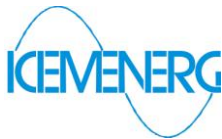




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3 bronze medal patent in EU - 2008



Energy Efficiency Policies and Measures in Romania

Monitoring of Energy Efficiency in EU 27, Norway and Croatia (ODYSSEE-MURE)

Energy Research and Modernizing Institute-ICEMENERG

Bucharest, September 2009

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1 Executive Summary

Romania's economic evolution after 1990 has been strongly influenced by phenomena specific to the period of transition to the market economy.

The evolution of consumption has been influenced by the restructuring of the Romanian economy. After attaining a maximum value exceeding 50 mil toe in 1996, the value of consumption has lately stabilized at about 40 mil toe. Natural gases have the highest share within primary energy consumption. Nevertheless, this share is decreasing (from 43 % in 1996 to 37 % in 2006). Oil product consumption has also decreased. After the measures taken for the industry restructuring between 1966 and 1999, internal lignite production stabilized at 9 Mtoe. Non-carbon energy (nuclear, hydro, wind, solar, etc) has visibly increased and this tendency will continue in the future. In 2007 the 700 MW Unit II of Cernavoda NPP was put into operation.

Industry is still the greatest energy consuming sector. During the period of centralized economy, Romania's economic development was based on the development of the great energy intensive industrial branches. The restructuring has led to a major decrease of the share of industry within the national economy (from 43% in 1992 to 33 % in 2007), in energy consumption and energy intensity in this sector.

The structure of industry underwent modifications. Thus, the share of the food industry within the total manufacturing industry increased from 23 % in 1992 to 29 % in 2006. The share of the energy intensive industrial branches within the total manufacturing industry decreased.

Nevertheless, the share of industrial consumption within total consumption, decreased from about 48% in 1992 to 40% in 2007.

The structural changes led to modifications in the end-use energy consumption, as well as to modifications of energy intensity in industry on its whole. The branches that have registered favorable economic evolutions (the food, textile and wood industries) have also registered favorable evolutions from the point of view of energy efficiency. Energy intensity in these branches has practically continuously and greatly decreased. On the other hand, the evolutions of the great energy consuming industrial branches were rather contradictory.

The residential sector is the second sector in importance relating to energy consumption (31% in 2007). The evolution of consumption in the residential sector was influenced by several factors among which evolution of family income, evolution of prices, and evolution of subsidies from the budget.

After a historical maximum in this sector of 10.6 mil toe attained in 1996, total energy consumption registered a permanently decreasing trend (7.5 mil toe in 2007).

Considering the increase in the number of dwellings at the national level, the decrease in end-use energy consumption per dwelling has been even greater.

A more in-depth analysis should consider not only the evolution of the number of dwellings, but the evolution of their average area, as well. The areas of the newly built dwellings are greater.

The factors that have been previously mentioned have determined an important decrease in the energy consumption /m² of useful area. The value of this indicator was of 22.7 kgoe/m² in 1992 and 24.9 kgoe/m² in 1996, but only 14.8 kgoe/m² in 2007, representing 59 % against 1996. In our opinion the last value characterizes the progress made at the national level concerning energy efficiency increase in the household sector in the best way.

The characteristics of consumption in the services sector are close to the residential sector and the evolutions have been similar.

The evolutions in the transport sector after 1990 have been influenced by two factors:

- Elimination of administrative restrictions against fuel procurement and acquisition of means of transport;
- Aligning of fuel prices with the prices on the international market.

Romania's connection to the international markets and economic development after 2000 has determined an important increase in the freight transport. The structure has also greatly changed and, unfortunately, this modification was not to the benefit of energy efficiency and sustainable development. The road transport has attained 73 % of the total in 2006 against 37 % in 1992. The great loser in this competition is the railway transport which has considerably diminished its activity, both in absolute value and as a share in the total activity. The passenger transport has had

a relatively similar evolution. The registered structural changes have rather led to a worsening of the energy efficiency in the transport sector.

Nevertheless, the modifications registered in the structure of the national economy and of its sectors have led to a reduction in energy intensity on the whole. An increase in energy efficiency, in the technical sense (meaning reduction of losses, increase in efficiency), was registered in all sectors.

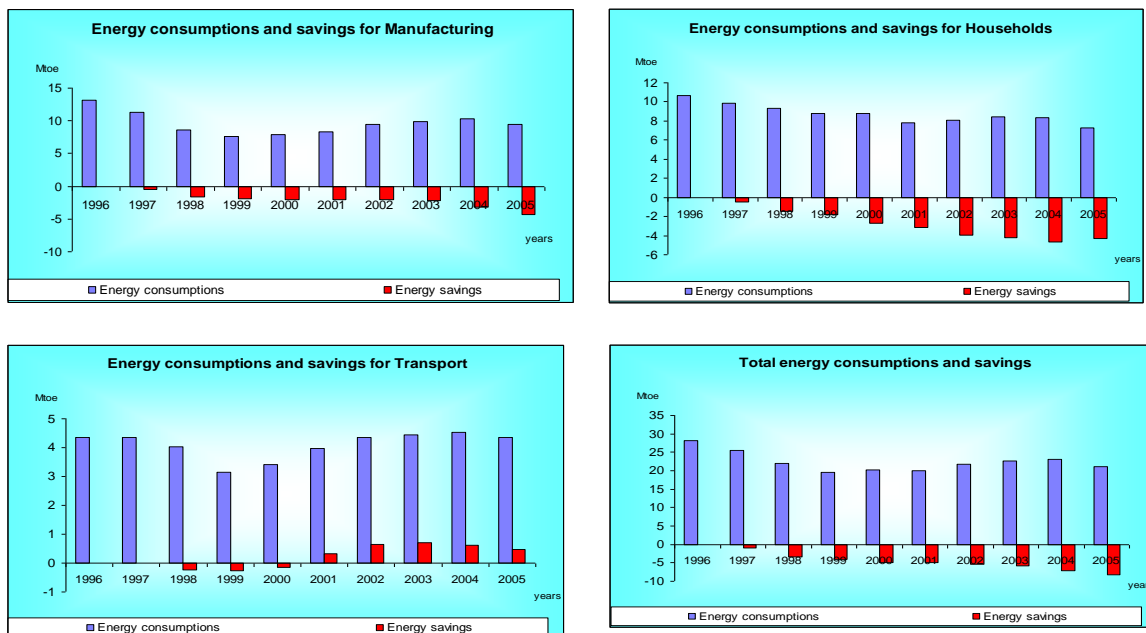
Due to these factors energy intensity diminished by 50 % between 1992 and 2007.

Nevertheless, energy intensity in Romania is still higher than in the developed countries and in particular in the EU15 countries.

Utilization of ODEX indicators in Romania has enabled the quantitative illustration of the energy efficiency policies.

There results that the residential sector has registered the most favorable evolution from the point of view of energy efficiency. By choosing 1996 as the basic year (100 %), the value of the ODEX indicator for this sector was of only 66 % in 2005. The manufacturing industry has also had a favorable evolution. The transport sector is in an unfavorable situation from the point of view of energy efficiency. In comparison with the basic year 1996 (100 %), in 2006 the ODEX indicator value was 111 %, after being 119% in 2003.

The calculation of the ODEX indicators and the sectoral energy consumption values enabled the calculation of the energy savings in physical units. These savings are presented in the following figures.



CO₂ emissions from fuel combustion in energy industries amounted to 48.61 mil. tonnes of CO₂ equivalent in 2007. During the entire analyzed period emissions tended to reduce in this sector. The trend reflects the changes that occurred in the Romanian economy, the decrease in production, respectively, in the 1990-1996 period. After 1996 emissions continued to diminish as a result of Cernavoda NPP Unit I starting operation.

The putting into operation of Cernavoda NPP Unit 2 in 2007 will contribute to the further decrease in CO₂ emissions.

The main institutions responsible for energy efficiency at the national level are:

- The Ministry of Economy;
- The Ministry of Environment;
- The Ministry of Regional Development and Housing (for the energy efficient utilization in buildings);
- The Romanian Agency for Energy Conservation (ARCE);
- The Romanian Energy Regulatory Authority (ANRE);

In 2007 Romania's Energy Strategy for the period 2007-2020 was developed and approved by the Government (GD 1069/2007).

The established strategic objectives are the following:

- Energy security;
- Sustainable development;
- Competitiveness.

As a Member State of the European Union, Romania has to translate the EU directives into its internal legislation and observe the energy policy measures established by the European Commission.

According to the EU Energy Efficiency Directive provisions, on June 30, 2007 Romania submitted the European Commission the first NEEAP.

Romania's energy saving target is given in the following table:

Romania's energy saving target

	[Thousand toe]
Average in the 2001-2005 period	20, 840
The 9% target of energy savings by 2016	1,76*
The target of energy savings adopted by Romania by 2016	2800**
The intermediate target for 2010	940***

* The minimum value according to the Directive 2006/32/EC

** 13.5 % of the average consumption 2001 – 2005, 1.5 % annually, respectively

*** 4.5 % of the average consumption 2001 – 2005, 1.5 % annually, respectively

The energy efficiency increase measures included in the first NEEAP fall into the following categories:

- Regulations
- Information and legislative measures (energy audit)
- Voluntary agreements and cooperation instruments
- Energy services for energy savings (financing with the third party, energy efficiency agreements)
- Financial instruments (subsidies, tax exemption for the issuing of the construction authorization in order to carry out thermal rehabilitation works, co-financing of works)
- The energy efficiency mechanisms and other combinations between the other subcategories (energy efficiency funds)

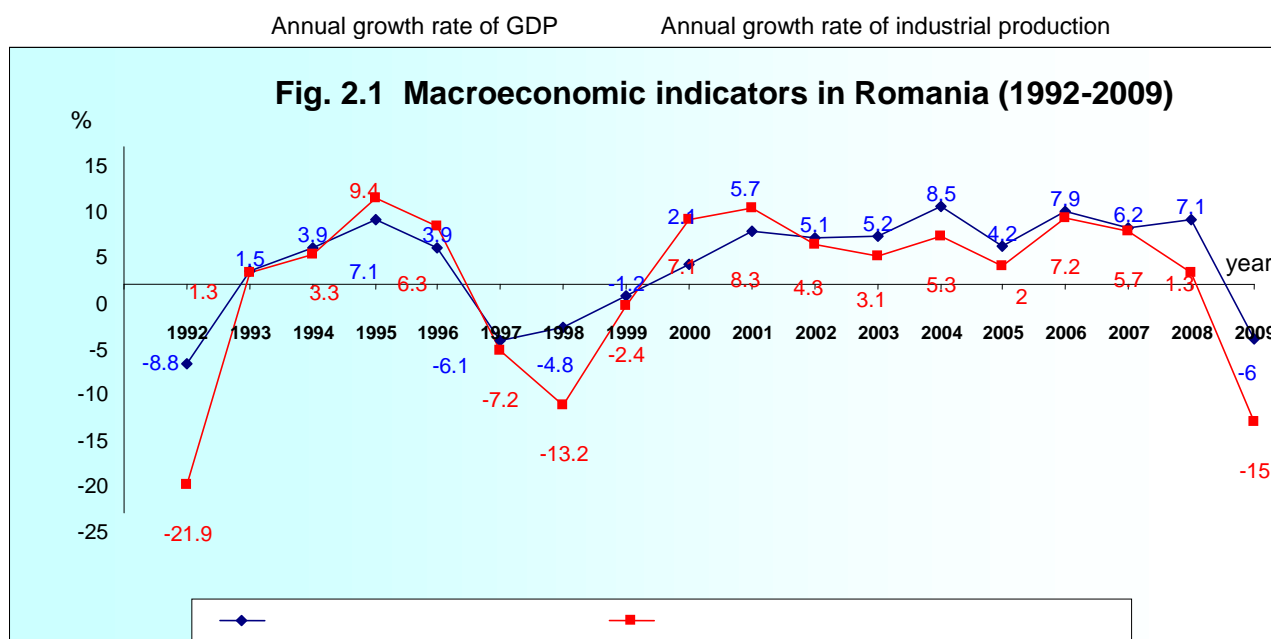
2 The Background to Energy Efficiency

2.1 Overall economic context

Romania is a country situated in South Eastern Europe numbering 21.6 million inhabitants, with an area of 238,391 km². After the fall of the communist regime, in 1989, Romania underwent a process of transition from the former centralized economy to the market economy.

