Geothermal Energy Education in Hungary

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ABSTRACT

To escape the current world economic crisis, the petroleum-based industrial society is trying to maintain the continued economical growth by maximizing fossil energetic capacities.

The added renewable resources - solar, wind, hydro or geothermal - will unfortunately not be able to compensate the decreased use of fossil energy resources.

The only way to avoid a drastic global social-economic downturn lies in how mankind can manage its relationship to the environment.

Michel Ricard, French University Professor, president of the French National Council on Sustainable Development said the following quote during a presentation at the French Institute in Budapest in November 2012:

"The only way to answer to the challenge of sustainable development is to change our behaviours at personal, social, economic and cultural levels. This can be only reached through education, public awareness and training."

The comprehensive focus of this change is primarily based on education. The task however is a major challenge for everyone, since the right understanding of environment and sustainable development represents not only a radical CULTURAL change for students, but for teachers as well.

Nelson Mandela once said: “Education is the most powerful weapon, which you can use to change the world.”

To provide radical changes of perception, a new network of Environmental Education Centres (EEC) has to be developed in Hungary, since a current comprehensive education of environmental science and alternative energies is missing.

These Environmental Education Centres provide real life information for teachers and other educators. The children (aged 6-18) take part in groups inside and outside of EEC environmental programs in a prearranged manner.

In the framework of the EU Renewable Energies Transfer System - RETS (Interreg IV C program), an international conference on education and renewable energies was organized in the small town of Vecsés (Hungary) to discuss good examples of teaching new ways related to sustainable environmental education.

Vecsés was involved in the RETS European Union program for three years, which aimed to familiarize the local and regional decision makers of participating countries with the use of new possibilities offered by renewable energies and to promote the usage of these alternative energies.

Hungary has great potential in using geothermal energies, consequently, basic information need to be provided on alternative energies for elementary and secondary school children.

For this we need to do the following:

1. establish environmental education centres for elementary and secondary schools

2. publish new environmental education textbooks on subjects, as the understanding of geothermal energy.

3. organise local community presentations on environmental issues and raise public media awareness.

The establishment of an Environmental Education Centre (EEC) is on agenda in Vecsés Town. The use of alternative energy (geothermal energy) would also be part of the EEC education program.

More environmental education centres should be regionally organized later and interact based on a network where geothermal resources, pictures, alternative energy good examples, and any other types of information should be provided for teachers and educators who have been involved in the EEC program.

Finally, the environmental education centres should be related and connected with each other based on a joint network within the European Union.

1. INTRODUCTION

One of the most efficient renewable energy resources in Hungary is geothermal energy. Hungary is located in the Pannonian basin and the average geothermal gradient is in a 5-7 Celsius degrees range.

Hungary is also known to be rich in thermal waters (50 billion m3 thermal water could be used, from the about 500 billion m3 total supply). There are also around 1400 thermal water wells and 800 around them are using 450 M m3 water per year. The geothermal heating by thermal wells was already used during Hungary's Turkish occupation (1541-1699) for spas. In the town of Szentes, thermal-heating systems operate for many thousands of inhabitants, including flats and municipality run institutions for more than 50 years.

More than ten Hungarian cities run their district heating systems and spas on geothermal energy, e.g. Veresegyház, Mórahalom, Cserkeszölő, Hajduszoboszló, etc.

Figure 1abc shows three geothermal global application pictures in Hungary.

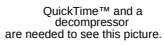

Figure 1a, is a picture about the thermal water wells in Hungary (source: waterfire.fas.is).

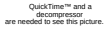

Figure 1b explains the geological problems of geothermal assets in Hungary (source: sciencecaffee.com)

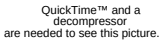

Figure 1c shows the heat flow map in the Hungarian basin (source: PannErgy.Portfolio.hu).

2. GEOTHERMAL CULTURE HAS DEEP TRADITIONAL ROOTS IN HUNGARY

The geothermal technology has strong traditions in Hungary. The famous Hungarian mining engineer - Vilmos Zsigmondy - drilled a 970 m deep well in the Városliget part of Budapest in 1878, which later became the Széchenyi Thermal Bath. This experiment was one of the deepest drillings in Europe at that time.

Many Hungarian universities e.g. University of Debrecen, Budapest University of Technology and Economics, University of Miskolc, etc., currently educate graduate and undergraduate students in different academic areas related to the utilisation of geothermal energy.

