



# *CLUSTHERM*

„Creating a Central European  
Thermal Water Research Cluster”



*Action Plan  
Recommendations*



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Central European Thermal Water Research Cluster



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Thermal Water Research Cluster”

## Action Plan Recommendations



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Central European Thermal Water Research Cluster

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## I. FOREWORD

The CLUSTHERM project is one out of the 5 projects which have been financed under the Capacities Work Programme of the FP7 entitled Regions of Knowledge, aiming to set up a new, research driven cluster. In this Regions of Knowledge project - CLUSTHERM - we set out to connect the specific areas research and rural economies.

Central Europe's underdeveloped, rural areas have been facing great challenges due to their geographical handicaps and economic structural problems, problems related to the economic structure, although they possess an unexploited natural treasure: the geothermal water. The exploitation of thermal water has long traditions in the area, geothermal heat being used in buildings, greenhouses, spas and other traditional "direct use" facilities instead of fossil fuels or electricity. With a growing demand for alternative fuel production geothermal resources can also play a major role in providing the energy needed for the energy-intensive production processes.

To connect the areas research and rural economics according to the targeted topic of the project we had to take into consideration different policies and actors coming from different fields of activity along to the knowledge triangle, like companies, research institutions and public authorities/institutions.

The Commission acknowledges that research governance at the level of the regions is central to the development of the ERA, stating that "regions emerge as dynamic players in developing and structuring the European Research Area".<sup>1</sup>

Recently, clusters got more and more attention in regional and national development policies supporting innovation and competitiveness. In consequence our concept is also strongly linked to the research and development policy, the energy policy and the rural development policy of the European Union and the participating countries and regions as well.

The emergence of clusters in a given location does not happen by 'accident'. Most typically, they are related to a so called „factor advantage”<sup>2</sup>, as it is in our case the geothermal water.

This was the environment when we started the implementation of the FP7 Regions of Knowledge project CLUSTHERM in May 2008.

<sup>1</sup> European Commission, 2001, "The regional dimension of the European Research Area", 03.10.2001 COM(2001),page 7

<sup>2</sup> The concept of clusters and cluster policies and their role for competitiveness and innovation: Main statistical results and lessons learned  
Commission Staff Working Document, SEC (2008) 2637, Annex to the Communication from the Commission "Towards world-class clusters in the European Union: Implementing the broad-based innovation strategy" COM(2008)652 final of 17.10.2008, p. 12

In all types of cooperation, but especially in the case of projects, different types of barriers can be identified. In our case, although the professional background of the project partners was quite similar, the regions and countries were lacking some relevant professional information. During our work we had to realize that the partner regions and countries can hardly be compared (or benchmarked) due to the different approaches on collecting hydrogeological data on wells. Facing this problem, we were forced to reduce the number of used indicators in order to make the regions comparable.

As a result, the partners agreed that a harmonized international database containing detailed information about all hydrogeological aspects of thermal wells could be a useful tool for research and also for authorities to harmonise their policies and activities to protect and create the basis for a sustainable utilisation of geothermal water resources.

Besides the state of the art analysis and the benchmarking study on the participating regions, there are two other main direct outcomes of the project: the Joint Action Plan and the Recommendations of the Clustherm regions. These outputs are published in this brochure.


Apart the above mentioned direct objectives of the project, the most important and strategic outcome of the project is the creation of the CLUSTHERM Central European Thermal Water Research Cluster. In this sense, the project partners have organized several events and workshops in their home regions and used different channels to raise awareness on the project and its concept. Using these inputs we have decided to set up the cluster in April 2010, in the last month of the project, which will be launched during the final conference in Debrecen, on the 16<sup>th</sup> of April, 2010. The Action Plan and the Recommendations will act as a basis for the cluster activities, creating synergies and facilitating cooperation, using the different sources of financing for the proposed activities carried out in order to implement the Action Plan.

We invite you to visit our homepage ([www.clustherm.eu](http://www.clustherm.eu)) and get in contact with us if you would like to build a closer relationship with the CLUSTHERM Central European Thermal Water Research Cluster.

As the coordinator of CLUSTHERM, I would like to express my acknowledgements to the partners and members of the working group for their essential contribution and dedication to the work carried out in the project. I believe that the established cooperation, will serve as a strong basis for the implementation of our future ideas of the Central European Thermal Water Research Cluster.

The findings and statements in this brochure are the results of interactive consultations within the CLUSTHERM project and the authors and contributors are solely responsible for this publication, which does not represent the opinion of the Community. The Community is not responsible for any use that might be made of the content of this publication.

Debrecen, 2010



Márta Völgyiné Nadabán  
project coordinator

## 2. PROJECT SUMMARY

**The CLUSTHERM “Creating a Central European Thermal Water Research Cluster” project has the strategic objective of setting up a new research driven cluster in Central Europe on thermal water utilization, which will develop the capacity of Central Europe’s rural economies rich in thermal water to access and benefit from the research conducted on the exploitation of geothermal resources.**

Although the rural areas in the partner regions have to face many difficulties related to their geographical positions or the economic structure, they all have a common, mostly unused advantage: the geothermal water. The overall concept of the CLUSTHERM project is to enable the regional actors to bring the geothermal R&D achievements to the ground of local services and products.

The objectives of the European Union aimed at growth and job creation require a shift in the economy towards knowledge-based activities. Fundamentally, the competitiveness of businesses in Europe depends on their ability to market new knowledge as soon as reasonably possible.

By 2010 Europe should become the most competitive and dynamic knowledge society in the world (Lisbon Council, March 2000). The Barcelona Council in March 2002 confirmed RTDI as a top priority for the EU by targeting an ambitious goal of allocating 3% of the GDP for research and technological development (RTD). European regions have been acknowledged as key actors to reach these targets and to support the European Research Area, the cornerstones of the Lisbon strategy. “The Regional dimension of the ERA” Communication [COM(2001) 549 final] and the 3% Action plan [COM(2003)226, Investing in research : an action for Europe] state the “motor role that regions may play in the overall context of economic growth based on research, technology and innovation” and underline the need to “encourage regions to develop their own innovation strategies, including research aspects”, in particular in convergence regions.

The European Union is confronted by a significant growth of energy consumption while energy sources are becoming scarce. The EU has limited room to manoeuvre on the energy supply side while renewable energy has not evolved enough to replace oil and gas in a sufficient quantity. In consequence we need to take into account the European possibilities for energy savings as well as the demand by the year 2020.

Partners in the CLUSTHERM project:

The consortium consists of 12 partners from 5 regions of 4 countries (Észak - Alföld and Dél-Alföld from Hungary, North West Region from Romania, Vukovar – Srijem County from Croatia and Styria from Austria). From these regions partners were chosen on the basis of fulfilment of project objectives.

As it can be seen in the table below, during the selection of project partners a special attention has been paid to establishing the project consortium. To meet the objectives of the project, -national, regional or local authorities, research entities, enterprises and other expert organisations had to be represented in the project. The consortium consists of 5 regional authorities, 3 research institutes, 2 enterprises and 2 other expert organizations.

### Consortium of CLUSTHERM project

Partners (Regions and countries)	Public, national, regional or local authorities	Research entities (experienced in the field)	Enterprises	Other expert organizations
Észak-Alföld North – Great Plain (Hungary)	INNOVA Észak Alföld Regional Development and Innovation Agency (coordinator) www.innova.eszak-alfold.hu	“VITUKI” Environmental Protection and Water Management Research Institution (VITUKI) www.vituki.hu	Central Geo Ltd. (CG) www.centralgeo.hu	Észak - Alföld Regional Thermal Innovation Pbo. (EARTI Pbo.)
Dél – Alföld South Great Plain (Hungary)	South Great Plain Regional Development Agency (DARFU) www.darfu.hu	-	-	South Great Plain Sustainable Environment Foundation (DAFKA) www.dafka.hu
North – West Region (Romania)	North—West Regional Development Agency (NORTH-WEST RDA) www.nord-vest.ro	University of Oradea (UOR) www.uoradea.ro	SC Transgex SA (TGX) http://transgex.rdsor.ro	-
Vukovar – Srijem County (Croatia)	Vukovar Srijem County (VSC) www.vukovarsko-srijemska-zupanija.hr/	Hrvoje Pozar Energy Institute (EIHP) www.eihp.hr	-	-
Styria (Austria)	ICS Internationalisierungszentrum Steiermark Gmbh (STYRIA) http://www.ic-steiermark.at	-	-	-

### The direct objectives of CLUSTHERM project were:

- **to analyse** the RTD development and the needs of geothermal energy utilisation
- **to promote synergies** and **to catalyse links** between regional, research and business actors involved in thermal water utilization (vertical clustering)
- **to foster** the transnational and cross-border **co-operations** between the regional actors of the participating regions in the field of thermal water utilization (horizontal clustering)

- **to develop and enhance** transnational **mutual learning through information exchange** possibilities of regional stakeholders in creating research driven clusters and to disseminate good policy practices and benchmarking activities
- **to develop a joint action plan and research strategy** among the participating regions to increase the regional economic competitiveness through the concentrated use of natural resources.

### The expected results have been the:

- **involvement of more regions in the “Regions of knowledge” activities** in the convergence areas of Europe
- **increased regional economic development** in rural areas through research activities and increased capacity of rural areas to benefit from research
- facilitating the emergence of a research-driven geothermal cluster in Central Europe to promote regional and rural development
- learning through information exchanges
- **improved links between regional authorities, research stakeholders and the local business community**
- **mobilisation of local, national and community funds to implement defined regional „action plans”**

To achieve the goals in the best possible way and to reach the expected results, the CLUSTHERM project has been divided into 6 work packages (WP0-WP5), each work package being managed by a WP leader. The overall co-ordination is defined as a specific work package (WP0), INNOVA serving as the project co-ordinator and being responsible for the project management.

### The work package leaders have been defined as following:

#### Work packages of the CLUSTHERM project

WP No.	Work package title	Organization
WP0	Project management	INNOVA, Co-ordinator
WP1	Scientific Coordination	VITUKI
WP2	Analysis and need assessment	STYRIA
WP3	Joint Learning Platform	DAFKA
WP4	Joint Action Plan	North-West RDA
WP5	Awareness raising and dissemination	INNOVA, Co-ordinator

CLUSTHERM has set up a good connection with the EGEC European Geothermal Energy Council located in Brussels in order to ensure the better implementation, synergies and dissemination of the project.

Project web page: <http://www.clustherm.eu>

### Project meeting in Oradea, Romania in March 2009



## 3. KEY FEATURES OF THE CLUSTHERM PARTICIPATING REGIONS

### 3.1. ÉSZAK-ALFÖLD REGION (HUNGARY)

<b>Area:</b>	<b>17 729 km<sup>2</sup></b>
<b>Population:</b>	<b>1.51 millions</b>
<b>Population density:</b>	<b>85 (persons/ km<sup>2</sup>)</b>
<b>GDP (2007):</b>	<b>8,955 (millions of Euro)</b>
<b>GDP/capita (2007):</b>	<b>5.892 (Euro thousands per inhabitant)</b>
<b>Employment rate (2008):</b>	<b>50,3 (%)</b>
<b>Unemployment rate (2008):</b>	<b>7,8 (%)</b>
<b>Activity rate (2008):</b>	<b>54,6 (%)</b>



#### Location, geography

Észak-Alföld, comprising three counties (Jász- Nagykun- Szolnok, Hajdú-Bihar and Szabolcs- Szatmár-Bereg), is bordered by Romania and Ukraine from the east, by the River Tisza from the north and by Hungarian counties from the south. The monotony of its plains is disrupted by saliferous and fresh-water lakes, dead channels surrounded by reeds, acacia trees and the blue ribbons of rivers flowing into the Tisza. Its territory covers nearly half of the Hungarian Great Plain, with an area of almost 17,729 square kilometres.

#### Economy, businesses

In terms of Gross Domestic Product per capita, the region registered 2 418 091 millions of HUF in 2008. This is relatively low compared to the rest of the country. Due to the recession the growth of the GDP is slowed down. The activity rate is 54,6 %, which is higher than a decade before, from 1998 it has shown an increase, until 2006, when a smaller drop was experienced. The unemployment rate is 7,8 %, it has grown during the last decade, although due to the recession it is higher than in 2007. The employment rate is 54, 6 %.

