Geothermal Communities NEWSLETTER

1st & 2nd joint edition
May 2011

Geothermal Communities is a project of the CONCERTO initiative co-funded by the European Commission within the FP7.

INTRODUCTION

This first, joint edition of our Geothermal Communities project newsletter is designed to introduce you to the project's main objectives and research components, and to describe the demonstration activities to be carried out at the three municipal sites involved, as well as the results already achieved during the first year of the project.

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The project *GEOCOM (full name: Geothermal Communities - demonstrating the cascading use of geothermal energy for district heating with small scale RES integration and retrofitting measures)* is a CONCERTO Phase III action within FP7, accepted and negotiated in 2009 and started in January 2010. It is led by Geonardo Environmental Technologies Ltd, a Budapest-based engineering and consultancy SME with relevant experiences in EC project management and in geothermal energy applications. The consortium consists of 16 partners, including municipalities, universities and other technological organisations as well as private companies active in the field of geothermal energy utilisation.

The overall objective of the project is to promote the use of geothermal energy as a reliable renewable energy source through demonstration activities and innovative energy-efficiency measures carried out in three different towns involved in the project as *Concerto Areas* (in Hungary, Slovakia and Italy). In addition to the demonstration elements, there is also a strong complementary component of research focusing on making geothermal projects more cost-efficient and technologically sound. Furthermore the project integrates a number of associated communities as project partners (from Serbia, Romania, Poland and the Republic of Macedonia) that either already have ongoing geothermal systems that need the adoption of new technologies (e.g. Kocani, Republic of Macedonia), or they would like to implement new systems from scratch with the help of the project partners (e.g. Subotica, Serbia).

Project coordinator: GEONARDO Environmental Technologies Ltd.
www.geonardo.com

Demonstration Sites:
- Municipality of Morahalom
- Municipality of Galanta
  Galantaterm Ltd.
  Bysprav Ltd.
- Municipality of Montieri
  SOFTECH Ltd.
  CoSviG Ltd.

Associated communities:
- Municipality of Oras Sacueni
- Municipality of Subotica
- Municipality of Kocani
- Municipality of Mszczonow

Research Partners:
- Slovak Energy Agency
- Polish Academy of Sciences
- Macedonian Geothermal Association
- University of Szeged

COMMUNITIES INVOLVED 2

MÓRAHALOM

is a small town situated in South-East Hungary, near the E55 highway at 92-95 metres above sea level. It is one of the most disadvantaged settlements in Hungary, but at the same time, in the past few years it has become one of the ten most dynamically developing communities. It is situated in an area of 8 314 ha and has a population of 5 636; 30% of whom live in the 800 peripheral farmsteads. At the moment there is no district heating in the town; the private houses are heated by mains gas, or they use gas bottles, coal, wood, or oil stoves. The public institutions have their own heating stations.

GEOTHERMAL SYSTEM DEVELOPMENT

The core work of the Geothermal Cascade System of Mórahalom was financed by the Hungarian Structural Funds *(„KEOP-4.1.0-2007-0006: Geothermal Cascade System of Morahalom (2008) – EURO 2,147,000")*. The priority of the CONCERTO project component is to further use the energy content of the low-enthalpy heating medium, which has not been used in the development financed from ERDF resources. **Within our CONCERTO developments, a high-performance heat-pump heating station will be established**, to which the buildings of the "New Town Centre" can be connected through secondary heating circuits (the new Town-Hall and the Thermal Residential Park).

As an innovative element of the project, the auxiliary power demand of the high-performance heat-pump heating station will be produced on-site by trapping the high methane content waste gas from the Cascade System's new abstraction well. The heat from the CHP unit will be used as an auxiliary source of heat for the abstracted water.

