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European experience in biomass applications and the lessons learned Romania's experience

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1. General Data

Romania is situated in the geographical center of Europe (south-eastern part of Central Europe):

- north of the Balkan Peninsula
- half-distance between the Atlantic Ocean and the Urals
- on the lower Danube course
- it has exit to the Black Sea.



Fig.1



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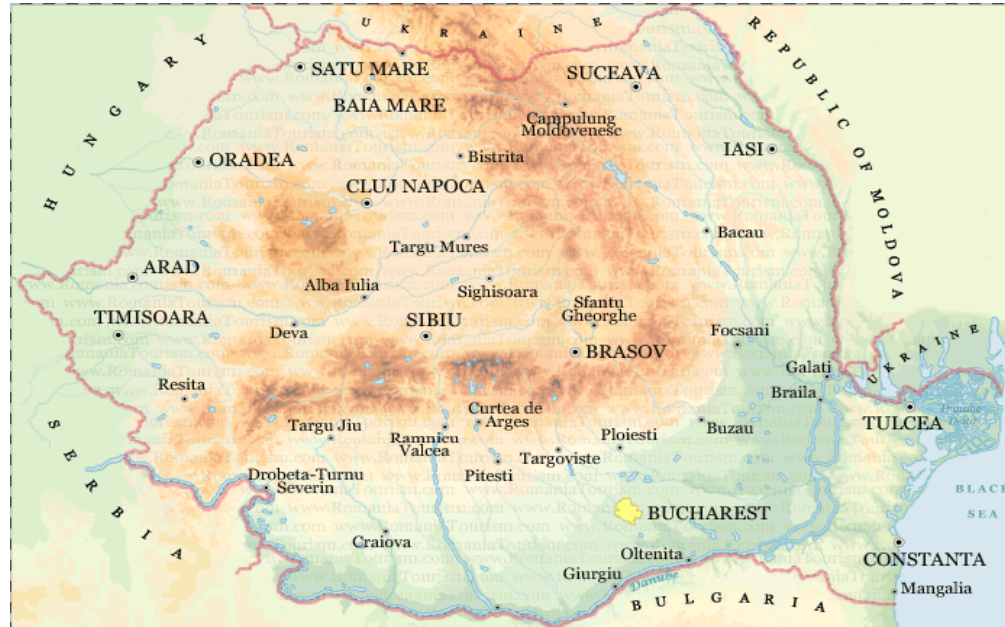


Fig.2

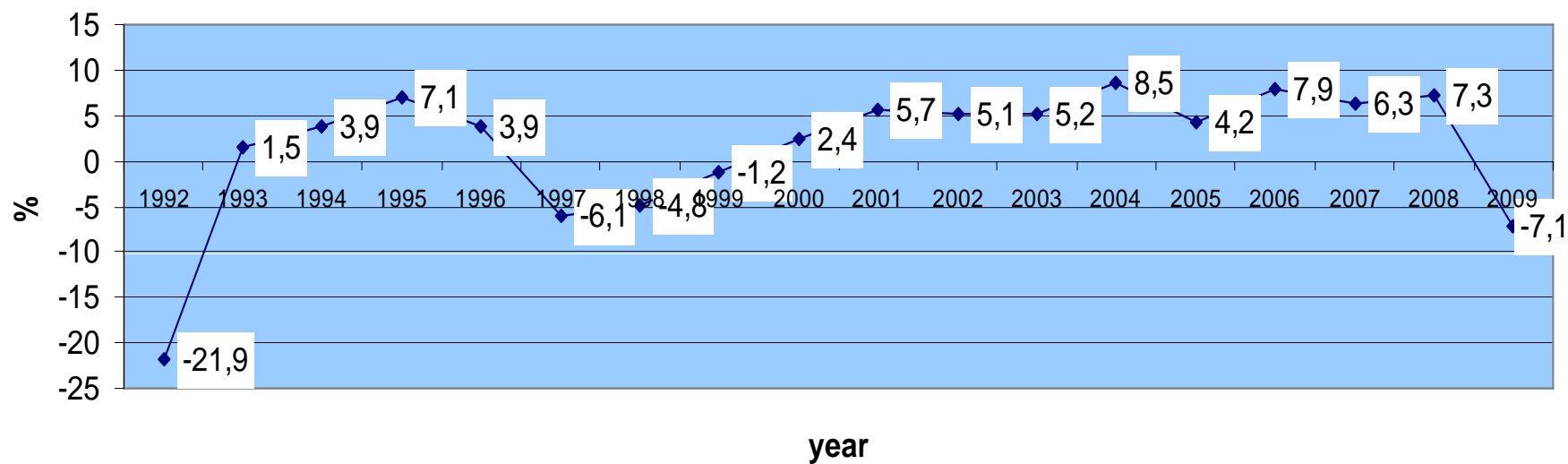


Population: 21.5 million (the seventh in EU)
Area: 238,391 sq km (the ninth in EU)
Capital: Bucharest (1.9 mil. inhabitants)
42 counties
8 development regions
Semi-presidential Republic
Two-house Parliament
22.12.1989 – overthrow of communist dictatorship (Ceausescu regime)
1. 01. 2007 Romania becomes a EU Member State



