



Renewable Energy Sources and Stimulation of the Rational Use of Energy in Mountainous Communities to support their Sustainable Development

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Lillehammer, September 2010

Fossil Fuels and Climate Change

And [energy] is superhuman in the sense that humans cannot create it. They can only refine or convert it. And they are bound to it by one of the paradoxes of religion: they cannot have it except by losing it; they cannot use it except by destroying it.

Wendell Berry, "The Use of Energy," The Unsettling of America 1977

We used to fear that there were enough nuclear weapons on earth to destroy the planet. But now we know that there is enough oil, gas and coal to do pretty much the same job.

*Andris Piebalgs, European Commission for Energy,
(SET Plan Conference, Stockholm, 21-22 October, 2009)*

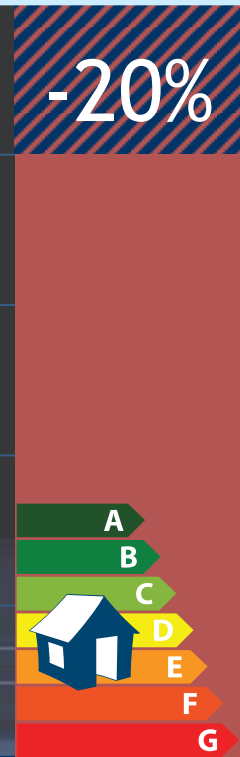
Outline

- ❖ **The 20-20-20 EU Policy Target by 2020;**
- ❖ **The Project;**
- ❖ **Involved Communities;**
- ❖ **Why Energy Sustainable Mountainous Communities;**
- ❖ **RES/RUE Projects' Impact on Sustainable Development;**
- ❖ **Best Practice Case Studies in Mountainous Areas;**
- ❖ **Paving the Way towards Sustainability;**
- ❖ **Conclusions.**