Figure 2abc shows three pictures related to the geothermal cultural and technological development in Hungary:

Figure 2a is a larch inside pipe used by Vilmos Zsigmondy during the drilling of the 970 meter well in Budapest. (source: photo Peter Praczki).

Figure 2b presents the Hungarian mining engineer Vilmos Zsigmondy. (source: hu.wikipedia.org).

QuickTime™ and a
decompressor
are needed to see this picture.

Figure 2c shows the Széchenyi Thermal Bath today. (source: www.budapest-foto.hu)

3. LOW UTILISATION OF GEOTHERMAL ENERGY RESOURCES

Hungary is rich in geothermal opportunities, but currently the country is only using 0,48% geothermal energy in the production of primary energy. This ratio could be increased especially in heat recovery by 4-5% based on a future long-term sustainable geothermal strategy.

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are needed to see this picture.

Figure 3 Ratio of renewable energy resources (source: www.mfa.gov.hu)

Better media representation and a strong development in environmental education would be the best tools that could raise the overall geothermal awareneess in the country.

4. INVESTING IN EDUCATION IS THE SINGLE MOST EFFECTIVE MEANS OF RAISING THE GEOTHERMAL CULTURE

Education is the most important key success factor for the raising of geothermal awareness. The development of environmental education could bring about real and lasting changes also in the field of renewable energy perception based on the better understanding of geothermal resources.

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Figure 4a Walt Disney quote "Our greatest natural resource is the mind of our children" (source: taolifeststudi.com)

Figure 4b Nelson Mandela "Education is the most powerful weapon to change the world." (source: www.rottentomatoas.com)

The lack of geothermal energy awareness is due to the absence of the elementary and secondary school cohesive environmental education system.

The Hungarian school book market offer only few environment related elementary school books, e.g. Bozsoki A. (1998) Környezetgazdálkodás (Environmental management), Dr. Siposné - Ádám T. (2011) Környezetvédelem (Environmental protection), etc. so teachers should often integrate their own environmental knowledge in their submitted subjects.

These textbooks focus on global environmental issues and are not specialized on alternative energies. Similar perspectives can be found in the appropriate academic education level, e.g. Kerényi A. (2006) Általános Környezetvédelem (General Environmental Protection).

Alternative energy (e.g. geothermal energy) resources are therefore poorly available. Some questions regarding energy use should have already been taught in kindergarten.

It is welcome news that more and more Hungarian schools – Ökoiskola (Eco-schools) - offer nowadays environmental education programs.

5. A GLOBAL PERCEPTION CHANGE IS NEEDED REGARDING THE SUSTAINABLE ENVIRONMENTAL EDUCATION PERSPECTIVES

The Hungarian elementary and secondary school subject-areas should soon be changed. ENVIRONMENTAL SCIENCE must be added to key disciplines subjects, such as mathematics, history, literature, geography, etc.

GEOTHERMAL ENERGY should be taught in the framework of the 'alternative energy resources' course within the subject of environmental science.

Figure 5. "Sustainable environmental transformation of perception" change ahead (source: healt-act.net)

6. SUSTAINABLE TRANSFORMATION OF PERCEPTION

A large transformation needs to be carried through the whole Hungarian education system.

This basic structural perception transformation should primarily focus on changing children's relation to their social environment on a sustainable way.

The transformation of perception will not only affect the children, but the teachers as well. In terms of energy education, non-specialist teachers should use appropriate teaching materials.

Many children energy-related educational materials are available in Europe. Some of them were presented in the RETS program.

The Centre for Alternative Technology (Wales-UK) has published the material "Teaching about Energy" for practical activities for 7 to 11 year olds, which provides teachers with interesting and fun activities to help them teach about energy to children. Activities include investigations, experiments, games, design, building projects and demonstrations from which teachers can select those that are suitable for their classes.

The German Geothermal Association (Geothermische Vereinigung – Bundesverband Geothermie e.V. Berlin) 2012 edited "Geothermal Energy – Energy from the Hot Planet" (Geothermie – Energie aus dem Heissen Planet), which presents a journey through an inexhaustible source of energy. Materials and information are available in this book for children and for teachers as well.

The French "Préserver la Planète" (Preserving the planet) 2012 focuses on how to understand the dangers that threaten the planet, and act and learn the steps to take daily actions.