#### Industry, services

Industrial production underwent significant development in Észak-Alföld between 2000 and 2008. A look at industrial output per resident and per industrial employee reveals that, relative to the national average. As regards the distribution of industrial employees, regional figures exceeded

their national counterparts in the following sectors: the manufacture of textiles and textile goods, leather goods, footwear, foods, beverages, tobacco, wooden and paper product and printing. Within the region the following sectors play a more significant role than elsewhere in the country. Hajdú-Bihar County: chemical industry and mining, electricity, gas, steam and water supply; Jász-Nagykun-Szolnok County: textile and food industries, unprocessed metal, manufacture of processed metal products and machinery; Szabolcs-Szatmár- Bereg County: foods, beverages, tobacco and chemical industry. Industrial parks play an important role in industrial development nationally and in regional level as well, 31 industrial parks are located in Észak-Alföld. Small and medium-sized towns play an important role in local employment provided they are properly developed. In the course of the establishment of industrial parks, with environmental sustainability as a major consideration, brown field investments will have to take priority over green-field ones. As a combined effect of privatisation and the en masse establishment of and a strong fluctuation in commercial businesses, the commercial supply network grew many times over its original size first through the mushrooming of mainly small shops before the mid-1990, then, from 1997 on, through the emergence of super- and hypermarkets, shopping malls and dedicated stores selling consumer durables, each with a considerably larger floor area.

### Agriculture

In respect of Hungary's agricultural development, Észak-Alföld is a key strategic area. 21.7% of the country's agricultural land is in this region. Based on gross added value and employment, agriculture plays a significant role in all three counties of the region. A further asset is that natural heritage/attributes and expertise needed for manufacturing certain agricultural products are available in the region, which provides an excellent basis for the evolvement of an innovative and competitive agrarian economy. However, there is hardly any efficient manufacturing, processing and distribution-related cooperation between the individual agricultural producers, and the number of highly processed agricultural products is low. Poor production security is attributable to an inadequate background, i.e. the absence of a physical infrastructure needed for efficient business management, logistic systems that lag behind in terms of quantity and quality, the deficiencies or the inadequate standard of quality assurance, agrarian innovation and marketing in several areas.



### Tourism

The region is twice as rich in tourist attractions as the national average. The medicinal waters of Hajdúszoboszló are famous internationally, and many people visit the spas of Nyíregyháza - Sóstó, Debrecen as well as Szolnok. Tourists can have a relaxing rest in the thermal baths or get cured from the world famous health spas with their curative waters. The region has a special



natural treasure: thermal and curative waters replete with special types of minerals. There are many relics of the characteristic folk architecture and folk traditions. The water mill in Túristvándi is a monument of industrial history. In the open-air museum of Nyíregyháza, one can find residential houses characteristic of the region. The protected habitats of Hortobágy National Park and Körös-Maros National Park preserve a unique flora and fauna. In the area of Csaroda and Bátorliget, the remnants of the ancient peat moss marsh are still

observable. There are huge ancient trees in the nature park of Tiszakürt. The plants of the already more famous Szarvas nature park originate from here. The Hortobágy National Park became a World Heritage Site in the heart of Europe and is unique in its preservation of its treasures. The area of the National Park is of 81,000 hectares. Whoever looks at this area as just the "Pusztá" would be wrong: a good part of the area is salty meadows but there is a huge lakes system here as well. More than 40% of this area is boggy, marshy and swampy. Horses and riding are inseparable from Észak- Alföld Region. A lot of people come in Észak- Alföld Region just for this activity.



### Research Activities

Észak-Alföld has significant research and development capacity that promotes intensive development of innovation-oriented technologies in the region. Research and development, which is mostly closely related to higher education, is one of the strengths of Észak-Alföld –at least in Hungarian context. The region ranks second in terms of the ratio of R&D expenditure to the GDP, third in terms of R&D expenditure per resident and fourth in terms of the share of R&D employees; overall, by Hungarian standards, it has a very strong research base. The importance of research and development is also reflected in the Regional Innovation Strategy (RIS), identifying three main focus areas for RTD activities: ICT, agriculture and health. The region provides a solid R&D base, concentrated in Debrecen and in the other two county seats, Szolnok and Nyíregyháza, which could be attractive to companies with high quality requirements. Institutions of tertiary education have age-long tradition in the region, with specialised institutions among them. University of Debrecen is a major and dynamically developing university centre of the region. College-level education is available in Nyíregyháza, Szolnok, Hajdúböszörmény, Jászberény and Mezőtúr.



### 3.2. DÉL – ALFÖLD REGION (HUNGARY)

<b>Area:</b>	<b>18 339 km<sup>2</sup></b>
<b>Population:</b>	<b>1.325 millions</b>
<b>Population density:</b>	<b>72 (persons/ km<sup>2</sup>)</b>
<b>GDP (2007):</b>	<b>7,719 (millions of euro)</b>
<b>GDP/capita (2007):</b>	<b>6.7 (euro thousands per inhabitant)</b>
<b>Employment rate (2008):</b>	<b>47,9 (%)</b>
<b>Unemployment rate (2008):</b>	<b>8,7 (%)</b>
<b>Activity rate (2008):</b>	<b>52,5 (%)</b>



#### Location, geography

The South Great Plain Region is the largest and a very special region in Hungary. It covers an area of 18 339 km<sup>2</sup>, and only 13.4 percent of Hungary's population live on this plain. The South Great Plain Region borders Serbia to the South and Romania to the East, while the river Danube serves as a natural boundary to the West, which serves as a basis for cultural diversity in this region. This region consists of three counties, namely: Bács-Kiskun, Csongrád and Békés County, and beautiful rivers cross the plain. There are three national parks within the region, and their total area constitutes 21% of all national park territory in the country. These parks are worth visiting, as they show untouched natural beauty – the Kunsági National Park, the “House of Nature” National Park in Kecskemét and the Körös-Maros National Park. There are eight different landscape

protection areas from which 13% of nature reserve areas are on the South Great Plain. Circa 85 percent of the region's land is suitable for agricultural use, but still, with 47 towns, it is also the second most urbanized area of the country.<sup>3</sup>

#### Economy, businesses

The South Great Plain Region's major aim is to fall into line with the EU's requirements and to improve its economy even more, but now it is one of the regions that are far below 75% of the EU average. If we compare to the EU average we can claim that a so called “catch-up trend” has already begun for the whole country. The region's greatest contribution to gross added value in 2002 (61.7%) was generated by the tertiary sector, which means a 9.4 percent of gross added value for Hungary. The greatest contribution to GDP is made by services but many of these services are public services, and still financed by the central budget.

<sup>3</sup> [http://www.darfu.hu/index.php?menu\\_id=4&content\\_id=225](http://www.darfu.hu/index.php?menu_id=4&content_id=225)

In the South Great Plain, which is the lowest-ranking region in Hungary from the view of the GDP growth per capita, the value at PPP was below 3 percent. ([http://www.darfu.hu/index.php?menu\\_id=4&content\\_id=225](http://www.darfu.hu/index.php?menu_id=4&content_id=225))

#### Industry, services (1500 character)

“Industry has a 24% share of the regional economy. Industrial parks in the region generated 7.8% of national industrial production. The South Great Plain Region is responsible for 9.7% of national production in the construction industry, representing 5.5% for the region.

In the Southern Great Plain, a total of 32 industrial parks offer their services to investors. Of these, nine operate in Bács-Kiskun County, eight in Békés County and fifteen in Csongrád county. Two enterprise zones have been created on the periphery of the region, one in Csongrád County (Makó and its sub-regional enterprise zone) and one in Békés county (in the area of Sarkad and Szeghalom). The combined share of industry and construction in the economy is more or less equal to that of agriculture, for which the region is naturally well suited. Meanwhile, the service sector accounts for approximately six tenths of the region's economic performance. Creating national logistics centres to reinforce the importance of the region derived from its geographical location may have a similar impact. New activities, such as electronic and mechanical engineering, are taking over from the region's traditional industries: textiles, leather and shoe production. The food industry (cereals, meat, canning and dairy products) continues to play an important role with several key brands, such as Pick salami and Csaba sausage, have acquired an international reputation. Mechanical engineering and the chemicals industry are also strongly export-oriented. Some of the region's industrial products also account for a sizeable share of national production (e.g. crude oil, natural gas, china products, roofing tiles and glassware).”<sup>4</sup>

#### Agriculture

In the South Great Plain Region there are a great number of orchards, vineyards that makes the landscape stunning. The farmers plant plenty of apple, plum and pear trees and the fruits are processed for several kinds of jams, preserves, etc.. The unique paprika of Szeged or the Giant Szegedi Sweet Pepper brought fame to this region, and is widely used not just in the country, but everywhere in the world. Agriculture in this region represents nearly 20% of national extraordinary income which takes it to the first place in this field among the sector. After reviewing acquisitions by economic branches agriculture comes in the third place, being the commerce in the first place and manufacturing industry in the second. Agriculture plays a very important role in employment



<sup>4</sup> [http://www.itdh.com/engine.aspx?page=Southern\\_Great\\_Plain#\\_toc336](http://www.itdh.com/engine.aspx?page=Southern_Great_Plain#_toc336)

in the Southern Great Plain Region, especially in Békés County's economy. The region's domestic economy is heavily predominated by agriculture, forest management and fishery. (Top 100, The Southern Great Plain Region: An Economic Profile 2006, edited by József Ballai).



### Tourism

This region offers a great number of recreational activities. One can enjoy in active tourism, cultural and heritage tourism, ecotourism – such as hiking, gastronomic- and wine tourism, health tourism, rural tourism, water tourism, etc. “The region's most important tourist attractions for the growing market of health tourism are the abundant medical and thermal water resources. (In the Great Plain, the geothermal gradient is uniquely high for

the continent, at an average of 50°C/km). A major part of the abundant thermal water resources is classified as having medicinal properties, to be used primarily for treatments of rheumatic and locomotor disorders. In order to exploit this natural resource, a number of medicinal spas have been opened in the region. Despite the wealth of resources, the potentials in health and spa tourism are largely unexploited due to the uneven standards of services and the limited variety on the supply side. The standard of certain services in existing medicinal spas is sometimes below the European standard, therefore their quality should be improved. The complex diversification of the services offered in medicinal and thermal spas is necessary if we are to retain our international competitiveness.”<sup>5</sup>

### Research Activities

The biggest educational institution in this region is the University of Szeged, which offers 134 departments for its students with its highly qualified 1.713 professors in total. “Csongrád County alone boasts three internationally renowned research institutions while nearly 50 organisations pursue research activities of various kinds, predominantly in Szeged. The most famous research institutions are the University of Szeged, the Biological Research Centre of the Hungarian Academy of Sciences, the Grain Production Research Institute and the Bay Zoltán Biotechnology Institute. In Békés County, the Research Institute of Fishing and Irrigation and the Centre for Regional Research of the Hungarian Academy of Sciences conduct significant research work. In Bács-Kiskun county, technical scientific research activities are carried out at the Faculty of Mechanical Engineering and Automation at the College of Kecskemét.”

<sup>5</sup> [http://www.darfu.hu/index.php?menu\\_id=4&content\\_id=225](http://www.darfu.hu/index.php?menu_id=4&content_id=225)

### 3.3. STYRIA (AUSTRIA)

<b>Area:</b>	<b>16.401 km<sup>2</sup></b>
<b>Population:</b>	<b>1.207.479</b>
<b>Population density:</b>	<b>74 residents/km<sup>2</sup></b>
<b>GRP (2008):</b>	<b>33.909 Mio € (Gross Regional Product)</b>
<b>GRP/capita (2008):</b>	<b>26.506 €</b>
<b>Employment rate (2008):</b>	<b>71,6 (%)</b>
<b>Unemployment rate (2008):</b>	<b>7,7 (%) (Austrian calculation method); 3,3 (%) (Labour-Force-Method)</b>
<b>Activity rate (2008):</b>	<b>50,9 (%)</b>

#### Location, geography

Styria is Austria's second largest province. Because of its extensive forests, Styria is also called the „Green Province“. About 60% of the province's territory is forested. Three-quarters of Styria is mountain terrain. From both the Austrian and the EU perspective, it is situated in a peripheral and border location: It is close to Germany and Italy and provides a gateway to Central and Eastern Europe. Graz, the capital of Styria, with about 300.000 inhabitants, is Austria's second largest city.



Styria consists of five regions: Upper Styria, Eastern Styria, Western Styria, Southern Styria and Central Styria.

#### Economy, businesses

Styria's regional economy is dominated by the manufacturing sector, which produces 21% of the GRP. The economically most important regions are Upper Styria and the capital Graz (and surrounding areas), both with a long-lasting industrial tradition. In the 1980s and early 1990s Styria faced several economic problems due to the crises of the traditional steel industry in Upper Styria. Resulting from far-reaching structural changes, Styria has made the transition from an old industry to a modern technology-oriented and ambitious innovative economy with a strong focus on the manufacturing sector centred on the production of cars, machinery and equipment. The small and medium sized companies are the backbone of its economy.

Moreover, Styria can be addressed as an essential driving force in cluster development. The need to cope with regional structural and economic changes led to the establishment of the Styrian cluster policy. The decision, whereupon technologies should be the thematic centre of a cluster, was in most cases based on scientific research and on the strengths of the regional economy.