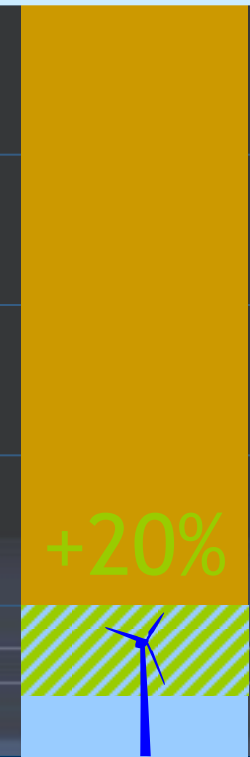
The 20-20-20 EU policy by 2020



Greenhouse gas levels



Energy consumption



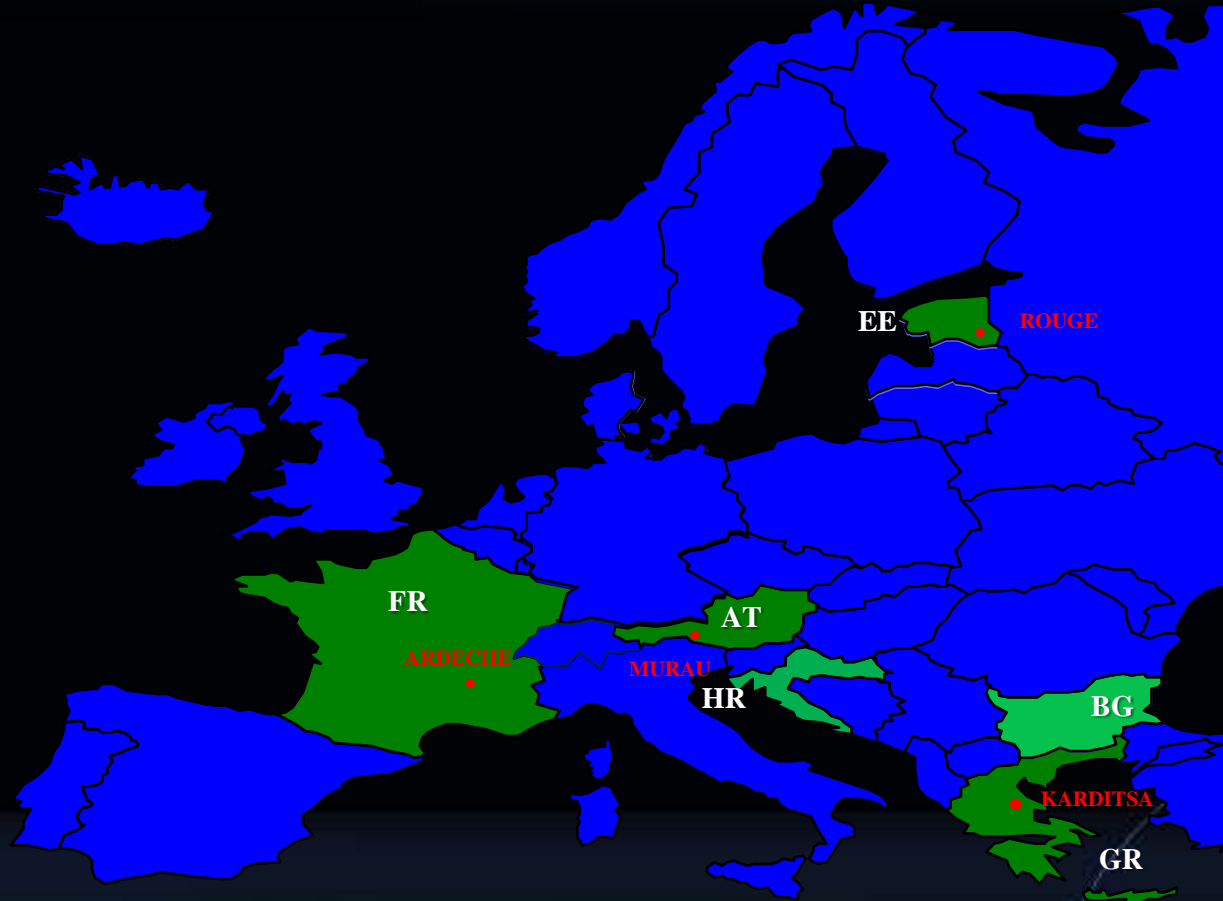
RES in energy mix

100%

The Project

- ⇒ **Summary:** RES and RUE stimulation of mountainous – agricultural local communities of the European Union (EU), in a way that will ensure both the integrated and balanced evolution in the most common dimensions (economical – employment, environmental, social and technological) of the Sustainable Development (SD);
- ⇒ **Carried out:** Under the Intelligent Energy for Europe Programme, managed by the Executive Agency for Competitiveness and Innovation;
- ⇒ **Start – End Dates:** 1/12/2007 - 30/11/2009;
- ⇒ **Coordinator:** EPU-NTUA;
- ⇒ **Number of Partners:** 9.

Involved Communities



Implementation Communities



Dissemination Communities



Why Energy Sustainable Mountainous Communities [1/4]

Local Development

- ➔ Development of new infrastructure and utilization of the already available;
- ➔ Creation of an environmentally friendly profile for the area, targeting eco tourism and therefore, stimulating the local economy;
- ➔ Secure jobs, new jobs in new markets, while existent jobs are saved;
- ➔ Reduction of the migration of inhabitants;
- ➔ Future perspectives for local youth.

Environmental Protection

- ➔ Reduction of the region's pollution, thus improving the citizens' quality of life;
- ➔ Sustainable management of natural resources.

Why Energy Sustainable Mountainous Communities [2/4]

Economic Benefits

- ➔ Development of new markets;
- ➔ Creation of investment opportunities for local businesses and enhancement of regional development;
- ➔ Waste utilization from several production stages, contributing to the creation of a circular economy.

Energy Sustainability

- ➔ Management of regionally produced energy quantities;
- ➔ Independence of compatible energy resources and the impacts of international energy crisis.

