

ENERGY PEER REVIEW IN MARAMURES (RO)



...creating the basis for the development of a regional energy strategy...

Report drafted by:

- **Adina Dumitru**, *Energy Management Agency of Maramures (RO)*
- **Hans Rijnten**, *Province of Flevoland (NL)*
- **Geert Jan ten Napel**, *Province of Flevoland (NL)*
- **Kenneth Backgaard**, *County Council of Norrbotten (S)*
- **Iris Flacco**, *Abruzzo Regional Energy Agency (I)*
- **Riccardo De Blasis**, *Abruzzo Regional Energy Agency (I)*
- **Justyna Podralska**, *Assembly of European Regions*

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PEER REVIEW EXPERTS

ADINA DUMITRU, MARAMURES (RO)

Adina Dumitru holds degrees in Electrical Engineering and Economic Sciences. She worked for 9 years as a senior computing engineer for a Romanian-Australian exploration and mining joint-venture, and has 4 years professional experience in the sector of public administration. Adina currently holds the position of director of the Energy Management Agency of Maramures, established with the support of the European Commission under the Intelligent Energy Europe Programme. The agency intends to become an independent body that will assess existing environmental problems and promoting RES and energy efficiency at a county level.

HANS RIJNTEN, PROVINCE OF FLEVOLAND (NL)

Hans Rijnten holds a degree in biology. He has worked as a consultant on sustainability and communication for several engineering and consulting offices. For the Province of Flevoland he continued his work on communication and sustainability. He was the program manager of the second climate action program.

GEERT JAN TEN NAPEL, PROVINCE OF FLEVOLAND (NL)

Geert Jan ten Napel holds a degree in environmental sciences. He has worked for four years as a consultant on soil pollution and environmental impact studies for several engineering and consulting offices. For the Province of Flevoland he has worked on sustainability, first on waste management later on climate and energy. He was the program manager of the first climate action program.

KENNETH BACKGARD, COUNTY COUNCIL OF NORRBOTTEN (S)

Kenneth Backgard, is an authorised Psychologist and has worked 5 years for the Swedish armed forces specializing in personnel selection and research. He has also worked as a clinical psychologist for 14 years and was head of a specialized team of psychologists at the central hospital of Norrbotten region. In addition he worked as a teacher in clinical psychology at the health science institution in Boden, now a branch of Luleå technical university. Since 1995 he is a full time politician in Norrbotten county and the town of Boden. Specializing in climate- and energy issues. Member of the county board and the board of two companies dealing with renewable energy. Joint leader of the town of Boden, Norrbotten.

IRIS FLACCO, ABRUZZO REGIONAL ENERGY AGENCY (I)

Iris Flacco holds a Geological Science Degree. She has been working as Energy Manager in Abruzzo Region since 1982 on different activities like EU and National/Regional Projects, Interreg Projects, Management of Regional Guidelines for development of wind energy, Drafting of Regional Law to include renewable energy sources in urban planning. She is Vice President of FEFARENE, HyRaMP Board Member and member of RENAEL. She is also teacher at the University of L'Aquila of the course "Environment and Energy Systems" in "Environmental Education" Degree.

RICCARDO DE BLASIS, ABRUZZO REGIONAL ENERGY AGENCY (I)

Riccardo De Blasis has been working as information technology and languages assistant at the Energy Sector in Abruzzo Region since 2007. He collaborates in different EU and Regional Projects and Interreg Projects. He is actually graduating at the University of Chieti-Pescara in Managerial Sciences.

JUSTYNA PODRALSKA, ASSEMBLY OF EUROPEAN REGIONS

Justyna Podralska joined the Assembly of European Regions in August 2008. She works as a policy coordinator at the Committee 1 for Economic and Regional Development where she is mainly responsible for the implementation of policies and projects regarding the issue of rural development and environment protection. Justyna holds a Master's degree in International Relations from Warsaw University and Master in EU policies from the Institute of Political Sciences ("Sciences Po") in Paris. She has completed internships within the Embassy of Republic of Poland in Paris and AER. Justyna assisted in the application of the peer review procedure as described in the "Guidelines for the Implementation of Sustainable Energy Peer Reviews" developed by AER.



Peer review team with the representatives of EURISY and the host region

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Baia Mare, 2010

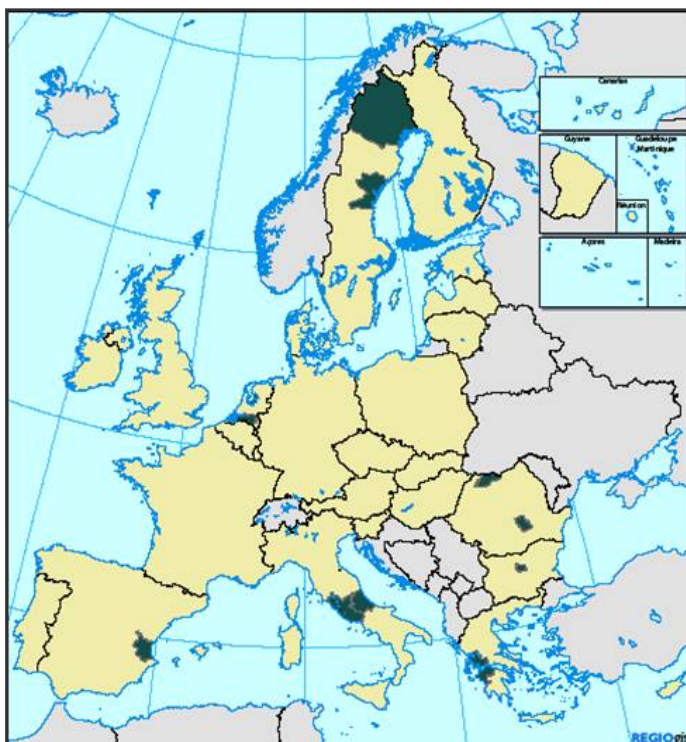
SECTION 1: INTRODUCTION

MORE4NRG Project

MORE4NRG is an INTERREG IVC project aiming to strengthen the delivery of regional strategies for renewable energy sources and energy efficiency by exchanging best practices on sustainable energy policies and jointly developing an integrated monitoring tool for measuring the effect of regional sustainable energy strategies.

In order to reduce the effects of climate change and be ready for the decline of the oil-age, European regions have a key role in promoting, developing and implementing renewable energy sources (RES) combined with energy efficiency strategies to help resolve the energy impasse.

The MORE4NRG partnership will address these interrelated issues at interregional level. The project brings together 12 partners from all over Europe; 11 regions and the Assembly of European Regions (AER).



- Abruzzo (IT)
- Flevoland (NL)
- Gabrovo (BG)
- Western Greece (Gr)
- Lazio (IT)
- Maramureș (RO)
- Noord-Brabant (NL)
- Norrbotten (SE)
- Prahova (RO)
- Valencia (ES)
- Västernorrland (SE)
- AER

The partnership includes regions with more and less advanced strategies and action plans, with great varieties in approach and extent to which they have set specific targets. Interregional exchange of experience enables all of them to improve their sustainable energy strategies. It will help the less advanced regions to speed up their development.

The partners will compile their experience in a toolkit for regional energy strategies, including tools for measuring progress in achieving sustainable energy targets. Building on combined experience guarantees it will be applicable to Europe-wide regions.

Project activities include an analysis of the state of the art of energy strategies and a study of the framework conditions for generating development of and investment in regional renewable energy infrastructures. Several seminars will focus in detail on the state of the art in energy strategies. Peer reviews will be performed by experts from more experienced partner regions in the less experienced regions to review and improve their regional energy strategies. A mutual learning seminar will bring together the experiences and effects of the peer reviews and other lessons learned during the project for all partners. All project results will feed into a toolkit for regional sustainable energy strategies including monitoring tools for measuring the effect of regional sustainable energy strategies. This toolkit will be available for all EU regions.

Following the cooperation established between EURISY and the MORE4NRG Consortium, an additional activity has been included in the work plan consisting of a case study aiming to set up an implementation model for satellite information and services that can help MORE4NRG regions achieve the objectives of their own sustainable energy strategies.

Peer review methodology

What it is an AER energy peer review?

An energy peer review is a mentoring visit undertaken by a group of international experts to a region interested in improving its energy situation. Its overall aim is to analyse how energy is used by the region. Peer reviews help local authorities understand how well their energy policies work and support them in making concrete improvements. During the visit, peer reviews perform a number of field inspections and hold meetings with a variety of stakeholders concerned with the issue of energy, such as energy legislators, market operators, representatives of local development agencies and business sector, and consumer associations. AER energy audits provide a good opportunity for regional representatives to exchange their experience and learn from one another.

Types of energy audits

There is a wide spectrum of energy peer reviews ranging from a quick walk through an energy facility to more comprehensive studies regarding the overall energy situation in a given region. The duration of the peer review is up to one week. AER peer reviews usually last four days.

Energy audits cover a wide variety of themes. Typically, an energy peer review is conducted to make an overall performance assessment of the region's energy sector. However, a peer review can also seek opportunities to reduce energy intensity in public buildings and public transport or to suggest regional authorities how to develop a certain type of alternative energy sources, i.e. biomass-based energy; solar or wind power. The role of peer reviewers can also consist of recommending regional authorities how to draft effective energy strategies that would accurately depict changing trends in the energy market, such as energy demand, energy supply and energy cost.

Selection of AER peer review's topic

It is upon to the peer review team and host region to choose a topic for their energy audit. While selecting the most appropriate theme, the region should take into account its specific energy needs, previous feasibility and pilot studies that were conducted over its territory, as well as time, human and financial resources allocated to the project. The peer review' objectives should comply with these requirements. If peer review's targets are not properly defined, it can be disastrous for the whole project's cycle. The expert team should know well in advance what is to be evaluated so to come with appropriate conclusions and recommendations.

The topic for the peer review in Maramures is in line with the objectives of the MORE4NRG project and the sustainable development objectives defined at county level.

The starting point for the selection of the topic was that Maramures intends to develop a regional energy strategy to be integrated in the Local Environmental Action Plan and in the medium and long term Sustainable Development Strategy of the county. Therefore, the peer review objective was for the region to obtain advice based upon the experiences brought by the experts from their own regions and upon the review of the local potential and resources that will assist in the development of this strategy.

Final report

After the visit the review team prepares a report with a series of recommendations on how bring the region's energy sector up to the current standards. The host region then considers the conclusions and prepares an action plan, setting out how it intends to implement experts' recommendations.