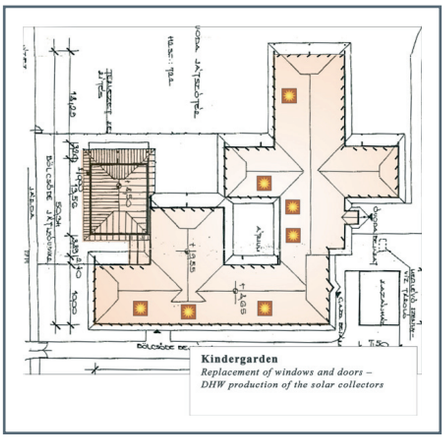
ENERGY EFFICIENCY

These activities aim at increasing the energy efficiency of two public institutions with a large floor plan and bad thermal parameters, currently considered as significant gas consumers: the *Mora Cultural Centre, Elementary and Grammar School and the Kindergarten – Day-care Centre Complex.* Both groups of buildings have several wings with different conditions and energy features.

Within the CONCERTO project, almost 2000 m² of school walls with bad thermal parameters will be insulated and upgraded to meet standards and recommended diathermal requirements. Beside the insulation of walls, the draughty doors and windows (see pictures) will be

replaced with ones with a total heat transmission coefficient of Uw=1.2-1.3 W/m²K (glazing: Ug=1 W/m²K coefficient). The insulation of walls is expected to decrease the heat demand by 12-14%, and the replacement of doors and windows by an additional 16-21%, which means a total decrease of 28-35% in energy need.

Additionally, the doors and windows in the older parts of the Kindergarten will be replaced, with an expected heat demand decrease of 16-21%.



RES INTEGRATION

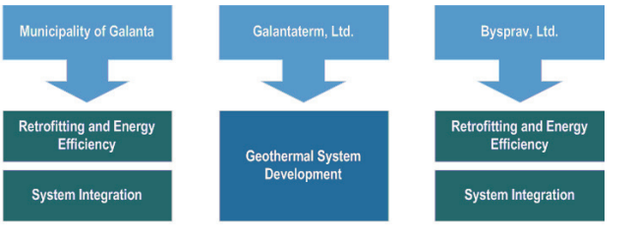
As part of the activities, solar collector systems for domestic hot water production will be developed in two consumption locations: *Mora Cultural Centre, Elementary and Grammar School – Sports Hall, and the Kindergarten – Day-care Centre Complex.* The solar collector systems planned will cover the 64-68% of the energy demand to produce DHW at the *Kindergarten – Day-care Centre Complex and 75-77% at the School and Gymnasium – Sports Hall.*

Additionally, the modernisation of the complete public lighting of the town centre and the changeover to a solar-powered LED lighting system will be implemented.

COMMUNITIES INVOLVED

GALANTA

is a medium sized (16 500 citizens), regional commercial and cultural centre, situated approximately 50 km from Bratislava. The town is surrounded by many big streams and small streams too – such as Vah, Malý Dunaj and Dudvah. There are plenty of thermal springs in the vicinity of the town that are used by the city for district heating. The GEOCOM project activities will be implemented by the joint effort of three main local organisations as follows:



GEOTHERMAL SYSTEM DEVELOPMENT

The main aim of this project element is **to improve the environmental performance of the existing geothermal heating system**, which mainly depends on the possibility of reinjection into sandstone. From the perspective of the sustainability and environmental suitability of solutions, reinjection could be an important step, as nowadays over 500 000 m³/year of waste geothermal water is pumped into the river Váh. As part of the project activities,

a geological survey, additional studies and the **full documentation of a reinjection borehole** will be developed. Furthermore **a new junction will be constructed and new multi-storey houses, an old people's home** and a biotechnical accessories producing company **will be connected to the geothermal system** in the first phase. The junction will provide heat and domestic hot water all year round. The connection will be achieved by a double pipeline system, which will be connected to the existing circuit of the energy centre and the exchange stations. The new area that will be connected to the geothermal heating system has a great potential for further enhancement.

