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Measures taken to reach the "Climatic changes and clean energy" objective from the National Strategy of Sustainable Development, in Region V West Romania

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Abstract – In 2005, after a long debate, the European Committee has adopted a revised proposal of the Goteborg Strategy from the year 2001. As a result of this process, the European Union Council has adopted on June 9th 2006 the Renewed Strategy of Sustainable Development for an extended Europe.
"Climatic changes and clean energy" is one of the objectives that will have to fulfil these horizons. The aim of this paper is to establish what measures are taken in Romania to reach the established Horizons in the Region 5 West.
Key words: sustainable development, clean energy, climatic changes.

I. INTRODUCTION

In 2005, after a long debate, the European Committee has adopted a revised proposal of the Goteborg Strategy from the year 2001. As a result of this process, the European Union Council has adopted on June 9th 2006 the Renewed Strategy of Sustainable Development for an extended Europe.
In the context of the decisions made by the European Union Council, the National Strategy of Sustainable Development seeks to achieve the following strategically objectives on short, medium and long term:
Horizon 2013: organically integration of the principles and practices on sustainable development in the Romanian ensemble of programs and regulation as European Union member.
Horizon 2020: reaching the actual medium level of European Union countries regarding the main indicators of sustainable development.
Horizon 2030: significant approaching to that year medium level of the European Union members by Romania regarding the sustainable development directives.
"Climatic changes and clean energy" is one of the objectives that will have to fulfil these horizons. The aim of this paper is to establish what measures are taken in Romania to reach the established Horizons in the Region 5 West.

Region 5 Vest is located in the western part of Romania at the Hungarian and Serbia&Muntenegru border and it contains four counties: Arad, Caraş-Severin, Hunedoara and Timiş. Region 5 Vest has the following extreme points: the southern extremity of the region is located in the Berzasca locality, Caraş-Severin - 44º35'12" Nordic latitude, the northern extremity in Berechiu locality, Arad - 46º38' Nordic latitude, the western extremity in Beba Veche locality, Timiş - 20°15' easterly longitude, and the southern extremity near the Petroşani locality, Hunedoara - 23º easterly longitude.
The region has a surface that totalize 32.034 km^2, representing 13,44% of Romanian territory. Timiş County is as surface the largest in our country (3,65% of national territory), while Caraş-Severin county is in third place (3,56% of national territory), Arad county, is the sixth (3,25% of national territory) and Hunedoara county occupies 2,96% from our country territory.

II. MATERIAL AND METHOD

According to the Frame Convention of United Nation regarding the climatic changes, approved in Romania in 1994, climatic changes are defined as changes due to direct or indirect human activities that affect the atmosphere composition at global level. Despite the present efforts to decrease the green house gases, the global temperature will continue to grow making necessary all the efforts to adapt at the climatic changes effects.
For Romania a country that is member of the EU is highly important to connect to the general frame of the energetically communitarian policies with four major objectives on a medium and long term: to increase the energy supply safety and the critical infrastructure; to increase the competitiveness in the energy area; to decrease the impact for the environment and integration on the regional energy market.

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The main strategically directions in the area of energetically politics were Romania must canalize his efforts according to the objectives and regulations at European Union level are the following:

- Energy security**:** maintaining national sovereignty over the primary resources of energy and respecting the national options in the energy area, increasing the stability for the national energy offer and maintaining an acceptable level on imports dependence on by diversifying the sources of import, the energy resources, the national and regional networks for transportation routes and regional cooperation to protect critical energy infrastructure;
- Sustainable development**:** Improving energy efficiency throughout the production chain - resources – transmission – distribution - final consumption by optimizing production and distribution processes and reducing the total primary energy consumption compared to the products or services, increasing the share of energy produced from renewable resources in total consumption and in the production of electricity, rational and efficient use of primary non-renewable resources and the gradual decline of their share in final consumption, promoting the production of electricity and heat in cogeneration plants of high efficiency, energy recovery of secondary resources, support research and development and innovation in the energy sector, with emphasis on increasing energy efficiency and environmental awareness, reducing the negative impact of energy on the environment and compliance with obligations in reducing emissions of greenhouse gases and emissions of air pollutants;
- Competitiveness: Continue development and improvement of competitive markets for electricity, natural gas, oil, uranium, coal, energy services, promoting the renewable sources through the green certificates in the context of regional integration, preparing the market for white certificates on the efficient use of energy, participation in Community scheme for trading emissions of greenhouse gases, the liberalization of energy transit and ensuring consistent and non-discriminatory access of market participants to transmission, distribution and international interconnections, energy infrastructure development, further restructuring and privatization in the sectors of electricity, heat and gas, further restructuring in the extraction and use of lignite in order to increase profitability and capital market access, setting up regional power exchange and continued participation in the process of strengthening the Romanian market European energy.