The outcomes of the final report from the peer review in Maramures and further steps to be taken were discussed and agreed with the representatives of the region. The document is available at <http://www.more4nrg.eu>

SECTION 2: REGION OF MARAMURES

Territorial @ Administrative Data



- The county of Maramures is located in northwest Romania, bordering the Ukraine along the Tisa river
- The county's area is 6 304 km², representing 2.6% of the national territory
- The county's capital city is Baia Mare
- In 2002 the county had a population of 510 110, of which 82% Romanians, 9% Hungarians and 7% Ukrainians
- The county has 2 municipalities, 11 towns, 63 communes and 225 villages.
- Access:
 - by plane - from the following airports: Baia Mare, Satu Mare (70 km) and Cluj Napoca (150 km)
 - by car – the nearest Hungarian border crossing : Petea (70 km)
 - by train
- NUTS Classification:
 - NUTS Level 1: Macroregiunea Unu
 - NUTS Level 2: Nord-Vest
 - NUTS Level 3: Maramures

History

Maramures, with Baia Mare as its capital, was first documented in 1991, but archaeological evidence points to habitation of these lands since the Neolithic age. Prior to this date, Dacia tribes are thought to have settled here around 1000 BC; today's inhabitants believe they are descended from these tribes. When the Roman emperor Traian conquered the lands south of the Carpathians and north of the Danube, his forces never made it over the range of mountains protecting Maramures, which remained outside the Roman province, as an independent territory.

Hungary gradually exerted its rule over the region from the 13th century onwards. Tatar invasions of the Hungarian-dominated region continued into the 17th and 18th centuries, the last documented battle being on the Prislop Pass in 1717. Numerous churches sprang up in Maramures around this time to mark the Tatars' final withdrawal from the region.

Maramures was annexed by Transylvania in the mid-16th century, and then ceded to the Austrian empire in 1699. The Habsburg Dynasty ended in 1848 with a revolution. Maramures was returned to Romania in 1918, but only part of it – the remainder went to what is now Ukraine.

Between 1940 and 1944 the Maramures region – along with northern Transylvania and parts of Moldavia – fell under pro-Nazi Hungarian rule. The Axis powers took control of all of Northern Transylvania and Maramures by order of the Dictate of Vienna. The Hungarian language was required in all governmental affairs. Martial law was adopted. People were routinely beaten, jailed and executed. Most horrific, the entire Jewish population of Sighetu-Marmatiei was evicted to Nazi Germany's concentration camps. This was elaborated in the writings of Nobel Peace Prize Laureate, Elie Wiesel, who was born in Sighet.

At the end of the war Maramures, once again, became a part of Romania. But Maramures and Romania were far from free. The Soviet army became the occupying force. Elections were falsified and the Romanian Communist Party took power. Its political enemies were deported, jailed or executed.

The prison in Sighetu-Marmatiei became The "Ministers Prison." Here were kept the intellectuals of Romania. Priests, writers, painters, poets and scholars were starved, tortured and killed. Only a stone's throw from the Soviet border, the prison was seen as a safe location for such "dangerous" people. Today it is a museum to the brutality that communism and its jail system inflicted on the people of Romania.

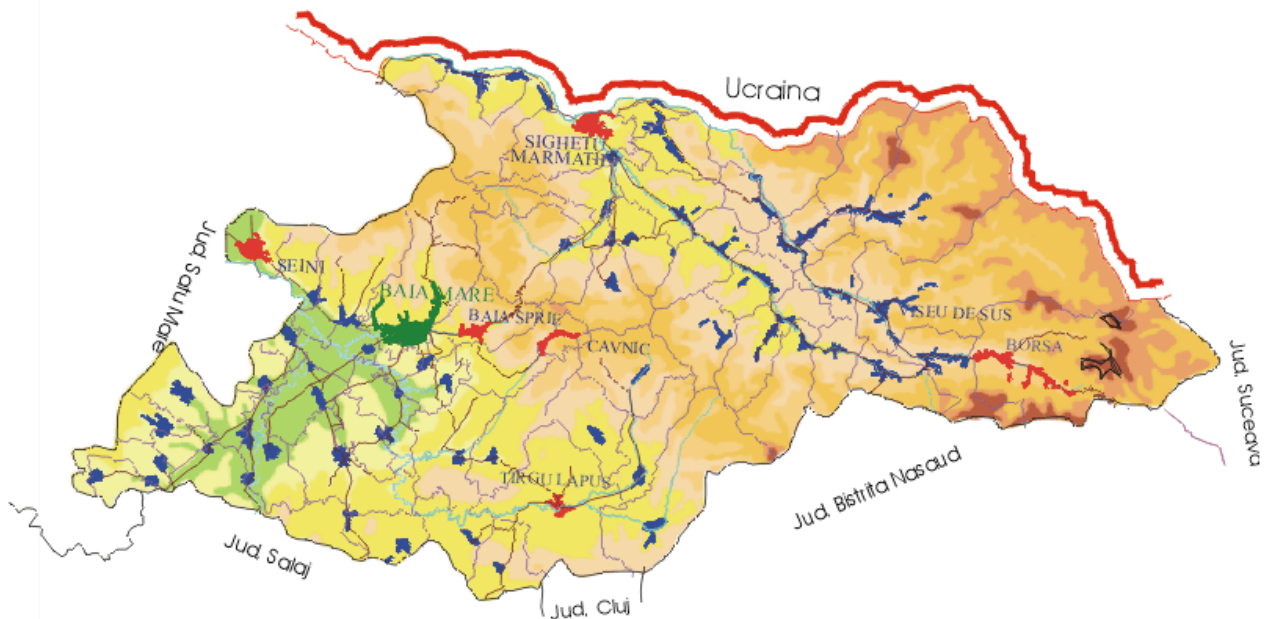
Ceausescu's rule had little effect on the area. Indeed, he curiously encouraged the people here to maintain their traditional culture, contrary to his systematisation policies for the rest of Romania. Also, the region escaped collectivisation under Communist dictator Nicolae Ceaușescu, with the result that local people retain a very close relationship with the land. Ploughing, planting, harvesting, hay-making and almost every demand of farming are met by manual labour.

Maramures County has a very long history of metal mining that is documented back to the 14th century, and is generally believed to have started in the Roman period. Mining in the region exploited both base (Cu, Pb, Zn) and precious metals (Ag, Au) from Neogene age hydrothermal vein mineralisation deposits. In the intensive mining period (up to 1995) there are 19 flotation plants and 215 disused and functioning mine tailings ponds, in addition to a number of Cu and Pb smelters, including the famous 351.5 m high S/C Phoenix stack.

The past mining activities generated high levels of persistent contamination of soil, water and air with many pollutants released during the decades of industrial activity that used environmentally unsound technologies.

Since 1989 the economy has contracted quite sharply and out-migration has accelerated. Mining operations are almost entirely closed. But the resourcefulness of the population could boost Maramures as a area of small-scale enterprise harmonising with the physical resources and cultural milieu.

Natural Features



Map of Maramures region

- Climate: temperate-continental
- Predominantly hills and mountains (El. 200 m - 2308 m)
- Large areas of forests with diversified flora and fauna, covering 289.179 ha, representing 45.9 % of the county surface and 4.5 % of the national forestry fund; broad leaved 60.5% and coniferous – 39.5%. Main species:
 - Beech – 44%
 - Spruce – 33%
 - Oaks – 8%

- Fir tree – 2%
- 60% - protective role
- 40% - production role
- Rivers and lakes: dense river system totalling over 3000 km. There are natural and artificial lakes, including two reservoirs: Stramtori-Firiza (18 mil. m³) and Runcu-Brazi-Firiza (30 mil. m³) used primarily for water supply and also for flood mitigation and hydro-power production
- Maramures County has a valuable natural patrimony that includes 35 protected natural areas out of which a national park – The National Park of Rodnei Mountains - a Biosphere Reservation, as well as The Natural Park of Maramures Mountains. Once the Maramures Mountains were declared through the Government Decision no. 2151/2004 to be a Natural Park, Maramures County became the second in the country with the largest surface of protected natural areas

Economy

Industry

The weight of the industrial branches in the total turnover (as on 31.12. 2006):

- The extraction industry 3.7 %
- The processing industry 94.6 %, out of which :
 - Metallurgy 9.5 %
 - Food and beverages 6.6 %
 - Wood processing 9.5 %
 - Furniture and other industrial activities 26.5 %
 - Ready-made clothes and garments 4.2 %
 - Electrical and thermal energy, gas and hot water 1.7 %

Constructions

The value of the construction works reached in 2006 the amount of 161.204 thousand RON (some 38.800 thousand EURO), the emphasis being on new construction works (64.1 % of the total).

From the point of view of the structure of the new constructions works, the works performed at the engineering constructions have the greatest weight (61.4%) while the works at the residential constructions have the smallest weight (3.9%).

Agriculture

Agriculture land: 311.177 ha, out of which:

- Arable land - 84.009 ha
- Pastures - 101.022 ha
- Hayfields - 119.762 ha
- Orchards - 6.154 ha
- Vineyards - 230 ha

As concerns the surface cultivated for the exploitation of the main crops, the surfaces were occupied in 2006 as follows:

Total: 73805 ha, out of which: grains 37927 ha, wheat and rye 6876 ha, barley and two-row barley 549 ha, maize 21410 ha, oily plants 1126 ha, sunflower 1097 ha, sugar beet 1 ha, potatoes 15145 ha and vegetables 2273 ha.

Forestry

Total of 289.179 ha of woods.

Livestock

- Cattle - 94.126 heads
- Swine - 88.130 heads
- Sheep - 156.977 heads
- Goats - 14.600 heads

The agricultural lands summed up in 2005 a total surface of 3111.5 km² out of which, arable lands 839.98 km², pastures 1010.2 km², hayfields 1197.6 km², vineyards 2.3 km² and orchards 61.54 km². The agricultural land covers 46.6 % of the entire area of the county.

Tourism

Maramures County offers conditions for alpine climbing winter sports, for mountains tourism, balneal treatment, and agro-tourism.

Places of touristic interest: the museums in Baia Mare and Sighetu Marmatiei, the monuments of popular architecture, the Borsa, Izvoarele, Mogosa resorts, the villages on the valleys of Iza, Mara, Viseu and Tisa rivers, "The Merry Cemetery", the Monasteries from Sapanta, Barsana and Rohia.