2. Macroeconomic evolutions

Fig. 3 Annual growth rate of GDP (1992-2009)



Source: Romanian Statistical Yearbook



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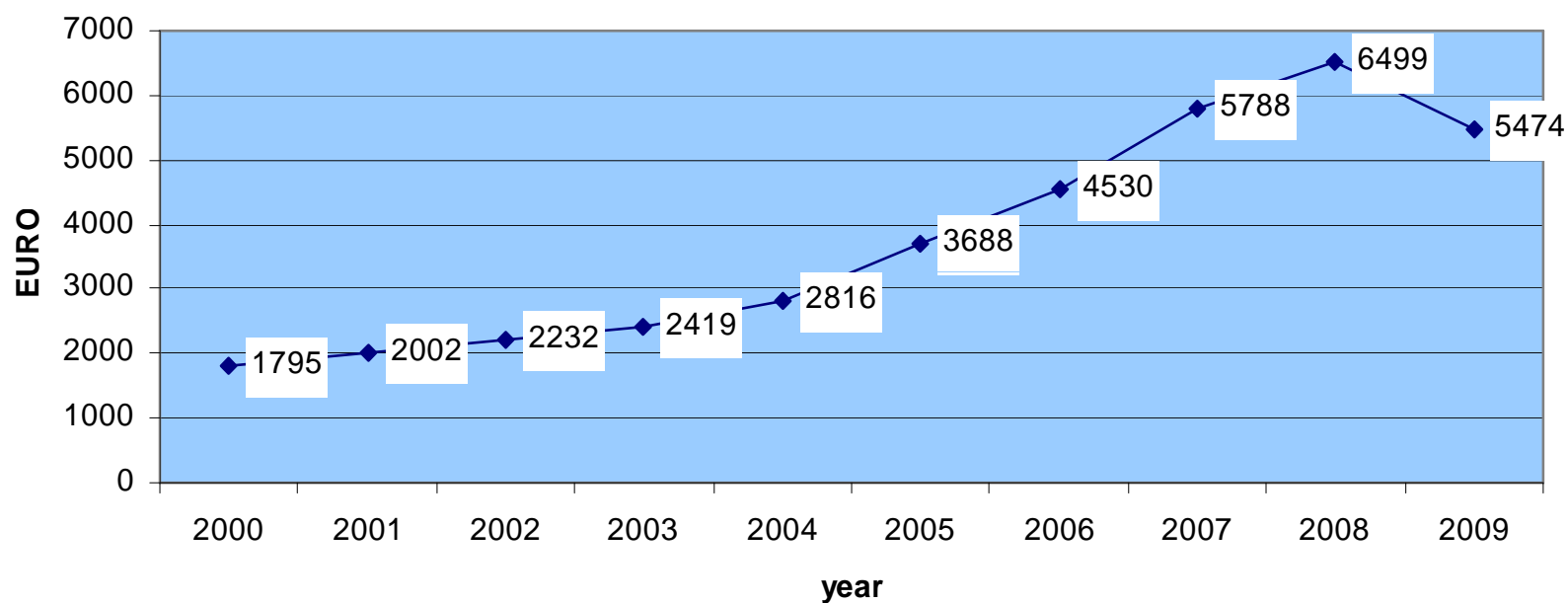


- **Romania's economic evolution after 1990 has been strongly influenced by the phenomena specific to the period of transition to the market economy.**
- **The periods of economic growth have alternated with periods of recession.**
- **The first two recessions (1990-1992 and 1997-1999) were due to the economic reorganization specific to the transition to the market economy. The latest recession (2009-2011) has been registered in the context of the international economic crisis.**
- **Nevertheless, the period between 2000 and 2008 was characterized by a constantly positive evolution.**



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Fig. 4 GDP Euro/capita in Romania (2000-2009)