Through consistent measures to increase energy efficiency it will result a reduction in final energy consumption by 13,5% during 2008-2016 compared with 2001-2005 average consumption level in accordance with the first National Action Plan Energy Efficiency 2007-2010. These objectives will be achieved through legislative measures, regulations and voluntary agreements, expansion of services for energy savings, financial instruments and cooperation.

Based on national policies and strategies at regional and local level will be promoted the modernization of cogeneration and district heating systems using high-efficiency technologies. Energetic rehabilitation of at least 25% from the multi-storey buildings fund will ensure the significant energy savings, reducing carbon dioxide emissions and increasing affordability of energy bills for consumers. It will implement a new system of social assistance, uniform and targeted to ensure the necessary coordination between various authorities to reform the current system of energy subsidies and aid to vulnerable consumers. Special attention will be given to rural energy policy, aiming at upgrading heating systems eco-efficient housing and affordable energy supply costs.

By encouraging selective investments will ensure the commissioning of new power generating capacity based on clean technologies, with a major impact on reducing emissions of greenhouse gases and emissions of pollutants and the safety of operation of power system nationally.

Regarding the renewable energy, according to the legislative package presented by the European Commission on 23 January 2008, Romania is obliged to prepare and present to the European Commission a National Action Plan with an indication of the share of renewable energy in the transport, electricity, heating and cooling, as well as measures to be taken to achieve these objectives, by 31 March 2010. With the overall objective of the EU-target is that 20% of total energy consumption come from renewable sources by 2020, new objectives for Romania in the period 2012-2020 will comply with the targets agreed in the distribution of Member states responsibilities. In 2010, the share of renewable resources in Romania will be about 11% of the total consumption of primary energy will reach 11.2% in 2015. The application of "green certificates" will boost the share of electricity produced from renewable sources at 9-10% of final electricity consumption compared to the amount of electricity sold to consumers, given that the central mechanism of trading green certificates market, operating since 2005. In addition, legislation requires that providers are required to purchase annually a number of green certificates equal to the product of the value of mandatory quota, the EU agreed to distribute responsibilities between Member States on promoting renewable energy, and the annual quantity of electricity supplied to consumers end. Romania will participate actively in the EU internal negotiations on the adoption in 2009 of the legislative package "Climate change and renewable energy sources" presented by the European Commission on 23 January 2008. At the same time, Romania will participate, through the EU at international negotiations under the UN (Framework Convention and Kyoto Protocol) to agree in late 2009 in Copenhagen, a new global agreement on climate change for setting targets reduction of greenhouse gas emissions and further actions needed in the post 2012.

Adaptation to climate change is a complex process because the severity of effects varies from one region to another, depending on physical vulnerability, the degree of socio-economic, natural and human adaptive capacity, health services and mechanisms disaster surveillance. Since 2007, issues addressed at European level and adaptation to climate change by adopting a Green Paper by the European Commission.

The document provides for action at EU level concentrates on four areas:

- Integration of adaptation into sector policies;
- Integrating adaptation in EU Member States' foreign policy, aimed at neighboring countries;
- Reducing uncertainty through the development of research in the field;
- The involvement of the society, business and public sector in preparation of coordinated and comprehensive strategy on adaptation.

Sectors vulnerable to climate change in Romania and which require more detailed analysis are: biodiversity, agriculture, water resources, forestry, infrastructure, construction, transport, tourism, energy, industry.

Consideration should be given to poor communities who depend largely on the direct use of local natural resources. They have limited means of subsistence and limited ability to cope with climate variability and natural disasters.