In 2005 in Maramures 112 touristic units, out of which 21 hotels and motels, 1 chalet, 1 villa/bungalow, 3 school and pre-school camps, tourist boarding houses, 66 agro-tourist boarding houses and 1 hostel were recorded.

Gross Domestic Product (GDP)

The Maramures GDP per capita amounts to EUR 2,818 (2006 data) representing 1.72% of the national GDP. The average GDP per capita at national level is 38.3 higher than the Maramures GDP.

Grouped on the 4 economical sectors of the county's economy, the GDP is divided as follows: 10% in agriculture and forestry, 32% in industry and constructions, 9% in transport and 49% in services.

Employment

The number of employees in June 2009 was of 97,024 falling by over 5,000 employees recorded in the same month of the previous year (102,209 employees).

The unemployment rate recorded in December 2008 in Maramures was 3.9%, below the national average of 4.9%.

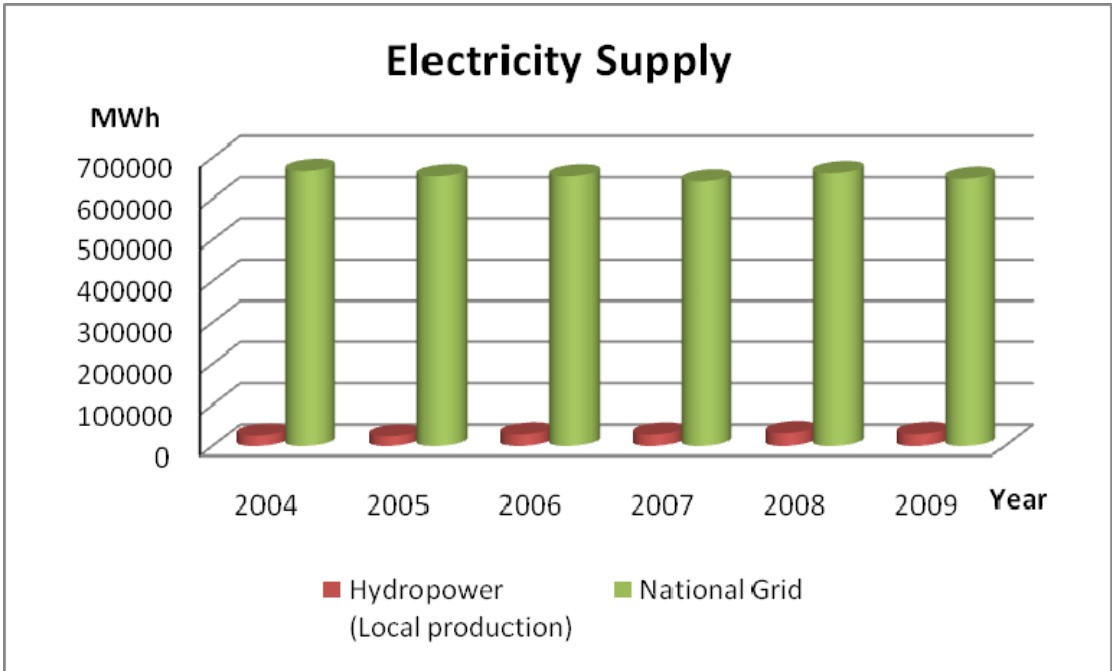
Energy

Electricity

There is no thermoelectric power plant in Maramures, therefore the only production of electricity comes from hydro power plants.

Electricity Supply:

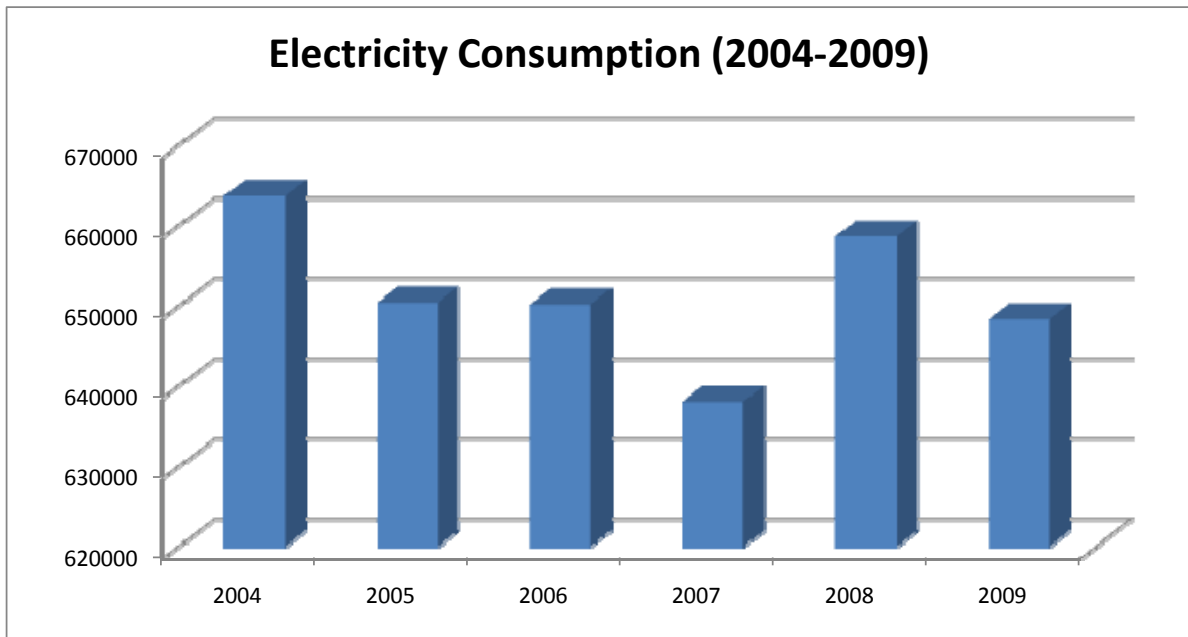
The electric power in Maramures is mainly supplied by the National Grid with a small percentage (approximately 4.5%) of local hydropower production.



Electricity Supply in Maramures (2004-2009)

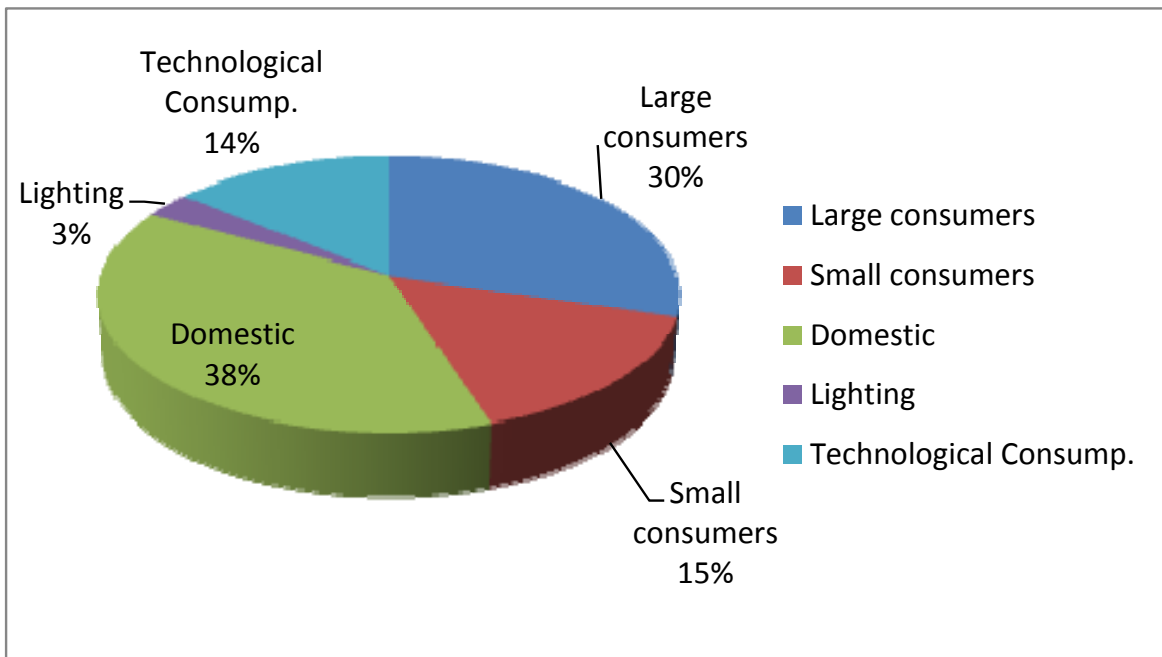
The hydropower is produced by two private companies and one State owned company. An analysis of the electricity production of the two types of companies shows that the private sector increased its production while the public sector decreased its production significantly as a result of the privatisation policy.

Electricity is distributed in Maramures by ELECTRICA TRANSILVANIA NORD.



Total Electricity Consumption in Maramures (2004-2009)

An analysis of the electricity consumption in 2009 shows that the highest consumption is related to the domestic sector.



Electricity consumption in 2009 by type of consumer

Electricity data for 2009:

Production of hydro-electric power:	29 548 MWh
Electricity from National Grid:	648 835 MWh
Electricity consumption :	
- large consumers:	192 114 MWh
- small consumers:	99 146 MWh
- domestic:	246 593 MWh
- public lighting:	19 501 MWh
- own technological consumption:	91 003 MWh

Consumption KWh/domestic consumer: 1274.6 KWh/year

Heating

Heating in Maramures is focused on two main sources: natural gas in urban areas and wood in rural areas.

In Baia Mare, the capital city of Maramures (population of 150,000 inhabitants) disconnection from the centralised heating systems of an important number of flats for economic reasons took place during the 90's. Baia Mare's system, typical of Romanian district heating, had low efficiency, high distribution heat and direct hot water losses, and poor reliability which lead to the closure of the centralised heat supply systems. The flats adopted individual heating units on natural gas.

The complete decentralization became possible due to legal or technical regulations in the field of gas supply which allowed separate gas metering for each apartment. The installation of individual boilers required substantial financial effort for the flat owners; the investment cost per flat ranging between 1,500 € to about 2,000 €.

The new individual system eliminates the massive losses in the distribution network however it does not solve the losses through the building envelope. Therefore the target in this field is to improve the thermal insulation of the buildings.

In the rural areas, wood is predominantly heating for heating and food preparation by means of traditional technologies - stoves and ovens – with low energy efficiency and generation of high noxious emissions (CO, CO₂, NOx).