Romania's economic evolution after 1990 has been strongly influenced by phenomena specific to the period of transition to the market economy. The economic reforms necessary for replacing the mechanisms of centralized economy with those characteristic of the free market, introduction of the energy efficiency principles in all activities, have resulted in a powerful recession at first, a phenomenon common to all the countries in this zone, nonetheless.

The evolution of the annual growth rate of GDP and industrial production is given in Fig. 2.1.



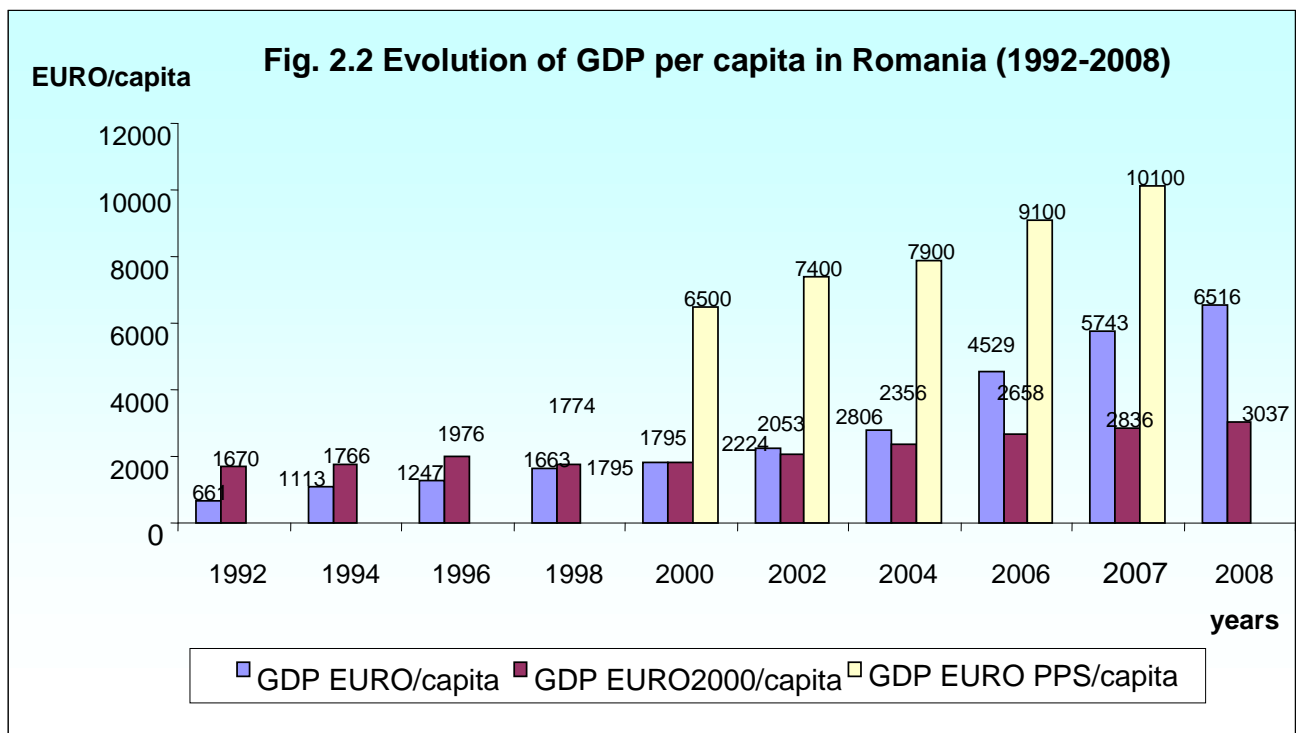
Source: Romanian statistical Yearbook and NRB site

For 2009 – estimated values

It has been established that 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-?) has been registered in the context of the international economic crisis. Nevertheless, the period between 2000 and 2008 has been characterized by a constantly positive evolution with increase rates above the EU average. This has led to the rapid increase in the GDP per capita, a significant indicator characterizing the level of development. The evolution of GDP per capita is presented in figure 2.2. Three measurement units have been used for GDP, namely:

- Current EURO, utilizing the official exchange rate of the NBR;
- EURO 2000;
- EURO PPS (EURO at the parity of the power of purchase established by EUROSTAT).

In all these instances a trend towards the increase has been noticed. The converging trend between the official exchange rate and the power of purchase is obvious. This means that there is a trend towards aligning the detail prices on the Romanian market to the average European prices. The values of the analyzed indicator are still lower than the EU 25 average values (22,700 Euro/capita).



Unfortunately, the latest signs from economy are less favorable. The global economic crisis has begun to make its presence felt as early as the IV quarter of 2008 and has accentuated in the first months of 2009. Thus, the GDP value during the IV quarter, 2008 was only by 2.9 % higher than that of the IV quarter 2007. The good results obtained during the other quarters made it possible that the increase amount to 7.1% in 2008.

The volume of industrial production produced in the IV quarter of 2008 decreased by 7.7 % against the IV quarter of 2007. In this case, too, the results of the other quarters have enabled to register a 1.3% increase in industry by over the entire year.

As we have mentioned the signs of the crisis have accentuated in the first months of the year 2009. Thus, during the first six months of the year industrial production represented only 84.6 % in comparison with the corresponding period of the previous year (provisional data). The decrease was of 13.4 %, representing a very high value. The evaluations made on the basis of the results after six months show that a decrease in the GDP of about 6 % will be registered this year. There are many discussions (in Romania and at the international level) on the extent and duration of the

crisis. At present, it is considered very risky to develop certain scenarios on future economic evolutions.

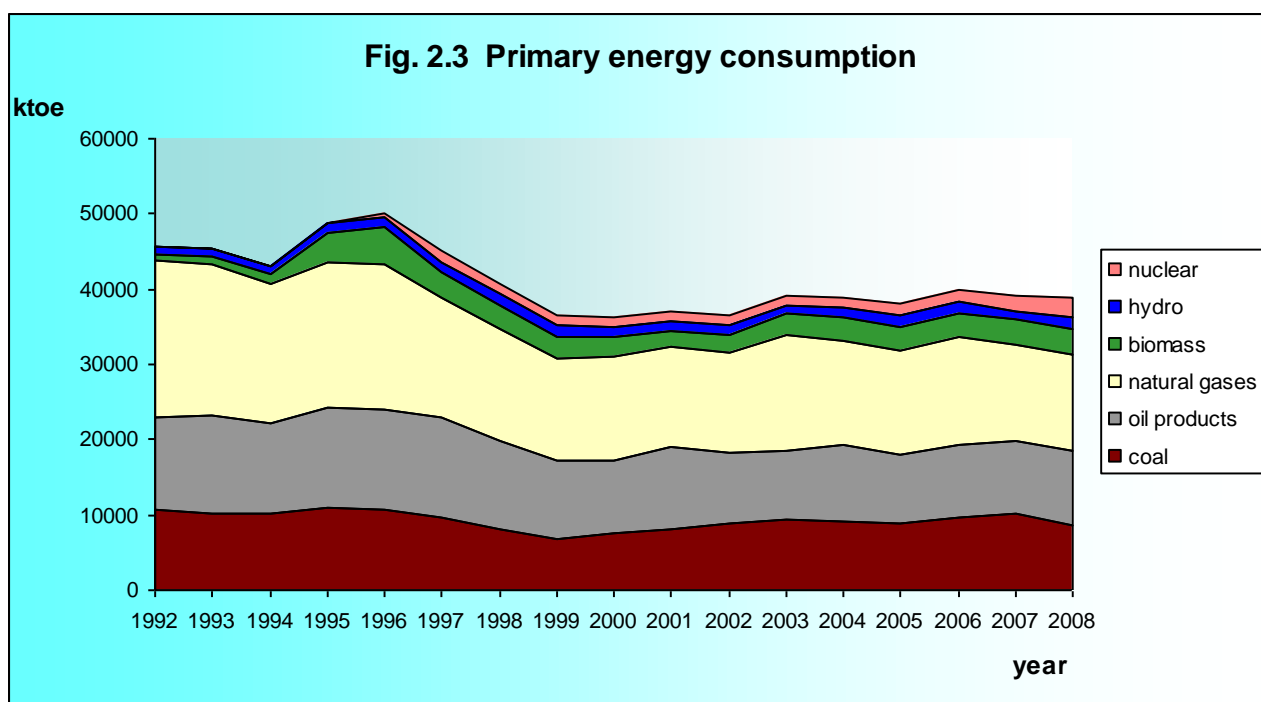
Mention should be made that this economic crisis is the third one in the last twenty years. The first two (1990-1992 and 1997-1999) were determined in the first place by the restructuring of the national economy and the phenomena characteristic of the transition to the market economy. This crisis represents an actual test as concerns the success of the reforms carried out in Romania.

2.2 Energy consumption trends: by fuel and by sector

2.2.1 Evolution of the primary energy consumption

Romanian economy restructuring has influenced the evolution of energy consumption. After a maximum value surpassing 50 mil toe was attained in 1996, the value of consumption has lately stabilized to about 40 mil toe (figure 2.3). It is expected that the economic development of the country will lead to an increase in this consumption, but the latter will decrease due to the envisaged energy efficiency measures.

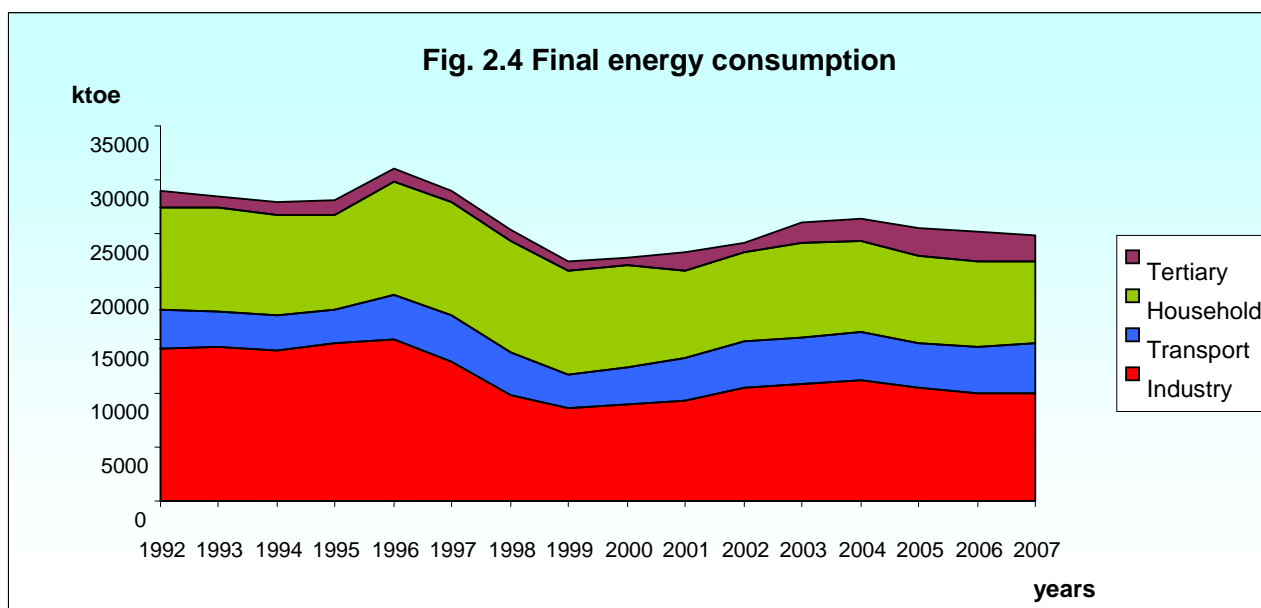
- The highest share within primary energy consumption is held by natural gases. Nevertheless, this share is decreasing (from 43 % in 1996 to 37 % in 2006). The forecasts indicate a continuous decrease in natural gas consumption due to the prices on the international market. The fact that Romania depends on a single external supplier (Russia) could enhance this tendency. Consumption of oil products has decreased in a similar way.
- Lignite is the energy resource that can diminish the dependence on imports. After the measures taken for restructuring this industry between 1966 and 1999 internal lignite production stabilized and the decision-makers hardly consider a decrease in coal consumption. The latest legislative initiatives of the European Commission relating to the allocation of the GHG emission quotas could have a major effect.
- Non-carbon energy (nuclear, hydro, wind, solar, etc) is visibly increasing and this tendency will further increase in the future. In 2007 the second 700 MW unit of Cernavoda NPP was put into operation. This has contributed to the increase in non- carbon energy in the structure of primary energy consumption.