Based on the potential for further development of the area, the heat provided can be divided into two main phases. Initially we can connect existing buildings: a multi-storey block of flats (37 dwellings), an old people's home and a microbiology laboratory for the geothermal system. The estimated heat provided will be approx. 3700 GJ/year. For the second phase, two multi-storey blocks of flats are planned in this area with total numbers of 74 dwellings. The heat provided at the second phase will be approx. 2100 GJ/year. As this new location has great potential, the municipality is planning to create a new town district with multi-storey blocks of flats that will mean a new phase in the geothermal energy expansion in Galanta.

ENERGY EFFICIENCY

Activities include retrofitting three 8-storey blocks and an elementary school heated by geothermal energy. The school has several pavilions and the retrofitting activity will comprise window and door replacement as the existing closures are in disrepair and have poor thermal insulation attributes (expected energy saving on heating is up to 30 %). The retrofitting work at the buildings (96 dwellings) includes facade and roof insulation, replacement

of the doors and windows in the common spaces and a hydraulic adjustment. You can read more information on the results achieved on page 6 of the newsletter.

RES INTEGRATION

Activities include the integration of geothermal heating with photovoltaics. The town municipality is responsible for the installation of photovoltaic panels (with a performance of up to 5 kW and an annual energy gain of up to 5300 kWh, calculated on the solar radiation in the Slovak Republic). In order to enhance the efficiency of this measure, a comprehensive upgrading of the lighting system at the school will be implemented, allowing an average saving of electricity consumption up to 25%. Besides electricity saving, the upgrading of lighting fixtures will contribute to improving the conditions for the education process, reduce the number of lamps, and increase light output (in terms of technical standards). Bysprav Ltd. will cover the second part of RES integration – the deployment of photovoltaics to provide electricity for the retrofitted multi-storey houses heated by the geothermal source. The photovoltaics will serve the lighting needs of the common spaces. For each insulated housing unit a photovoltaic system with up to 1.5 kW of power will be implemented, sufficient for the common areas of housing units with up to 48 dwellings.

COMMUNITIES INVOLVED 4

MONTIERI

(Tuscany region – Province of Grosseto) lies on the northern flank of the mountain that bears the same name (Poggio di Montieri). The medieval town is part of the Italian Geothermal District with a significant proportion of housing to be renovated. It counts 1249 inhabitants (Montierini), an area of 108.61 square kilometres and a population density of 11.50 inhabitants per square kilometre. The town rises 704 metres above the sea level, presenting a number of degree-days amounting to 2.500, and a conventional length of the heating season for 14 hours daily for a period between October 15 and April 15, for a total 184-185 days per year. **The Montieri Geothermal Community Project focuses on the town as a whole.**

GEOTHERMAL SYSTEM DEVELOPMENT

The main activity is the realisation of a highly innovative geothermal district heating network and power generation system, using high enthalpy fluid, which can serve as a new, ambitious example for Central-Eastern European countries, where higher temperature fluids (medium/high enthalpy) may also be recovered (although at significantly higher investment costs). A preliminary investigation highlighted the feasibility of **a geothermal district heating network, exclusively devoted to the city of Montieri**, for a total of 425 residential units to be served by the system, with a total heated volume of 110 000 m^3. **The GEOCOM project will support the cost of the buildings' connection to the district heating network** and upgrading the existing heating system of residential houses.

ENERGY EFFICIENCY

Montieri also represents a challenging site for defining and testing a qualitative architectural integration of renewable energy technologies and retrofitting measures because in such an architectural heritage the potential for intervention at the building envelope level is quite limited. The retrofitting demonstration will conserve the town's high cultural and artistic value. Only natural materials and methods that are in conformity with the mediaeval city structure are acceptable. Twenty percent of the total dwellings in Montieri will be retrofitted during the project! Additionally, the building refurbishment will be matched with eco-measures to improve on the new 2006 Italian code for heating demand by 50%. These buildings will make use of geothermal heating to obtain 100% free fossil fuel.