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Figure 6. Transformation of perception (source: liar.bramz.net)

7. GOOD PRACTICES FROM EUROPEAN UNION PROGRAMS

Organizing international seminars and conferences should draw attention to the changes of perception.

The Municipality of Vecsés (Hungary) hosted the environmental conference of the European Union, entitled "Education and Renewable Energies" in April 2012, where Hungarian and international renewable energy experts participated.

Figure 7a. Professor Guy Turchany, vice president of the World Council of Hungarian University Professors

gave a lecture at the RETS - Education and Renewable Energies Conference in Vecsés 2012 (source: photo Peter Praczki).

The subject of the conference was: "How to motivate young people to know more about renewable energy, environmental sciences, climate change, geothermal energy and any other factors which would profoundly impact their life"

Another RETS international conference was also organized in Vecsés in September 2012 about the topic of Geothermal Development in Hungary. Dr. Miklós Antics represented the European Geothermal Energy Council. The conference organizers invited the teachers and the children of the region as well.

The children had the opportunity to participate in an international geothermal conference and gained experiences about previously unknown areas.

The conference was followed by a study tour in Mórahalom, where the international guests visited the city's geothermal facilities.

Figure 7b. RETS international study tour to the city of Mórahalom (Hungary). The city was demonstrating total utilisation of geothermal energy (source: photo Peter Praczki).

8. RETS LECTURES ON GEOTHERMAL ENERGY

During the RETS international seminars geothermal lectures were organized in many places e.g. Strasbourg (France), Swansea University (Wales), Varese (Italy) etc. These lectures presented the use of geothermal energies including the Hungarian good practices.

Figure 8a. RETS international seminar in Varese (2010 Italy). Lecture on the "Enhanced Geothermal System" (source: photo Peter Praczki)

Figure 8b. RETS international seminar in Strasbour (2010 France). Lecture on the "Enhanced Geothermal System" (source: photo Peter Praczki)

Figure 8c. RETS international seminar at Swansea University (2012 Wales UK). Lecture on "Geothermal Energy in Hungary" (source: photo Peter Praczki)

9. RENEWABLE (GEOTHERMAL) ENERGIES SEMINARS FOR CHILDREN

Lectures were organized for children in the framework of the RETS program in cooperation with the Zöld Erdő Kör (Green Forest Circle) civil association of Monorierdő (Hungary) on the use of renewable (geothermal) energies in the Vecsés subregion. schools.

A seminar program was also presented for French-Hungarian high schools with the support of the French Institute of Budapest and the Hungarian communication company: PP Connection Ltd.

Figure 9a. Lecture at the Halmi Elementary School of Vecsés - 2012. (source: photo Peter Praczki)

Figure 9b. Geothermal energy lecture at the French High School of Budapest – 2012 (source: photo Peter Praczki)

10. CONCLUSIONS

Based on the RETS international good examples. Vecsés could become an alternative educational regional centre for teaching elementary and seconfary school children in environmental sciences and alternative energies. The children would be taught about geothermal energy in the framework of alternative energies. The Environmental Education Centre (EEC) would operate in the Vecsés New Cultural Center. The preparation of the EEC program is supported by the company HungaroControl.

In this Environmental Education Centre, the best educational examples of RETS partners would be tought. Teaching materials would come from RETS project partners, e.g. Municipality of Sittard Geleen (Netherland), Staffordshire University (UK), Center of Alternative Technologies (Wales), Swansea University (Wales), and from other educational experiences from Romania, Slovenia, Germany and Portugal.

The Vecsés Environmental Education Centre should develop good examples for alternative energy teaching. Other regional Environmental Education Centres in Hungary could be developed and connected with each other and extend the framework in Europe.

The Vecsés EEC project could be extended with an environmental database system and communicate interactively with other European elementary, secondary school and academic level networks.

The Environmental Education Centre Network (EECN) should gather and communicate millions of different environmental information for teaching purposes.

An overall European environment education system needs to be developed, where all involved teachers could have access to pre-generated environmental educational tools, sustainable information, pictures and other educational materials and where they could also share the best practices with each other.

This European EEC network would not only assist elementary & secondary school and academic teachers, but also children and university students as well.

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are needed to see this picture.

Figure 10. Welcome to Hungary - Hotel Gellért Budapest (source: flickriver.com)