Wood harvested in 2009 (thousand cubic meters – gross volume)

From State owned forest	367.6
From forests owned by administrative-territorial units	38.4
From privately owned forests	112.2
TOTAL	518.2

Source: National Institute of Statistics

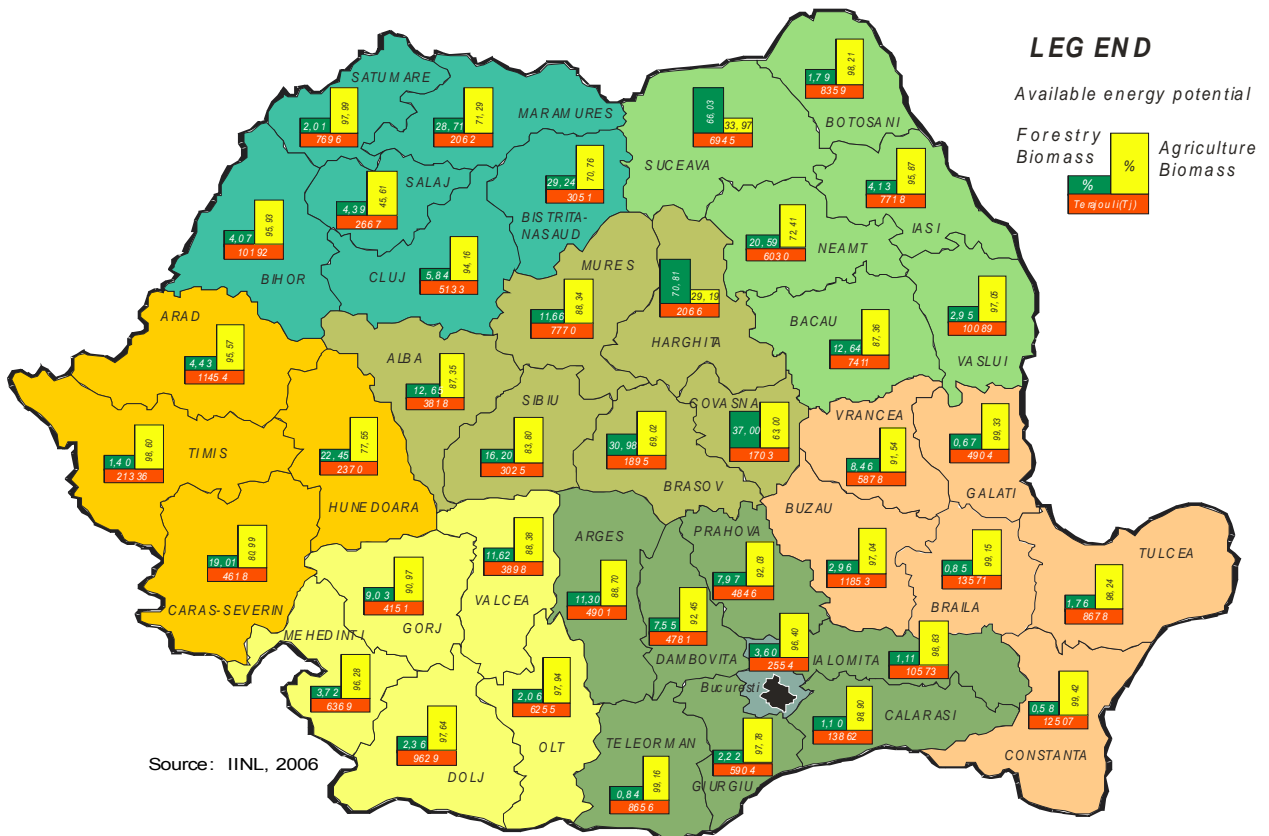
As per the above table the total wood harvested in 2009 amounts to 518,200m³. According to the information obtained from the Forestry Authority, 40% of this amount is used as fuel for heating. Therefore, the total amount of wood used for heating in Maramures in 2009 was 207,280 m³.

Renewable Energy Sources

Biomass

- Use of saw dust by wood processing units for generation of steam and hot water preparation
- 1 large pellet production company

Map of Biomass Potential



As indicated on the map, an energy potential of 2062 TJ is available from local biomass, of which 28.71% from forestry biomass and 71.29% from agricultural biomass.

The land fund of the Maramures is divided as follows (data from 2008 in hectares):

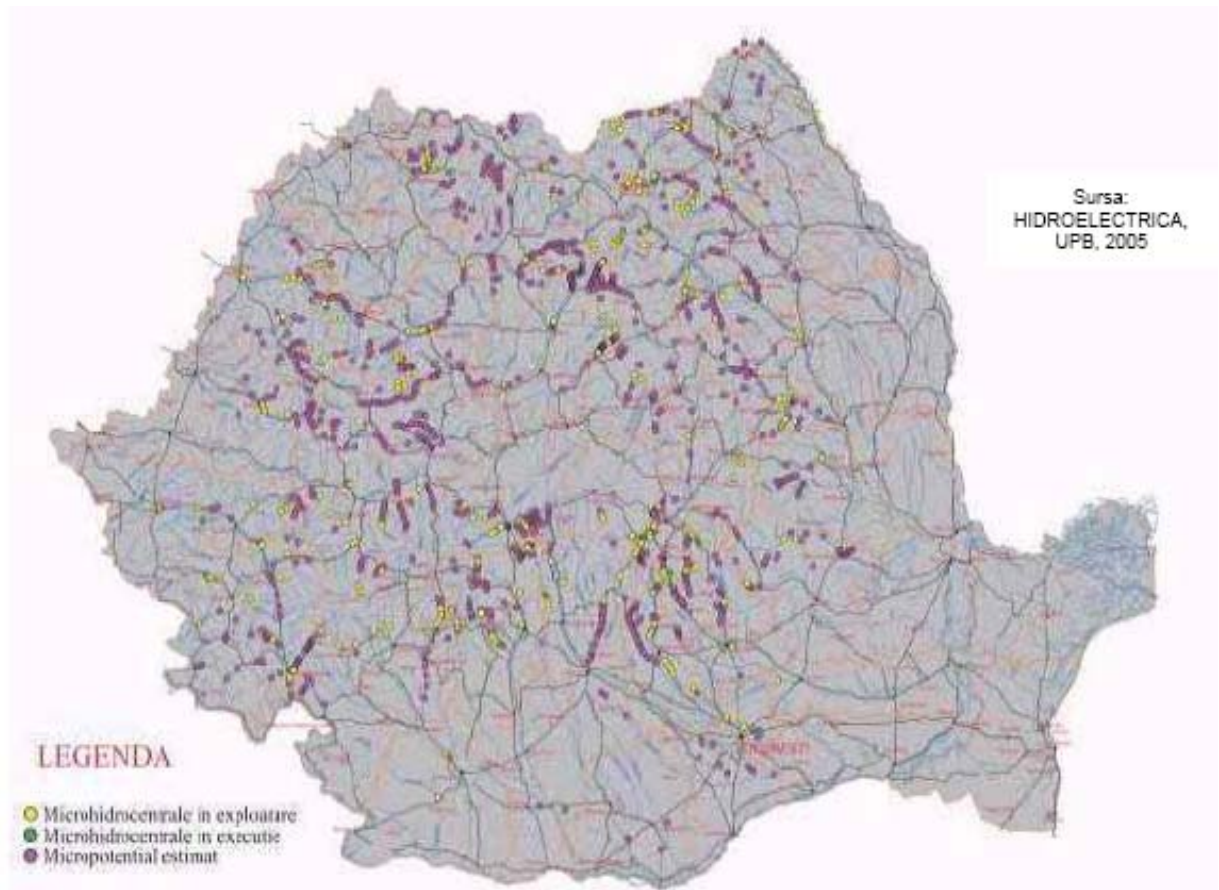
Total area	Agricultural land	Forests and other land with forestry vegetation	Waters and ponds	Other areas*
630 436	310 545	288 699	5 340	25 852

* Includes: non-productive land, construction, roads and railways

Hydro

- There are 7 micro hydro power plants owned by 2 private companies and 4 owned by the State owned company Hidroelectrica S.A.
- A large number of licenses for construction of private micro hydro power plants were granted in the recent years, however not much development took place.

Map of Hydro Power Potential

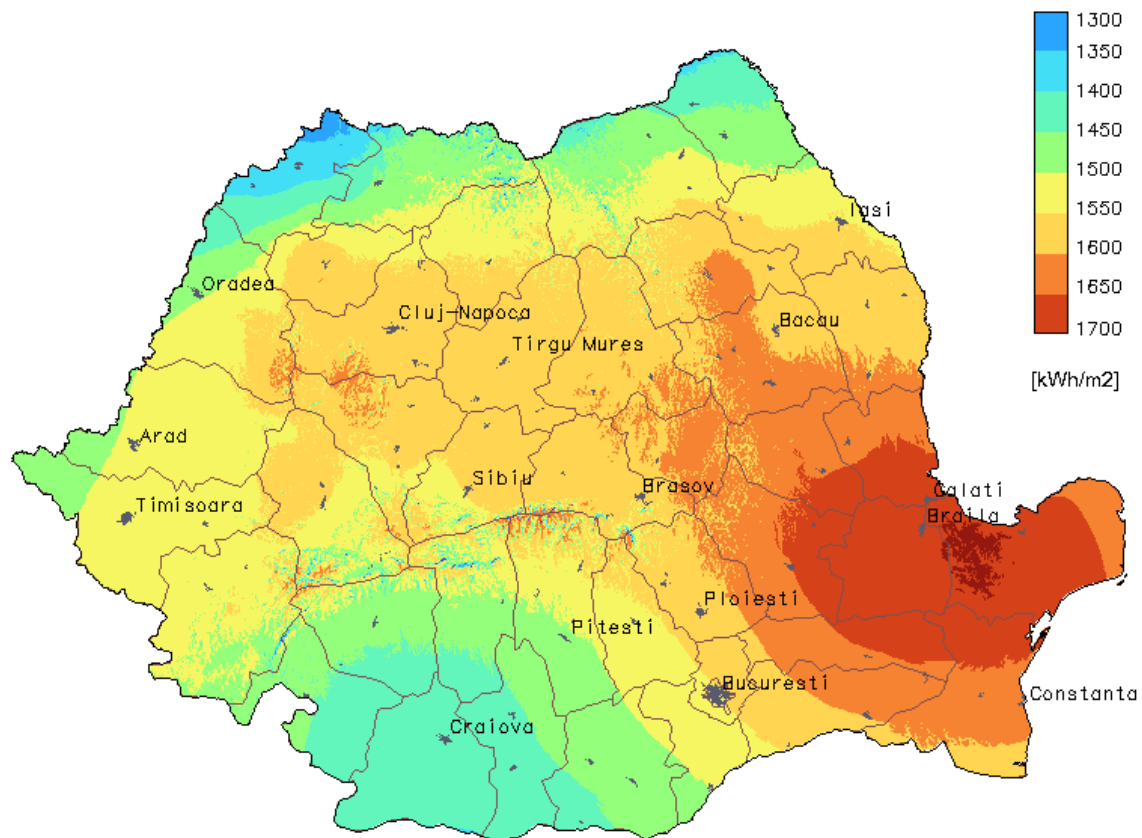


Solar

Before 1990 a number of apartment blocks in Baia Mare were equipped with domestic hot water installations, however they are currently decommissioned. Even though the solar irradiation is within reasonable limits, the solar potential is not valorized in Maramures.