Source: *ICEMENERG* using data from *Romanian Statistical Yearbook*

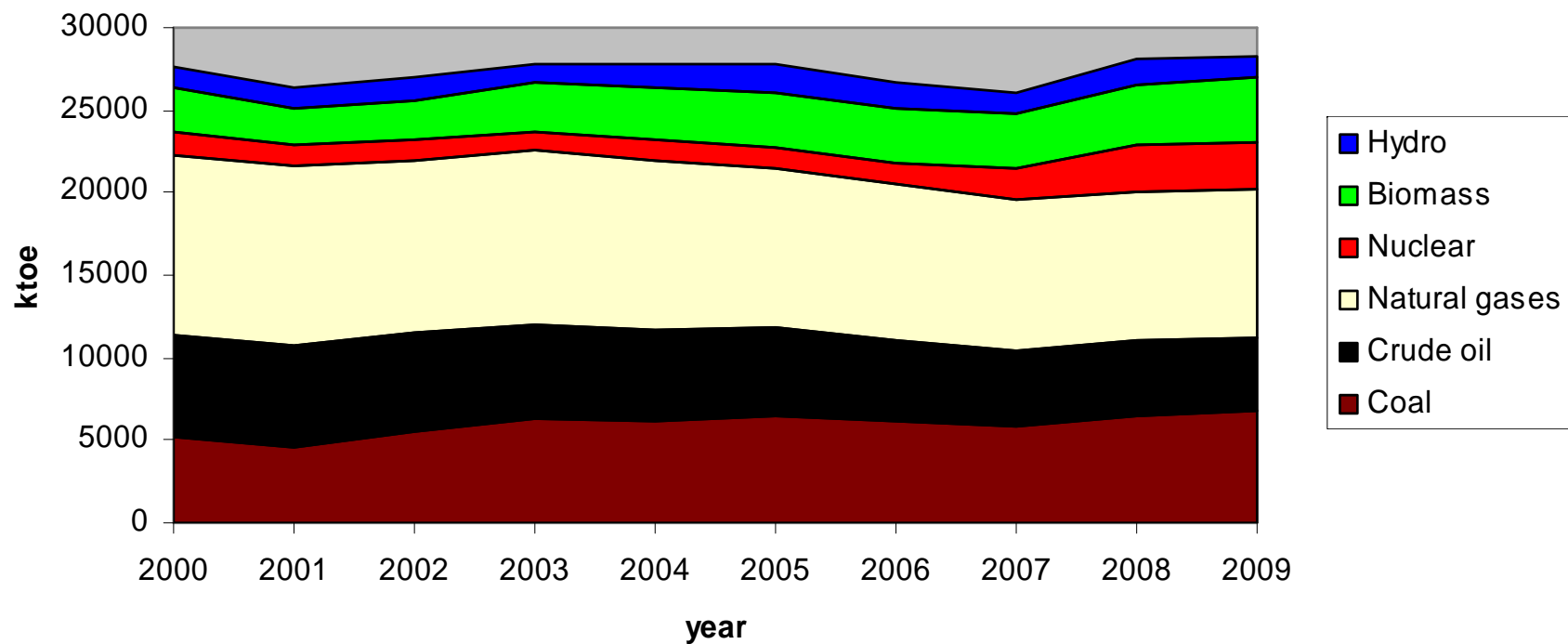


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3. Energy production and consumption

Fig. 5 Primary energy production in Romania (2000-2009)



Source: National Statistics Institute-Energy Balance



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- In the last decade Romania's production of primary energy ranged between 27 and 29 million toe.
- Romania was an important oil and natural gas producer at the European level but production began to decrease after 1970 due to the depletion of the gas deposits and oilfields. Oil production lowered to 6.1 mil toe in 2001 and 4.4 mil toe in 2009 (against 14 mil toe in 1973), while natural gas production decreased from 10.9 mil toe in 2001 to 8.9 mil toe in 2009. It is estimated that this production decreasing trend is irreversible.
- The coal industry underwent a deep-going restructuring process between 1997 and 2000 and has registered a slight increasing tendency this decade (from about 6,2 mil toe to 7 mil toe). It is estimated that the coal production will stabilize at this value.