Source: Romanian Statistical Yearbook

2.2.2 Evolution of the final energy consumption

Evolution of the final energy consumption is presented in figure 2.4.



Source: Romanian Statistical Yearbook

This evolution has been qualitatively similar to the evolution of primary energy consumption and, in fact, to the evolution of the national economy on its whole.

Figure 2.5 presents the structure of final energy consumption in 1992 and figure 2.6 presents the same structure in 2007. By comparing the two figures the changes that took place in the share of the consumption sectors within final energy consumption can be pointed out.

In the analyzed period, consumption in the industrial sector and population consumption registered a certain decrease. Nevertheless, in the service sector, a very dynamic one, energy consumption has increased.

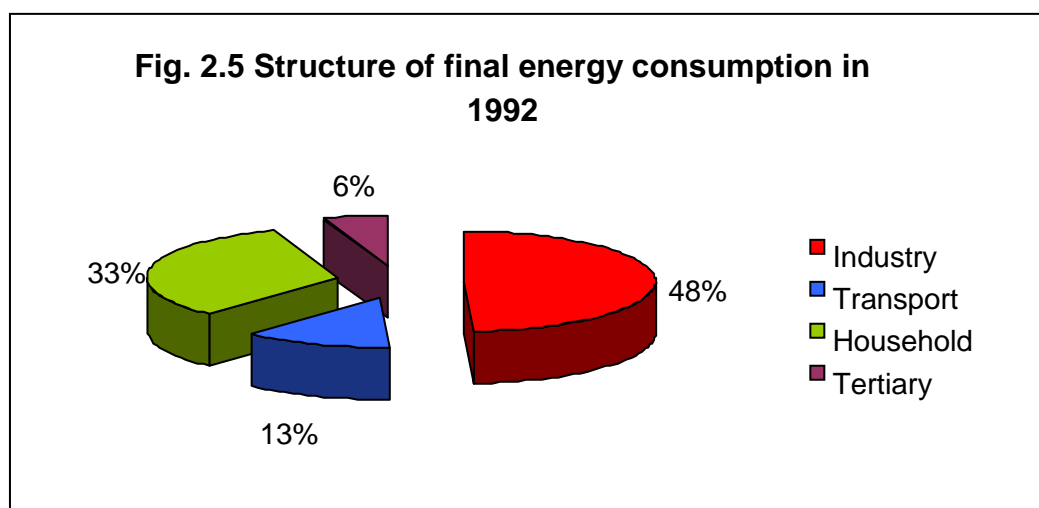
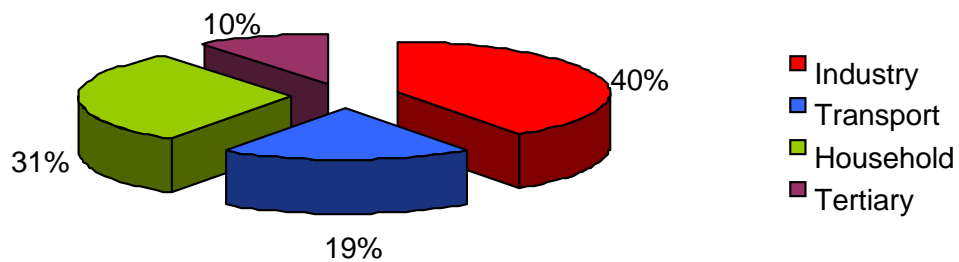


Fig. 2.6 Structure of final energy consumption in 2007



2.3 The policy background to energy efficiency

As a Member State of the European Union, Romania has to translate the EU directives into its internal legislation and observe the energy policy measures established by the European Commission. The main governmental institutions that are responsible for these actions are:

- The Ministry of Economy (through its General Energy, Oil and Gases Division);
- The Ministry of Environment;
- The Ministry of Regional Development and Housing (for the energy efficient utilization in buildings);
- The Romanian Agency for Energy Conservation (ARCE);
- The Romanian Energy Regulatory Authority (ANRE);

As a technical consultant to the Ministry of Economy and ARCE, ICEMENERG is directly involved in these actions. The main regulatory acts that have been lately developed will be further presented.

❖ The Energy Strategy of Romania in the period 2007- 2020, approved through GD 1069/2007

The general objective of the Strategy is to “cover the present and future energy demand at the least price, in the conditions of a modern market economy and civilized life standing, ensuring quality and security of supply and observing the principles of sustainable development”.

The established strategic objectives are the following:

- Energy security;
- Sustainable development;
- Competitiveness.

In order to reduce energy intensity in the great energy consuming sectors and attain the targets proposed both by the National Energy Efficiency Strategy and the Action Plan in the energy efficiency field, corresponding to the EC Directive 2006/32/ on efficiency, by the final consumer, measures will be taken in the following directions:

- **Industry**
 - Information campaigns;
 - Long-term voluntary agreements in different sectors of the processing industry;
 - Energy audits and efficient energy management;
 - Energy efficiency improvement by supporting financing from the Community funds.
- **Transport**
 - Energy consumption reduction by people and merchandise railway transport modernization;
 - Public transport quality increase so that to be preponderantly used by people instead of own cars;

- Expansion of public transport by new route building;
- Increase traffic and parking efficiency;
- Provision of public means of transport for employees by the beneficiary companies;
- Increase development of rail transport within urban transport (trams, trolleybuses);
- Increase energy efficiency of vehicles by establishing minimum efficiency criteria;
- Introduction of standards to support the most efficient and least polluting vehicles;
- Utilization of gaseous and bio-fuels in the transport sector.

An essential component in the implementation of the above-mentioned measures is education for making the population accept and apply them on a large scale.

- **Residential** (final energy consumption in buildings: heating, hot water and lighting):
 - Rehabilitation of the building envelope through thermal rehabilitation measures and financial support for the low-income owners for carrying out the rehabilitation works;
 - Increasing efficiency of the existing thermal installations;
 - Increasing efficiency of lighting, utilization of low consumption lamps;
 - Obligation to apply the provisions of the Directive and the European standards on the new buildings;
 - Increasing energy efficiency by supporting financing from the Community funds;
 - Continuing final consumer thermal energy metering;
 - Development of a national energy saving education programme for population, in schools and through mass-media, aiming at saving energy, protecting the environment and locally utilizing the renewable energy sources;
 - Stimulation of energy service company (ESCO) functioning.
- **Public sector**
 - Efficiency increase and reduction in the public lighting consumption;
 - Efficiency increase and reduction in the water supply installation consumption;
 - Public building efficiency increase.
- **Agriculture**
 - Increase in the efficiency and utilization of bio-fuels for the agricultural machines;
 - Development of energy crops, both for producing bio-fuels, and electricity and heat through cogeneration;
 - Increase in the energy efficiency of irrigations.
- **Cogeneration**
 - Promotion of highly efficient cogeneration;
 - Identification and turning to good account of the national cogeneration potential;
 - Energy auditing of cogeneration units;
 - Rehabilitations and modernizations of the existing installations for increasing efficiency and reducing the environmental impact;
 - Building of new, highly efficient cogeneration installations.
- **Renewable energy sources**
 - Increase in the degree of RES utilization under high economic efficiency conditions for producing electricity and heat, by means of facilities, including facilitation of access to the electrical network, in the investment phase;
 - Green certificate improvement with a view to attracting the private capital in the RES field investment;
 - Promotion of mechanisms for supporting utilization of RES for producing heat and Hot water for domestic use;
 - Utilization of structural funds.
- **Bio-fuel utilization**

The targets established in Romania relating to the bio-fuel utilization are the following:

 - By the end of 2010, the percentage of bio-fuel utilization within the total energy content of the fuels used in transport will be of at least 5.75% (target established through the EC Directive 2003/30);
 - By 2020, the percentage of bio-fuel utilization will amount to at least 10%, in the conditions of the new generations of bio-fuels.
- **Development of nuclear energy** is explicitly approached in the Strategy, not in the context of GHG emission reduction, but in the context of increasing energy supply security and import reduction.

In this respect, two new nuclear units, Cernavoda 3 and 4, will be built, each with an installed power of 706 MW.

❖ **GD 1043/2007 on the eco-design requirements for the energy- using products**

The decision translates the Directive 2005/32/EC that sets a framework establishing the eco-design requirements that apply to the energy-using products. The decision establishes the eco-design requirements the energy-using products should fulfill when they are introduced to the market and/or when they are put into operation with a view to ensuring:

- Their free circulation on the internal market;
- Sustainable development by increasing energy efficiency and environmental protection;
- Safety of energy supply.

❖ **Ordinance 22/2008 on energy end-use efficiency and promotion of renewable energy source utilization by the end-consumers**

The ordinance translates the provisions of the Directive 2006/32/EC on the energy end-use efficiency and energy services into the Romanian legislation, envisaging the establishment of a legal framework for the development and application of the national energy efficiency policy.

❖ **GD 409/2009 for approving the Methodological norms for the application of the Government Decision no. 22/2008 on the energy end-use efficiency and promotion of the renewable energy source utilization by the end-users**

❖ **GD 1661/2008 on the approval of the National Program for increasing energy efficiency and utilizing renewable energy sources in the public sector over the 2009-2010 period**

The National Program for increasing energy efficiency and utilizing renewable energy sources in the public sector represents the continuation of the actions for the implementation of the measures for increasing energy efficiency carried out between 2005 and 2006.

The financial support for the project co-financing has come from the state budget though the budget of the Ministry of Economy and Finance, through transfers between the units of the public administration.

For financing the National Program between 2009 and 2010, the amounts of RON 32.9 million for 2009 and RON 40 million, respectively, for 2010, have been allocated.

The National Program 2009-2010 ensures co-financing of the projects whose direct beneficiaries are the local public administration authorities relating to the following types of investment objectives:

- Rehabilitation and modernization of the district heating systems,
- Thermal rehabilitation of certain public buildings;
- Modernization of interior and exterior public lighting

The program establishes the technical and financial requirements for the fulfillment of its objectives.

❖ **Emergency Government Decision 1661/2008 on increasing the energy efficiency of the blocks of flats**

The Ordinance establishes the works necessary for the thermal insulation of the blocks of flats designed and built between 1950 and 1990, the stages in carrying out the works, the way of financing the latter, as well as the obligations and the responsibilities of the public administration authorities and of the owners' associations.

Carrying out the works established through this emergency ordinance aims at increasing the energy efficiency of the blocks of flats and reducing energy consumption for heating the apartments, respectively, while ensuring and maintaining the interior thermal climate, as well as improving the urban aspect of the localities.

The execution of the works will be financed as follows:

- a) 50% from the state budget allocations, within the funds annually approved to this goal from the budget of the Ministry of Regional Development and Dwellings;
- b) 30% from the funds annually approved to this goal from the local and/or other sources legally established;
- c) 20% from the repair funds of the owners' associations and/or other sources legally established.

The Ordinance stipulates the obligations and responsibilities of all the factors involved in applying this ordinance, as well as the monitoring and control actions.

