: final energy savings per country based on their Geothermal HP stock (GWh/year)

Country	Percentage of Geothermal SHP units stock	GHG emissions (project ends)	GHG emissions (5y after)
Belgium	1.89%	183397.58	534909.63
Germany	31.17%	3024604.63	8821763.63
Ireland	0.42%	40755.01	118868.80
Spain	0.29%	28140.37	82076.08
Netherlands	8.54%	828685.39	2416999.08
Austria	8.24%	799574.66	2332092.79
Poland	5.28%	512348.81	1494350.72
Sweden	44.17%	4286069.51	12501036.24
aggregated	100%	9703576	28302097
		9703576	28302097

5 Investments in sustainable energy:

The developed concepts of GeoBOOST will support raising the share of geothermal heat pumps in the European heat pump market from currently 21% to 50% in 2030. At the end of the project: at least 4 billion Euros of investments in renewable and efficient renewable technologies throughout Europe. The methodology for calculating the indicators is as follow: Considering around 20% market share, assumption of 4,8 TWh of renewable heating and cooling production added by end of project (based on Hotmaps data), amounting to 4 GW of added capacity (around 571k unit addition, but not limited to geothermal and solar thermal cooling, also including Air HP cooling...). Assumption of an average system size of 7kW, with a use rate of 1200 hours (14% capacity factor). Assumption of costs of from 1-2000 euros/kW for renewable cooling technologies.

Table 5: investment triggered per country based on their Geothermal HP stock (EUR)

Country	Percentage of Geothermal SHP units stock	Investments in sustainable energy (project ends)	Investments in sustainable energy (5y after)
Belgium	1.89%	567000000	2079000000
Germany	31.17%	9351000000	34287000000
Ireland	0.42%	126000000	462000000
Spain	0.29%	38427900	319000000
Netherlands	8.54%	2562000000	9394000000
Austria	8.24%	2472000000	9064000000
Poland	5.28%	1584000000	5808000000
Sweden	44.17%	13251000000	48587000000
aggregated	100%	30000000000	110000000000
		30000000000	110000000000

6 Legislation and policy:

The main goal of GEOBOOST is to support member states in implementing the provisions related to heating and cooling in the renewal directive and to comply with referred targets. The number of legislation, policies or strategies created/adapted to include geothermal HPs at any governance levels due to the project is expected to be 20 within project duration and 50 new regulations within 5 years after the project is achieved. It includes the following policy impacts:

- **On RED:** the revision of the Renewable energy directive includes a simplification of the permitting for geothermal HPs. Each Member States will have to establish a traffic light systems to implement this simplification.
- **REPowerEU:** New support measures are expected following the announcement of tripling geothermal and have 10 millions new HP units installed, including geothermal ones.
- **EPBD:** Providing clear recommendations to greatly increase the quality of reporting of the heating and cooling sector under the EED article 14.

- **NECPS:** GeoBOOST provides a basis for an improved quality of reporting, National Energy and Climate Plans and Long-Term renovation strategies as well as more effective planning, for example of smart Heating and Cooling Networks**.** GeoBOOST will support the inclusion of GHPs in spatial energy plans in the participating 8 target countries. To ensure an impact on capacity building and policy adaptation, the outcomes and hints from the guidelines to integrate GHPs into spatial planning procedures will be used to develop 4 policy briefs, targeted to decision makers. Three rounds of national events for decision makers will be organized in each country (WP6) to ensure capacity build.

7 Market uptake:

GeoBOOST will contribute to a market uptake of installed systems in Europe exceeding, 2 million units in 4 million units by 2025 (end of the GeoBOOST project) and more than 10 million units by 2030. The REPower EU Plan 2022 stated in its Communication that "The European Union should aim at doubling the current deployment rate of individual heat pumps, resulting in a cumulative 10 million units over the next 5 years. Member States can accelerate the deployment and integration of large-scale heat pumps, geothermal and solar thermal energy in a cost-effective way. Moreover, it added that "To reach the EU 2030 targets, energy demand covered by solar heat and geothermal should at least triple. To reach a 300% increase (tripling) in 10 years, the milestone is to double by the end of the project. In 2021, only 100,000 geothermal HP units have been installed in the EU, with three EU countries (Sweden, Finland and Germany) representing 80% of the market share. Increasing these annual sales to (2,000,000/3) 666,666 units/year, will pass through a deployment in all EU member states and especially in GEOBOOST countries. We speak about 0.5% of the total individual heat appliances market in the EU representing 100 million units.

The developed concepts may lead to additional annual investments through public intervention between €50-100 million in the geothermal heat pump sector and €4 billion from RES HC investments. 5 years after the end of the project, total additional investments triggered amount to 7.5 billion Euros.

5 products (goods or services), processes and methods launched into the market by the project are expected by the end if the project, and other 5 within 5 years after the end of the project.

8 Implementation sites

8 real life implementation sites carried out by the project are expected (one per project country), while within 5 years after the end of the project results are expected in all EU countries thanks to the replication of solutions and best practices. As the project has no democases, in the referred countries the impact will result in the spread out of guidelines to integrate GHPs into spatial planning procedures, collections of strategies and measures for fostering future investments and good practise business models to implement geothermal heat pumps systems at different scales.