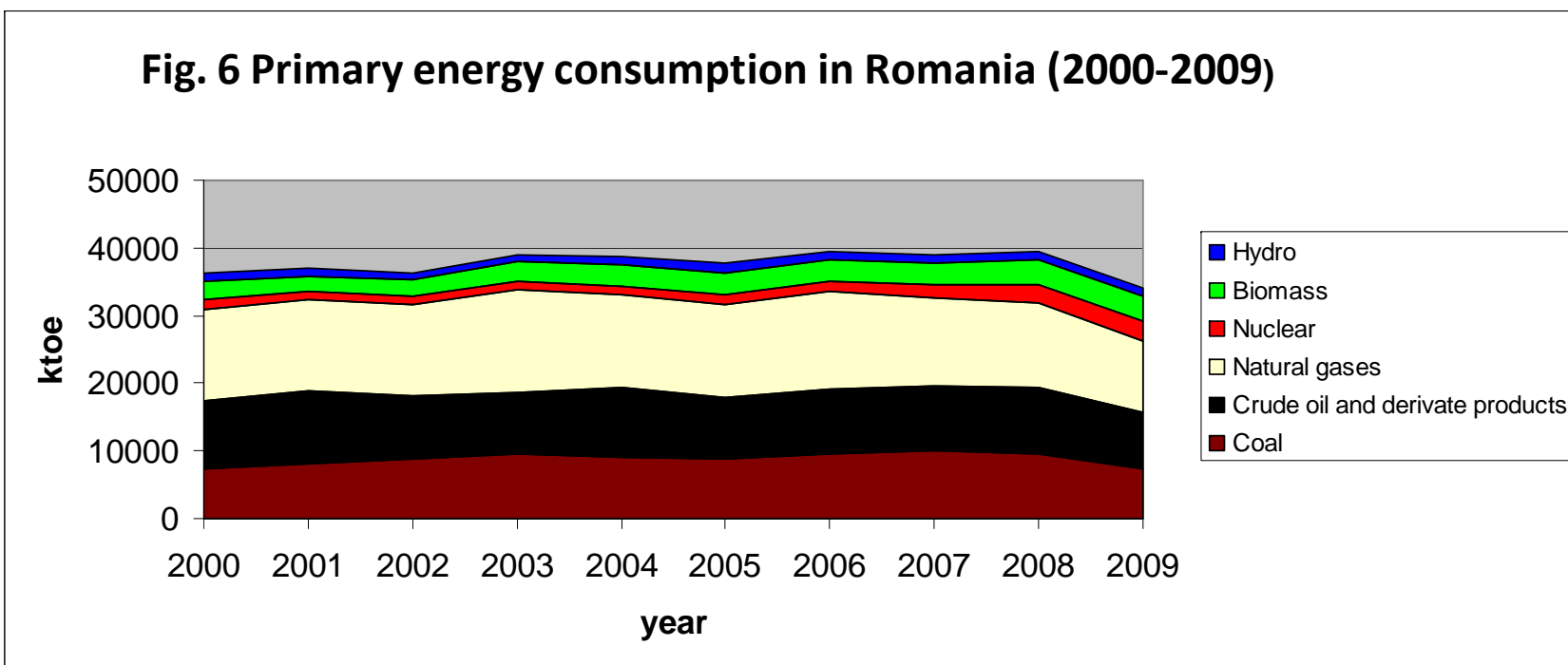
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- **Romania uses nuclear energy for producing electricity by means of the CANDU technology. Two 708 MW units are in operation at the Cernavoda NPP. Within this decade two more units, 3 and 4, are planned to be commissioned.**
- **The main renewable energy sources used in Romania are hydro energy (for electricity production) and biomass (for heat production). The biomass (fire wood) is used on a large scale in Romania, especially in the rural area. The technologies used are the traditional ones. Important development projects for the valorization of renewable energy sources are underway in the context of Directive 2009/28/EC application.**



Fig. 6 Primary energy consumption in Romania (2000-2009)



Source: National Statistics Institute-Energy Balance



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- **Primary energy consumption increased from 36.4 mil toe in 2000 to 39.8 mil toe in 2008, but it registered a sudden decrease to 34.3 in 2009 due to the economic crisis.**
- **Energy consumption (39.8 mil toe in 2008) is higher than energy production (28.9 mil toe in 2008), Romania being an importer; it imports natural gas and oil.**
- **Natural gases have the greatest share within consumption, but this share is decreasing (from 37.71% in 2000 to 31.20% in 2009).**
- **The share of biomass increased from 7.62% in 2000 to 10.97% in 2009.**



4. Biomass production and consumption

Fig. 7 Biomass consumption in Romania (2000-2009)