#### Industry, services

Besides traditional strengths (Automotive Industry, Metallurgy/Materials, Wood/Paper, Environment/Ecological Technologies, electrical engineering, TIME, mechanical engineering, civil

engineering) so called emerging fields (nano-technology, computer-based simulation and chemical engineering) are increasingly recognized and developed. That is proved and demonstrated by relevant facts and data as well as by Styria's 3rd position in a ranking of Austrian regions.

The Province of Styria does not only promote business diversity but concentrates on economic strength fields as well. These strength fields are business sectors in which Styria has already established a solid basis. As mentioned above, Styria has a long tradition of industry too and is known for its successful cluster and networking policy. Many years ago Styria began to create structures that would not only subsidize enterprises in financial terms, but also facilitate the additional development of a decidedly future-oriented economy in the region.

### Agriculture

Austria's agriculture and forestry are not just the backbone of a rural area worth living in; they also reflect the country's cultural tradition. Characterized by essentially small-scale structures, much-prized natural and cultural landscapes with a rich flora and fauna, and almost inexhaustible resources of water, they play a significant and essential role within Austria's economy as a whole.



With 45,782 farms Lower Austria was in 2007 the most prominent Federal Province in terms of agriculture, followed by Styria with 42,370 and Upper Austria with 36,385 farms. Two thirds of all agricultural and forestry holdings were located in these three Federal Provinces.

The wood and timber industry is, after tourism, Austrians second-largest income source: Around 280,000 people earn their living directly from forestry and timber. 41 percent of the gross production value from the wood and timber industry comes from the paper industry, the wood industry adds an additional 19 percent, and the rest is distributed amongst carpenters (10 percent), plant construction (8 percent), paper (7 percent), forestry and timber sales (6 percent each), furniture and architecture.

The Austrian province richest in timber is Styria. In 2001, a wood cluster was formed with 130 direct partners. The task is to create a network predominantly for SMEs, helping them in international distribution and getting solid projects. The Eastern and South Eastern European countries are an important market for the future.

### Tourism

Tourism plays a very important role in the Austrian economy – it has been developing steadily and successfully over the past 50 years. The industry accounts for more than 8% (2008) of the annual GDP and represents one of the most important and fastest growing sectors of Austria's economy.

The tourism in Styria is driven by its beautiful nature and the originality and friendliness of the inhabitants. The culture, the sustainable sense for innovation mixed with mountains, hot thermal water, original food and carefully in harmony with nature developed infrastructure led Styria to one of Europe's top destinations.

The region "Thermenland Styria" is situated in the south-eastern part of Styria, about 160 km from Vienna and about 65 km from Graz. The history of Thermenland Styria reaches back 170 years to the time when Austria was still a monarchy. The springs in this area rise from a depth of 3,000m and reach temperatures of 110°C. They all have healing properties.



### 3.4. NORTH-WEST REGION (ROMANIA)

<b>Area:</b>	<b>34.160 km<sup>2</sup></b>
<b>Population:</b>	<b>2,72million</b>
<b>Population density:</b>	<b>79,7 (persons/ km<sup>2</sup>)</b>
<b>GDP (2007):</b>	<b>12.077 (millions of euro)</b>
<b>GDP/capita (2008):</b>	<b>4.440 (euro per inhabitant)</b>
<b>Employment rate (2008):</b>	<b>68,6 (%)</b>
<b>Unemployment rate (2008):</b>	<b>3,3 (%)</b>
<b>Activity rate (2008):</b>	<b>71 (%)</b>

#### Location, geography

The North-West Region (Northern Transylvania) has a strategic geographical position at the crossroads of the north-southern and east-western axes of Eastern Europe, being the most frequently used gateway into the country when entering from Western Europe and the Ukraine. The Region sits at the Hungarian and Ukrainian border, its Eastern and Southern neighbours being the West Region (Banat), the Centre Region and the North-East Region (North Moldavia) from inside Romania. From a geographic and a historical point of view as well, the region mostly corresponds to the area known as "Northern Transylvania", a name promoted as a regional brand for touristic and investment purposes as well.



The region is one of the most picturesque in Romania, starting from the particular charm of the Apuseni Mountains, to the special cultural/folkloric heritage in the ethnographic regions, unique in this part of Europe.

Northern Transylvania is a multi-ethnic region, where, besides the Romanian population we can find approximately 37% of the total number of the Hungarian population living in Romania, as well as Germans, Armenians, and other nationalities - that has brought about the emergence of a unique cultural identity.

#### Economy, businesses

From an economic point of view, Northern Transylvania is, after the Bucharest-Ilfov Region, one of the most attractive development regions in Romania. This is mostly due to the labour market and to the wages, to foreign investments, but also to the private business environment



and the competitive market, as well as to the inputs of modern technologies. It is important that the service sector has come to represent a higher percentage of the total regional economy – 50% -, trade and tourism also being significant branches.

Considered to be real engines of regional economic growth, there were 78750 enterprises in the North-West Region at the end of 2008. Although the entrepreneurial culture in Romania and also in the North-West region is lagging behind, the dynamics of enterprises in the region knew an ascending trend in the last years and has

represented over 14% of the total companies of the country, being situated on the second place after Bucharest-Ilfov region. Regarding the number of SMEs, these have a high percentage (over 95%) in the total number of enterprises registered at regional level

#### Industry, services

Looking at the specialization index calculated by the National Agency for SMEs, one can notice that the North-West Region is mostly specialized in industry (textile products, clothing articles, wood manufacturing) and the construction sectors and it is under-specialized in agriculture and services (a better situation can be noticed in transports and tourism).

The investments in the region are mostly directed to certain sectors such as: metal constructions, hotels and restaurants, machinery and equipments, textiles, furniture, transports and wholesale and retail trade, and cover investments in: IT, marketing, market research, and to a lesser extent in human resources training.

Concerning foreign direct investments, the North-West region was situated on the 4th and 5th place among the regions of Romania. More than half of the foreign investments have been in the manufacturing industry, followed by trade, post and telecommunication, financial and insurance activities.

#### Agriculture

At regional level, we can observe that agricultural land occupies most of the surface (between 49,4% in Maramures and 71,9% in Satu Mare), followed by forests and other vegetation, which ultimately demonstrates the huge agricultural potential of the region. These favourable natural assets offer the possibility to develop a complex agriculture. Also, official statistics and analyses show that the importance of the agricultural sector in the North-West Region is somewhat higher than in the rest of the country and significantly higher compared to other EU regions. More than 50% of the population living in rural areas is occupied in agriculture, and almost half of them have a low education level, less than 7 classes. These figures illustrate the pressure mounting on the

rural population, and also the fact that without adequate training programs it will be very hard for this group to find work in other field. Still, we can see that in the last few years the number of the population employed in agriculture has been steadily decreasing in the favour of those employed in services.

### Tourism

The natural touristic potential of the region is mostly connected with the very diverse mountainous relief, especially the glacial formations in the Rodnei Mountains, the volcanic ones in the Oas, Gutai and Tibles Mountains, the petrographic mosaic of the Apuseni Mountains and the vast resources of geothermal water in the western parts. There is also quite an important speological potential thanks to the many caves of the Apuseni area as well as the canyons, valleys and straits offering unforgettable natural landscapes.

In the North-West Region we can distinguish quite a few ethno-folkloric areas, each one unique due to the peculiarities of the traditional clothing, trades and crafts, traditions and different customs. The beauty of the region is enhanced even more by the vast number of wooden churches, buildings and traditional instruments that are still functional (ex. mills).

Despite its attractive touristic potential, considering the net utilization index of the accommodation facilities the North-West Region has slightly fallen back, 34,1% ensuring only the fifth place at country level, the most popular facilities being the spas. The official statistics have shown that in 2008 there were a total of 585 tourist accommodation facilities in the region - an increase of almost 60% since 2002 – from which 121 were hotels.

The number of tourist arrivals has shown a steady increase since 2001, reaching almost 1 million in 2008, which represents 12,74% of the total value. Regarding the Regional GDP, the contribution of the hotel and restaurants sector has been oscillating in the last few years, reaching 1,7% in 2007 (country average 1,9), although in this case we have to consider the multiplying effects of tourism as well. The main reasons for this situation are the lack of infrastructure, the low cooperation between tour operators, tourism agencies and public authorities, the lack of regional tourist agencies, the lack of regional tourism marketing, low number of tourist information centers and the low marketing of niche tourism (hunting, sport, science, etc.)



### Research Activities

Roughly 10% of the total number of 1335 relevant actors at national level in the field of R&D can be found in the North-West Region. From the total number of 133 research entities 33,83% are public research institutes, 66,17% are private research units while the remaining 0,88% are mixed ones. The distribution of the types of actors reveals the majority of universities – 11% of the total number of universities at national level, followed by research, development and innovation institutes and companies in the field of R&D. Also 10% of the total number of companies undertaking research activities can be found in Northern Transylvania, as well as 9% of the research institutes of the Romanian Academy and 2% of the national research institutes.

In the past years the region of Northern Transylvania was one of the regions that received the smallest amount of funds destined for research and development from the state budget. All this started to change beginning with the year 2005 when for the first time the North-West Region received more than 7% of the country's total public R&D budget, in 2007 reaching almost 9%, putting Romania in third place at national level.

Considering the R&D expenditure separated on sources of financing, most of the money is coming from public funds (60,16%), roughly 27% is financed by different companies undertaking research activities, 8,4% comes from universities and other institutions for higher education and a very small amount, 0,05% from NGO-s. More surprising is the amount of financing coming from other states – 4,5% - which can be attributed to foreign companies or funds coming research projects funded by the EU.

## VUKOVAR – SRIJEM COUNTY (CROATIA)

<b>Area:</b>	<b>2 448 km<sup>2</sup></b>
<b>Population:</b>	<b>204.768</b>
<b>Population density:</b>	<b>84 (persons/ km<sup>2</sup>)</b>
<b>GDP (2007):</b>	<b>1 144 000 000 €</b>
<b>GDP/capita (2007):</b>	<b>5 756 (euro per inhabitant)</b>
<b>Employment rate (2008):</b>	<b>N/A</b>
<b>Unemployment rate (2008):</b>	<b>26.4 (%)</b>
<b>Activity rate (2008):</b>	<b>N/A</b>



### Location, geography

Vukovar–Srijem County, one of 21 Croatian regional self-governments, is situated in the Eastern-most part of Croatia, between the Danube and Sava rivers, bordering with Serbia in the East and Bosnia Herzegovina in the South. It covers 2448 km<sup>2</sup>, which is 2,8 percent of the total Croatian territory. Total border length is 266 km. Its low altitude landscape ranges from 78m to 204m and it has a moderately continental climate comprising cold winters and warm summers. Average annual

temperature is 11.2°C (summer - median warmest 30°C; winter median coldest – 12°C). Average annual rainfall is 660 mm.

According to the 2001 census, the County's population is 204.768, or 4.6% of Croatia's total population. The average density of VSC's population is 84 inhabitants per km<sup>2</sup>, slightly above the Croatian average of 78 per km<sup>2</sup>.

VSC's ethnic mix is 78,27% Croats, 15,45% Serbs and 6,28% other nationalities (eg. Hungarians, Slovaks, Bosnians, Ukrainians, Roma). Currently, 49% of VSC's inhabitants live in 5 urban centres (Vinkovci, Vukovar, Županja, Otok, Ilok) and 51% in 26 rural settlements (municipalities).

### Economy, businesses

Traditionally, the VSC was considered to be one of the richest areas in the former Yugoslavia with several huge agricultural conglomerates and well developed processing and manufacturing industries driving the economy.

Now, almost a decade after the end of the homeland war (1991-1997) and the subsequent break-up of Yugoslavia, VSC is now considered amongst the economically weakest counties in Croatia. This is unsurprising considering the enormous negative impact the war had on the physical, economic and social structure of the county compared to other counties. Such problems were compounded when VSC faced the transition from a planned to a market economy.

Although showing some signs of improvement since 2000, VSC's economy continues to lag behind most other counties due to two main reasons: Other counties had a head start in their

development efforts (e.g. unlike other counties, almost half of VSC was occupied till 1997) and the speed of positive change since 2000 is inadequate to enable VSC to catch up with the rest of Croatia, thus reinforcing its lagging position.

Verified direct war damages in VSC were estimated by the Croatian Government at €4.1 billion, of which €1.3 billion were categorized as economic damages. In its efforts to mitigate the consequences of that destruction, the central government invested approximately €0.6 billion in renewal of communal infrastructure and houses between 1998 and mid 2006. However, due to finite resources, it was unable to focus on investments for renewal of the economic sector.

Following independence, Croatia's non war-damaged counties were able to begin investing in economic development initiatives themselves, whilst VSC was struggling to deal with its renewal process.

On the VSC territory there are thermal water springs that offer a significant potential to construct a thermal spa / wellness/ recreation and tourism facility, as well as green houses and a heating system for the nearby municipalities. VSC is located within European corridor 10 (west-east), close to European corridor 5 (north-south), and is easily accessible from Europe by highway, railway and waterway. This, along with the Danube and Sava rivers and future Danube-Sava canal, represents good potential for further development of the County.