Estimating the impact of climate change on Romania in a study conducted by the Romanian Academy were selected different atmospheric general circulation models that best reflects the conditions of our country. According to the results generated by these models in terms of doubling the CO_2 concentration in the atmosphere are expected for the coming decades, global average temperature increase of between 2,4 and 7,4˚C. Projected changes in temperature will occur at regional and local level will affect ecosystems, human settlements and infrastructure. Climate change will affect all sectors of the economy will lead to periods of vegetation change and displacement of the dividing lines between forests and meadows. Extreme weather events (storms, floods, droughts) will occur more frequently, and the risks and damages incurred, may become more significant.

Areas affected by drought in recent decades have expanded in Romania, the most exposed being in the southeast, almost the entire country being affected by prolonged drought. With floods, long periods of drought lead to significant economic losses in agriculture, transport, energy, water, health and household work. Impacts on agriculture

Agriculture is the most vulnerable sector studies highlighting the following issues:

• For the wheat crop, an increase of production of around 0,4 to 0,7 t/ha and a growing season decreasing with 16 to 27 days;

• For irrigated maize crop, grain production increased from 1.4 to 5.6 t/ha, a decrease in growing season of between 2-32 days, a decrease of the growing season between 2 - 19%, values are estimated based on the model used;

• For irrigated maize crop, the results depend on models used and the conditions of sites chosen for data collection.

To analyze the potential impacts on agricultural productivity of main crops in Romania were used several agro meteorological models.

Effects on forestry

In Romania, 26,7% represents the area covered by forests, which are distributed unevenly across the country (58,5% in the mountains, 27,3% and 6,7% in the hilly area in the lowlands). Forest area is 6,366,888 ha, of which 6,249,236 ha is occupied by forests and 117,652 ha by forest culture, production and management. It is predicted a significant drop for low forest areas and hilly forest productivity after 2040, due to increasing temperatures and precipitation.

Effects on water management

Hydrological consequences of increased CO_2 concentration in the atmosphere are significant. Modeling the effects of this phenomenon was carried out focusing on the main river basins. Results show the likely effects of changes in precipitation and evapotranspiration. Maximum monthly flows are estimated during spring - summer to late winter. It also notes that in September the lowest leakage occurs from the case so far, when, very often, the minimum flow in was in winter.

Effects on human settlements

Industrial, commercial, residential and infrastructure (including energy and water supply, transport and disposal) are vulnerable to climate change in different ways. These sectors are directly affected by changes in temperature and rainfall regime, or indirectly through the general impact on the environment, natural resources and agricultural production. The sectors most vulnerable to climate change impacts are construction, transport, oil and gas exploitation, tourism and industries located in coastal areas. Other possible affected sectors are food industry, wood processing, textiles, production of biomass and renewable energy. Romania ratified the United Nations Framework Convention on Climate Change (UNFCCC), assuming the commitment to achieve its objective: "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic climate system, level should be done in a timeframe sufficient to allow ecosystems to adapt naturally to climate change, so that food production is not threatened and economic development to take place in a sustainable manner."

Also, Romania has ratified the Kyoto Protocol by Law no. 3/2001, assuming stronger commitments to stabilize greenhouse gas emissions, the establishment of measures, targets and clear periods to reduce emissions of greenhouse gases. Thus, the commitment to reduce greenhouse gas emissions for the period 2008-2012 is 8% below base year 1989, to harmonize with EU measures, reducing emissions of greenhouse gases with the same percentage.

During the year 2007 were implemented a series of actions aimed at: improving the national system for estimating emissions of greenhouse gas inventory and

national implementation of the scheme of emissions trading of greenhouse gas emissions and Development Plan NAP, the functioning of the national registry, development of the Guide on adaptation to climate change, continued participation in flexible mechanisms under the Kyoto Protocol, public awareness on climate change impacts and adaptation. The establishment of national system for estimating anthropogenic emissions of greenhouse gas emissions by sources or removals of carbon dioxide sequestration (SNEEGHG) were set tasks and ways of cooperation between institutions involved in this process, the necessary data to build reports , the procedural steps for the estimation of anthropogenic emissions of greenhouse gases, reporting, processing, archiving and storage of data contained in the National Inventory of Greenhouse Gas Emissions Greenhouse (INEGES). The purpose SNEEGHG administered by the National Agency for Environmental Protection is to ensure transparency, consistency, comparability, completeness and accuracy INEGES and compliance and obligations assumed by Romania under the Kyoto Protocol and/or under Community legislation on estimation of anthropogenic emissions of greenhouse gas emissions by sources or removals of carbon dioxide sequestration.