❖ Law 220 / 2008 establishing the system for the promotion of energy production from renewable energy sources (RES)

The Law establishes the legal framework for the expansion of RES utilization and the system for the promotion of electricity production from RES.

In order to promote production of electricity from RES the system of compulsory shares combined with the green certificate trading or the "fixed price" system are applied.

The RES electricity producers and suppliers can trade the green certificates on the centralized market of green certificates, as well as on the bilateral green certificate market.

The green certificate trading framework on the markets established in paragraph is ensured by the operator of the electricity market.

3 Overall Assessment of Energy Efficiency Trends

3.1 Overall trends in energy intensity

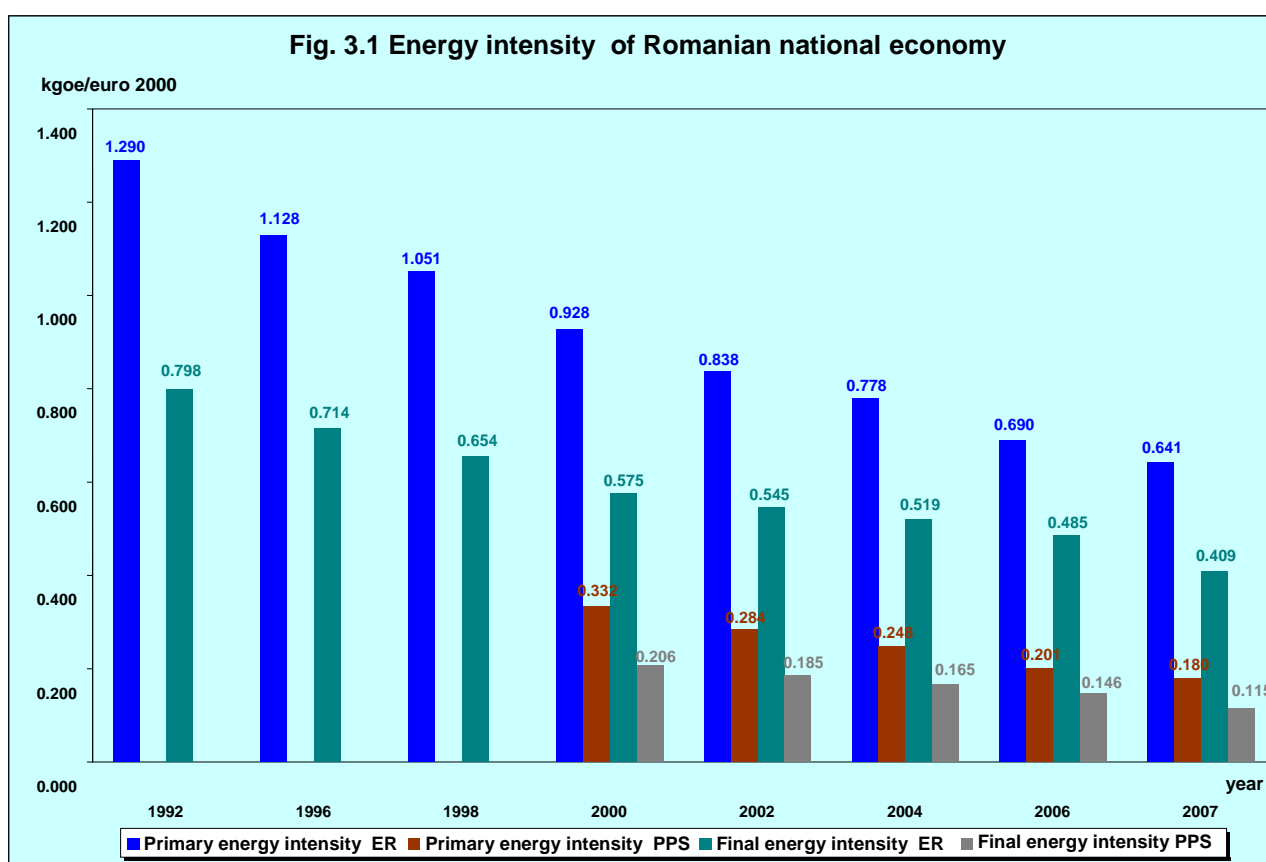
The frequently utilized indicators for synthetically characterizing energy efficiency at the national level are the following:

- Primary energy intensity (PEI);
- Final energy intensity (FEI);

By definition, primary energy intensity represents the ratio between the total consumption of primary energy (TPES) and the gross domestic product (GDP). Final energy intensity and electricity intensity are calculated in a similar way.

The indicators reflect the general tendencies in energy utilization as compared with the economic development rate.

The values of energy intensity are given in kgoe/Euro 2000, both at the exchange rate, and at the purchase power standard. The results are presented in **Figure 3.1**.



Source: National Institute of Statistics, Romanian Statistic Yearbook of Romania, Energy Balance of Romania, - collections; Eurostat site

The main conclusions that can be drawn from the above mentioned data are the following:

- During the period of centralized economy, Romania's economic development was based on the development of industry, of the great energy consumer branches, in the first place. The criteria of energy efficiency played a secondary role. Consequently, energy intensity in economy registered very high values. Thus, in 2002, primary energy intensity was 1.290 kgoe / Euro 2000. When passing to the market economy the respective companies encountered great difficulties. Many of these enterprises went bankrupt. The sector of services that

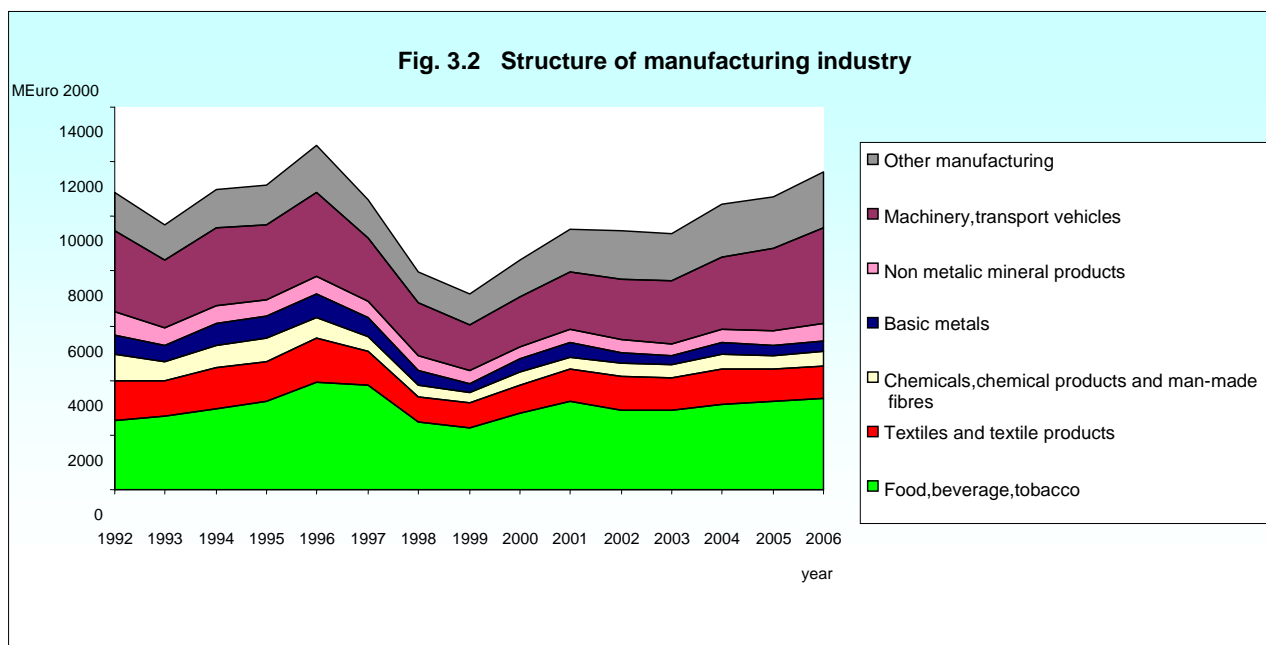
developed in parallel was characterized by low energy intensity. Due to economic restructuring energy intensity diminished by 50 % between 1992 and 2007.

- In the analyzed period of time an increase in energy efficiency, in the technical sense (meaning reduction of losses, increase in efficiency), was registered. An adequate institutional framework was developed and energy policy measures leading to an increase in energy efficiency were initiated.
- Considering the rather low level of prices on the internal market there are great differences between the official rate of exchange RON – euro and the purchasing power parity. This results in great differences between the value of the GDP calculated in the two variants and, implicitly, between the values of the energy intensities.
- Considering the value of energy intensity calculated at PPS, relatively great differences against the developed countries in Western Europe and the USA are registered. In 2001, primary energy intensity in Romania was of about 1.5 times greater than in the EU15 zone, while final energy intensity was 1.25 times greater. The comparisons are much more unfavorable if we use energy intensity values determined on the basis of the exchange rate.

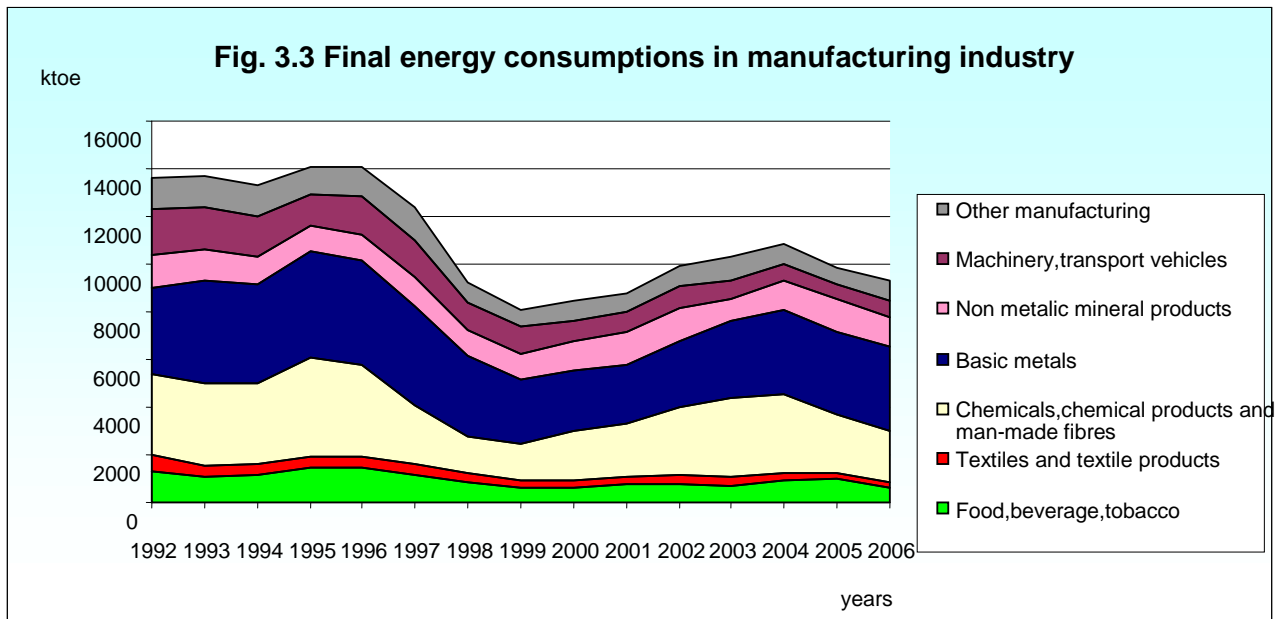
At the national level, the estimated average value of the energy saving potential (determined as a weighed average of the saving potentials in economic sectors such as industry, transports, residential sector, district heating, etc.) is of about (30÷40) %. Sustainable economic development cannot be achieved without increasing energy efficiency. Therefore, economic growth should be obtained without increasing energy resources consumption.