Why Energy Sustainable Mountainous Communities [3/4]

Safeguarding of jobs through target- oriented energy policy



Heating Oil



Natural gas facilities



Wood chips-,
pellets-, split logs
tiled stoves

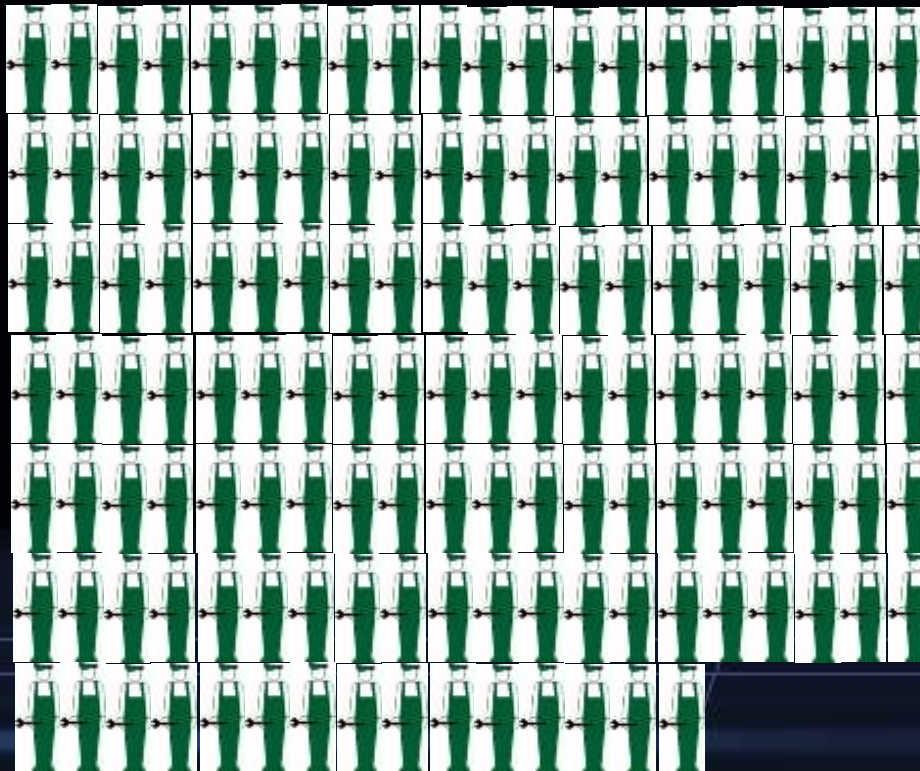
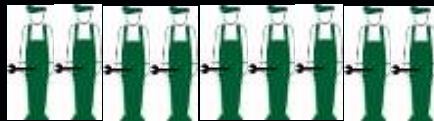


biomass-
district
heating



Micro net
contracting

9



1
3
5

Example:

Municipality with 10.000 inhabitants,
4.000 apartment units,
communal- & industrial buildings,
40 MW heating power

Why Energy Sustainable Mountainous Communities [4/4]