RES INTEGRATION

Montieri will be also a demonstration site for photovoltaic and solar thermal technology integration. A low environmental impact design for these technologies will be set by choosing an appropriate location. The photovoltaic plant will provide 8.5 kWp, and will be integrated with the buildings of the two heat-exchange stations of the geothermal district heating net. Furthermore, solar thermal collectors with an area of 42,5 m^2 will be installed on the roof of the distant sport facilities of Montieri to directly supply heat for domestic hot water where the district heating net cannot provide it. This choice means there will be no visual impact issues and the best orientation and irradiation will be provided for the system.

TECHNOLOGICAL RESEARCH

Work package leader: University of Szeged

❖ INTEGRATION WITH OTHER RES

Under this sub-WP the project team will study the existing experience on the integration of different RES into a cascaded facility with a special view to environmental improvements and the extension of the utilisation time and spectrum of uses of such facilities.

❖ TRANSBOUNDARY ISSUES CONCERNING THE UTILISATION OF GEOTHERMAL ENERGY

These activities will be carried out in close synergy with the 'Complex utilization of geothermal energy and planning of the monitoring of the common Hungarian-Serbian thermal water reservoirs' (HUSER0602/086) project.

❖ REINJECTION MONITORING AND MODELLING

The aim of the work package is to collect data and information in production conditions that clarify the relation between well construction and well-geophysical relations of abstraction-reinjection wells constructed on Upper Pannonian sandstone reservoirs, and the actual abstraction-operation methodology.

❖ INTEGRATED UTILISATION OF WASTE GASES FROM THERMAL WELLS

Researchers of the University of Szeged, involving the leaders of the other test sites, will carry out an on-site study of the Morahalom site, assess the results of integrated use of waste gases of thermal wells, conduct benchmarking, analyse the needs and potential of other possible sites and outline suggestions for wider applications.

SOCIO-ECONOMIC RESEARCH

Work package leader: Polish Academy of Sciences

❖ PUBLIC PERCEPTION OF GEOTHERMAL ENERGY

❖ THE WORK WILL ASSESS AND EVALUATE SOCIETY'S UNDERSTANDING OF THE FUNCTIONING AND ROLE OF GEOTHERMAL ENERGY IN ENERGY SYSTEMS AND EVERYDAY USE.

❖ PUBLIC PERCEPTION AND UNDERSTANDING OF RUE MEASURES (pilot-site case studies)

❖ OVERVIEW OF MARKET DRIVERS, FISCAL MEASURES AND SUBSIDIES

Issues such as financial constraints (on capital investment, flow of capital, etc.); environmental constraints; land concessions; water rights; taxation; etc. will be thoroughly investigated with regard to their handling through the relevant existing legislative and administrative framework.

MONITORING

Work package leader: Slovak Energy Agency

Work will include

❖ AMBIENT MONITORING
❖ TECHNICAL MONITORING OF RES SYSTEMS
❖ TECHNICAL MONITORING OF CONCERTO BUILDING PERFORMANCE
❖ NON-TECHNICAL MONITORING – IN COOPERATION WITH WP6
❖ REAL-TIME ON-LINE MONITORING OF SYSTEM PERFORMANCE

You can read more information on the recent results of these research activities in the next edition of our newsletter (to be expected in January 2012).

THREE MULTI-STOREY UNITS HAVE BEEN RETROFITTED IN GALANTA

Three eight-storey blocks of flats have been retrofitted in the Galanta demonstration site. Due to the high interest shown by the Municipality of Galanta and the building inhabitants, this activity has been implemented one year earlier than originally planned. As a first step, local project partners, Bysprav Ltd. and the town municipality organised information seminars and presented the project to the inhabitants of the district concerned. As a result three multi-storey blocks were selected for retrofitting, and then three stand-alone public procurements were carried out. After the successful procurements, the residents decided to begin with the retrofitting works in 2010 on all three buildings. Each block has 32 dwellings, so the total number of retrofitted flats is 96, while the total gross floor area of the flats totals 8723 m^2. The retrofitting works included the replacement of windows in common spaces and facade insulation.