9 Skills:

GeoBOOST will contribute to an improved understanding of consumption trends, potentials, market barriers, impacts and non-energy benefits as well as measurement of impacts and benefits. GeoBOOST facilitates the increase of geothermal energy in the future energy mix by understanding and removing concerns and barriers to the implementation of geothermal projects. The experiences gained and challenges still existing will be pooled from 10 target countries, evaluated and complemented by strategies, measures and instruments for facilitating investment decisions towards geothermal heat pumps. The knowledge created inside GeoBOOST will be transferred to decision makers and multipliers at national levels as well as at a European level in targeted communication activities.

The number of public entities trained with increased skills and competencies on geothermal energy issues due to the project will be more than 50 persons during the project and 100 persons 5 years after the project ends:

- GeoBOOST will raise the awareness and level of information, and training of at least 50 policy and decision makers in the 10 target countries as well as at an EU level towards actions, which need to be taken to enable a significant uptake of geothermal heat pumps by 2030. In WP3, Engagement scenarios will be in a form of a series of webinars and 3 workshops, and an online helpdesk.

- GeoBOOST will provide analysis of market barriers, potentials for the implementation of the technology as well as consumption trends.
- GeoBOOST will develop a strategy and elaborates measures to make the use of geothermal heat pumps accessible irrespective of the available income.
- GeoBOOST stimulates investments in sustainable energy and triggers primary energy savings as well as renewable energy generation.

Considerations based on the population have been made to calculate the number of market stakeholders trained with increased skills and competencies on energy issues due to the project.

Table 6: number of market stakeholders trained with increased skills and competencies on energy issues due to the project

Country	population eurostat 2023	sharing key population	Skills (project end)	Skills (5y after)
Belgium	11742796	5%	2	19
Germany	84358845	38%	31	311
Ireland	5271395	2%	1	4
Spain	48085361	22%	1	3
Netherlands	17811291	8%	8	85
Austria	9104772	4%	8	82
Poland	36753736	16%	5	53
Sweden	10521556	5%	44	443
aggregated	223649752	100%	100	1000
	223649752		100	1000

10 Communication:

The potential of replication of the GEOBOOST results is very important, since efficient and renewable heating and cooling solutions are a marginal component of the h&c market in European buildings today, and thanks to this project, solutions will be available to mainstream these solutions from the part of service providers which will be able to adopt relevant business models and implement best practices at the building level, from the part of end users who will be able to access information about technologies and cost-benefit analysis, and from the part

of local authorities who will have robust tools to plan and model the uptake of GHPs technologies to decarbonise the supply of heating and cooling to their buildings.

This replication will be favoured by the promotion of the best practices identified as part of GEOBOOST to relevant stakeholders at trade conference, in network of cities in energy transition, to associations of consumers or end users such as building owners. This will be facilitated by the involvement of some key stakeholders in the advisory board of the project, and by the work of dissemination undertaken as part of the project's implementation.

The potential users of the results include:

- European local authorities designing their heating and cooling transition plants, for instance the 10,777 cities and town signatories of the Covenant of Mayors.
- European businesses installing efficient and RES HC solutions, for instance the installers of 100,000 geothermal heat pumps annually, or for the 1% of European new buildings or buildings undergoing energy renovation respectively every year (BPIE, EU buildings under microscope; Renovate Europe, Renovation a kick starter for the EU recovery).

The Work Package on communication and dissemination of the project results will ensure the information on the findings, recommendations and resources of the GEOBOOST project will be made available to all relevant stakeholders.

Results of the GEOBOOST project will already be disseminated and replicated as the project progresses (WP6). As the project concerns all efficient and GHPs solutions and technologies, the findings will be disseminated and transposed beyond the core focus of the GEOBOOST project.

The second replication concerns more European countries, as GEOBOOST will have a special focus on 8 countries. The concept of market maturity and the selection of countries to reflect several market readiness levels (MRL), will ensure that project results could be replicated to more European countries.

In WP6, a mapping of all European countries is done to present the MRLs. GEOBOOST will focus on the identification and implementation of solutions and best practices in the target countries of the project in a first time, before focusing on the replication of said solutions and best practices in WP6. GeoBOOST is designed to be replicated across the GHP, geothermal and other renewable energy sectors.

Table 7: number of stakeholders reached through media and events during the project

Country	population Eurostat 2023	sharing key population	Communication (project ends)	Communication (5y after)
Belgium	11742796	5%	52	262
Germany	84358845	38%	377	1886
Ireland	5271395	2%	24	118
Spain	48085361	22%	215	1075
Netherlands	17811291	8%	80	398
Austria	9104772	4%	40	204
Poland	36753736	16%	165	822
Sweden (44.17%)	10521556	5%	47	235
aggregated	223649752	100%	1000	5000
	223649752		1000	5000

11 Job creation:

72,000 job created by the end of the project. 5 years after the end of the project, additional creation of 133.500 jobs. The methodology for calculating the indicators is as follow:

Calculated according to the Renovate Europe data that 18 jobs can be created by 1 million euros invested in building renovations, considering the very deep similarities between the heating and cooling sector for buildings and the overall construction sector.

Table 8: number of jobs created in FTE

Country	Population Eurostat 2023	sharing key population	Employment (project ends)	Employment (5y after)
Belgium	11742796	5%	2,625	52,505
Germany	84358845	38%	18,860	377,192
Ireland	5271395	2%	1,178	23,570
Spain	48085361	22%	10,750	215,003
Netherlands	17811291	8%	3,982	79,639
Austria	9104772	4%	2,035	40,710
Poland	36753736	16%	8,217	164,336
Sweden	10521556	5%	2,352	47,045
aggregated	223649752	100%	50000	1000000
	223649752		50000	1,000,000