Map of Solar Potential

Yearly sum of global irradiation received by optimally-inclined PV modules
Romania



PVGIS © European Communities, 2001-2007
<http://re.jrc.ec.europa.eu/pvgis/>

Solar radiation data for Baia Mare and optimal exposure angle

Month	Jan	Feb	Mar	Apr	Mai	June	July	Aug	Sep	Oct	Nov	Dec	Annual
Irradiation at optimal angle inclination: (Wh/m ² /zi)	1743	2941	4299	4838	5613	5408	5789	5553	4520	3747	2035	1295	3988

Optimal angle

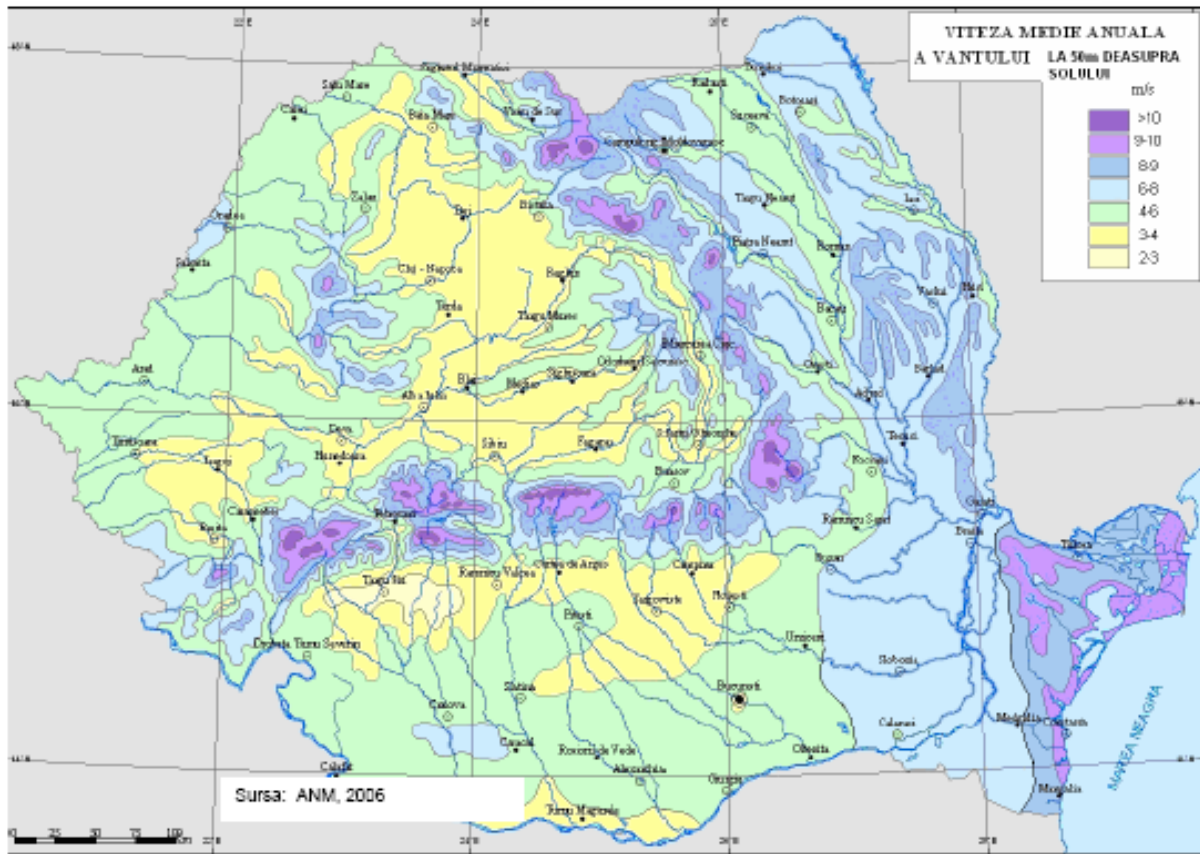
Month	Jan	Feb	Mar	Apr	Mai	June	July	Aug	Sep	Oct	Nov	Dec	Annual
Optimal angle: (Degrees)	65	60	48	32	18	11	15	28	43	57	63	65	37

Source: ECOVOLT Romania, LP ELECTRIC systems

Wind

Never used, however a wind measurement study is carried out by the Moisei Municipality for a proposed wind farm project.

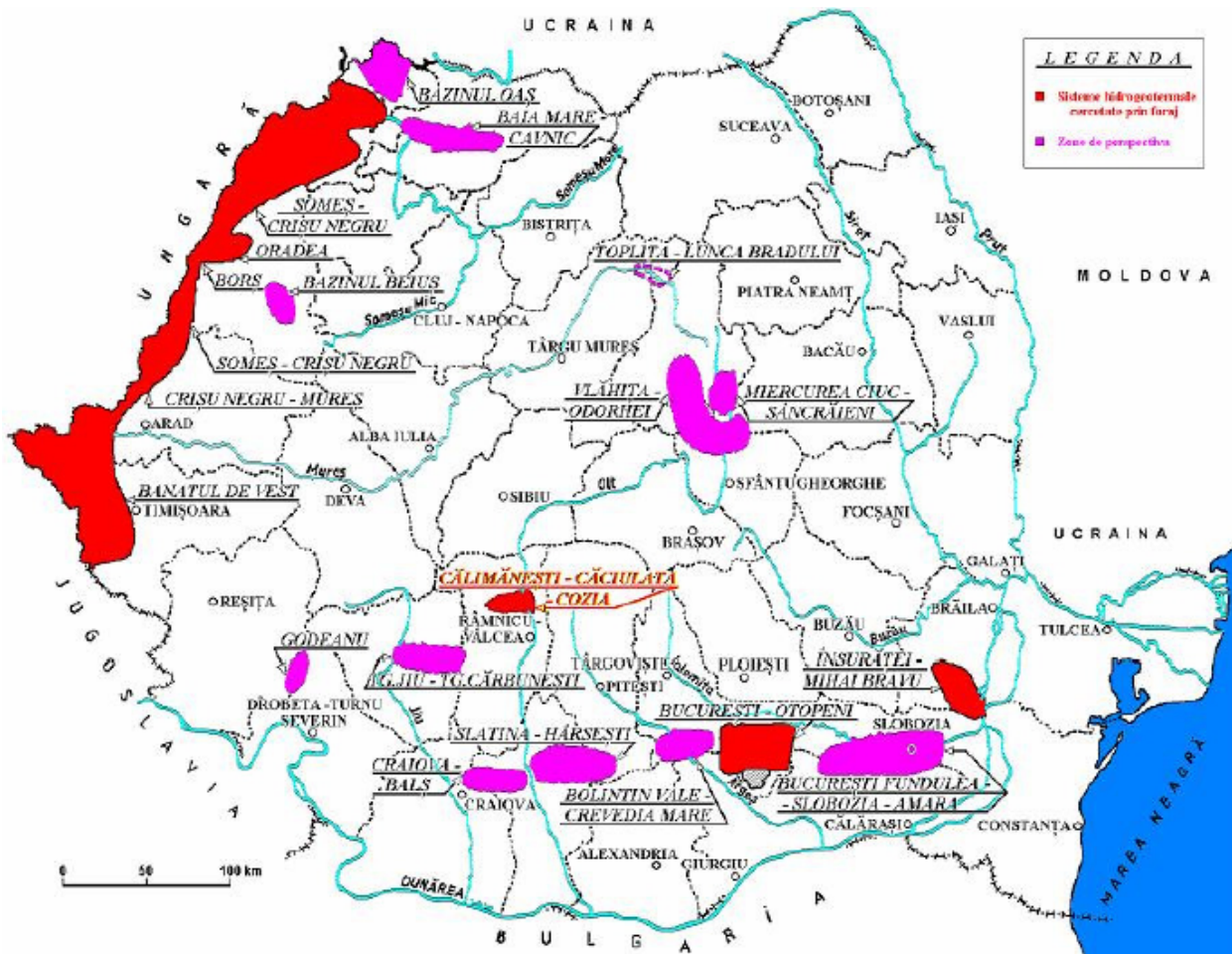
Map of Wind Potential



Geothermal

Some exploration drilling was carried out with positive results in Baia Sprie-Cavnic area. The potential exists, but it has not yet been exploited.

Map of Geothermal Potential



Energy Efficiency of Buildings

The majority of buildings in Maramures are residential; approximately 97% of the total dwelling stock is privately owned. Most of the buildings are individual houses, with a much lower percentage of apartment blocks.

All buildings constructed in the period 1950 - 1985 were designed and erected based on the principle of "minimum investment costs". The result: buildings with poor thermal insulation, high heat losses and high heating costs. The majority of the dwellings are located in buildings with ages ranging between 15 and 55 years, characterized by a low level of thermal insulation and poor condition.

The thermal energy consumption in apartment blocks in urban areas:

- 390 kWh/m² yr (210 kWh/m² yr domestic hot water & 180 kWh/m² yr heating)
- In all EU buildings: 220 kWh/m² yr

In Romania, the energy consumption per capita is:

- 50% higher than in Poland
- 7 times higher than the EU average

The annual specific energy consumption in buildings is in:

- Romania - 120 kWh/m³
- EU - 40 kWh/m³

National potential for energy saving for the residential sector as percentage of the consumption: **41.5%**.