3.2 Industry

The share of industry within the national economy has greatly decreased after 1990 (from 43% in 1992 to 33 % in 2007). The causes have been succinctly analyzed in the previous chapter. In this context the structure of industry underwent modifications. Thus, the share of the food industry within the total manufacturing industry increased from 23 % in 1992 to 29 % in 2006 (fig. 3.3). In the same period the companies from the great energy consumer branches had to overcome great difficulties and many interrupted their activity. The share of the chemical industry within the total manufacturing industry decreased from 9% in 1992 to 4 % in 2006. The metallurgical industry registered a similar decrease (from 7 % in 1992 to 4 % in 2006). The evolution of the manufacturing industry structure is given in figure 3.2.



The structural changes led to modifications in the end-use energy consumption, as well as to modifications of energy intensity in industry on its whole. The evolution of final energy consumption is presented in figure 3.3.



Total consumption decreased from 13617 thousand toe in 1992 to 9288 thousand toe in 2006 (by 32 %), while the total added value increased by 7 %. This indicates from the very beginning a significant reduction in the energy intensity of the manufacturing industry on its whole (from 1252 kgoe/Euro 2000 in 1992 to 799 kgoe/Euro 2000 in 2006, i.e. by 36 %).

The branches that have registered favorable economic evolutions (the food, textile and wood industries) have also registered favorable evolutions from the point of view of energy efficiency. Energy intensity in these branches has practically continuously and greatly decreased. Neglected during the centralized economy period, these branches have developed after 1990 on the basis of green investments by means of modern technologies and equipment. Thus, final energy intensity in the food industry decreased from 511 kgoe/Euro 2000 in 1992 to 174 kgoe/Euro 2000 in 2006 (i.e. three times). Similarly, energy intensity in the textile, clothes and leather industries decreased from 500 kgoe/Euro 2000 in 1992 to 226 kgep/Euro 2000 in 2006 (i.e. less than half). These decreases, correlated with the increase in the share of the respective branches within industry on its whole, determined a decrease in energy intensity on the entire manufacturing industry.

On the other hand, the evolutions of the great energy consuming industrial branches were rather contradictory. Thus, energy intensity in the chemical industry increased from 3511 kgoe/Euro 2000 in 1992 to 7498 kgoe/Euro 2000 in 2003, then decreased to 4145 kgoe/Euro 2000 in 2006. A practically similar evolution witnessed the metallurgical industry (from 5044 kgoe/Euro 2000 in 1992 to 9767 kgoe/Euro 2000 in 2003 and 8559 kgoe/Euro 2000 in 2006).

Relating to the values given above the following should be mentioned:

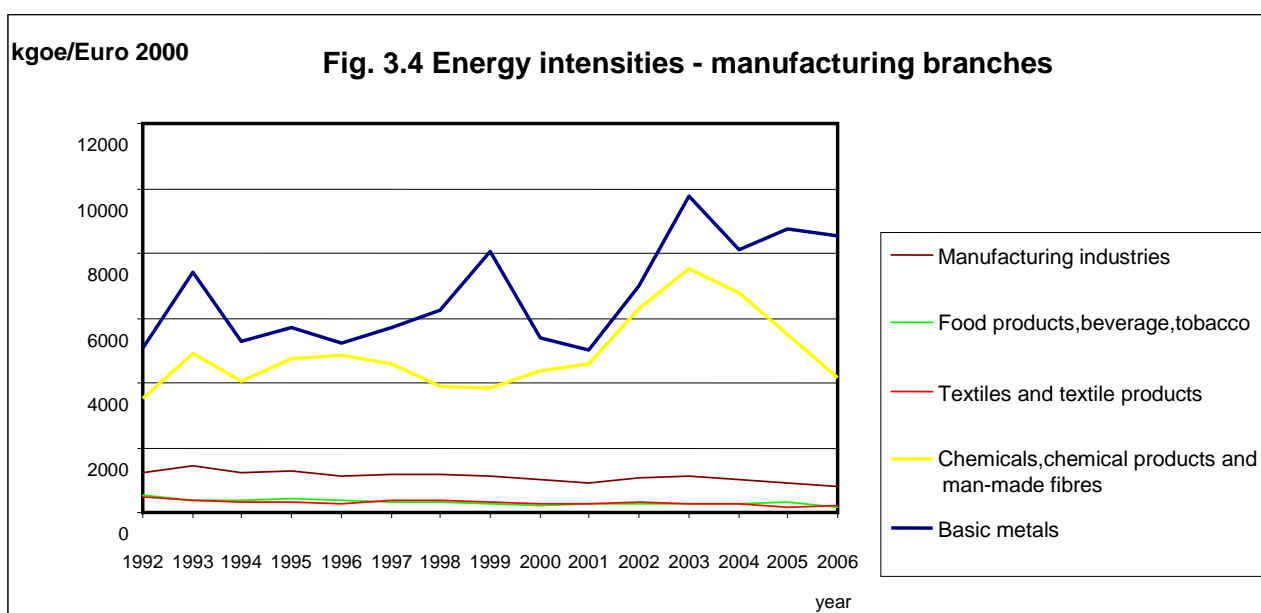
- The gross added values for all the years have been calculated in a constant currency (Euro 2000) so that the values presented are comparable;
- The technical efficiency of energy utilization would have been more correctly expressed by means of the specific energy consumption indicator (kgoe/t steel, kgoe/t sugar, etc). On the background of the changes that took place in the structure of the ownership and management of the industrial units it was not possible to obtain information enabling the calculation of such indicators. This is a preoccupying problem not only for the project developing, but for the state authorities, as well. Activities have been initiated to this goal.

The contradictory evolutions of energy intensities in the great energy consumer branches are a cause of actual concern for the decision-makers at the national level, too. These evolutions question the viability of the companies in these branches in the conditions of the competition on the free market. The respective companies are, in general, the great industrial complexes that were built before 1990 and their activity directly influences the life of the population from a certain locality or even geographical zone. In Romania actual mono-industrial zones were created where a certain

locality depended on such an industrial complex. The present day decline of such complexes has resulted not only in economic problems, but has also generated great social problems and resulted in the appearance of very poor zones. Their privatization has not always been successful. The Romanian factories were sold at low prices; in exchange, the investor was obliged to make great investments in their retrofitting. These investments were supposed to rapidly improve and increase energy efficiency. In reality, the investors found ways not to fulfill their contractual obligations and, it was also believed that corruption played an important role, too. It seems that, in their rush to make a greater and quicker profit, the present owners have preferred to operate the technological installations they acquired (at a low price) up to the end of their useful lifetime, selling the installations as scrap material and the land for a profit afterwards. In fact, this process is underway.

The fact that the energy sector has benefited from different subsidies (direct or indirect), that financial indiscipline on the energy market has been tolerated, etc., have facilitated this process. The fact that Romania has become an EU Member State has brought about a certain consistency, but the effects will probably be seen in the years to come.

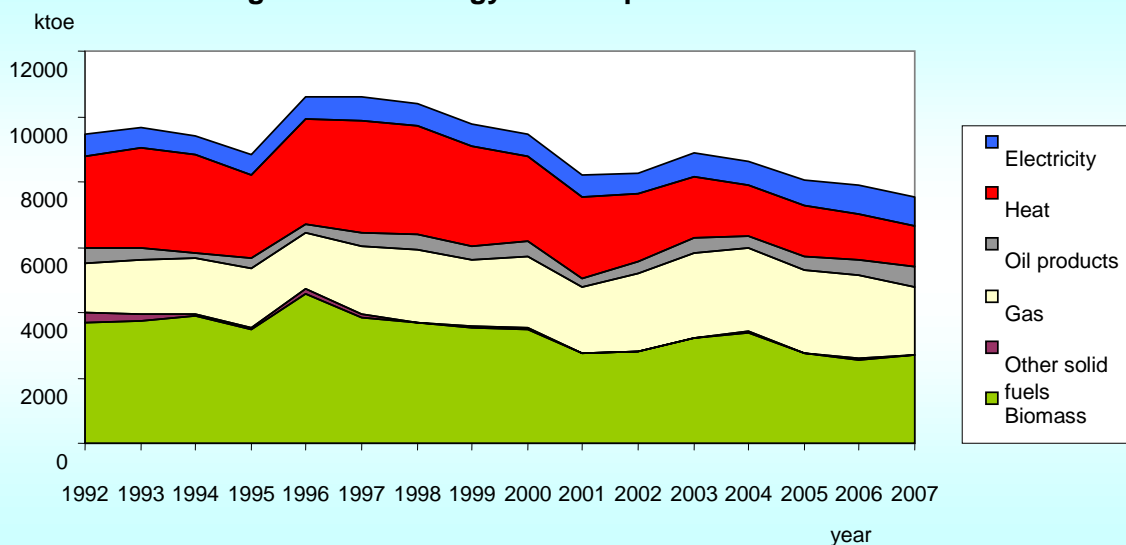
The evolution of energy intensity in the manufacturing industry on its whole and in several important branches is presented in figure 3.4



3.3 Households

Figure 3.5 presents the evolution of end-use energy consumption in the residential sector in the 1992-2007 period of time.

Fig. 3.5 Final energy consumption in residential sector



The evolution of total consumption has been influenced by several factors, among which:

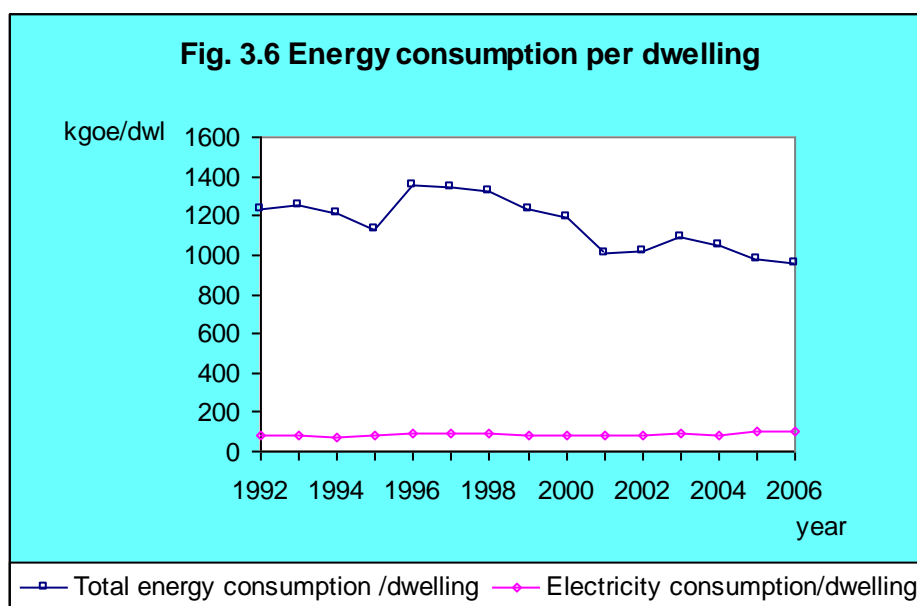
- Evolution of family income;
- Evolution of prices;
- Evolution of subsidies from the budget.

After a historical maximum of 10.6 mil toe attained in 1996, total energy consumption registered a permanently decreasing trend. In the first period (1996-2000), the decrease was undeniably the result of the economic crisis Romania had gone through and of the decrease in the purchase capacity of the population. It is very difficult to make a direct connection between the decrease in energy consumption and the increase in the efficiency of utilization in this period.