### Industry, services

Based on the existing raw materials and available work force, Vukovar- Srijem County has developed significant production- processing capacities. Primarily, this refers to the food processing industry, construction industry, wood industry etc. Unfortunately, during elapsed decade due to the Homeland War, poorly implemented processes of transformation and privatization, and insolvency proceedings, there were no significant investments in the installed capacities to modernize them. This is the main reason of a poor competitiveness of the industries in the area comparing to the Republic of Croatia, and especially comparing to developed economies of the Western countries.

### Agriculture

Agriculture and forestry offer significant economic potential for VSC due to the large surface of high quality land (150.000 ha; 62% of total surface) and Slavonian oak woods (69.000 ha; 28% of total surface). These two resources, along with VSC's geographical location, represent the main potential for its development. Traditionally, VSC was a production base for raw material (mainly cereals – corn and wheat) whilst processing occurred elsewhere, but this organizational structure is un-sustainable in a



market economy. If the County is to evolve economically, it must continue to leverage on its natural assets but simultaneously redefine the agricultural sector to add value to its raw materials through strengthening the processing sector.

VSC faces a significant threat from large scale, low cost, competition when Croatia accedes into the EU. VSC cannot afford to delay its response to this impending challenge through diversification of agricultural production, cooperative development, maximization of irrigation, identifying niche markets, finalising production and encouraging producers to consider fruits, vegetables, medical herbs, spices (i.e. products aligned with the current national guidelines for agricultural production), as ways to maintain a strong, competitive agricultural sector.

At present, less than 1000 Ha is being irrigated, whilst the plan propose irrigation of 7.500 Ha by 2010. Along with irrigation, it is necessary to ensure drainage of agricultural land through better maintenance of detailed canal network. The programme of cleaning the detailed canal network is ongoing and by 2008. it should be brought down to zero status and handed out to the County to manage.



### Tourism

Due to lack of exploitation of the County's potential, as opposed to the County having little to offer, tourism has never made a significant contribution to VSC's economy. Under the planned socialist economy, the tourism focus was directed towards Croatia's Adriatic coast, with continental tourism of the kind that VSC could offer little understood and mainly overlooked. VSC has a range of assets that collectively encapsulate its significant tourism potential. These include natural beauties, unique Slavonian gastronomy, extensive

forest hunting grounds for numerous tourism types (hunting, excursions...), excellent terrain for outdoor sports such as fishing, cycling etc., the thermal waters (e.g. in Babina Greda), a tradition of and wine production, and a significant historical / cultural tourism offer arising from VSC's rich history and on-going traditions. The under-utilized Danube riverbanks are also an important natural asset, but must be recognized within the context of a much wider 'international' tourism offer spanning the length of the Danube. Banks of other rivers are also under-utilized for the tourism purposes. Although currently at a very low level, rural tourism may be expanded through exploitation of such natural assets.

### Research Activities

In the area of research, Vukovar-Srijem County is behind comparing to the rest of Croatia. The main reason for that is a departure of a qualified work force and experts to Zagreb and foreign countries, i.e. most of them do not return after they finish their education. Because of that, Vukovar-Srijem County has started to provide scholarships to quality students conditioning

their return and employment in the County area after they finish their education. It has also been planned to establish company which would pursue environmental protection and usage of renewable energy sources. Their activities would also include engagement in all necessary researches that need to be done in those areas. Also, since there are no college institutions for higher education in the County, it has been planned to connect with the University in Osijek.

## 4. ACTION PLAN FOR THE CLUSTHERM REGIONS

### 4.1. DESCRIPTION OF THE ACTION PLAN

The main objective of the Clustherm project was to establish the Central European Thermal Water Research Cluster.

On the basis the documents elaborated in the framework of the project the following problems have been identified:

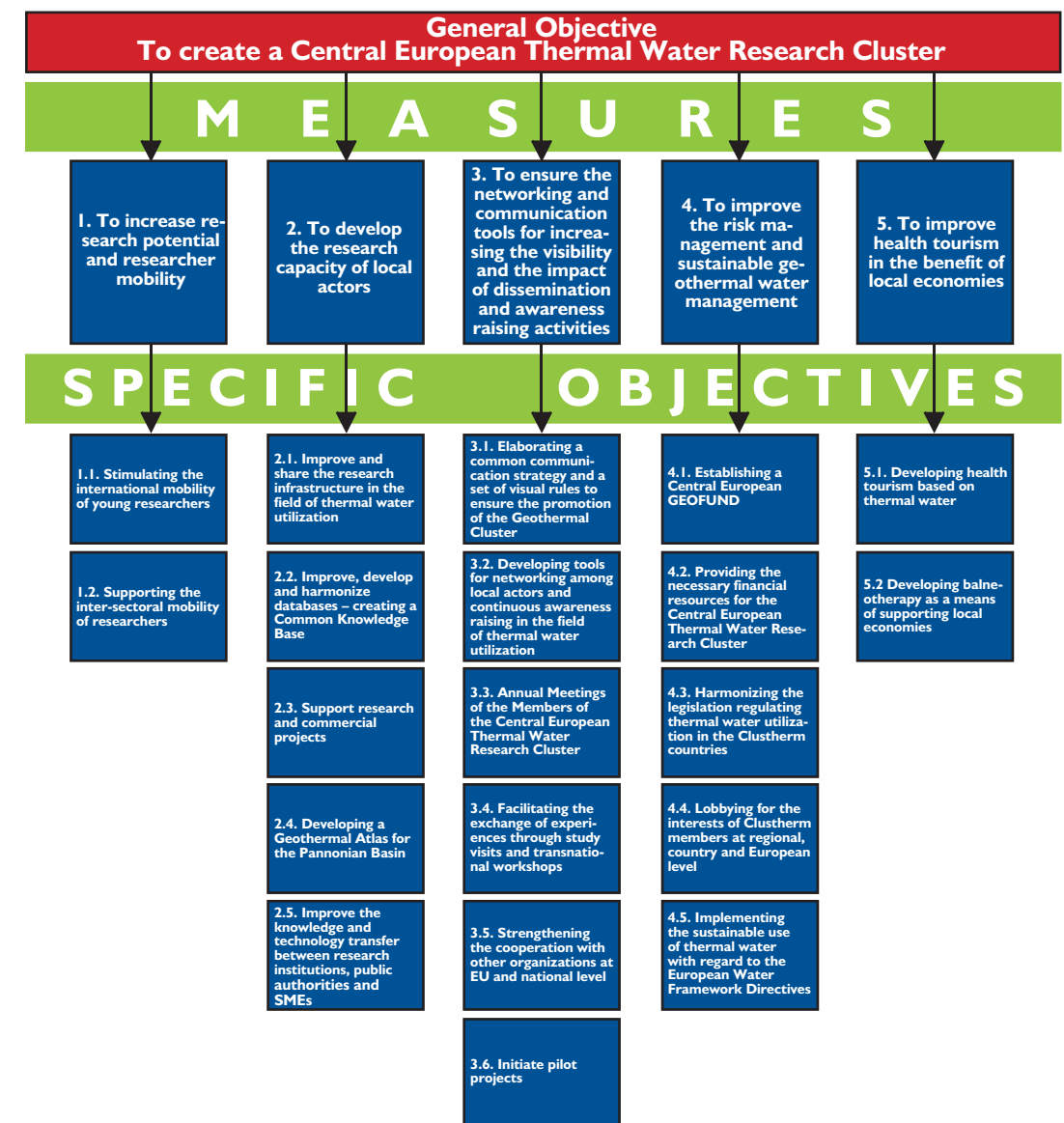
- low research potential and the low mobility of researchers in the field of geothermal research;
- the poor state of research capacity;
- low impact of awareness raising and dissemination activities amongst decision makers;
- poor risk and geothermal water management;
- low utilization rate of thermal resources in some areas for health tourism.

In conclusion, in order to achieve the main objective of establishing the Cluster, to make it functional and to overcome the problems identified above, the Clustherm team has come up with the following actions which will form **the five objectives of the Joint Action Plan:**

- 1. To increase research potential and researcher mobility**
- 2. To develop the research capacity of local actors**
- 3. To ensure the networking and communication tools for increasing the visibility of the cluster as well as the impact of dissemination and awareness raising activities**
- 4. To improve the risk management and sustainable geothermal water management**
- 5. To improve health tourism in the benefit of local economies**

In order to achieve these objectives specific actions and strategic partnerships are needed, as well as investments in Human Capital and policy recommendations. In this sense it will be very important to create a network of development agencies, research institutions, NGOs and companies in order to offer integrated services for local authorities and other actors in the field, from advice to project identification, recommendations as well as specialized services like elaborating strategies and analyses. In addition, such a structure could also undertake lobby activities, taking common problems to a higher level and being able to represent local actors and public administrations in negotiating problems related to utilizing geothermal energy, while raising awareness on problems and solutions amongst decision makers. For this reason it is an absolute must to involve other actors in the future cluster in order to dispose of a critical mass with sufficient lobbying power to influence decision makers not only at EU level, but also at the country levels.

The first step in achieving these objectives is to establish the basic structure of the cluster, ensuring a more efficient link and the communication between the partners. This partnership, on the long term could help influence decision makers, policy makers and ultimately lead to the harmonization of the legislation within the EU regarding the utilization of thermal water and also other forms of thermal energy, giving a boost to sustainable development through the responsible utilization of this renewable energy source.



## OBJECTIVE 1.

### To increase research potential and researcher mobility

Human resources are an important element in the field of research, business and all other aspects of the social-economic environment due to their unique capability to be creative, to learn and to innovate. In order to be able to increase the potential for innovation and the quality of research, it is absolutely necessary to keep or even to retrieve young researchers and entrepreneurs, to sustain their initiatives in business, to develop a real culture for learning - in all levels of education - oriented towards innovation and toward the practical needs of the market.

#### Measure 1.1.: Stimulating the international mobility of young researchers

**Purpose** of this measure is to ensure the supply of highly qualified human resources in the R&D activities, as well as to encourage the mobility and exchange of experience between the researchers from the different member states of the EU and not only.

**Description:** Through developing the R&D sector, the potential to increase the performance and the prestige of the Universities concerned rises considerably. In this sense, these institutions can act towards a process called “brain-regain”, in other words they can stimulate the return and the integration of the students and researchers that have left the country. With the help of different scholarships - if implicated into the different research projects – they can contribute with a significant added value, making use of the knowledge and experience gathered abroad. The large number of young researchers studying at renowned universities around the world could contribute to shortening the way to development, through the direct transfer of competences, know-how and technology. In this sense, by opening the doors of the universities and research centers and by creating a stimulating and attractive environment that would allow for the development of optimal professional careers, the process of brain regain will intensify paving the way for future spin-offs.

This measure could also be linked to the Euraxess – Researchers in Motion initiative of the European Commission and all other member states participating in the FP7 Programme, supporting researchers through the four sections dedicated to researcher mobility: Jobs, Services, Rights and Links, offering a wide variety of possibilities in fields like chemistry, geology, environmental sciences, medical sciences, technology, etc.

#### Measure 1.2.: Supporting the inter-sectoral mobility of researchers

**Purpose:** Mobility is one of THE key aspects of science in the context of the Lisbon agenda and the European Research Area (ERA). By achieving somewhat equal research conditions on the European level we would also increase the possibilities for mobility. However, mobility between

different countries is not enough. Mobility has to go much further and deliver prospects for young researchers to get jobs in different industrial sectors – not only in research-related sectors.

**Description:** Best practices from Western European university systems show us that intersectoral mobility in engineering or consulting is a common practice. Postdocs acquire positions in industry directly after their doctorate and often return to academic research after a couple of years. In this way the “magic circle” of knowledge exchange is maintained. Industry benefits from the innovation capacities of research and research profits from practical questions that can be solved by applied sciences. Since all partner regions dispose not only of companies utilizing thermal energy, but also renowned research institutions and universities in the field as well, it is of the utmost importance to have different agreements, protocols signed between these organizations, offering the possibility for university graduates to work and become acquainted with the practical aspects of the subjects they are researching on one hand, while giving valuable input and expertise for the companies which accept to be part of these programs on the other.

## OBJECTIVE 2.

### To develop the research capacity of local actors

Besides the development of the human capital, another essential precondition for encouraging research in the field of thermal water utilization is to develop the research capacity of the local actors through promoting the joint utilization of infrastructural resources, databases and by facilitating the joint work, the organization of common events as well as developing common tools for better work efficiency and a more targeted impact. The problem is that in most partner regions the research capacity of isolated research centers is very limited, most of the research activity being made up of small scale initiatives. In order for these initiatives to be sustainable and to have a more visible impact, they need to become a mass phenomenon. The lack of connections between the research and the private sector in some of the regions means that actions will have to be taken in order to support joint work and collaboration. These connections will have to be further developed in time, establishing a close cooperation network where partners will be able not only to do research on specific topics, but also to test them in the benefit of their local economies. Therefore this objective is aiming towards promoting a more efficient utilization of the resources by making the necessary knowledge available, facilitating cooperation in the common use of infrastructural resources as well as developing common databases.