New Buildings

In Romania there is an explosion of new buildings. The building sector grows every year: company headquarters, offices, commercial centers, residential complexes erected in the big cities or on the outskirts. Unfortunately, the Romanian architecture is a show-off architecture. The wealthy people build huge houses with high capacity boilers, heaps of home appliances, large swimming pools with no regard to economics or ecology aspects.

There are no incentives for green houses, therefore people are not encouraged to build such houses, in particular as they are more expensive;

A poll ordered by Green Report showed that Romanians are ecologists mainly if this means personal benefits, translated into incentives and facilities. The reduction of the household energy costs represents the main reason for energy savings (85.7%);

However the starting point has already been set by major companies and institutes integrating energy efficient systems in the existing systems or building new headquarters to the highest EE standards.

The Law 372/2005 (applied as from 1st of January 2007) provides that all new buildings must be constructed in compliance with certain EE requirements and have to obtain an energy performance certificate, while the new buildings with an area of more than 1,000 sqm require a technical, economic and environmental feasibility study on the potential of using RES.

The medium and long-term perspective is positive; however in the changing of the mentality an important role is played by the authorities. If they offer incentives, the people will be encouraged to build or buy an ecological house at a good quality – price ratio.

Energy Efficiency and RES Promotion in Romania

All the relevant energy and climate change EU Directives were transposed into the Romanian legislation

Fuel type	Structure of installed capacity (MW) by fuel type in Romania 2008	Structure of electricity production (GWh) by fuel type in Romania 2008
coal	7472	27531
hydrocarbons	5110	8902
hydro	6377	17105
nuclear	1413	11223
wind	8	11
total	20380 MW	64772 GWh

EU ENERGY POLICY TARGETS

Directive 2006/32/EC (ESD)

Energy efficiency increase in energy end-use sectors, by:

Purpose:

- Providing the indicative targets as well as mechanisms, incentives and institutional, financial and legal framework necessary for the promotion of efficient energy end-use
- Creating the conditions for the development and promotion of the market for energy services

Target:

- Energy savings of 9% for the end of the period 2008-2016, respectively 1% per year, of the annual average of the final energy consumption in the last 5 years (period 2001-2005) (the companies under emission trading scheme are excluded)

National Energy Efficiency Action Plans

Deadlines : 30th June 2007; 30th June 2011; 30th June 2014

Energy and Climate Change Package

Published in the Official Journal of the European Union 5 June 2009-L 140

- Revising the EU's Emission Trading System (ETS)
- Targets for each EU Member State to reduce greenhouse gas emissions from non-ETS sources
- New carbon dioxide capture and storage technology (CCS)
- Promoting the use of renewable energy in the electricity, heating and cooling, and transport sectors in order to ensure that by 2020 renewable energy makes up at least 20% of the EU's total energy consumption.

Energy and Climate Change Package:

TARGET

Reducing greenhouse gas emissions by 20% by 2020 comparatively with 1990;

- Energy savings of 20% of the EU total primary energy supply by 2020 ;
- Share of the renewable energy of 20% in overall energy mix by 2020 and a minimum target of 10% for biofuels.

Proposal for Romania: 24% share of RES in final energy consumption

National TARGETS:

RES share in the gross electricity consumption

2010: 33%

2015: 35%

2020: 38%

minimum share: 5,75% in 2010

Promoting biofuels and other RES in transport

SECTION 3 PEER REVIEW DESCRIPTION

Program

The peer review in Maramures started on 1 September 2009 and ended on 4 September 2009. The event was organized jointly by the Maramures County Council and Energy Management Agency of Maramures with the financial support of the INTERREG IVC Program.

Within the framework of the More4NRG project, the Romanian region of Maramures, member of the AER, opened for a peer review. The peer review team conducted a four-day visit to assess the performance of Maramures energy policies. Through field inspections and meetings with energy stakeholders from both public and private sectors, mainly hydropower plants, pellet factory under construction and wood processing facilities (furniture factory). The team investigated the current status of these facilities and elaborated on future possibilities to development within the framework of clean energy. The aim was to come up with guidelines for the host region to meet current and future energy requirements.

The methodology was by presentations, field visits and interviews, thus collecting data for discussion and evaluation within the team afterwards.

1st day: Stakeholder Seminar

The first day was dedicated to a seminar type event which offered the opportunity for the team of experts and local stakeholders to meet and discuss the concept and purpose of the peer review.

The event was structured on three sections: first section comprised presentation of best practices delivered by the members of the peer review team followed by a section dedicated to presentations provided by the relevant institutions of Maramures (i.e. County Council, Water Authority, Environmental Protection Agency, Baia Mare Municipality, Romanian Agency for Energy Conservation, Forestry Authority). The third section comprised animated discussions between the peer review team and a wide range of stakeholders from the public and private sector of the host region.

AGENDA

1 September 2009

09:00 – 09:30	Registration of the participants
09:30 - 09:45	Welcome Introduction of the expert team and representatives of the host region
09:45 – 10:00	Opening speech by Mr. Man, president of Maramures County Council Opening speech by Mr. Radu Rosca, president of Energy Management Agency of MM
10:00 – 10:30	MORE4NRG –Adina Dumitru, Maramures project coordinator Peer review concept – Justyna Podralska, AER
10:30 – 10:45	Coffee break
10:45 – 12:30	Energy Strategy – presentation of the energy strategy in the MORE4NRG partner regions delivered by the peer review experts <ul style="list-style-type: none">- Hans Rijnten (Flevoland, NL)- Riccardo De Blasis (Abruzzo, Italy)- Lars Sandström (Norrbotten, Sweden)- András Bakos (GE Infra, Water) Discussion, questions and answers
12:30 – 13:30	Lunch break
13:30 – 15:00	Energy Situation in Maramures Presentations delivered by the representatives of the following institutions: <ul style="list-style-type: none">- Graziella Bolma, executive director – Maramures County Council- Viorel Iancu, executive director – Environmental Protection Agency of MM- Aurora Hauși, head of department - Baia Mare Municipality- Ramona Cosma, head of office - Maramures County Council- Vlaicu Pop, councilor – Maramures Water Management Department- Titus Coriolan Rus, Oradea branch coordinator – Romanian Agency for Energy Conservation- Costel Bucur, director –Baia Mare Forestry Authority
15:00 – 16:00	Discussion, questions and answers Summary of the first day and conclusions



Day 1 - Relevant Facts

Conditions for sustainable energy development:

- Strong political impetus
- Efficient collaboration and coordination between different players in and outside the region
- Focus on the most prospective local resources
- Local policy defining measurable targets and actions for their achievement
- Local governments should set an example
- Simplified permitting procedure for RES projects
- Increased public awareness
- Enforcement of relevant legislation at local level
- Increased use of EU funds for energy projects

2nd day: Visit to the hydro power installations

2 September 2009

	Field visit 1
09:00 – 11:30	Hydro power installations at the Firiza Dam
11.30 – 12.30	ESPE ENERGIA micro-hydro power plant at Blidari
13.00 – 14.30	Lunch break
15.00 – 16.00	Visit at the Mineralogy Museum
16:00 – 17:00	Internal meeting of the peer review team Summary of the second day and conclusions

The second day was dedicated to a field visit to several hydro power installations where the experts had the opportunity to have on site discussions with the relevant actors in the fields of water management and hydro power production.

U.H.E.II - PRESURE NODE

- $P_i = 0.4$ MW
- Turbine Type: Horizontal Francisc
- Transformer Type: raising of 750 KVA
- Power Supply: From the 6kV grid with 2 x 250 KVA transformers
- Nominal Flow Rate: 1.0 mc/s
- Design Head: 60m
- Upgraded in 2002

U.H.E.I - STRAMTORI

- $P_i = 4.2$ MW
- Turbine Type: Kaplan
- Transformer Type: raising of 6500 KVA
- Power Supply: From the 20kV grid with 2 x 250 KVA transformers

- Nominal Flow Rate: 15.0 mc/s
- Design Head: 36m
- Upgraded in 2003



MHC BLIDARI 2

- Commissioned in 2006
- Water basin: 1000 m³
- Pipeline diameter: 1000m
- Operation: automatic with computerized management

Turbine Type	Francis	Pelton
Flow (m ³ /s)	1.52	0.5
Head (m)	45.7	40.2
Pmax (kW)	850	210



Day 2 - Relevant Facts

- The hydropower potential is significant but not sufficiently used
- A study to inventory and assess this potential is required
- The competent authority is the Romanian Water National Authority which:
 - issues WM endorsements for the construction of MHP plants
 - issues WM permits for the operation of MHP plants
 - monitors the compliance with the relevant WM legal requirements
- The national legislation for the promotion of RES + incentive schemes (green certificates mechanism) + financing programs – **in place**
- Development of MHP plants can be achieved by:
 - private investments
 - public investments (using EU funds)
 - private public partnerships

3rd day: Visit to the wood companies

3 September 2009

	Field visit 2
10:00 – 11:00	Pellet factory SC ENERG LEMN SA in Câmpulung la Tisa (in construction)
11:00-12:00	PLIMOB SA Furniture Factory in Sighetu Marmăției
13.00 – 14.00	Lunch break
14.00 – 16.00	Wood processing facility SC RG HOLZ SRL in Vișeu de Sus
16:00 – 17:00	Maramures Mountains Nature - Park Vișeu de Sus

Visit to the largest pellet factory in SE Europe



Visit to the furniture factory SC PLIMOB SA in Sighetu Marmatiei



Visit to the Wood Processing Facility SC RG HOLZ SRL in Viseu de Sus



Visit to the Maramures Nature Park



Day 3 - Relevant Facts

- The forestry potential is significant but inefficiently or not sufficiently used
- A study to inventory and assess this potential is required
- The competent authority is the National Forest Administration which:
 - manages the forests
 - ensures the wood needs for local and/or national economy
 - ensures the sustainable use of non-timber forest products
- The national legislation for the promotion of RES + incentive schemes (green certificates mechanism) + financing programs – in place
- Development of energy production facilities based on forestry waste can be achieved by:
 - private investments
 - public investments (using EU funds)
 - private public partnerships
- Pellet heating systems should be promoted among local people

4th day: Discussions and preliminary conclusions

4 September 2009

09:00 – 10:15	Internal meeting of the experts
10:15 – 10:30	Coffee Break
10.30 – 13.00	Concluding session - presentation of first conclusions of the peer review team on the energy situation in the region Meeting with the representatives of different local administrations, NGOs, public companies and other institutions

General impression

Industry holds the top place in the economy of Maramures. The county is rich in gold, silver, lead, copper and salt and there is a long history of mining in the region. Nonferrous ore mining and nonferrous metallurgy were very well developed, but in the last years the mining industry and subsequently the nonferrous metallurgy have been closed. In Maramures county there is a strong tradition in doing businesses with Germany, Austria, Hungary and Italy. The main sectors are: wood processing (well known factories that still employ over 1000 people) and furniture, mechanics, textiles. Maramureş is also known for its pastoral and agricultural traditions. Ploughing, planting, harvesting, and hay making and handling are mostly done manually. Maramures is a beautiful region with high potential of development within green energy production and different areas of tourism. Maramures holds huge but uncapped potential to produce a great deal of sustainable energy, particularly with small to midsize energy plants.