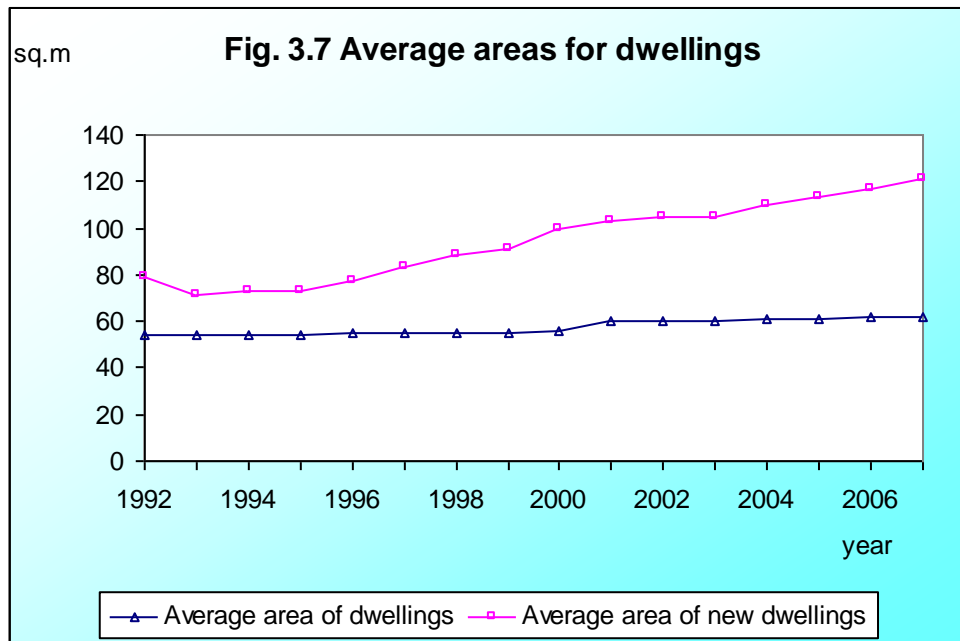
After 2000, the economy has had a positive evolution and this has led to an increase in the population income. Energy consumption increased only between 2001 and 2004; afterwards, the descending trend was resumed. The value registered in 2007 was of only 7.5 mil toe, representing only 70 % of the value registered 11 years before.

Considering the increase in the number of dwellings at the national level, the decrease in end-use energy consumption per dwelling has been even greater, from 1230 kgoe/dwelling in 1992 and 1359 kgoe/dwelling in 1996 (the year when the maximum consumption value was registered) to 958 kgoe/dwelling in 2006 (fig. 3.6).

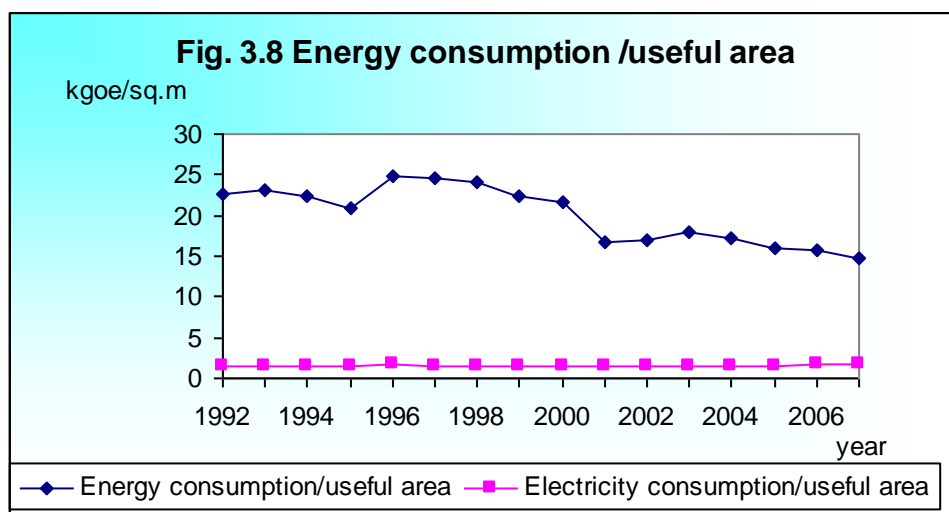
Fig. 3.6 Energy consumption per dwelling



A more in-depth analysis should consider not only the evolution of the number of dwellings, but the evolution of their average area, as well. The areas of the newly built dwellings are greater determining an increase in the corresponding average area of a dwelling at the national level. At the same time, the new buildings are built according to new, improved standards, by means of new materials and technologies. Their energy efficiency is much improved. Figure 3.7 presents the evolution of the average area of a new building in the course of time, as well as the evolution of the average area of a dwelling at the national level.



The factors that have been previously mentioned have determined an important decrease in the energy consumption /m² of useful area. The value of this indicator was of 22.7 kgoe/m² in 1992 and 24.9 kgoe/m² in 1996, but only 14.8 kgoe/m² in 2007, representing 59 % against 1996. In our opinion the last value characterizes the progress made at the national level concerning energy efficiency increase in the household sector in the best way.(fig.3.8)



It is true that important increases in the energy price and a reduction in the direct or cross subsidies have been registered in this period (after 2000). These phenomena have influenced consumption to a certain degree. Nevertheless, it is also true that the population has taken steps to increase energy efficiency. Significant modifications in the structure of energy consumption

underlining the increase in efficient utilization, firewood and biomass consumption decrease, both in absolute values (from 3.7 mil toe in 1992 and 4.6 mil toe in 1996 to 2.7 mil toe in 2007), as well as in relative values (from 39 % in 1992 and 43 % in 1996 to 35 % in 2007).

When examining these values one must consider that in Romania heating by means of firewood and biomass is made by means of traditional stoves with very low efficiencies. Their replacement with natural gas installations (both for heating and cooking) has undeniably represented a factor of technical progress made by means of the population financial effort, but also with the support of the natural gas distribution companies, that have expanded their distribution networks (including the rural areas). It is true that at present Romania is confronted with the issue of fulfilling the assumed targets relating to consumption of energy from RES (Directive 28/2009). The target set by the European Commission for our country is of 24 % by 2020 against the reference value of 17.8 % in 2005. All the analyses have pointed out that biomass is the main source of renewable energy in Romania and that it can be used in the residential sector for heating, cooking and water heating. Nevertheless, great efforts will have to be made in order to increase its utilization by using only modern technologies, practically excluding the possibility to return to the utilization of the obsolete technologies/equipment used in the near past.

Natural gases represent the second important form of energy utilized in the residential sector. Natural gas consumption has increased from 1.5 mil toe in 1992 (16 % of the total) to 2.6 mil toe (33 % of the total) in 2006.

Electricity consumption registered a slowly increasing trend (from 0.654 mil toe in 1992 to 0.894 mil toe in 2007), but its share within total consumption is still relatively low. The electricity consumption specific indicators (kWh/household or kWh/inhabitant) have low values as compared with the values from other EU countries, meaning that the endowment of the population with household appliances is modest.

In Romania electricity is not used for space heating or for cooking and preparation of hot water for household use. An increase in the level of population endowment with household appliances (refrigerator, washing machines, etc) has been registered, but this is registered only in the conditions of efficiency increase. The influence of receiver labeling has been very favorable from this point of view.

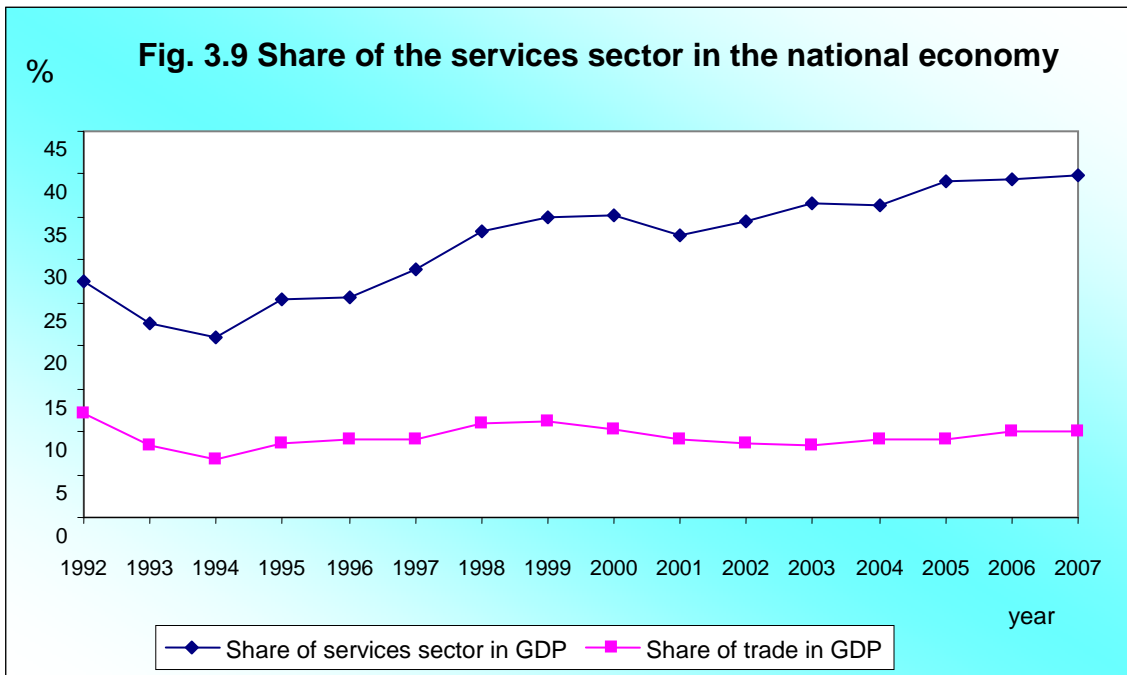
Consumption of centralized heat (district heating system) has dramatically decreased from 2.8 mil toe in 1992 (30 % of the total) to 1.2 mil toe in 2007 (17 % of the total) although this energy has been continuously subsidized from the state budget and the local budgets.

In the first place this was due to the fact that some of the heating sources were the cogeneration plants from the former industrial complexes, especially from the chemical ones. As we have pointed out in the previous chapter, these units have had great difficulties after 1990 and some of them stopped operating. In these conditions the respective plants have also stopped their operation.

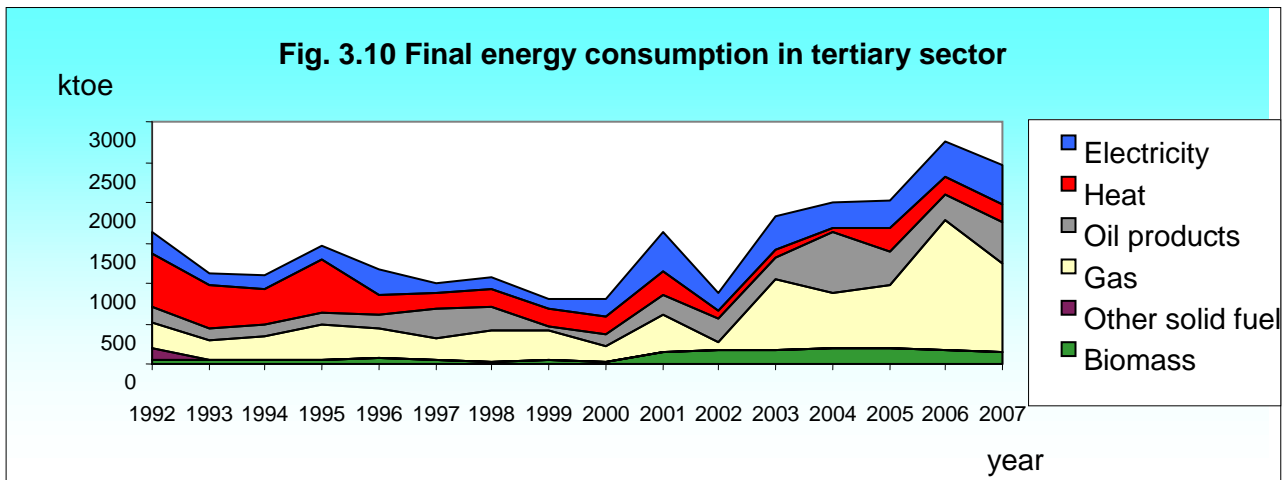
Another cause was the very low quality – price ratio for the services provided to the population by the district heating service. Although subsidized, the price of heat has continuously increased, attaining high values. The district heating systems that were built 40-50 years ago have not been rehabilitated so that they have great energy losses and the quality of the services provided to the population is low. That is why many people have preferred to disconnect from the district heating network and install their own apartment plants burning natural gases. The phenomenon has registered a peak between 2001 and 2003. In the last years the officials have taken measures to stop this phenomenon by means of administrative restrictions, increasing heat subsidies and district heating installation retrofitting.