#### Measure 2.1.: Improve and share the research infrastructure in the field of thermal water utilization

**Purpose** of this measure is to ensure the development of research activities related to thermal water utilization, by using the existing research infrastructure among partners for the mutual

benefit of both. Furthermore the common purchasing could ensure and maintain the common interest in the cluster as well.

**Description:** Nowadays a lot of research institutions deal with the subject of geothermal water utilization, geothermal energy and different research activities related to this topic, using different software and other specialized laboratory equipment. Sharing this infrastructural background with industrial partners will make the future common work much easier, as well as much more labour - and cost - effective, making cross-disciplinary research needed to solve complex problems possible. Universities and expert organizations use well-developed and very specialized equipment, software and research infrastructure, some of them having really good expertise, the problem being that they usually work on a theoretical level. With this measure the Action Plan will contribute to creating the connection between the experienced scientists and the well developed infrastructural background.

### Measure 2.2.: Improve, develop and harmonize databases – creating a Common Knowledge Base

**Purpose** of developing a Common Knowledge Base is to have studies, reports, maps and other types of publications related to thermal water and geothermal energy available for all of the involved members of the project/cluster at any time. The type of information can be regional information, base studies or international publications.

**Description:** one of the most common problems in the field of thermal water utilization these days is the lack of information, especially information that covers an area larger than the territory of a specific country. Therefore, any project that crosses the official boundaries of a country has to begin with collecting and harmonizing the data that they will use, spending too much money and energy over and over again. This common knowledge base would contain all the information on wells, recent studies and publications in the field mainly from the member organizations, but not only. The project area could be the area of Pannonian Basin (from the geological point of view). Because of the geological framework of the Pannonian Basin and the special types of aquifer that it is made up of, a special knowledge and specialized researchers are necessary. Furthermore the Knowledge Base will act as a common platform to exchange information on expertise, events concerning geothermal energy, to present and improve ideas in all phases of a project. The knowledge base will be the first common knowledge base in the Pannonian Basin in the field of the geothermal potential.

### Measure 2.3.: Support research and commercial projects (personal consultancy for cluster members, training, and events) in the field of thermal water utilization

**Purpose** of the measure is to facilitate the increase of the number of SMEs that are involved, together with research institutions in research and development projects not only on a local level, but also at regional, country and even European level as well. This measure is aiming at

increasing the innovation capacity of Small and Medium Size Enterprises to innovate and to take part in research and development initiatives, as well as to better utilize the existing capacities and infrastructure for research, including them in different cooperation- or even technology transfer networks.

**Description:** unfortunately SMEs and even big companies invest very little in research activities. On the other hand, the results offered to them by universities and research institutions are limited, these being mostly theoretical, with a very limited applicability. The participation in R&D projects has a very high importance in increasing the competitiveness of the economic actors, being considered the starting point in entering the way to a knowledge economy. The SMEs will further have to take part in strategic partnerships in the field of thermal water utilization, because only these networks will be able to facilitate their inclusion into international research projects, ensuring the technology transfer, support and consultancy in elaborating project proposals from which everyone could benefit.

The close relations with Universities and research institutions will be supported alongside other actions in order to facilitate international cooperation.

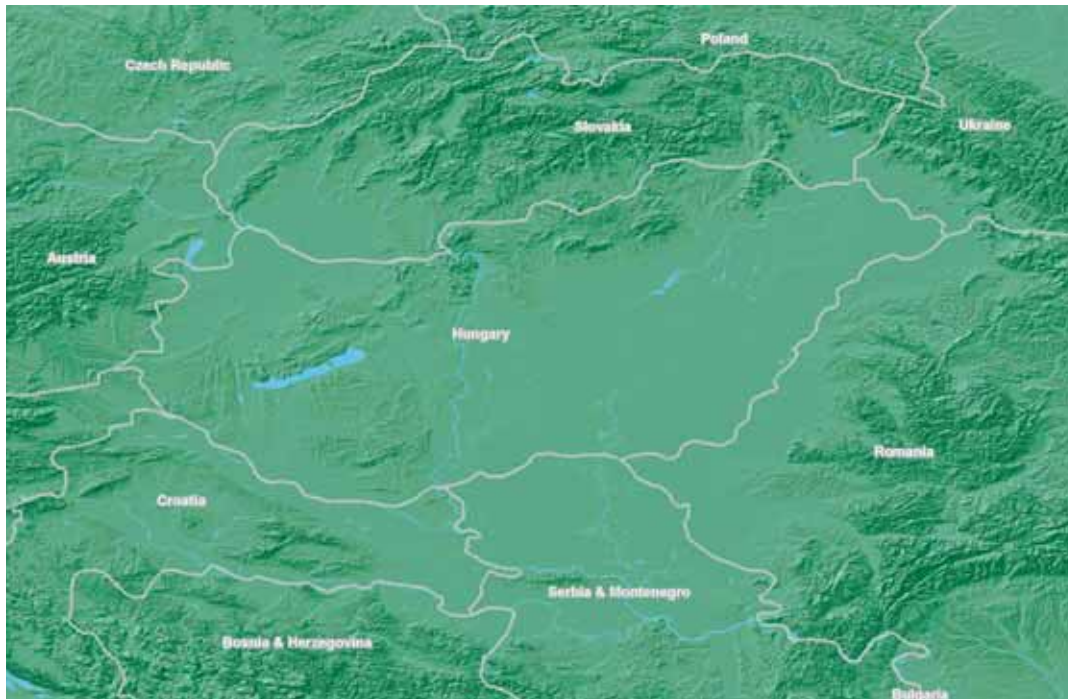
### Measure 2.4.: Developing a Geothermal Atlas of the Pannonian Basin

**Purpose:** is to have a common archive of information about the geological framework, the present use of geothermal resources, the potential for future projects, the environmental impacts, state of monitoring, which would be very useful in order to ensure the sustainable use of thermal water in the whole area, to mark regions with high/low potential for the future, to set up a base for the work on cross-border impacts, influences and settle conflicts concerning thermal water use. Cross-border aspects also have a relevance to the European Water Framework Directives

**Description:** the idea entitled “Geothermal Atlas of the Pannonian Basin” came up from the work within different hydro geological and geothermal projects in the area of the Pannonian Basin. The Pannonian Basin covers parts of Austria, Slovenia, Croatia, Serbia, Romania, Slovakia and a large part of Hungary. From the geological point of view the Pannonian Basin has a common genesis, which could lead to a high geothermal potential in these regions covered by the basin. Therefore the Pannonian basin is a proper project area.

A modern geothermal atlas is based on one or more databases (MS Access) connected to a GIS-database. The most important input in the case of a geothermal atlas is a database containing information about deep wells (geothermal wells, hydrocarbon wells, water supply wells) with name, coordinates, depth, and other parameters. This well database combined with existing maps will give the base of the planned geothermal atlas.

Map of the Pannonian Basin



### Measure 2.5.: Improve the knowledge and technology transfer between research institutions, public authorities and SMEs

**Purpose** of this measure is to improve the technology transfer between research institutions, public authorities and SMEs in order to make better use of the results of research projects, to be able to transfer them on to the market so that the authorities and the public will be able to benefit from them as well.

**Description:** Technology transfer is the process of sharing of skills, knowledge, technologies and facilities among governments and other institutions to ensure that scientific and technological developments are accessible to a wider range of users who can then further develop and exploit the technology into new products, processes, applications, materials or services. Technology and Knowledge Transfer provides in-depth guidance designed to fasten and streamline the commercialization process, as well as maximize the financial benefits of the cluster. By establishing a Clustherm Knowledge and Technology Transfer Office we can strengthen the bond between the research and the market, creating benefits for all parties, making it much easier to market intellectual property towards the corporations, resulting in license agreements or joint venture agreements. It can also contribute to an easier registration and exploitation of patents, tightening

post-license performance monitoring at the same time. This strong cooperation between research and SMEs can often yield lucrative spin-offs and start-ups, can make it easier to apply for grants financing research projects and ensures the compliance with the different regulations, avoiding legal disputes.

## OBJECTIVE 3.

**To ensure the networking and communication tools for increasing the visibility of the cluster as well as the impact of dissemination and awareness raising activities**

The aim of this objective is to ensure the proper dissemination for the results of the research activities undertaken within the CLUSTHERM Cluster as well as to ensure political support for common initiatives at regional, country and EU level as well. For this we will need to develop the right instruments, find the right people and send the right message and involve decision makers in all important activities of the network. Considering the impact of the cluster, the objective concerning awareness raising is probably the most important one, offering solutions and possibilities to get through to the right decision makers and at the same time shaping the perceptions of future generations regarding the use of renewable energy sources, mostly that of geothermal energy. The actions undertaken under this third objective have been elaborated based on the experiences and findings from WP5 – Dissemination and awareness raising.

### Measure 3.1.: Elaborating a common communication strategy and a set of visual rules to ensure the proper promotion of the Geothermal Cluster

**Purpose:** Among dissemination and awareness raising activities, a major emphasis will have to be put on the marketing activities as well, including the editing and designing of brochures, books, leaflets and other marketing materials, which will help the cluster in its awareness raising activities. In order to insure proper promotion, a visual identity handbook shall be created.

**Description:** The starting point shall be the elaboration of a common communication strategy with annual plans of activities and multi-annual budget. The management organization of the CLUSTHERM cluster will coordinate the elaboration of the communication strategy and will prepare the visual identity handbook on the existing design of the CLUSTHERM project. The strategy should be referred to by all the members of the cluster and the handbook will have to be used in all future Clustherm related activities. In addition, promotion materials will have to be elaborated, presenting the structure, activities, results and other information about the cluster, as well as partners and the expertise that they possess, contacts, etc. This awareness raising tools will have to go hand in hand with the geothermal portal, all of the information being made available also in an electronic form for environmental reasons. These

tools will increase the visibility of the cluster, contributing to its sustainability and the increase in the lobbying power.

### Measure 3.2.: Developing tools for networking among local actors and creating continuous awareness raising at the level of the general public in the field of thermal water utilization

**Purpose** of this measure is to ensure the continuous and effective communication among partners of the geothermal cluster on the basis of a common and clear communication strategy, delivering the outputs of the cluster to the general public. In this sense it is necessary to create a Web based information platform with an interactive intranet to act as a major geothermal portal for sending information and findings towards the right contacts but not only.

The web page will serve not only as internal communication platform, but furthermore, it will be developed for awareness raising at the level of general international public. Therefore, the information will be adapted by means of web 2.0 techniques to be understood and used by the general public (short documentaries, digital interactive maps, platform for promoting events related to environmental issues, etc).

At the same time, it is essential to present the cluster on national and international events. Through these networking activities more and more projects will be developed not only in the cluster but among other similar partners as well. The visibility of the cluster will increase also the general interest in geothermal and eco-friendly issues.

**Description:** The different communication tools including the web page, events, newsletters, documentaries and maps will help us put a major emphasis on awareness raising.

The tools will serve the following expectations:

- To strengthen the ways of cooperation and relation among partners of the CLUSTHERM cluster, who will have to be informed in a comprehensive and transparent way
- To increase public awareness, interest, recognition and transparency
- To provide students, research communities, institutes, universities and policy makers with proper information on the results and research activities of the CLUSTHERM cluster
- To reach policy makers, make them aware of the cluster's results
- To ensure that the results will reach the target audiences at regional, national and EU level; using these instruments they will be involved in establishing a common standpoint
- To establish the means of continuous and effective external communication
- To develop links with the media in order to use them as a tool to reach all target groups and thereby communicate to a wider public

The portal will have one area for the general public and one restricted area reserved for the members of the geothermal cluster. Our main target groups: experts, policy makers, the scientific sphere tend to prefer specialist websites.

The CLUSTHERM Cluster will pay special attention to disseminate the information of the project through the participation at other important national and European events. Presenting the cluster results on these occasions will ensure the widest dissemination and the possibility for inviting new partners to join the CLUSTHERM activities. For example:

- National renewable energy conferences
- National conferences on research and development
- Regional events organized in the topics of cluster building and renewable energy
- GREEN WEEK of the EU in Brussels
- OPEN DAYS – event of European Commission DG Regio and the Committee of the Regions
- Regions for Economic Change – European conferences – DG Regio
- International Clustering Events
- Worldwide, International and National Geothermal Conferences

### Measure 3.3.: Annual Meetings of the Members of the Central European Thermal Water Research Cluster

**Purpose:** this measure is to highlight the importance of personal relations. Besides the modern information technologies this measure will demonstrate the power of face to face meetings, that it is necessary to meet at least once a year in order to discuss partners results in the field and to disseminate them towards other European and national decision-makers. The conference will be held in different CLUSTHERM region each year.