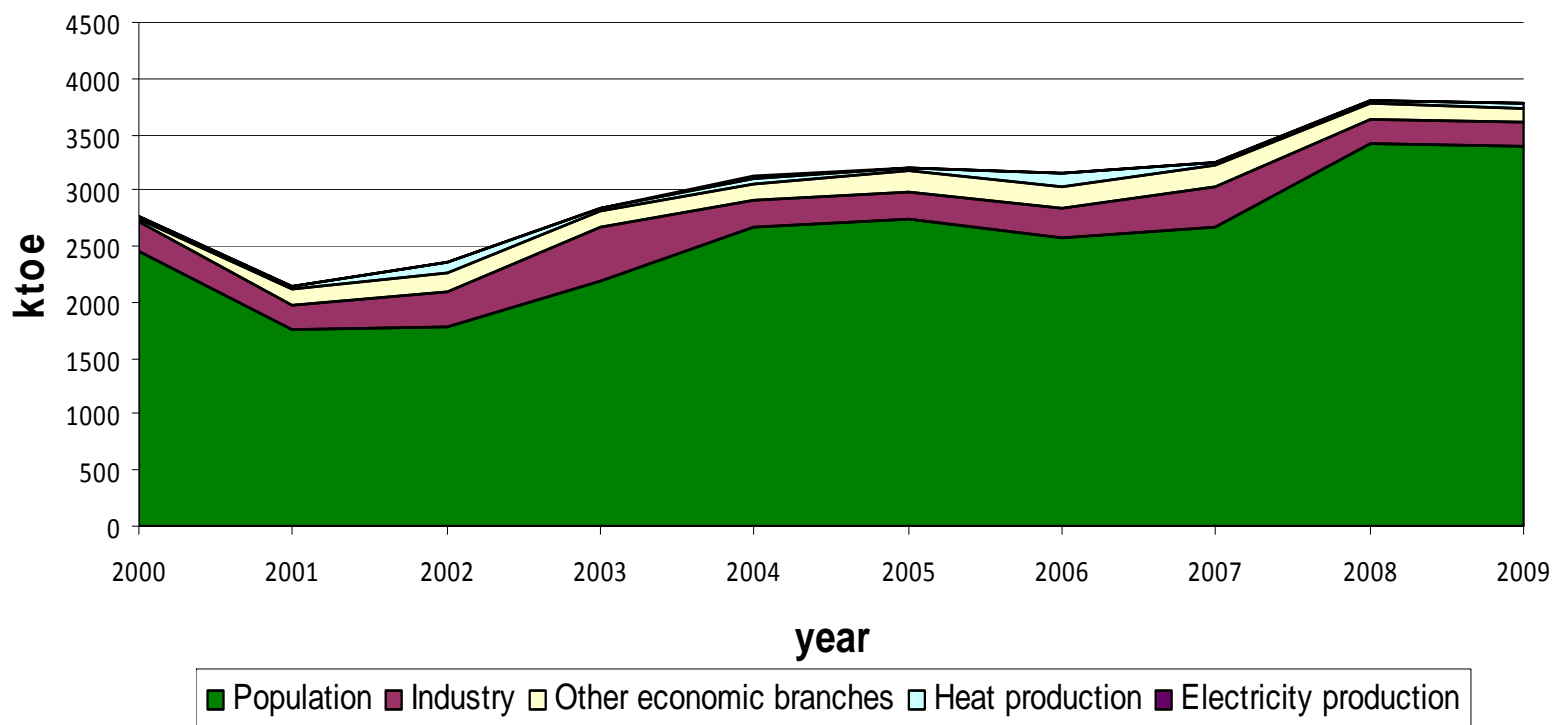
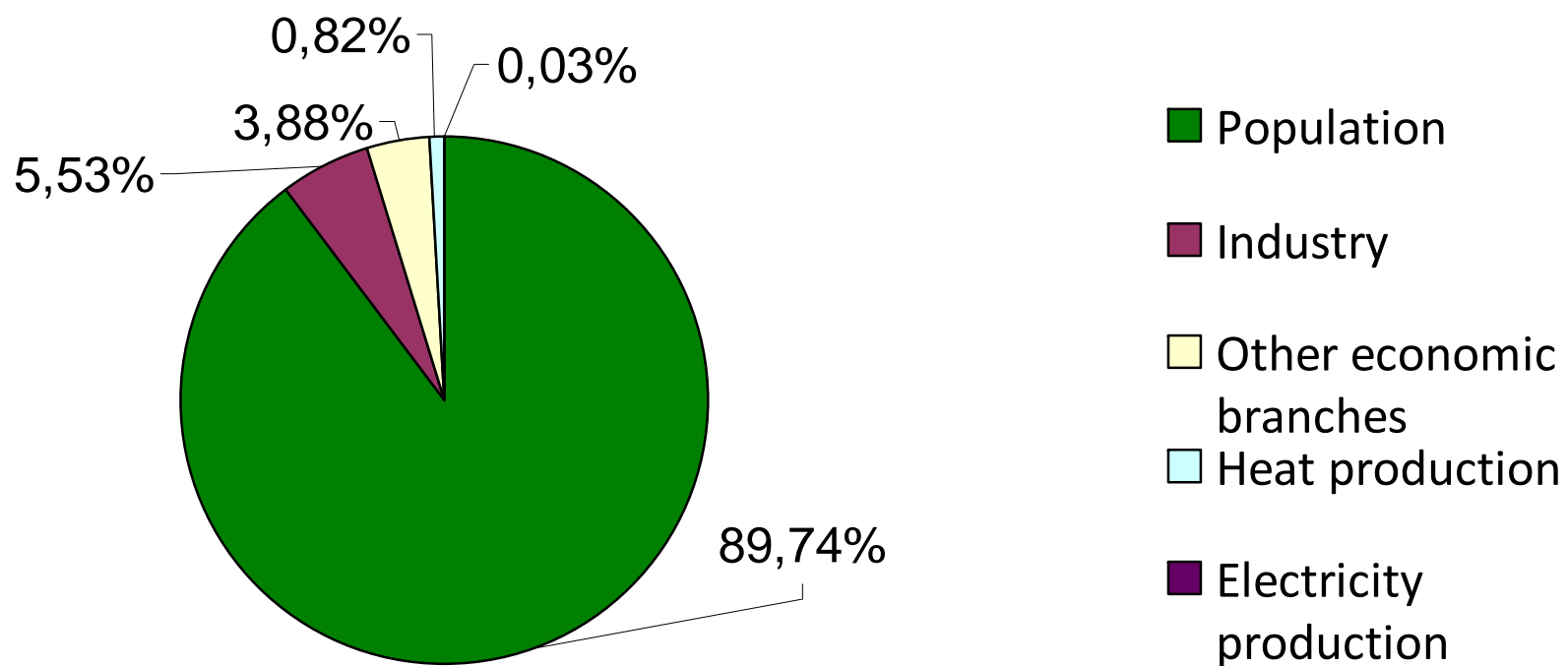