III. RESULTS AND CONCLUSIONS

Compared to the commitment under the Kyoto Protocol, the total emissions of greenhouse gases (without absorbing forests) decreased by 44.42% in 2006 compared with 1989. Based on these observations, there is thus a strong possibility for Romania to meet its obligations to reduce greenhouse gas emissions for the first commitment period, 2008 - 2012, without additional measures to reduce emissions. As obvious from Fig. 1 the decline of economic activities and energy consumption in the period 1989 to 1992 directly caused decrease in total emissions. Some energy intensive industries reduced their activities and this has resulted in reducing greenhouse gas emissions. Emissions began to increase until 1996, with the revitalization of the economy. After commissioning of the first reactor of the "Cernavoda"" Nuclear Power (1996) and further structural reforms needed at the national level, emissions began to decrease again until 1999. After 1999, the trend reflects the economic growth during 1999-2006.

Trend in total annual emissions of greenhouse gases is shown in Figure 1. The sectors for which we estimated levels of emissions/removals by sequestration of greenhouse gases are: energy, industrial processes, solvent and other products, agriculture, land use, land use change and forestry (abbreviated by LULUCF) Sector waste. Levels of total annual emissions of greenhouse gases are specified in the table 1.

Figure 1 Emissions of total greenhouse gas emissions (without LULUCF)

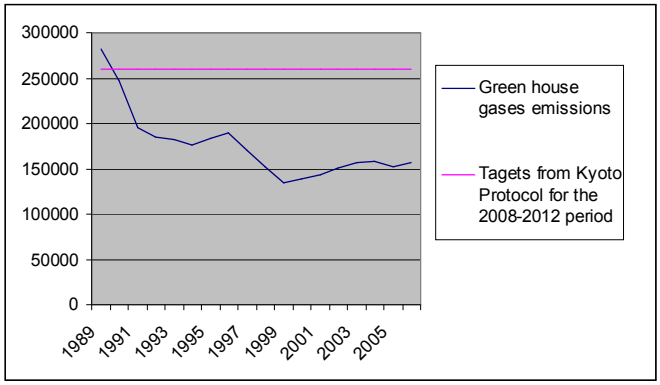


Table 1 Levels of total annual emissions of greenhouse gases, 1999 - 2006, thousand tones CO2 equivalent

Anul	1999	2000	2001	2002	2003	2004	2005	2006
Total emission (excluding LULUCF)	134.611,66	138.718,56	14.3724,84	150.010,01	156.892,19	158.752,12	151.980,80	156.680,02
Total emission (including LULUCF)	95.099,25	100.430,42	104.419,64	113.174,57	120.407,92	122.983,98	114.497,99	119.185,14

Sectors contribution to the overall emissions of greenhouse gases at 2006 levels and trends are presented in Fig. 2 and 3.

Figure 2 Sectors contribution to the overall emissions of greenhouse gases in 2006

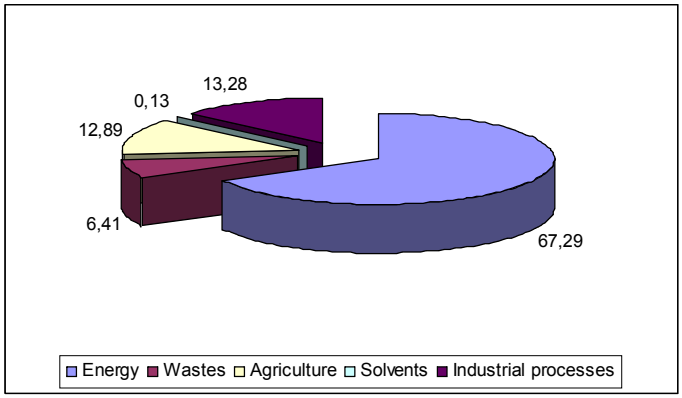
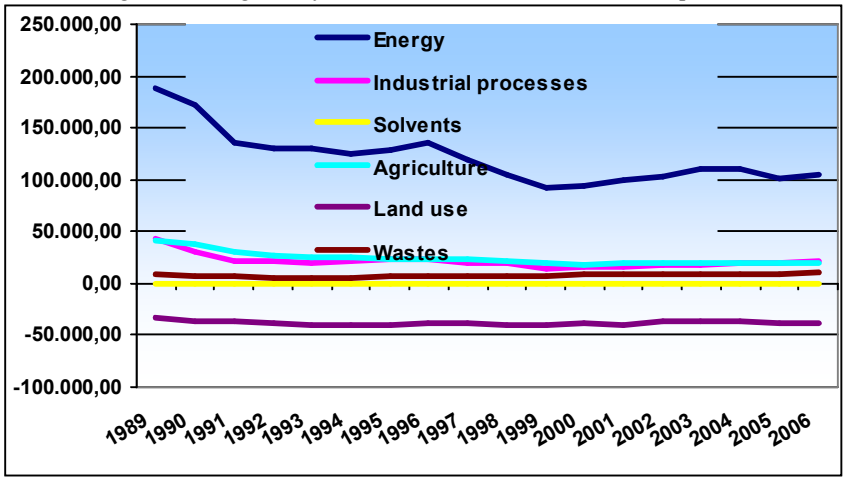