**Description:** The project partners will be able to maximize the impact of these conferences by involving other communication- and awareness-raising tools as well. The large number of participants will contribute to the spreading of the information about the activities of the cluster. Furthermore, other working groups within the cluster will have to meet more frequently, at least two times a year or organize Skype- or video conferences in order to keep each other up to date on the phase of their current research projects and other matters of interest. With these events the cluster will contribute to the continuous connection among partners in the cluster and outside the cluster as well.

### Measure 3.4.: Facilitating the exchange of experiences through study visits and transnational workshops

**Purpose:** although all the partner regions in the project have many different problems in different areas, from the lack of infrastructure to the lack of expertise, from legal issues to technical setbacks, the common issue among all of them is that they have all implemented successful projects in the field of thermal water utilization. In this sense it will be a great opportunity to learn from each other's experiences and to exchange and exploit solutions for a more efficient utilization of thermal resources.

**Description:** With the help of an experience exchange program the project partners will first of all be able to identify common problems and areas of concern regarding the utilization of the geothermal resources, find common solutions to common problems with each others help as well as identify good practices concerning the utilization and research in the field. During study trips good practices will be identified and analyzed from the point of view of transferability. Also, later on these good practices will be discussed, improved following discussions organized in the framework of transnational workshops, where also local actors and representatives of the public administration will be invited. These stakeholders after all will be the final beneficiaries of the good practice transfers. Nonetheless, the transnational workshops will also offer the possibility to disseminate the results and experiences of the study trips towards the local actors concerned.

### Measure 3.5.: Strengthening the cooperation with other organizations at EU and national level (research institutes, companies, clusters, EGEC)

**Purpose** of the measure is to strengthen the relations between the cluster members and the cluster as a whole with other important organizations in the field of geothermal water utilization not only at national, but also at EU level or even world-wide.

**Description:** In order to be able to lobby for the common interest of the Clustherm partnership, the consortium will need to have access to different organizations in the field, high level decision makers, but also local organizations like research associations, as well as to important events. This social capital will form the basis of all future cooperation of the cluster on a vertical level in both directions, strengthening not only the bond between the cluster and other organizations, but also within the cluster itself. In this sense a database with all known organizations and contact persons will be elaborated, sorted by different categories, obviously mentioning the cluster member who is in good relations with the person or the respective organization. This database will be accessible to all members of the cluster and will be updated at least once a year.

### Measure 3.6.: Initiating pilot projects

**Purpose** of this measure is to validate engineering work, to conduct process development, to learn and to better understand the whole process of geothermal water utilization, especially in the regions where utilization is not on high level.

**Description:** Pilot projects are necessary scale-up links between initial engineering and successful operation of the future. In regions where utilization of geothermal water is at very low level, the initiation of pilot projects is the best start for developing and increasing the utilization process. From the point of view of more developed regions, pilot projects give great opportunity for research activities and for finding the solutions for issues arising from the utilization process. Exchange of knowledge between the regions is the most useful deliverable in both cases. So, through this measure great impulse can be given for undeveloped regions, research activities can lead to significant findings and of course, the exchange of knowledge between the regions will ensure the development of the region

## OBJECTIVE 4.

### To improve the risk management and sustainable geothermal water management

Nowadays the management of resources has become a very serious issue all over Europe and the World, not only in the case fossil fuels, but also concerning certain types of renewable energy sources as well. In order to minimize waste, more and more voices are raised in favor of a wise management and an optimal combination of the energy resources, not only because of the effect on the natural environment, but also because of concerns regarding sustainability and the other problems of generations to come. Although geothermal water and energy can be considered renewable, the delicate balance of our environment requires us to proceed with caution and carefully plan ahead in order to overcome problems related to overexploitation, pollution, etc. even if it is considered one of the cleanest and most environmentally friendly sources of energy. Risk management in geothermal development is quite a challenge as well due to the extremely high risk of loss during the identification, exploration, and delineation drilling phases of project development. This high probability of loss in the early stages of development makes supporting geothermal development very challenging, especially in the private sector, but also in the case of government funded projects as well. But financial problems also come in all shapes and sizes, many local private initiatives to utilize thermal water being abandoned because of the lack of funding.

In consequence the fourth objective commits itself to dealing mainly with financial issues, but will also tackle problems related to the legal framework, which on one hand can be very important in ensuring the sustainability of the resources in some cases (reinjection), but can also act as barriers in utilizing this renewable resource if they are not defined coherently. So, analyzing all the good and bad aspects of the legislation in all partner countries, recommendations will be made not only at country level (integrating the recommendations of the EC Directive no. 28/2009 into the national legislation) but also at EU level (harmonize legislation regarding the use of renewable energy sources), taking advantage of the lobbying capabilities of the Central European Thermal Water Research Cluster.

### Measure 4.1.: Establishing a Central European GEOFUND

**Purpose** of the Central European GeoFund (CEGF) is to systematically promote the use of geothermal energy in the region of Central Europe by removing barriers in the way of developing the use of geothermal energy, leading to greater diversification in energy use and an increase in demand for-, and supply of geothermal energy projects. The system would be identical to the GeoFund managed by the World Bank

**Description:** The CEGF supposes the following activities:

- A **Technical Assistance Window /TAW/ (5M USD)** is to address barriers that pull back on the use of renewable energy resources, mostly geothermal energy. It will also help set up or systematize geothermal databases, contribute to dissemination of geothermal knowledge and technical expertise, and help to identify, prepare and implement geothermal projects.
- A **Direct Investment Funding Window /DIF/ (8M USD, for 4-5 wells)** to support project developers by providing low cost loans, contingent grants and outright grants which would cover part of the project cost through monetization of external benefits. Grant funding, in the aggregate would be limited to **US\$3 million**, with outright grants for individual projects being limited to **less than 10% of total project investment cost**.
- A **Partial Risk Guarantee Window /PRG/ (12M USD, cca. for 6-8 well)** to partially insure project developers/investors against the short-term and medium-term geological risks. This insurance will help to mitigate the risks associated with geothermal energy exploration and operation that is considered as one of the key barriers to geothermal energy investments.

Two types of risks will be covered under the PRG Facility:

- (a) Drilling the production well (exploration risk) to compensate for a part of the cost of drilling in the event of a “dry” well, the maximum commitment period being six months, so the guarantee can be provided for up to 8 months
- (b) Insufficient thermal energy recoverable over the life of the well (geological/operational risks of re-injectivity or of resource parameters (temperature, yield) being lower than estimated ex-ante). This will compensate for a part of the revenue losses caused by insufficient heat energy recovered from the well, although this will only be provided during the critical phase of operation for a short duration and with a lower coverage ratio, but in this case the maximum commitment period could go to a few years. The fees payable to the fund in case of successful drilling and exploration shall maintain the level of sources and keep a manageable cash flow.

#### **Measure 4.2.: Providing the necessary financial resources for the Central European Thermal Water Research Cluster**

**Purpose:** to ensure the continuous development/research work in the different working groups within the CLUSTHERM cluster by obtaining financial subsidies. The basis of this work will be the common operating plan for each working group.

**Description:** The financial assistance will give the possibility for the CLUSTHERM partners to have a person who can take care of their relations with the cluster and other different communication activities. Obtaining the necessary financial subsidies from national or EU programmes will guarantee the stable R&D&I work within the CLUSTHERM cluster. It will be the responsibility

of all working group leaders to collect all information related to national/international financing sources. On the basis of this, the cluster will be able to prepare a more concrete working plan based on the available budget.

#### **Measure 4.3.: Harmonizing the legislation regulating thermal water utilization in the Clustherm countries**

**Purpose:** The legal and regulatory framework for the exploitation of thermal waters is very different in the European countries, and in many cases it creates barriers for the development of this sector. The measure should aim at identifying these barriers, elaborating proposals for changes in the current legal and regulatory framework, and lobbying at local, regional, national and European level for the approval of these proposals.

**Description:** The European Commission has already financed projects aiming at identifying non technical barriers to the development of renewable energy sources utilization in European countries. Some of these projects have already been finalized, while others are still on-going. The conclusions of these projects on the utilization of thermal waters has to be analyzed and compared to the situation in the countries of interest (CLUSTHERM partners first, countries of all future members of the new Central European Thermal Water Research Cluster). Based on the results, proposals will be made to improve the legal and regulatory frameworks in all these countries, followed by the identification of barriers and the means of removing them by the cluster members.

#### **Measure 4.4.: Lobbying for the interests of Clustherm members at regional, country and European level**

**Purpose:** to ensure the political and professional support to all the projects and activities of the CLUSTHERM cluster members by influencing the decision makers at national and European level as well.

**Description:** Lobbying (also Lobby) is a form of advocacy with the intention of influencing decisions made by legislators and officials in the government by individuals, other legislators, constituents, or Advocacy groups. A lobbyist is a person who tries to influence legislation on behalf of a special interest or a member of a lobby. Governments often define and regulate organized group lobbying which has become very influential on policy. In the Cluster, the cluster manager and the working group leaders will act as a lobbying group at different decision making levels, possessing all the necessary scientific information to back up certain policy recommendations.

#### Measure 4.5.: Implementing the sustainable use of thermal water with regard to the European Water Framework Directives

**Purpose:** The base for sustainability is a good monitoring data base. Knowing that geothermal aquifers pay no respect to administrative borders, it is imperative to establish a good monitoring network among partners which could allow for a sustainable exploitation and could present common advantages.

**Description:** The main idea behind this measure is to elaborate a study/analysis with a special emphasis on defining sustainability, making a comparison between the different water laws among partner organizations, environmental laws concerning reinjection, elaboration of a strategy for the sustainable common use of thermal water resources, containing best practices as well as recommendations and measures addressed to the different decision making levels.

**Description:** The elements this measure would like to target are the formation of strategic public-private partnerships with the involvement of research institutions and the public administrations as well, finding the sources of financing for the start-up phase and the efficient purchasing of goods and services, developing quality services through collaboration between the different sectors involved (health as well as tourism). These health tourism services should be developed with consideration to the human resources available, the technology, research and development activities in the field as well. The goals mentioned above will be achieved through campaigns for awareness raising mostly among decision makers and the large public as well as local events serving the purpose of identifying the training needs in order to make better use of geothermal resources.

#### Measure 5.2.: Developing balneotherapy as a means of supporting local economies

**Purpose:** balneology could be a key field related to thermal water utilization in Central and Eastern Europe, knowing that dealing with balneology and providing the right conditions for this sector to thrive can be a solution to survive the current economic situation.

**Description:** The importance of balneotherapy is becoming quite obvious these days, more and more spas trying to develop and to extend their activities around therapeutic activities based on their local thermal or mineral water which they use for their treatments, as these offer an additional health benefit due to their mineral rich composition. The belief in the holistic and medical powers of mineral water goes back to prehistoric times and is popular world-wide, but is especially popular in Europe and Japan. Although balneology mostly focuses on the treatment of special diseases and treatments after clinical operation, it can be associated with any kind of spa treatment that you might get that is associated with water, assuming that there is a medical benefit to the treatment. This means that the term "balneotherapy" is generally applied to everything that we usually experience during our spa treatments, since the majority of spa treatments do have mental and physical health benefits.

Professionals agree that there are lots of treatments related to balneology which need to be developed, furthermore, spa operators and other interested local actors will have to examine not only the possibilities offered by this form of treatment but also the changing needs of consumers will have to be analyzed. These comprehensive analyses will later have to be correlated with the possibilities that local resources can offer, on the basis of which a common Action Plan can be developed, setting the guidelines for future development in each of the participating regions.

## OBJECTIVE 5.

### To improve health tourism in the benefit of local economies

Globally, the healthcare industry is the largest growing industry in the world. Also, health tourism is an emerging industry - representing an annual growth of 3.9% between 2000 and 2005 - consisting of global trade in health services. This growth is driven by an aging global population with chronic diseases, rising healthcare costs in developed countries, lower costs and improved quality for health services providers in developing countries, medical labour market fluidity and greater research and development in some health tourism destinations. This growth could have a significant impact on regional, national and global economies, health systems, and health equity. Therefore it is very important to take advantage of the possibilities of developing health tourism and balneology mostly in the favour of poorly developed rural economies, where health industry could be the only source for sustainable development.

#### Measure 5.1.: Developing health tourism based on thermal water

**Purpose** of the measure is to establish a framework for a sustainable development of the health tourism industry in the partner regions, making use of this growing global industry and exploiting it in the benefit of local economies. Although many rural settlements sit on large reservoirs of geothermal water, much of these remain unused because of a number of reasons, such as the lack of awareness regarding the possibilities, lack of funding or even legal barriers. This measure aims at promoting the development of health tourism through the establishment of local partnerships; finding sources of financing as well as providing quality services that are competitive on a globalizing market.