With the retrofit, the town has achieved a heating energy consumption decrease of 296,393 kWh (1,067.01 GJ). **This saving is more than the annual heating energy consumption of a multi-storey block of flats without the retrofitting!**

Using the recent price level of geothermal heating in Slovakia (€13.94/GJ), it means an annual saving of €14,874.12 on district heating. By dividing this figure by the total number of retrofitted dwellings, 96, we get the annual impact of the project on each household. Each household saves 3087.43 kWh (11.12 GJ) every year, which means €155.01 of annual savings. The table below shows the detailed figures achieved, broken down by element.

Multi-storey block on Mierova 1436

Staircase doors have been replaced as part of the project activities

CONDITIONS AFTER RETROFITTING

Construction element	U-value		
	Before retrofitting	After retrofitting *(proposed condition)*	Reduction in %
Ceiling of the cellar	1,11	0,49	55,86 %
Gable wall	0,69	0,31	55,07 %
Facing wall	0,77	0,32	58,44 %
Roof	0,37	0,18	51,35 %
Windows of the common spaces	3,00	1,50	50,00 %
Doors of the common spaces	6,00	1,50	75,00 %
Wall of the entrance	3,04	0,69	77,30 %

Multi-storey block on Mierova 1436 after retrofitting

FIRST RESULTS OF THE ENERGY RETROFIT STUDY ON THE HISTORIC VILLAGE OF MONTIERI

The preliminary evaluations of the study of energy retrofitting in Montieri town centre (project deliverable) demonstrate that improving energy efficiency and conserving the historical value of the buildings is achievable and it leads to a reasonable payback time for final users. From an analysis of both historical and current urban maps and official documents, Montieri's building estate has been subdivided into four main categories of historical value in order to set appropriate energy efficiency measures to reach new ambitious energy standards without damaging buildings or the urban appearance of the village.

GEOCOM project sets high energy efficiency standards for retrofitted buildings in Montieri: energy requirements of the Italian Building Regulations for the year 2006 have to be reduced by 50%. The meaning of this standard is to anticipate future energy requirements for the entire lifespan of retrofitting measures. different case studies are being analysed to assess how and in which kind of buildings these standards can be achieved. **The retrofit design of the first four representative buildings has led to encouraging outcomes.** The town hall and three residential houses have been analysed. The first two buildings are listed by the local authority for monument protection and the other two represent common building typologies in the village and were built with traditional materials and technologies.

The table below shows the definition of different levels of retrofitting measures tailored to each class of historical value.

CLASS	Energy retrofit measures
HIGHT historical value	Do not modify external and internal appearance of the building. Do not damage building elements. **Permitted measures:** loft insulation, first floor insulation, secondary glazing (if original windows are present)
MEDIUM historical value	Do not modify external appearance of the building. **Permitted measures:** roof insulation, loft insulation, first floor insulation, plastering of facade, substitution of windows
LOW historical value	Keep uniformity of external façade of the building in its urban context **Permitted measures:** roof insulation, loft insulation, first floor insulation, plastering of facade, substitution of windows, internal insulation of walls
NO historical value	Keep uniformity of external façade of the building in its urban context **Permitted measures:** roof insulation, loft insulation, first floor insulation, plastering of facade, substitution of windows, internal insulation of walls

LATEST RESULTS

The table below summarises energy efficiency measures adopted in energy retrofit design evaluations and the results achieved for each case study.