3.4 Services

The services sector has had the fastest evolution of all the sectors of the national economy. Its share within the total GDP increased from 21 % in 1994 to 40 % in 2007. Within this sector the most developed branch is trade whose share amounted to 10% of the GDP in 2010. The respective evolutions are presented in fig. 3.9.



The development of the sector has led to an increase in energy consumption (fig. 3.10).



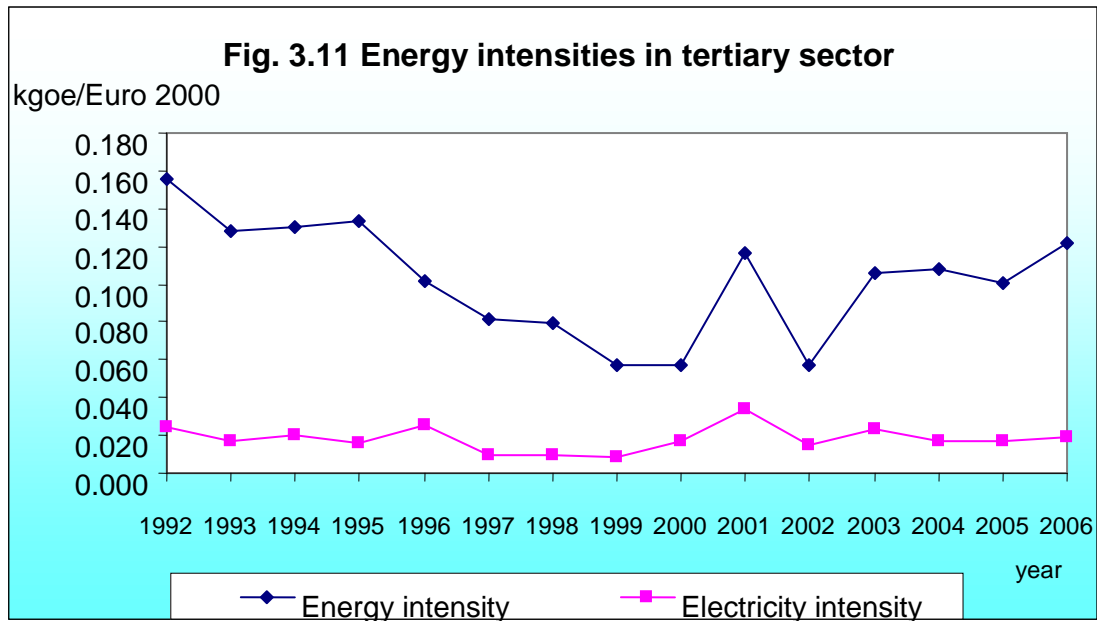
The evolution of this consumption has practically followed the evolution of the activities in this sector, registering a decrease between 1996 and 2000 (the period of recession) and a continuous increase after 2000. The value for 2002 represents an exception that can be explained by certain errors in the statistical data collection.

Energy consumption in the tertiary sector has certain similarities with household consumption and this also reflected by the structure presented in fig. 3.10. Thus, we notice the following:

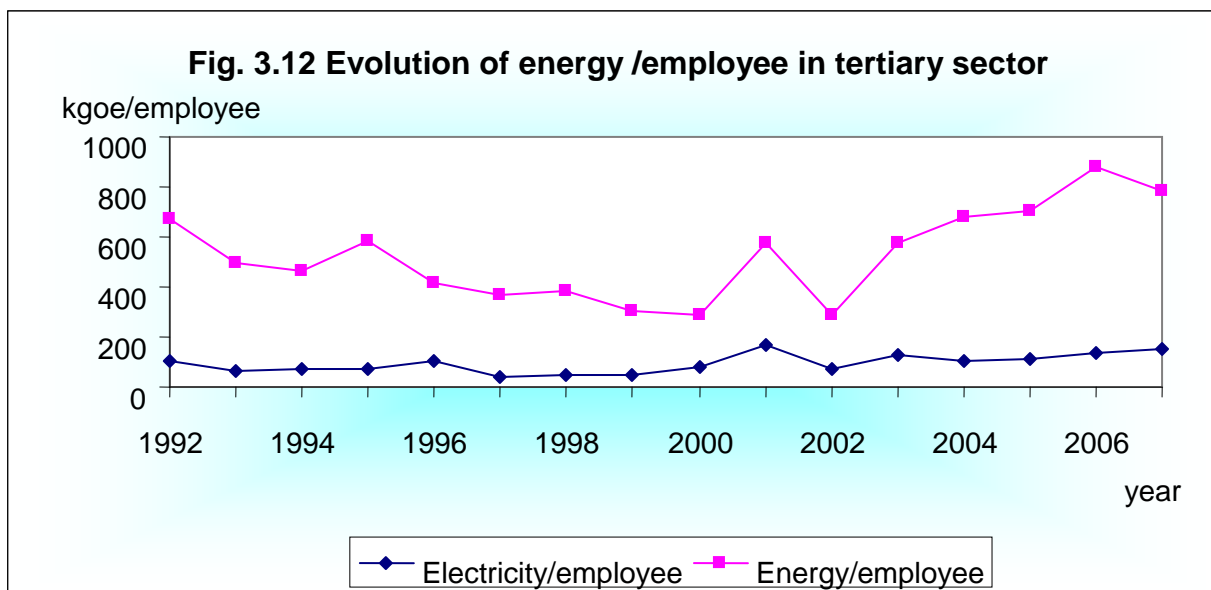
- An important increasing trend in natural gas consumption;
- A decrease in the consumption of heat from the district heating networks in the period 2001-2004 followed by a recovery trend;
- An increase in electricity consumption.

The lack of information makes it difficult to perform a quantitative estimation of energy efficiency in this sector.

Figure 3.11 presents the evolution of energy consumption for producing a unit of product in this sector (kgoe/Euro 2000). It is difficult to identify a firm descending trend of this indicator.



Another indicator recommended in the literature for characterizing energy intensity in the services sector is final energy consumption and / or electricity / employee. The evolutions of these indicators are presented in figure 3.12



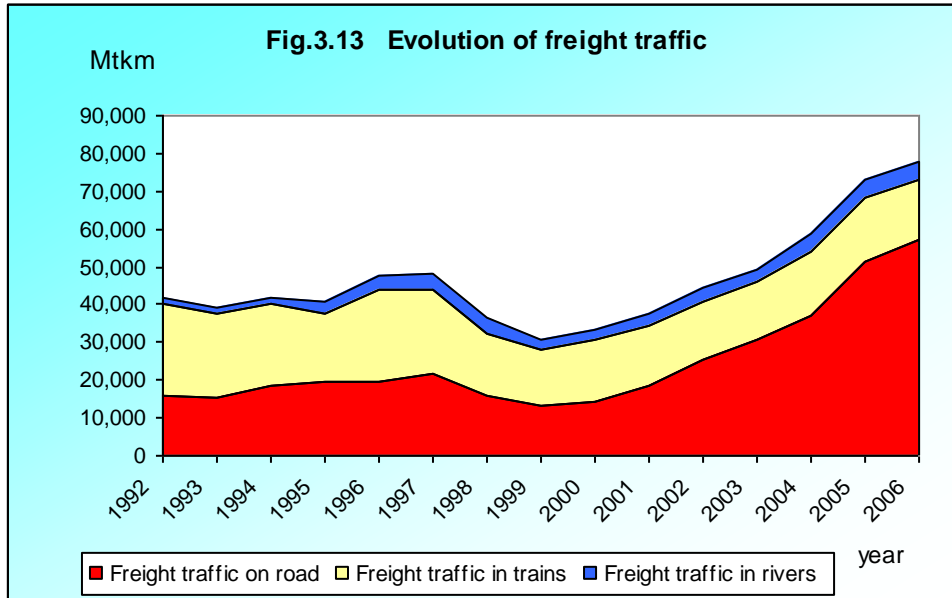
This figure (as well as the previous one) indicates a rather slightly increasing tendency after 2000 in comparison with the previous period. Nevertheless, it would be premature to draw the conclusion that the development of the services sector takes place under low efficiency conditions. In the near future actions for completing the information in this field will be necessary. The EL-TERTIARY project financed by the European Commission has provided certain information but activities should be continued.

3.5 Transport

The evolutions in the transport sector after 1990 have been influenced by two factors:

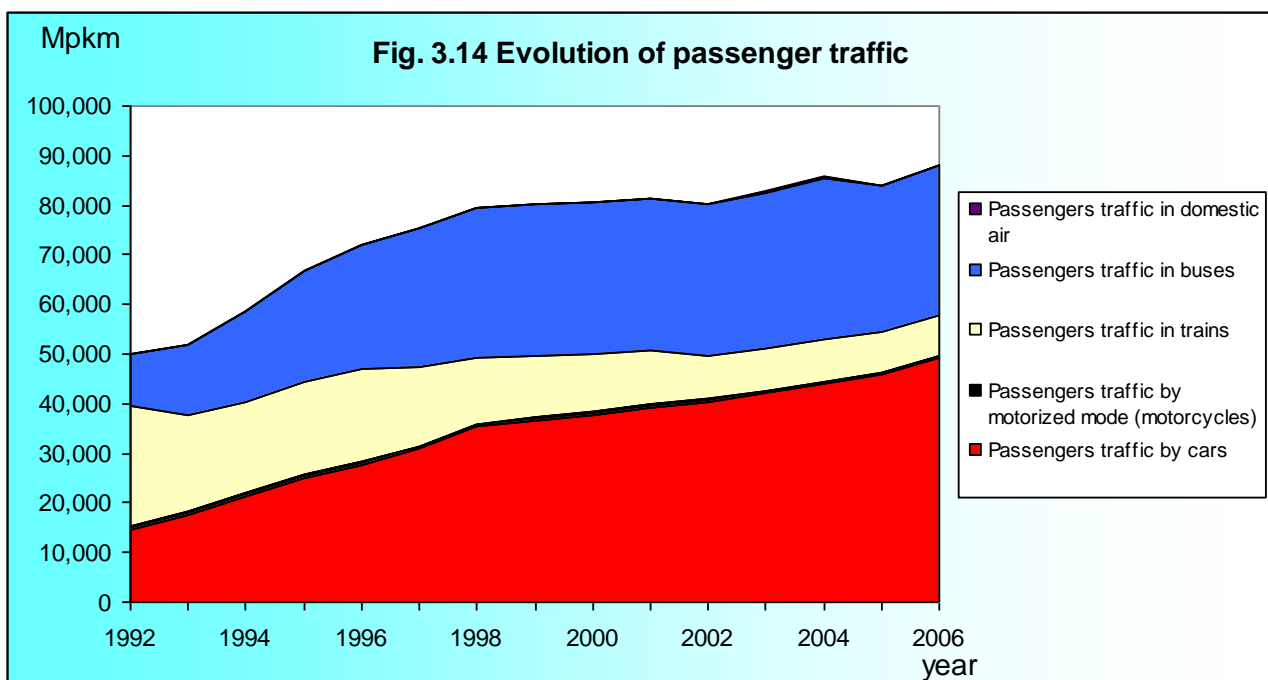
- Elimination of administrative restrictions against fuel procurement (acquisition) and acquisition of means of transport;
- Aligning of fuel prices with the prices on the international market.

The evolution of freight transport is given in fig. 3.13.



Romania's connection to the international markets and economic development after 2000 has determined an important increase in the freight transport. The value of this indicator was 1.86 times greater in 2006 than in 1992. The structure has also greatly changed and, unfortunately, this modification was not to the benefit of energy efficiency and sustainable development.