## 4.2. CONCRETE MEASURES OF THE ACTION PLAN

### Objective 1 – To increase research potential and researcher mobility

Measure	Proposed Activities	Responsible Organizations	Results and timeframe	Budget and sources of financing
1.1. Stimulating the international mobility of young researchers	<ul style="list-style-type: none"> <li>- attracting young researchers with attractive scholarships and professional</li> <li>- linking young researchers eager to obtain work experience abroad via the Euraxess website</li> </ul>	Partner universities and research institutions from the Clustherm consortium, and from outside of the consortium	<ul style="list-style-type: none"> <li>- 4 scholarship programs initiated (two years each)</li> <li>- 20 new researchers that were reintegrated after studying abroad</li> </ul>	Estimated budget: 200.000 euro per scholarship program Source of financing: international mobility programs (5000 euro per person)
1.2. Supporting the inter-sectoral mobility of researchers	Offering the possibility for post-doctoral researchers to work for a limited amount of time at different companies getting acquainted with the technical aspect of the subject they are studying while giving valuable scientific input to the host organization	Research institutions and universities from the partner regions and companies dealing with the utilization of geothermal water and energy	Signed agreements between universities and companies	Source of financing: Operational programmes for the development of human resources (Structural Fund), Interreg programs (IVc, IVb and cross-border)

### Objective 2 – To develop the research capacity of local actors

Measure	Proposed Activities	Responsible Organizations	Results and timeframe	Budget and sources of financing
2.1. Improve and share the research infrastructure in the field of thermal water utilization	To analyze and categorize the infrastructural background in the research and expert organization of CLUSTHERM regions and to create harmonious relationships among CLUSTHERM partners and universities/research institutes located in the CLUSTHERM regions regarding the use of infrastructure. Pilot actions would be initiated for the development and common use of the research infrastructure in the CLUSTHERM regions	University of Oradea; University of Debrecen, Transgex, Energy Institute Hrvoje Pozar, Central Geo and also other possible partners from the Clustherm regions	<ul style="list-style-type: none"> <li>- shared infrastructural background among cluster members;</li> <li>- pilot actions based on improved and shared infrastructure;</li> <li>- harmonized infrastructural resources</li> </ul>	Estimated budget: 250.000 euro. Source of financing: Interreg programs (IVc, IVb and cross-border) and Seventh Framework Programme, Structural Funds

Measure	Proposed Activities	Responsible Organizations	Results and timeframe	Budget and sources of financing
2.2. Improve, develop and harmonize databases: creating a Common Knowledge Base	Establishing a common database for sharing information on thermal wells, aquifers, experts and events	All Clustherm members and other organizations related to the utilization of thermal water	1 common database for data and information sharing with a timeframe of three years	Estimated budget: 1 million euro Source of financing: Interreg programs (IVc, IVb and cross-border)
2.3. Support research and commercial projects (personal consultancy for cluster members, training, events)	Organizing thematic Workshops for research institutions, SMEs and public authorities	Research Institutions, SMEs and Public Authorities	1 Workshop / year / region	Source of financing: Cluster's own resources, members' resources, small national grants, Regional operational programs of the Structural Funds
	Supporting the participation of SMEs in R&D projects through consultancy and the elaboration of applications		no. of clients of the research cluster in need of consultancy and writing applications	Source of financing: Cluster's own resources from participation fees
2.4. Developing a Geothermal Atlas for the Pannonian Basin	<ul style="list-style-type: none"> <li>- develop a modern geothermal atlas based on one or more databases (MS Access), connected to a GIS-database.</li> <li>- the most important database would be the one containing information about deep wells (geothermal wells, hydrocarbon wells, water supply wells) with name, coordinates, depth and other parameters of the wells.</li> <li>- the well database combined with existing maps gives the base of the planned geothermal atlas</li> </ul>	Clustherm Expert-groups from the regions covered by the Pannonian Basin: Hungary, Austria, Romania, Croatia and maybe Slovenia, Serbia, Slovakia	1 Geothermal Atlas which could be used for projects, to fundamental decisions on a political level (the interactive atlas would also be a modern decision support system for local-, national authorities and cross-border committees for the sustainable use of the geothermal potential). The development of the Atlas could be achieved in 2 to 3 years	Estimated budget: 1.500.000 euro. Source of financing: Interreg programs (IVc, IVb and cross-border)
2.5. Improve the knowledge and technology transfer between research institutions, public authorities and SMEs	Creating a CLUSTHERM Knowledge and Technology Transfer Office with the purpose of exploiting intellectual property rights, by marketing activities, licensing, patents and valuation.	Universities (University of Oradea; University of Debrecen, University of Miskolc, University of Szeged, Technical University of Wien, University of Padua, National Energy authority of Iceland); research and expert organizations, private companies which are involved in the CLUSTHERM cluster	1 functional Clustherm Knowledge and Technology Transfer Office established within the next 2 years	Estimated Budget: 200.000 Euro Source of financing: Interreg programs (IVc, IVb and cross-border), Structural Funds

### Objective 3 – To ensure the networking and communication tools for increasing the visibility of the cluster as well as the impact of dissemination and awareness raising activities

Measure	Proposed Activities	Responsible Organizations	Results and timeframe	Budget and sources of financing
3.1. Elaborating a common communication strategy and a set of visual rules to ensure the proper promotion of the Geothermal Cluster	- elaborating a visual identity manual - elaborate brochures and promotion materials - include a section on the portal with promotional instruments	Clustherm Cluster manager together with all cluster members	1 brochure presenting the cluster 1 booklet detailing the cluster members and cluster activities 1 flyer for promoting the cluster	Source of financing: Partners own resources as well as cluster's own resources, Interreg programs (IVc, IVb and cross-border), Structural Funds
3.2. Developing tools for networking among local actors and creating continuous awareness raising at the level of the general public in the field of thermal water utilization	- Developing a common cluster webpage, a common image and corporate design including online communication tools in order to strengthen the influencing power of researchers/decision makers working in the field of geothermal water utilization (this measure will also sustain the common attendance to national and international events)	All the members of the Geothermal Cluster coordinated by INNOVA Észak-Alföld	1 functional geothermal portal with intranet for the cluster members 15 international conferences on thermal water utilization attended Timeframe: 3 years	Estimated budget: 100.000 euro Sources of financing: national research programmes, Interreg programs (IVc, IVb and cross-border), Structural Funds
3.3. Annual Meetings of the Members of the Central European Thermal Water Research Cluster	- Organizing the CLUSTHERM Annual Conferences - emphasizing on the power of the common communication and preparing the agenda of activities for the following year	The Cluster Manager organization in close cooperation with regional authorities and other Clustherm partners	1 General Geothermal Cluster meeting per year 6 Cluster Working Group meetings per year	Estimated Budget: 40.000 Euro Source of financing: Interreg programs (IVc, IVb and cross-border), national programmes, own funds of the Geothermal Cluster, Structural Funds
3.4. Facilitating the exchange of experiences through study visits and transnational workshops	- Study visits - Staff exchange programs - Good practice transfers - Local dissemination seminars - Involvement of local actors in the exchange of experience	All interested Clustherm partners (mostly public)	1 project successfully submitted regarding the exchange of experiences in research and the efficient use of thermal water	Estimated Budget: 1 million euro Source of financing: Interreg programs (IVc, IVb and cross-border), Structural Funds

Measure	Proposed Activities	Responsible Organizations	Results and timeframe	Budget and sources of financing
3.5. Strengthening the cooperation with other organizations at EU and national level	- Elaborating a database with all relevant organizations that we have access to and those which we would like to have connections with - elaborating a calendar of relevant events	All members of the Cluster lead by the Cluster Manager	1 database of relevant contacts 1 calendar of relevant events	Virtually no cost, it would be just another interactive part of the intranet of the geothermal portal
3.6. Initiating pilot projects	Brainstorming sessions Exchange of ideas Contests for innovative project ideas for the utilization of thermal water in universities	Universities and other partners	1 brainstorming session followed by thermal water utilization contest / region / year	Source of financing: own sources, Interreg programs (IVc, IVb and cross-border), Structural Funds. Maybe it could be organized in the framework of other events

### Objective 4 – To improve the risk management and sustainable geothermal water management

Measure	Proposed Activities	Responsible Organizations	Results and timeframe	Budget and sources of financing
4.1. Establishing a Central European GEOFUND	Promote the use of geothermal energy by establishing Central European GeoFund in order to overcome financial barriers regarding the lack of funding and taking up part of the risk	Cluster Manager Organization by lobbying at European level with the help of the leaders of the Clustherm Working Groups	1 Central European GeoFund Established	Estimated Budget of CEGF: 25 mill USD Source of financing: European grants, the contribution of the national governments and private partners, bank loans, grants, Interreg programs (IVc, IVb and cross-border), Structural Funds
4.2. Providing the necessary financial resources for the Central European Thermal Water Research Cluster	CLUSTHERM Pilot Actions in each working group	Cluster Manager organization cooperating with working group leaders		Estimated Budget: 200.000 Euro Source of financing: FP7; FP8; CIP; Interreg programs (IVc, IVb and cross-border); ENPI; national programmes
4.3. Harmonizing the legislation regulating thermal water utilization in the Clustherm countries	Analysis of the laws and regulations specific to the utilization of thermal waters in different countries, and elaborate proposals to improve the current status in order to stimulate future development.	All Clustherm partners members in the Cluster	1 recommendations paper for EU level and one for country level in the next three years	Estimated Budget: 1.200.000 euro for a duration of 3 years

Measure	Proposed Activities	Responsible Organizations	Results and timeframe	Budget and sources of financing
4.4. Lobbying for the interests of Clustherm members at regional, country and European level	Creating a lobby network and close cooperation (networking); preparing a lobbying action plan	Cluster manager organization closely cooperating with working group leaders	1 lobbying action plan 1 lobbying network created	Estimated Budget: 200.000 Euro Source of financing: Own resources of the cluster
4.5. Implementing the sustainable use of thermal water with regard to the European Water Framework Directives	<ul style="list-style-type: none"> <li>- elaboration of study with an emphasis on sustainability of thermal water utilization</li> <li>- strategy for the sustainable use of geothermal resources</li> <li>- policy recommendations on sustainability</li> </ul>	All Clustherm Project partners	<ul style="list-style-type: none"> <li>1 study on sustainable thermal water utilization</li> <li>1 strategy on the sustainable use of geothermal resources</li> <li>1 policy recommendations paper on the sustainability of geothermal resources</li> </ul>	Estimated Budget: 1.500.000 euro for a duration of three years

#### Objective 5 – To improve health tourism in the benefit of local economies

Measure	Proposed Activities	Responsible Organizations	Results and timeframe	Budget and sources of financing
5.1. Developing health tourism based on thermal water	<ul style="list-style-type: none"> <li>- establishing of strategic partnerships (public-private)</li> <li>- finding financing sources for start-up phase</li> <li>- developing quality services</li> </ul>	Universities, research institutions, regional development agencies	1 strategic public private partnership established for developing health tourism in each region within the next 5 years	Source of financing: Private partners, bank loans, grants from Structural Funds
5.2. Developing balneotherapy as a means of supporting local economies	<ul style="list-style-type: none"> <li>- needs analysis of the population frequently using balneotherapy</li> <li>- analyzing local resources and the diseases they might cure</li> <li>- elaborating a Common but regional specific Action Plan for developing balneotherapy in the partner regions</li> </ul>	Clustherm partners and other interested local authorities rich in thermal water and wanting to develop health tourism based on it	1 Action Plan for developing balneotherapy in the partner regions in the next 3 years	Estimated Budget: 700.000 euro for the 7 year duration Source of financing: FP7, Structural Fund, Interreg programs (IVc, IVb and cross-border)

## 5. RECOMMENDATIONS OF THE CLUSTHERM WORKING GROUP

One of the objectives of CLUSTHERM project is to create the basis of an international research driven cluster focusing on utilisation of geothermal energy. Consequently, all the countries that are represented as partners of the project have significant development potential in geothermal water utilisation and therefore the partners of the CLUSTHERM project form a suitable basis for further co-operation in cluster arrangement, although the cluster should be open for new partners as well.

The present paper collects the most important topics (formulated as recommendations) that were touched during the implementation of the project.

The development of interactions and synergies among local actors such as the business sector, research institutions and regional authorities, constitute the key elements of research driven clusters in the knowledge economy. Successful clusters can stimulate innovation and contribute to exploitation of research results that generate jobs and wealth at regional level. To be successful, the research driven clusters should be considered and should act as a focal point for different policy interventions, which together can have greater impact.

The EU played a pedagogical role vis a vis national administrations and regions through the initiation of several activities that favoured the creation of the appropriate environment for the development of research driven clusters. Among the activities that have been initiated by the EU we can mention the exchange of good practices, the launching the open method of coordination (OMC) among the member states, mutual learning exercises, awareness activities and dissemination of information, benchmarking exercises, etc. This approach should continue and new initiatives should be planned for the near future.