Figure 3 Trends in emissions of greenhouse gases by sector, in thousand tones of CO_2 equivalent



It is apparent that energy sector is the most important sector in terms of emissions of greenhouse gases. It is responsible for 67% of total emissions of greenhouse gases nationally in 2006. Emissions from this sector decreased by 44% the level in front of 1989 (base year). Industrial Processes sector contributes 13% of total emissions of greenhouse gases. The sector has important decrease emissions of greenhouse gases in 2006, compared with the base year (a decrease by 53% front 1989). The reason for this is represented by a decrease or cessation of certain industrial decline.

Agriculture sector also registered a decrease of emissions of greenhouse gases. In 2006 this level presents a decrease of 50% compared with the base year. In 2006, 13% of emissions of greenhouse gases come from this sector.

LULUCF sector: the amount of greenhouse gases absorbed increased by 15% in 2006 compared with the base year. Emissions from the waste sector have increased over the period 1989 - 2006 by 20% and the contribution of this sector to total emissions of greenhouse gases at the national level is 6% for 2006.

Romania will continue to contribute effectively, according to international agreements in force and community in implementing common EU objectives on climate change by reducing emissions of greenhouse gases and implement adaptation measures to climate change. By increasing energy efficiency, primary energy consumption will be reduced by 30% and final energy consumption by 26% compared with the average consumption in 2001-2005. It will generalize efficient lighting lamps. It will expand the use of clean electricity and heat production based on renewable energy and power plants with very low carbon emissions, with features to capture and geological storage of carbon dioxide. We continue to build hydro plants and design to process 15-20% of hydropower potential but unrealized arrange. In order to cover electricity demand and consumption for economic development will be carried out additional 2 units of nuclear power. The heat will continue rehabilitation of about 40% of fund existing multi-storey buildings and passive building development projects or very low energy consumption (15-50 kWh per square meter and year).

In order to reduce costs and mitigation measures to limit emissions of greenhouse gases, the Kyoto Protocol provides for the use of three flexible mechanisms: Joint Implementation (JI), Clean Development Mechanism (CDM) and International Emissions Trading (IET). These mechanisms are "voluntary", which means that countries formulate

and implement its own policy regarding their use or not. JI and CDM mechanism helps to reduce emissions by developing specific projects in eligible countries where conditions are more favorable performance. Romania has been successfully involved in the implementation of investment projects for Joint Implementation projects in collaboration with different countries to achieve the transfer of technology to reduce emissions of greenhouse gases and thus to improve energy efficiency and environmental quality. Thus, they concluded 10 Memoranda of Understanding with Switzerland, Netherlands, Norway, Denmark, Austria, Sweden and France, Italy, Finland and the World Bank's Prototype Carbon Fund (Prototype Carbon Fund). Projects carried out under this mechanism favors revamping the areas where earning. For Romania, JI consists of the modernization, rehabilitation, improving energy efficiency and implementing new technologies, construction of cogeneration facilities and thermal conversion of CHP plants, switching fuels in power generation plants or industrial facilities the use of low-carbon fuels, the heating systems, promoting non-conventional energy and power generation facilities construction type clean energy, landfill methane recovery urban rehabilitation and groups of thermal efficiency, reducing greenhouse emissions agriculture sectors, energy, transportation, reforestation actions.

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