Biomass Gasification

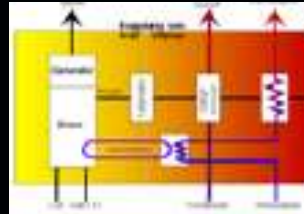


Bioethanol



Residues

Energy Production



Pellets Production



Ashes Utilization

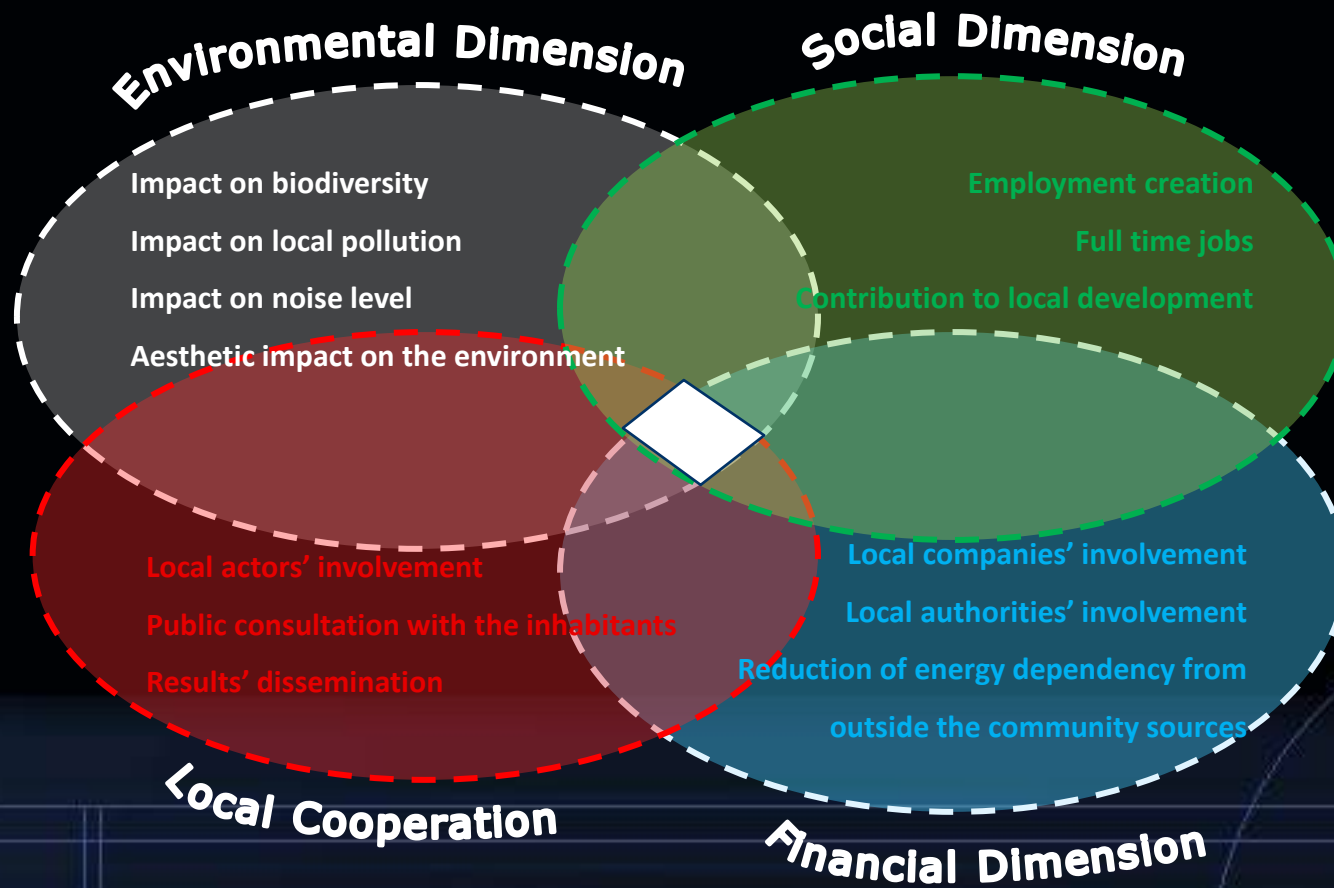


Raw Material Supply

Innovative Circular Economy for Processed Wood

RES/RUE Projects' Impact on Sustainable Development

The Framework



Best Practice Case Studies in Mountainous Areas (1/9)

Energy Vision Murau (Austria)

- ➔ The energy vision for Murau in 2002 intended to cover 100% of the region's energy needs by RES until 2015;
- ➔ Involved local stakeholders include: Regional energy agency (EAO), associations of farmers, local politicians, SMEs of the construction sector etc;
- ➔ In 2006, 57% of the heating needs were covered by RES;
- ➔ Budget 2002-2008: 190.000 euros for co-ordinating and monitoring the action.



The major participants



Best Practice Case Studies in Mountainous Areas (2/9)

Biomass CHP for District Heating (Austria)

- ➔ 8 MW of installed thermal power for district heating purposes;
- ➔ 750 kW of electric power fed into the grid;
- ➔ Raw material: reprocessed wood from sawmills as well as wood chips;
- ➔ 350 clients, Murau community.



Steam turbine

Best Practice Case Studies in Mountainous Areas (3/9)

Modular System for a Biomass – Solar Heating System (Austria)

- ➔ Available in sizes of 15 – 1000 kW heat load;
- ➔ Coverage of space and water heating needs;
- ➔ Container includes wood-pellet or wood chip boiler including chimney, in combination with a solar panel and buffer storage;
- ➔ Very easy installation (1 day).