Fig. 8 Structure of biomass utilization in Romania in 2008





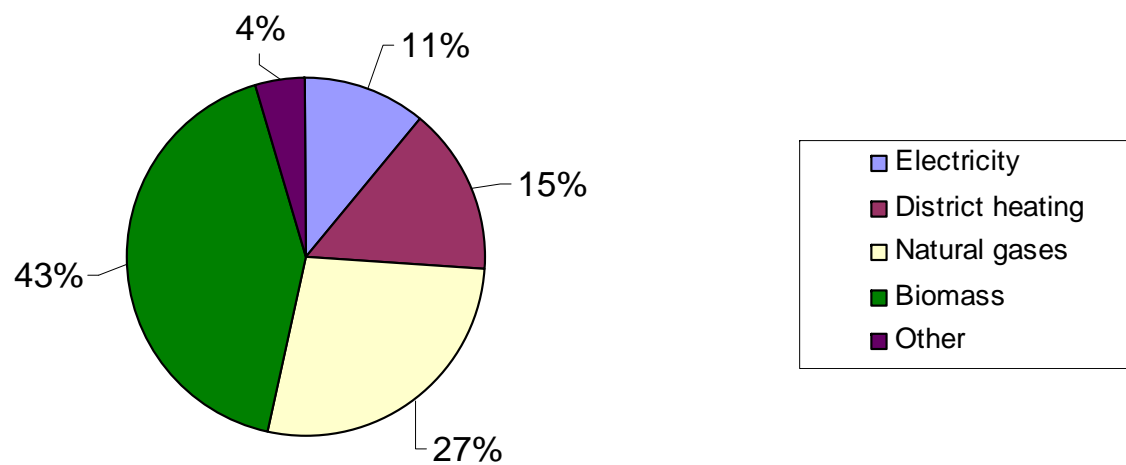
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- **Biomass consumption for energy purposes in Romania increased by 75% between 2001 and 2009 (figure 7).**
- **An important role was played by the reduction in the state energy subsidies for the natural gases, electricity and heat delivered to the population through the district heating systems. The consumers, the population primarily, have oriented towards an accessible and cheap form of energy.**
- **About 90% of biomass is consumed by the population living in rural areas and at the outskirts of the urban localities by means of traditional technologies (figure 8).**
- **The share of the biomass burnt in the district heating systems or highly efficient cogeneration power plants is below 1% (figure 8).**



Fig. 9 Structure of energy consumption of Romania's population in 2008





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- **Biomass represents the main form of energy used by the population in Romania, with a share of 43% within the total population consumption (figure 9).**
- **If we take into consideration the fact that the population in the great towns does not use biomass, there results that in the rural areas and the small towns the share of biomass represents 80-90% of the energy consumption.**
- **Expansion of good practices on biomass utilization is essential to the increase in the standard of civilization of the Romanian population and would enable Romania attain its targets in compliance with the provisions of the Directive 2009/28/EC as a EU Member State (24% of gross final energy consumption at the national level should be covered from renewable energy sources).**



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5. The official documents on the promotion of the renewable energy sources valorization in general, and of biomass in particular

- **Strategy for the valorization of the renewable energy sources**
 - **Approved by the Government in 2003 in the context of the negotiations for Romania's becoming a EU Member State which has a time horizon by 2015.**
 - **It contains an estimation of the RES potential in Romania according to which the biomass energy potential is of about 7600 thousand toe, 52% of the total potential of RES, respectively.**
 - **In order to carry out the objectives specific to the energy use of biomass the following activities are considered a priority:**
 - » **Increase in the available biomass amount by growing energy plants on degraded land areas, agricultural land or land that has been taken out from the agricultural use;**
 - » **Diversification of biomass forms with an energy potential tested in pilot units through burning/gaseification, etc.;**
 - » **Promotion of combined burning of coal and biomass;**
 - » **Organization of campaigns for promoting utilization of biomass advanced technologies.**



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- **Romania's energy strategy for the period 2007-2020**

Utilization of RES for building heating should be correlated with the measures for increasing building energy efficiency. In the case of the existing buildings, heat losses during the cold season and excessive heating during the warm season should be diminished. For this, the roofs (rather cheap) and the walls should be insulated, the doors and windows sealed and double glazing used. As regards the new buildings, the building thermal insulation standards should be observed and continuously improved. The authorities should support the workers' training in order to be able to apply the energy efficiency measures.