	Case studies	Retrofit technologies	Energy performance	Payback time
	TOWN HALL (High historical value)	- Loft insulation - Internal insulation of wall toward unheated space - Internal partition at ground floor	Present state: 207 kWh/m²y Retrofit design: 118 kWh/m²y	4,5 years
	CASA BIAGESCHI (High historical value)	- Loft insulation - Insulation of the basement's ceiling - Windows replacement	Present state: 177 kWh/m²y Retrofit design: 100 kWh/m²y	5,3 years
	HOUSE IN VIA DOGANA (Medium historical value)	- Loft insulation - Insulation of the basement's ceiling - Substitution of windows - Plastering on external façades	Present state: 173 kWh/m²y Retrofit design: 95 kWh/m²y	2,5 years
	HOUSE IN VIA GARIBALDI (Medium historical value)	- Loft insulation - Insulation of the basement's ceiling - Substitution of windows - Plastering on external façades	Present state: 177 kWh/m²y Retrofit design: 100 kWh/m²y	2,6 years

The retrofit solutions adopted improve the energy efficiency performance of existing buildings from class F-G to class E in the Italian energy regulation. Since the buildings analysed are representatives of the main typologies of the historical town centre, the retrofitting solutions proposed can easily be adopted in other case studies. The choice of **technologies is oriented to the use of natural materials to reduce the environmental impact of the project.** Further developments of this study will show how those measures can be extended to all existing buildings in the whole village and what level of energy saving can be reached entirely by adopting GEOCOM energy efficiency standards and retrofitting solutions.

PROJECT NEWS

THE MAYOR OF KOCANI AND MSZCZONOW HAVE SIGNED A BILATERAL COOPERATION AGREEMENT

*The Mayors of two associated communities have signed a **Contract for Friendship and Collaboration**. Poland, October 2010.*

As a basis of a bilateral collaboration, in the period of 24th to 27th of October 2010, the delegation of representatives of the *Municipality of Kocani and KJP Vodovod Kocani* performed a working visit of the *Municipality of Mszczonów* in the Republic of Poland as one of the forecasted activities within the project. The main aim of the visit was to review the geothermal potential of the town of Mszczonów and to establish possible ways of collaboration with a special focus on the preparation of a strategy for mutual approach to apply for EU funds in the field of renewable energy resources. As part of the visit, the mayors of the two cities, Kocani and Mszczonów, signed a *Contract for Friendship and Collaboration*, which foresees several ways of cooperation in the future – among others – in the field of exchanging experience and seeking possibilities in the area of utilising of renewable energy resources and protecting the environment.

2ND INTERIM MEETING OF GEOTHERMAL COMMUNITIES

The GEOCOM consortium held its latest general project meeting in Skopje, in the Republic of Macedonia **with a visit to the Kocani geothermal site** on 27-28th April 2011. The representatives of the three demonstration sites and the leaders of ongoing work packages (Technological Research, Socio-Economic Research) summarised the results of the first-year activities carried out and introduced the planned actions for 2011 (you can read more information on the latest results on pages 6-8). As part of the meeting, consortium members, together with the newly established **Concerto Premium*** representatives, took a site trip to Kocani, one of the project's associated cities, where visitors gained first-hand experience on the latest developments to the town's geothermal site. Furthermore, as an invited guest, a coordinator from another Concerto III project called PIMES's, also took part in the meeting in order to establish future networking opportunities with our project members. For more information on PIMES's please visit www.pimes.eu.

Consortium site visit at a primary school heated by geothermal energy in Kocani

Project Coordinator, Mr. Gabor Kitley (Geonardo Ltd.) gives an interview to local television

New greenhouses heated by geothermal energy in Kocani

** CONCERTO Premium adds value to the CONCERTO projects, supports the European Commission and contributes to the sustainable success of the CONCERTO initiative on scientific, technical and political level. The overall objective of the CONCERTO Premium initiative is to develop a robust data and information base that serves as a basis for setting regulatory frameworks and decision support for investors.*

Project coordinator: GEONARDO STATE-OF-THE-ART AND BEYOND
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