During the peer review field visits were made to micro hydro power plants, with a high degree of modern technology. Environmental and biodiversity issues are taken into account. It's overall a good example that could be further developed and used as an example elsewhere.

Maramures has around 260,000 ha of heavy forested areas that can be used in a lot of different ways. Large logs that can be used as raw materials for the furniture industry, but also smaller trees and so called wood slush that can be used for different purposes. Low grade biomass can be used for heating purposes within district heating systems, but also as a base for pellet production. During the field visits the team visited a pellet production factory under construction. A factory that will also use wood slush (domestic and imported from neighbouring countries).

There is a series of small hydropower plants with a very modern computerized regulatory system. Plants that are built within small streams and rivers, only using a part of the water flowing and thus still allowing fish to migrate and protect the biodiversity. These plants are well localized in the landscape in order to protect the landscape and environment.

Some local investors are already active in the realization of new plants like biomass plant and a big part of the energy comes from the active and functioning hydroelectric plants. The realization of small hydroelectric plants along small rivers, managed by new and powerful computer systems are very interesting so is the energy production from waste which is possible within a small period.

The investors face real difficulties in the realisation of new plants because of the insecurity around the authorization process.

First conclusions and recommendations

- Continue with the development of a new energy policy within the framework of Maramures present situation focussing on what Maramures does best.
- The landscape is forested and could be harvested in an intelligent way. Biomass is one of the main sources of renewable energy. The industrial development in this field is relatively young and could be encouraged by an easier process concerning permits and legislation.
- The actual situation represents the perfect ground for developing energy initiatives.
Starting from creating specific action plans related to different tasks and objective from additional strategies. Identify the priorities and involve the community and all the stakeholders to reach the common objective.
- The financial investment sector must be more developed and there is a need to create tools for easier access between entrepreneurs and potential investors.
- A main goal for the local energy agency, is not only to focus on the technological solutions available, those will always be developed. A new strategy is to be developed that will improve the efficiency of the energy policy and expand future energy choices through wise investment in new technologies. An equally important task is to create, invent or develop tools to facilitate the process within bureaucracy.
- It is useful to regulate the authorization flow by new laws and rules that give the competence to one single office, giving it the authority and defining the time limits to give the authorizations as to help the investors.
- *Hydro-power:*
Maramures produces a significant amount of electricity with hydropower and is simultaneously able to keep potential adverse environmental impacts to a minimum.
By doing so Maramures is a great example in how to keep energy in balance with ecology, this should be mentioned and communicated as one of the best practices of the region.
Further development of the small hydropower plants, with consideration taken to environment, biodiversity and landscape. The existing facilities are very modern and need only a minimum of supervision. This small scale production plants can actually function as a good example within the European union.

- *Biomass:*
The forestry potential isn't sufficiently used as forest residues aren't properly used and are largely left in the woods. People are allowed to collect and use the wood themselves. The wood exploitation company should collect the residues.

Law enforcement can lead to higher collection rates which will result in higher rates of processing and application (pellet industry) of these residues. The Eurisy case-study can help providing information to support collection of forest residues.

Furthermore co-generation of agricultural residues: Biogas production through co-generation of agricultural residues (manure/crops).

Pellet production is of course a method to enhance the energy value of wood as a raw material, especially from low grade raw materials as wood slush from roots, branches and so on. Renewable energy sources is always better than fossil fuels, but using wood as a raw material will put some long term planning demands on the energy policy. Wood is also a renewable building material as well as renewable materials for the furniture industry and so on. Harvesting wood should of course take growth, environmental and economical factors into consideration. What is a higher grade of development and usage? Wood for heating purposes or construction? These are questions to be asked when planning for biomass energy production.

- *Waste management:*
As we understood there are two large landfills in MM but no waste incineration. In Sundsvall there is a very good example of collection and incineration of the household waste. This produces enough electricity for the grid and heat for the district heating system to provide the entire city of Sundsvall. The city of Baia Mare possesses the right circumstances for a comparable project/industry. Furthermore a combination with a better waste management plan (focus on recycling, collection, prevention of litter) is recommended.
- *Geothermal energy:*
We recommend a study on possibilities for geothermal energy from old mine-shafts (there is a hole already).
- *Wind energy:*
We understood from the investor that joined us in our second field-day that there are not too many cost-effective options for wind energy in Maramures.
- *Solar power:*
There is a lot more potential for solar power in Maramures. Maybe not the PV-systems which are often still very expensive, but especially use of solar heat for households (shower/warm water/etc.) which is more cost-effective and a well-known technique. Besides you have a good solar-radiation regime.

- *Snow-cooling:*
There is a lot of snow in Maramures during winter-time. In summer however, it can be very hot. A similar climate as Sweden. In Sundsvall we visited the snow-cooling system. A very efficient, cost-effective and not too complex technique. We recommend a study on the potential for such a system for hospitals/industry/public buildings in Baia Mare.
- *Energy-efficiency:*
District-heating (combination: forest-residues > pellet industry > CHP > electricity & heat) is a very efficient option for the region of Maramures. However there are historical/political elements which make this option a delicate one. We advise that politicians are informed on the modern techniques and possibilities of District Heating (separate energy bills, separate temperature adjusting possible, etc.) to make this option possible for discussion.

SECTION 4 KEY FINDINGS AND RECOMMENDATIONS

Spatial planning and development

Key findings

There is a high degree of environmental and biodiversity considerations when building micro hydropower plants. There are some bureaucracy problems concerning the pellets plant.

The situation is still in embryonic stage with most of the systems to be developed and planned (road system, new infrastructures etc.)

Noteworthy is the aversion to collective systems (expressed by a director of Maramures County Counsel), created in the communist era. The freedom "to own the knob" is a great thing. This creates a social problem by implementing a technical solution, such as application of collective heating blocks in housing. Introduction of durable energy options such as bio-energy and geothermal, are complicated by this. Energy generation takes place centrally. The demand is determined individually.

The study did not focus on the energy performance on buildings. Most of the buildings during the field visit were of wooden construction or build with little regard to insulation (applies to both heat and cold) and need some refurbishments as to reduce the energy dispersion.

There are some ideas and regulations on new buildings and this represents the right way to follow. A major percentage of the population decided to use the individual heating system avoiding the old centralized system because of historical and political reason.

Recent investment in gas mains "every household owns their own meter " makes residents of Maramures free to decide on their energy, there is no central power that can turn off the tap. The costs for the construction of the (everywhere visible) yellow gas pipeline network and the installation of gas consumption meters in proportion to the power costs are so high that the user will not feel a quick stimulus to be economical with energy (gas / electricity).

The users are quite stimulated to be economic with energy consumption as the price of electricity and natural gas compared is extremely high, taking up a large share of the income; in fact many people who paid for the connection to the gas mains have disconnected and turned back to wood.

Illumination is sparse and inefficient. The electricity infrastructure is tied together with a lot of ramifications therefore there are many losses in the network. This applies to both the countryside and cities. The network isn't powerful enough to meet an increasing demand.

Recommendations

- Using a relatively quick and transparent process during planning and development.
- *Create strategic plans to guide the development of the energy system.*

It is a good period to develop the best practices in all fields and especially in the energy sectors taking in account the past strategies of other counties to avoid the same mistakes.

Invest in social infrastructure, to achieve improvement of the energy infrastructure. Participation in energy systems can assist, the system is still " one's own " because a group is collectively responsible for the exploitation.
- *Place the decentralized energy generation close to where the energy is required.*

With the introduction of collective systems, such as bio-energy and geothermal energy and even large-scale solar energy projects, the question arises as to how bring together supply and demand. Planning plays an important role. It is efficient to place the decentralized energy generation close to where the energy is required. This may mean that residential buildings / industry are located in a place where geothermal energy is available, but it can also mean that a biomass plant is carefully fitted into a (residential) district. By using waste as fuel this certainly applies. The distance from the incinerator to the customer (residential building / industrial) must be large enough to not cause any inconvenience and or damage. But it should be close enough to efficiently exploit the heat.
- *The use of waste as fuel involves a switch from deposit to burning.*

In itself, landfill as a disposal method is cheaper than burning (also as the EU directives on landfill are met). However exploiting the energy content of the waste has advantages it doesn't requires investment in landfill capacity (limited space and prevent pollution). Furthermore it reduces transportation (fuel and waste) and reduces use of fossil fuels. Burning household waste demands due to the (emissions) requirements a certain scale. And is therefore only attractive to a town of sufficient size, or in combination with several municipalities (which otherwise use the same dumping site).
- *Promote and share the good practices to reduce the energy consumption*

Common measures when it comes to energy efficiency and consumption. Insulation, renewable energy sources, and electrical appliances with low energy usage.

It is important to promote and share the good practices to reduce the energy consumption.

It would be useful to raise awareness among citizens about the importance of the use of centralized heating and cooling system that helps to reduce the energy consumption.

Furthermore to assist with the conversion from individual use to shared use of energy.

In developing new housing strictly implement and maintain the (insulation) standards. Not only focus on the heat demand (heating gas now), but also cold (refrigeration is growing larger share of electricity demand).

Income in Maramures is on average low. The living expenses on housing (energy costs) will increase significantly in the near the future, while the rent or maintenance costs for home ownership will not significantly increase. Awareness of this phenomenon should be promoted. Incentive for other combustion behaviour, but certainly a concern for indulation (and therefore also another type of fuel).

- *Checking and stabilizing the electric distribution grid*

The electric grid needs to be improved to increase efficiency by phasing and stabilizing the net especially close to the distribution cabin. The mains (network) must also be suitable for re-delivery. The development of 'smart grids' MUST be taken in account with the renewal of the existing network (mains). Otherwise the investments are useless.