Biomass is the main fuel used in rural areas. Biomass is used for heating and hot water preparation, as well as for cooking. Biomass can be easily transformed into solid, liquid or gaseous fuels. In the future, great amounts of biomass will be turned into more convenient fuels.



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The measures considered for the promotion of renewable energy sources at the national level are:

- **Increase in the level of RES valorization by means of facilities granted in the investment stage, access to the grid included;**
- **Improvement in the green certificate market for the electricity produced from RES and injected into the network for attracting the private capital in the RES investments;**
- **Promotion of certain support mechanisms for utilizing the renewable energy sources in the production of heat and hot water for domestic use;**
- **Utilization of structural funds.**



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- **The Government Ordinance 22/2008 on energy efficiency and promotion of renewable energy sources utilization**

Stipulates, among other things, that the Local Public Authorities from the localities with a population with more than 20, 000 inhabitants have the obligation to develop programmes for improving energy efficiency and turning to better use the renewable energy sources available at the local level.



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- **The programmes include actions in the following main directions :**
 - **Promotion of the highest energy efficient technologies;**
 - **Encouraging investments financed through the participation of the state or the private sector;**
 - **Promotion of highly efficient cogeneration and of measures necessary for increasing efficiency of heat production, transport and distribution to consumers;**
 - **Promotion of RES utilization by the final consumers;**
 - **Establishment of specialized departments at the corresponding levels, with trained personnel, able to develop, implement or monitor the programmes;**
 - **Diminishing environmental impact;**
- **Such programmes are also frequently developed by the local authorities from towns with less than 20,000 inhabitants.**



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6. Barriers to biomass utilization for energy purposes

- **Difficulties in the implementation of the waste collection system**
- **Issues related to biomass utilization for the supply of the district heating systems**
 - **In the rural areas and in many small urban localities there are no such district heating systems. In the period of centralized economy the district heating systems were developed in many localities where industrial complexes had been built together with the blocks of flats for the employees working there. The supply source included a thermal power plant that mainly supplied the respective industrial unit. When these industrial units were closed the entire district heating system was closed too. At present, the population has installed its own individual heating systems (usually small apartment heating plants burning natural gas). The rebuilding of the district heating systems represents a very difficult task due to its costs and the population acceptance.**



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- **Financial constraints that impede investments**

- **The low financial possibilities of the population/local authorities.**

- **There are financial support funds (structural funds, funds from the state budget), but it is difficult to access them:**

- » **the development of the necessary documentation usually surpasses the professional training of the employees of a local authority/ physical persons and hiring of consultants requires supplementary funds that represent non-eligible costs**

- » **all the costs need to be firstly paid by the applicant following to be reimbursed only after the completion of the project**

- » **Getting credits (loans) from the banks is difficult for the applicants as they require bank guaranties; the interest rate is very high (more than 10% usually and , about 15-20%)**



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- **Financial constraints in the operational stage**
 - **Utilization of modern technologies/equipment for the valorization of biomass for energy purposes implies the commercial acquisition of heat produced from biomass in the district heating systems, or of burning products obtained from biomass. Even if the investment is not carried out from own funds, the population (with low payment possibilities) from the small localities is reserved as to using commercial energy implying a systematic payment of the product/ service obtained, regardless of its price. In cases where it is possible to obtain local biomass through the non-commercial chains, these chains are usually preferred even if the technologies/ equipment have been technically surpassed and worn out.**
 - **The low income of the population makes the current issues (such as food procurement in the first place) an absolute priority.**
 - **The issues relating to the use of modern biomass-based technologies/equipment should be integrated into the major issues of economic competitiveness and financial force increase at the level of the small localities.**



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- **Low capacity of the local authorities and small localities**
 - Reduced number of employees
 - Permanent restructuring and salary reductions on the background of an economic crisis
 - Relatively poor professional specific training
 - Limited financial resources
- **Mentality issues**
 - During the period of communist dictatorship an ample propaganda was carried out according to which the ecological issues were “a characteristic” of the capitalist countries, generated by the drive towards making a profit on the market economy with which Romania was not confronted. The ecological culture, especially in the small localities, is still at a relatively low level.
 - The process of the young population migration from the small localities towards the great towns (where the possibility to get a job and where the salaries are higher) and to other countries. The population of the small localities from Romania is old, has a low income and a low adaptability level.