Consequently, some of the recommendations are specific to the geothermal energy sector but a good number of them are relevant for research driven clusters in other professional areas.

### 5.1. RECOMMENDATIONS TO BE IMPLEMENTED AT EUROPEAN LEVEL

#### 5.1.1 Launching horizontal actions to promote synergies among the different European institutions and instruments

There are good grounds to launch horizontal actions to promote synergies among those programmes and instruments that aim at developing the utilisation of renewable energies and the reduction of carbon-dioxide emissions. The relevant directorates of the European Commission (eg. DG Research, DG Enterprise, DG Regional Policy, DG Energy) should undertake joint actions with a view to intensify governance and co-ordination between the different programmes. This

should lead to the setting up of platforms, bodies or high level groups with a genuine mandate to remove barriers to the co-funding of activities from different programmes and to design and launch co-financed actions that can create synergies between different policy sectors. For instance, a small part of resources in the different programmes could be re-allocated and/or pooled and made available to these initiatives that support the utilisation of renewable energies. It might be too late in the final stage of the current EU programming period (2007-2013) but it should be clearly feasible in the new programmes beyond 2013.

### 5.1.2 Targeting EU funding for different development stages of research driven clusters and for improving the performance of their performance

There needs to be a targeted approach in the allocation of EU funding that recognises the development stage and performance of research driven clusters and it is particularly important for the clusters that work in the renewable energy utilisation sector. It should be ensured that any funding instruments or programmes are tightly developed to overcome the weaknesses appropriate to the particular clusters because research driven clusters have different focus for intervention:

- National funding and Structural Funds could focus more on supporting the creation and development of new research driven clusters and on closing the gap between the regions and helping the more disadvantaged.
- Specific measures at the EU level (FP7, CIP) should aim at the sustainability and excellence of research driven clusters, strengthening their global connectivity and allowing funding for collaboration at a global scale.

### 5.1.3 Creation of a cooperation matrix across Europe

Mapping of research driven clusters across Europe in the form of comprehensive database should be carried out. This would greatly facilitate collaborations among the clusters that are active in the renewable energy sector and clusters in other activity areas. The creation of such an interconnecting matrix could strengthen the EU's social capital and promotes connectivity to overcome regional barriers to growth.

### 5.1.4 Increase the research potential and the mobility of researchers

In order to be able to increase the potential for innovation and the quality of research, it is absolutely necessary to keep or even to retrieve young researchers and entrepreneurs, to sustain their initiatives in business, to develop a real culture for learning - in all levels of education - oriented towards innovation and toward the practical needs of the market.

Detailed description is worked out in the Action Plan including the following measures: Stimulating the international mobility of young researchers and supporting the inter-sectoral mobility researchers.

### 5.1.5 Improve the risk management and sustainable geothermal water management

Risk management in geothermal development is quite a challenge as well due to the extremely high risk of loss during the identification, exploration, and delineation drilling phases of project development. This high probability of loss in the early stages of development makes supporting geothermal development very challenging, especially in the private sector, but also in the case of government funded projects as well. But financial problems also come in all shapes and sizes, many local private initiatives to utilize thermal water being abandoned because of the lack of funding.

Detailed description is worked out in the Action Plan including the following measures: Establishing a Central European GEOFUND, Providing the necessary financial resources for the Central European Thermal Water Research Cluster, Harmonizing the legislation regulating thermal water utilization in the Clustherm countries, Lobbying for the interests of Clustherm members at regional, country and European level, Implementing the sustainable use of thermal water with regard to the European Water Framework Directives.

## 5.2. RECOMMENDATIONS TO BE IMPLEMENTED EITHER AT EU OR NATIONAL LEVEL

### 5.2.1 Development of links between the national and regional research and development programmes and elements of European framework programmes

In order to promote research and technology development activities in the renewable energy sector and increase their overall impact on the economy and society, one of the key policy objectives in Europe is the intensification of inter-action between EU, national and regional levels. These three levels of action should be seen as one functional entity that needs to be consolidated. National and regional development measures have to be better connected to an international operating environment and to EU actions - and vice versa.

In this respect, it would be valuable for the Member States to link national and regional research and development programmes to elements of European framework, such as FP7, European Technology Platforms and Joint Technology Initiatives. Success in this demands close interplay and a clear division of labour between international and domestic parties.

### 5.2.2 Launching of actions to improve the organization of networks (and other factors affecting to the absorptive capacities of cluster actors).

In order to increase the absorptive capacity of cluster members, actions should be launched to improve social capital by creating conditions for informal networking, enhance creativity, e.g. through training on the organization and management of networks.

Co-operation between industry and public research is a key to the development of research driven clusters. A number of successful incentives stimulating this collaboration already exists across Europe therefore such initiatives should be further enhanced and experience from them should be made available.

### 5.3. RECOMMENDATIONS TO BE IMPLEMENTED AT NATIONAL LEVEL (SPECIFIC TO THE GEOTHERMAL ENERGY SECTOR)

#### 5.3.1. Care should be taken to ensure that the research results in thermal energy utilisation become accessible for local communities in rural areas

Research and development in geothermal energy utilisation has created important results in the past decades. The benefits of these results, however, were used mostly in larger cities and more developed areas where availability of the necessary investment resources were easier to provide. Consequently, it would be important to enable smaller settlements and rural areas to benefit from the utilisation of renewable energy (including geothermal energy) because the know-how that would be adaptable for rural areas is available.

This aim can be reached if information about well performing pilot projects and demonstration actions is collected and made available for representatives of small settlements and rural areas. Professional assistance should also be provided because the adaptation of best practices to the particular situation might require special technical knowledge.

The co-operation partners of the CLUSTHERM project (and the research cluster that is formally created at the end of the project implementation period) are well suited to perform such professional service for the benefit of rural areas in the whole Pannonian basin.

#### 5.3.2 Hydro geological database should be created for the whole Pannonian basin.

The national authorities are responsible for the protection of natural resources including thermal water reservoirs. Consequently, a regional database (covering the whole Pannonian basin) that contains detailed information about all the hydro geological aspects could be a good tool for the authorities to harmonise their policies and activities in the protection and sustainable utilisation of thermal water resources. A common archive of information about the geological framework, the present use of geothermal resources, the potential for future projects, the environmental impacts, state of monitoring would be very useful to ensure a sustainable use of thermal water in the whole area, to mark regions with high/low potential for the future, to set up a base for the work on cross-border impacts, influences and conflicts concerning thermal water use.

A similar database had already been created for Hungary but it has not been updated for 20 years (and out-of-date information might also be available elsewhere, too). Consequently, the first step should be to collect the available information and to agree on how to build a new (and hopefully regularly updated) database on top of it as an international project.

The 2.4 Measure of the Action Plan includes activities to this recommendation.

### 5.4. RECOMMENDATIONS THAT CAN BE IMPLEMENTED EITHER AT NATIONAL OR REGIONAL LEVEL

#### 5.4.1 Creating of strategy processes and policy platforms bringing together relevant policy making parties from the national and local levels

The growing importance of creative innovation environments has activated regions to develop their competence and innovation activities through local-level decisions, on the basis of their regional competitive edges. However, in many EU Member States, the links between national and regional strategies and measures to the developments arising from the regions' own needs are as yet insufficient. A special challenge would be the creation of strategy processes and policy platforms that bring together all the relevant public and private parties involved in policy making and research and also technology development at both national and regional level. It should lead to more successful integration and exploitation of available EU and national instruments in the regional policy. In order to seek maximum benefits from EU programmes, new ways should be found to develop synergies between the different instruments, namely Structural Funds, 7th Framework Programme and Competitiveness and Innovation Programme. Strategic alignment and leverage of different funding sources will increase their impact.

#### 5.4.2 Developing regional strategies and measures for the identification and enhancement of strengths and capacities at the regional level in the field of renewable energy utilization

Research intensive clusters are often based on an integrated approach. This leads to the fact, that even if all the individual strategies and tools may be excellent, the region fails to benefit from them because the different stakeholders implement them as a separate agenda, losing the synergy effects and benefits. Therefore, analyses should be carried out and measures should be implemented aiming at the removal of barriers and at the effective integration of the individual components of the innovation value chain. Regions should capitalize on their fields of strength and existing capacities rather than attempting to build up expertise from scratch. Although top-down policy approach is often used in practice, is not enough in itself to ensure the success. That is why a bottom-up, demand-driven approach is essential for a well-functioning research intensive cluster.

#### 5.4.3 Raising awareness on the benefits and challenges of research intensive clusters

Raising awareness is essential to achieving the critical mass, which is a pre-requisite for a well-functioning research intensive cluster. Promotion and training seminars and informative materials need to be organised and disseminated. Creating and enhancing a research intensive cluster often also needs a new approach and mindset in policy design and implementation; policy design and implementation requires horizontal actions across the borders of different policy/administrative sectors. It is also important to make determined efforts to drive the innovation agenda across the governments and their administrative sectors. In this context, the

need of strategic co-ordination between different players and between national and regional levels is evident.

#### 5.4.4 Evaluation, foresight and benchmarking exercises

Evaluation and foresight should be intrinsic elements of innovation-related cluster policies and measures. In addition, policy actions can benefit a lot from benchmarking. Development of policies should be based on international 'good practices' that are tailored to national and regional contexts. This activity emphasises the importance of active learning and absorptive capacity of regions.

Evaluation activities in research intensive clusters are important because they provide knowledge on development needs and views on how to improve their focus and co-operation. The evaluations as well as foresight should focus on the entire cluster, not just individual organisations, instruments or sectors. Foresight activities are also important in the sense that they provide information that supports the setting of priorities and can enhance the connectivity and the efficiency of the clusters. Evaluation and foresight processes pave the way for shared awareness and views on trends, technologies or fields of expertise to be developed further.

#### 5.4.5 Initiatives on education, lifelong learning, entrepreneurship and spin-offs

Highly trained people are a key to success of research intensive clusters. Further education and qualification of the regional or local labour force is necessary with respect to the scientific and technological needs of the clusters. The clusters' engagement with public sector's research institutes is part of the journey to engage highly trained people effectively. It can demonstrate future resource needs of the future. Universities have an important role to play as a source of potential entrepreneurs and therefore they should be encouraged to develop specific courses and activities adapted to the local needs and capabilities.

Support for spin-offs from academia and industry is one important driver for development of research intensive clusters. However, the support for existing companies usually receives less attention than it deserves. The absorptive capacity of existing companies should also be increased and appropriate instruments should be put in place.

#### 5.4.6 Development of the research capacity of local actors

The lack of connections between the research and the private sector in some of the regions means that actions will have to be taken in order to support joint work and collaboration. These connections will have to be further developed in time, establishing a close cooperation network where partners will be able not only to do research on specific topics, but also to test them in the benefit of their local economies. Therefore this objective is aiming towards promoting a more efficient utilization of the resources by making the necessary knowledge available, facilitating cooperation in the common use of infrastructural resources as well as developing common databases. Detailed description is worked out in the Action Plan including the following measures: Improve

and share the research infrastructure in the field of thermal water utilization and Support research and commercial projects (personal consultancy for cluster members, training, and events) in the field of thermal water utilization.

### 5.5. RECOMMENDATIONS TO BE IMPLEMENTED AT REGIONAL LEVEL (SPECIFIC TO THE GEOTHERMAL ENERGY SECTOR)

#### 5.5.1 Good examples of pilot projects should be disseminated in order to increase the awareness of local actors about the potential benefits of using thermal energy.

The organisation of a Common Knowledge Base could include all the available studies, reports, maps and other types of publications for all of involved members of the CLUSTHERM project. This information base could be made open to new partners that are ready to join the new research cluster.

Furthermore the Knowledge Base will be a common platform to exchange information of events concerning geothermal energy, to present and improve project ideas in all phases of a project. The Measure 2.2 in the Action Plan is relevant for this recommendation.

#### 5.5.2 Improve health tourism in the benefit of local economies

The growth in thermal tourism is driven by an aging global population with chronic diseases, rising health care costs in developed countries, lower costs and improved quality for health services providers in developing countries, medical labour market fluidity and greater research and development in some health tourism destinations. This growth could have a significant impact on regional, national and global economies, health systems, and health equity. Therefore it is very important to take advantage of the possibilities of developing health tourism and balneology mostly in the favour of poorly developed rural economies, where health industry could be the only source for sustainable development.

Detailed description is worked out in the Action Plan including the following measures: developing health tourism based on thermal water, developing balneotherapy as a means of supporting local economies.

Finally thinking about the future, the prepared CLUSTHERM Joint Action Plan are already an opportunity to foster and to strengthen the trans-regional and transnational cooperation and the active communication among CLUSTHERM partners go on to implement the planned initiatives. Furthermore, the above mentioned recommendations provided by the CLUSTHERM project partners can be a useful guide to ensure the appropriate implementation of future trans-regional joint initiatives.



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