[http:// www.eao.st](http://www.eao.st)



Best Practice Case Studies in Mountainous Areas (4/9)

Biomass Innovative Logistics (Austria)

- ➔ Farmers' association operating the St. Lambrecht district heating and biomass distribution;
- ➔ Modern pump truck for wood chips logistics, with a flexible pipe of 20 meters length;
- ➔ Dustless blow in of wood chips;
- ➔ Ability to reach storage rooms away from road, allowing the much more flexible integration of biomass boilers to older homes.



[http:// www.eao.st](http://www.eao.st)

Best Practice Case Studies in Mountainous Areas (5/9)

Wind Park (Austria)

- ➔ Tauern wind park. At 1.900m elevation is the highest wind park in Europe;
- ➔ 11 windmills of 1,75 MW each – Total capacity of 19,25 MW – 40.000 MWh annually;
- ➔ Mean wind speed of 7 m/s;
- ➔ Basic obstacles: Difficult accessibility of the site and its arduous climate for construction and maintenance.



Best Practice Case Studies in Mountainous Areas (6/9)

Building Retrofitting (France)

- ➔ Choice of high environmental quality insulation materials: hemp wool and wood wool;
- ➔ Wood chips boiler;
- ➔ Use of efficient appliances;
- ➔ Use of double glazing;
- ➔ Installation of a system for lighting control (presence sensors etc).



Best Practice Case Studies in Mountainous Areas (7/9)

Hydroelectricity Plant (France)

- ➔ Installed capacity of 500kW – 1,5 GWh produced annually;
- ➔ Construction of fishes' and canoes' paths;
- ➔ Investment of 1 million euros;
- ➔ Monitoring takes place on crucial parameters. Depending on the river flow, sluices are adjusted in an automated way.



Canoe path



Best Practice Case Studies in Mountainous Areas (8/9)

Ground Source Heat Pumps (Estonia)

- ➔ 220 kW of installed capacity for the heating purposes of a primary school;
- ➔ Annual heating production of 620 MWh;
- ➔ Installation of 2,4 km of ground pipes and 3,5 km of floor pipes;
- ➔ Budget: 112.000 euros.



Best Practice Case Studies in Mountainous Areas (9/9)

Cardoon (wild artichoke) energy crops (Greece)

- ➔ Pilot crops from the University of Thessaly in several areas in Greece – Application also in Romania (Fetesti, Craiova);
- ➔ Cardoon is a resistant weed, characterized by its low demand in irrigation, fertilization and pesticides;
- ➔ Planted once every 10 years, harvested annually;
- ➔ Lower calorific value: 16,5 MJ/kg;
- ➔ $T_{opt} = 15-25^{\circ}\text{C}$ - $T_{min} = -10^{\circ}\text{C}$.



Paving the Way towards Sustainability [1/2]

Energy Concept, Vision

Project Implementation

Regional Energy Agency, Regional Development Agency

RUE/RES-
Project

Key
Player

RUE/RES-
Project

Key
Player

RUE/RES-
Project

Key
Player

Individual Players

Paving the Way towards Sustainability [2/2]

Establishing the action plan

- ⇒ **Step 1:** Establish the management team;
- ⇒ **Step 2:** Vision conception;
- ⇒ **Step 3:** Preliminary energy inventory;
- ⇒ **Step 4:** Mission quantification;
- ⇒ **Step 5:** Detailed data collection;
- ⇒ **Step 6:** Developing the action plan;
- ⇒ **Step 7:** Implementation of the action plan;
- ⇒ **Step 8:** Monitoring and evaluation of the action plan.

Conclusions

- ➔ Mountainous/ agricultural communities possess unprecedented dynamics for RES/RUE utilization;
- ➔ RES technologies with potential for mountainous communities include mainly the utilization of biomass, wind, solar and hydroelectricity;
- ➔ RUE technologies mainly focus on buildings' insulation and bioclimatic architecture;
- ➔ Behind every successful project there is at least one very committed and decisive person;
- ➔ The development and implementation of an action plan, with involvement of all community actors, is the only way to achieve and sustain the energy vision.

Thank you for your attention

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Project's Website: <http://sustainablemountains.epu.ntua.gr/>