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7. Ways and means to surpass the barriers (selection)

- Establishment of energy efficiency and RES valorization agencies with the statute of a non-governmental organization, which would provide counseling to the local authorities
- Participation in the European Programmes, directly or through the Regional Development Agencies existing in the eight development regions of the country
- Increasing the level of access to information, including through participation in collaborative networks
- Participation in the Covenant of Mayors (in which will participate 26 towns from Romania, out of which 6 with less than 20,000 inhabitants)
- Establishment of the national association “Energy towns from Romania”, a member of the international organization “Energie Cités”
- Support scheme for the promotion of RES utilization



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8. Support schemes for the promotion of RES utilization, biomass included

- **Support schemes in the operational stage**
 - Used only in the case of RES electricity (the system of compulsory quotas in combination with the green certificate trading). In the context of the project, this scheme applies only to electricity produced in the high efficient cogeneration plants operating on biomass.
- **Support schemes in the investment stage**
 - Used for the development of installations producing both electricity and heat.
 - The used funds are:
 - **International Funds (EU funds through the Sectoral Operational Programme – Economic Competitiveness increase through funds obtained by applying the mechanisms of the Kyoto Protocol, funds within certain bilateral programmes)**
 - **National funds (Allocations from the State budget, Environmental Fund)**



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9. Success cases of biomass utilization

Thermal plant burning wood waste in Vatra Dornei town

Vatra Dornei is a town numbering 16,500 inhabitants located in the northern part of the country in a depression between mountains. The town is an important tourist center and has an industry based on the valorization of the natural resources existing in the area (wood, milk and meat processing, mineral water springs exploitation).





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Prior to the project development the thermal energy necessary for the heating of the apartments and the hot water was supplied by six district heating thermal points that ran on light liquid fuel.

A modern thermal power plant running on sawdust from the saw mills/lumber factories in the area (including the sawdust from storage places) has been developed and logistic equipment for the sawdust and other waste collection and transport has been acquired.

The heat distribution network has been modernized and the old pipes from the basement of the blocks of flats have been replaced by new ones.



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Benefits

- **Centralized supply of thermal energy (hot water and heating), at low costs, for about 4200 inhabitants, 8 public institutions (schools, kindergartens, consulting rooms), 3 hotels and 2 treatment bases.**
- **GHG emission reduction mainly due to the reduction in the wood waste dumped in the woods whose anaerobic digestion emits methane**
- **Elimination of uncontrolled sawdust storage**



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**The total cost amounted to
EURO 4.5 million of which :**

- 36 % from the EU through the
PHARE Programme**
- 29 % from the Danish
Government within the
Joint Implementation
System**
- 25 % from the state budget**
- 10 % from the local budget.**



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The thermal power plant running on wood waste from Sebes town

Sebes is a town with a population of 22,000 inhabitants situated in the center of the country in Transylvania. The town is an important economic center in the area, industry, commerce and services being the most developed branches. In the industrial field, the wood processing, food, leather and textile companies are the most important ones.





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The Austrian company Holzindustrie Schweighofer is the leader in the wood processing industry in Romania and has developed an important production unit (subsidiary) in Sebes. This unit started operating in September 2003, being entirely completed at present.





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The factory requires a significant amount of heat, especially for the wood/lumber drying. In order to obtain it, two highly efficient cogeneration units burning biomass-wood waste have been developed in the last two years:

- Unit 1: thermal power 8.6 MW, electrical power 3.15 MW**
- Unit 2: thermal power 24 MW, electrical power 8.75 MW**

The electrical energy produced covers the own consumption of the factory entirely and the surplus is delivered to the public network thus benefiting from the green certificate mechanism (the support mechanism used in Romania).

The investment is entirely based on the private capital.



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10. Conclusions

- Biomass is the main renewable energy source available in Romania; its energy potential represents about 50% of the total potential of RES at the national level.
- Biomass is used traditionally and has a significant share in the energy balance at the national level (about 11% in 2009).
- The population burns 90% of the biomass that is annually used in Romania for heating, food preparation and hot water preparation. Biomass ensures 43% of the total amount of necessary energy but this percentage is much greater (80-90%) in the rural area and the small urban localities. Nevertheless, the technologies/equipment used are the traditional ones, their performance being low.
- Several strategies /programmes aiming at increasing the available biomass amount and implementing the new technologies/equipment, the best available practices, respectively, have been developed.



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- **The higher valorization of biomass has to remove certain barriers, among which mention should be made of the following:**
 - **Difficulties in the implementation of waste collection system**
 - **Problems relating to the utilization of biomass for supplying the district heating systems**
 - **Financial constraints on the investment development**
 - **Financial constraints on the operational stage**
 - **Mentality issues**
 - **Only partial observance of the legislation in force**
- **At the national level, support schemes have been developed both for the operational stage (variable scheme only for electricity) and the investment stage.**
- **Success cases relating to utilization of modern biomass-based technologies have already been registered and their number is expected to increase in the future.**



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Thank you!

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