A good grid permits to reduce the consumption and to have a better lighting system.

Common recommendations tare o use low energy lamps, and led lamps and to consider the introduction of solar energy.

- Plan the road system trying to keep the lowest CO₂ emissions.
- Share all the information with the citizens.

Political impetus

Key findings

Energy RES (Renewable Energy Sources)and EE (Energy Efficiency) is a concern of a few (= Energy Management Agency or Maramures) and is not on the agenda of the overall community. Other sectors (housing, water, forestry, etc.) work on their own interest above supply, this applies also to the energy sector itself. Persons employed by different departments do not even know each other, let alone collaborate.

Striking is the emphasis on the ecosystem. This manifests itself in the construction of the Micro Hydro Power plants (certain amount of water must remain at least through the stream flows, there is more water available than can be used to generate electricity). The regulation comes from the water management. This approach will not lead to maximize the potential of hydropower, but to optimal use.

The National Forest Administration is also aware that only proper management of forests can contribute to the economy of the country / region. Only if the economy and ecology pair off there is sustainable development. The inhabitants have autonomously developed their region due to their history and the fact that the dictatorial communist government (relatively) left them alone. Result: due to large scale projects no ecological 'disaster' happened (apart from the contamination of the soil caused by mining and metallurgist industry).

It seems that the citizens are not involved in the political life.

Recommendations

- *Pinpoint joint climate and energy goals and set sectoral targets.*
Make environmental action explicit, for those who already do (but are not aware), and certainly for those who don't .
- *Make the supply from forestry and water leading to filling the energy demand.*
Don't overcharge but work within the ecological limits.
- *The politics needs to give assistance and to be more direct to the community.* At the same time the citizens have to participate more in public issues.
The politicians have to be trained to the energy matters and mainly to the reduction and saving strategies.
- *Rationalize the process concerning building permits, environmental permits, legislation processes and financial support*
There are difficulties with bureaucracy, concerning development, regulation and financial issues. It is of course easier said than done, to recommend a country to

speed up and rationalize the process concerning building permits, environmental permits, legislation processes and financial support. Especially when so many different stakeholders are involved on different levels, national, regional and local. Both governmental, public and private. Nevertheless it is important to focus on these issues and really examine what can be done within the existing framework and legislation. The experience from other counties is that a lot can be done. Sometimes speed is of outmost importance to make it possible to go from an idea to a real project. Financial institutions will not wait to long before looking in other directions when a project is stalled. To involve all the stakeholders and shareholders especially in the planning and development of financial mechanisms and incentives. It is important to know the needs of the objectives of the incentives as to give the best service to the community.

- It is useful to regulate the authorization flow by new laws and rules that give the competence to one single office, giving it the authority and defining the time limits to give the authorizations as to help the investors.

Advice, education and training

Key findings

Advice, Education & Training was no specific subject of the review (see program).

Recommendations

A high degree of education, information and transparency is always recommended.

The objective is to inform everybody about the good practices on energy efficiency and saving. The starting point is to involve students from lower to higher schools and even create public competitions and funding advertising on energy.

Cooperation and partnerships

Key findings

The 'market', has discovered the waste wood from the furniture industries. Partly the furniture industries uses their scrap wood as fuel. In addition there are entrepreneurs (see program) who process waste into fuel: a product with economic value. The government considers this a good initiative, but let failure to effectively support this. The entrepreneurs are thus dependent on venture capital from lenders from abroad.

Recommendations

Follow with the European Projects and other international project to share the information and practices.

Recommendations: PPS incentives. Apart from financial assistance the Government can facilitate in other areas: provide space to set up activity, quickly handle licensing procedures, etc. If the government does not want to participate they can use the 'energy network' . In Maramures, such a network, needed to run a regional action plan can be established.

SECTION 5 CONCLUSIONS AND RECOMMENDATIONS

The peer review, see sections before, can be summarized in a SWOT analysis. A SWOT analysis is a strategic planning method used to evaluate the Strengths, Weaknesses, Opportunities, and Threats involved in a project or in a business venture. It involves specifying the objective of the business venture or project and identifying the internal and external factors that are favorable and unfavorable to achieve that objective. It is the culmination of much internal analysis and external research. Thinking about the outcome, one can define SWOT analysis as the extent to which an organisations current strategy, strengths and weaknesses are relevant to the environment that the organisation is operating in.

SWOT ANALYSIS



SWOT analysis is often presented in a matrix form:

- Strengths: attributes helpful to achieving the objective(s).
- Weaknesses: attributes harmful to achieving the objective(s).
- Opportunities: external conditions helpful to achieving the objective(s).
- Threats: external conditions which could do damage to the objective(s).

A SWOT analysis may be incorporated into the strategic planning model. First, the decision makers have to determine whether the objective is attainable, given the SWOT analysis.

Based on the key findings and recommendations is the previous sections the following matrix can be made for Maramures.

SWOT analysis, based on the peer review of Maramures

	Helpful To achieving the objective	Harmful To achieving the objective
Internal origin (Attributes of the organization)	Strengths: <ul style="list-style-type: none"> • Local energy agency • Ecological awareness • Wood industry 	Weaknesses: <ul style="list-style-type: none"> • Weak infrastructure (the energy grid as well a network for cooperation/partnership) • Connection between citizens and political power • Financial solutions • Undeveloped regional energy planning and policies • Lack of (or insufficient) political impetus
External origin (Attributes of the environment)	Opportunities: <ul style="list-style-type: none"> • Potential to produce sustainable energy with small to midsize energy plants: <ul style="list-style-type: none"> ○ Biomass: wood residues and industrial and municipal waste ○ Micro hydro power • Initiative of local entrepreneurs/ the market 	Threats: <ul style="list-style-type: none"> • Bureaucracy: Insecurity around the authorization process. • Aversion towards collective (heating) systems. • Political instability

This SWOT analysis, as part of the peer review rapport, can be used by the start of the process to develop a regional action plan.

The recommendation is to start with the development of an action plan which is a plan of whole Maramures and not from the energy agency alone: find partners, in- and outside the public domain, build a network. Create a basis for implementation. Especially when government finances are insufficient for executing the whole plan it is important to find external investors, locally or abroad (e.g EU funds).

Focus on a few topics, define realistic ambitions. Let the market cooperate in realising those targets. The government should give direction, set an example and above all facilitate the market in realising the necessary projects.

To speed up the process the following recommendations can be made:

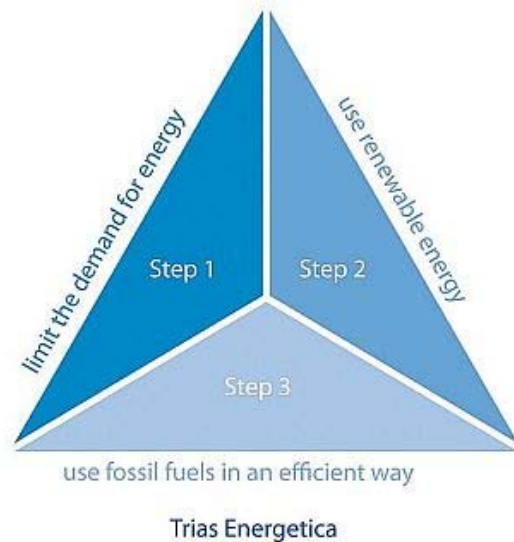
- Integrate energy efficiency, renewables and clean use of fossils (the Trias Energetica) in your own energy policy;

Trias Energetica is a way of dealing with energy.

Trias Energetica is a simple and logical concept that helps to achieve energy savings, reduce our dependence on fossil fuels, and save the environment.

The 3 elements of Trias Energetica are:

1. *Reduce the demand for energy by avoiding waste and implementing energy-saving measures.*
2. *Use sustainable sources of energy instead of finite fossil fuels or nuclear power;*
3. *Produce- and use fossil energy as efficiently as possible.*



1. Limit the Demand for Energy

It goes without saying that reducing consumption in itself is the goal. What's needed now, is to go beyond owner's "perceived needs" and into owner's "philosophical understanding" of what it means to build in an energy sustainable way. This requires the insight and knowledge into all current and foreseeable energy applications when designing facilities.

2. Use Sustainable Energy

Use natural resources wherever possible at any level, combined with reliable energy design choices.

- Apply wind power, hydro power, geothermal power, biomass where possible.
- Use aquifers for seasonal storage of surplus heat and/or cold, and use it again during the alternate season.
- Use for instance the building façade and parking lots as solar collectors, and use that energy for heating and/or cooling.

3. Use Conventional Energy with Maximum Efficiency, Compensate

After having applied the first two steps to the maximum possible, the remaining energy need, if any, will be met by applying fossil fuels as efficiently as possible, by applying state-of-the-art techniques, such as:

- Trigenation or CHCP: Combined Heating, Cooling, and Power Generation
- Low Temperature Heating, High Temperature Cooling
- Concrete Core Activation
- Use Waste Fuelled Biogas Generators

The extent to which the use of fossil fuels disturbs the balance of Carbon Dioxide is also a measure for the environmental damage caused by the airport. This effect can be fully compensated, for example by responsible planting of trees elsewhere.

- Stop making inventories of the barriers for introduction of renewables, it is better to start implementing policies and transferring knowledge;
- Don't wait for breakthroughs in renewable technologies (such as in PV cells), because their performance/price ratio will increase gradually and markets are available now;
- Prefer incentives above rules: tax incentives for example have shown to be powerful means to stimulate the use of renewables and to raise "green funds"; subsidies should always be temporarily, with a phase-out scheme;
- Whenever rules have to be established (such as energy performance of buildings and equipment): make sure all relevant parties are involved in establishing them and introduce them step-by-step;
- Prefer Joint Ventures above Joint Implementation, where possible: a PV solar home system project should be based on the benefits for the local population and the cooperation between a foreign and local firm, rather than on the CO2 benefits, which are perceived as a preoccupation of the developed countries;
- Seek strategic cooperation between developed and developing countries, at equal level, to transfer policy ideas, share incentive measures, transfer technologies and build up local capacity through exchange of people and knowledge.

ANNEXES

ENERGY STRATEGY OF ROMANIA

NATIONAL STRATEGY FOR ENERGY EFFICIENCY

FIRST NATIONAL ACTION PLAN FOR ENERGY EFFICIENCY (2007 – 2010)

ELECTRICITY LAW