The road transport has increased 3.65 times during this period of time and its share attained 73 % of the total in 2006 against 37 % in 1992. Thus, Romania follows the western example, although there are numerous indications that this model should be abandoned.



The great loser in this competition is the railway transport which has considerably diminished its activity, both in absolute value and as a share in the total activity.

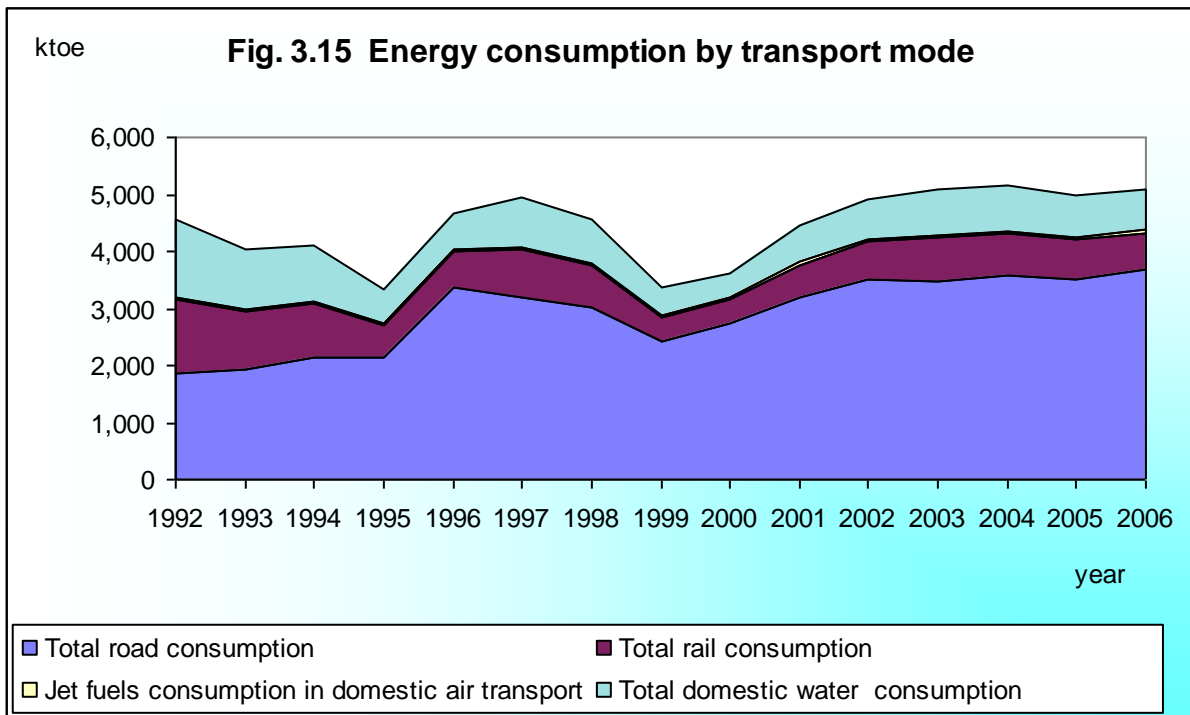
The water transport has increased 2.6 times but its total share is still minor.

The passenger transport has had a relatively similar evolution (fig. 3.14).

On the background of a general increase in the citizen mobility, passenger transport by cars has increased 3.4 times; its share within the total passenger traffic has also increased from 28 % in 1992 to 56 % in 2006.

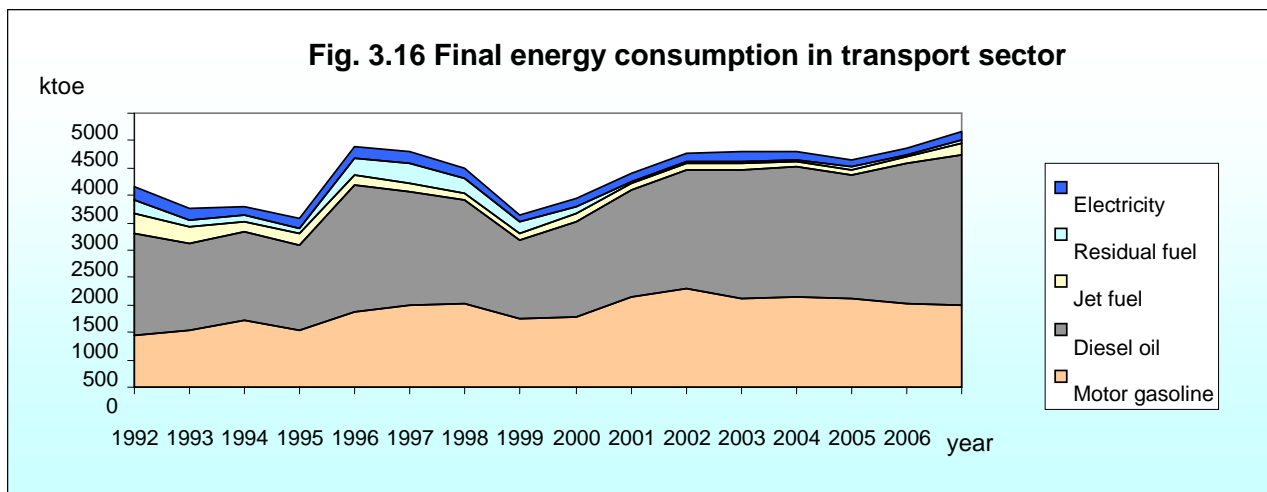
The passenger transport by buses has had a favorable evolution in the first period (1992-1998); afterwards we practically witnessed a limitation of the number of p · km. In this case, too, the railway transport has registered important changes. The passenger traffic by railway has decreased by one third and the total share reached 9 % against almost 50 % in 1992.

The modifications that have occurred in the structure of freight and passenger traffic have caused great changes in the structure of energy consumption by types of transport. (Figure 3.15).



Energy consumption for road transport has doubled and its share within the total consumption has increased from 40 % to 73 %. Energy consumption for the railway transport has decreased to half and its share amounted to 13 % in 2006 against 29 % in 1992.

The evolution of final energy consumption by energy forms in the transport sector is given in figure 3.16.



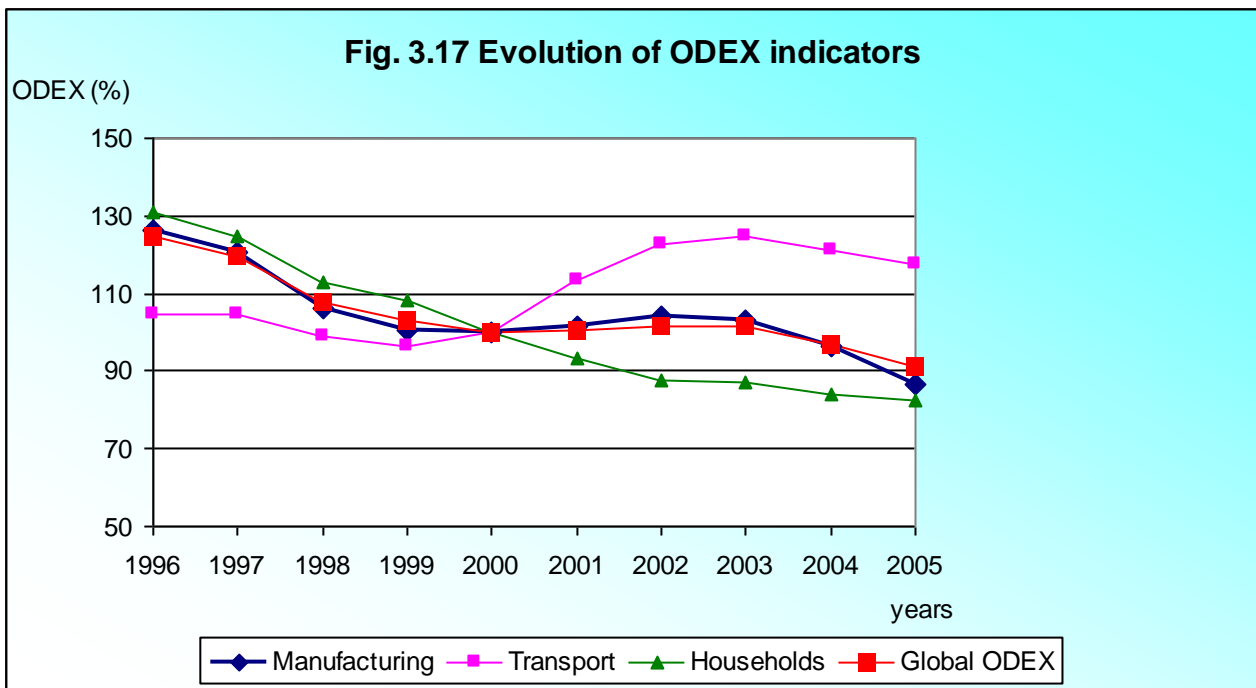
3.6 Assessment of energy efficiency/savings through ODEX: total and by sector

The orientations at the international level and the latest EU documents concentrate the importance of developing strategies/programmatic documents on the medium and long term including all the quantitative targets and measures for attaining them, as well as the continuous monitoring of these measures. According to the results, the measures initially envisaged can be corrected in the course of time, the set of initial measures can be supplemented, or the initially established target be modified.

The Directive 2006/32/ EC, in particular, establishes the target for the reduction of the end-use energy consumption in the EU zone by (at least) 1 % annually during the 2008-2010 period. As known, after the directive approval, the European Council and the European Parliament have enlarged its provisions, by establishing that energy consumption in the EU zone should be reduced by 20% by 2020, at the same time reducing GHG emissions by 20%, too, increasing the share of renewable energy sources in the energy consumption to 20 % and the share of bio-fuels to 10 %. The Directive also requires that national action plans for energy efficiency be developed (NEEAP). The first NEEAP submitted in 2007 included only the envisaged measures, but the following two (that should be submitted to the European Commission in 2010 and 2012, respectively) will have to include both “ex ante” corrections of the initial plan and an evaluation of the measure efficiency envisaged for the entire 2008-2016 period. At the same time, the Directive will have to include the ex post determination of the actual efficiency registered in the past years.

The Directive explicitly stipulates that energy efficiency savings are determined by means of a mathematical model combining the top-down and bottom-up models. It is also explicitly required that the top-down methods be developed on the basis of the ODEX indicator system developed within the ODYSSEE – MURE project.

Utilization of the ODEX indicators in the case of Romania has enabled the quantitative illustration of certain aspects that have been presented in the previous chapters. The evolution of the ODEX indicators, determined as an average of three years, for the manufacturing industry, transport, residential sectors and the global ones, is presented in figure 3.17.



There results that the residential sector has registered the most favorable evolution from the point of view of energy efficiency. The evolution had a permanent character over the entire period 1996-2005 for which data were available. By choosing 1996 as the basic year (100 %), the value of the ODEX indicator for this sector was of only 66 %. The manufacturing industry has also had a favorable evolution. In comparison with the year 1996 (100 %) the ODEX indicator calculated as an index on three consecutive years decreased to 69 % in 2005 and to 60 % in 2006. A certain increasing trend that was registered in the 2001-2002 period (when the economic development was resumed after the powerful recession of the 1996-2000 periods) was rapidly corrected afterwards.

The transport sector is in an unfavorable situation from the point of view of energy efficiency. This has also been pointed out in chapter 3.5. In comparison with the basic year 1996 (100 %), in 2006 the ODEX indicator value was 111 %, after being 119% in 2003. The descending trend registered in the last years is, nevertheless, promising.

As a result of all these sectoral evolutions a global decrease in the ODEX indicator (calculated as a three-year average) has been registered. Considering the year 2000 the reference year, the value of this indicator attained 91 % in 2005.

The calculation of the ODEX indicators and the sectoral energy consumption values enabled the calculation of the energy savings in physical units and the total savings in the analyzed branches. These savings are presented in figures 3.18 – 3.21.

Fig. 3.18 Energy consumptions and savings for Manufacturing

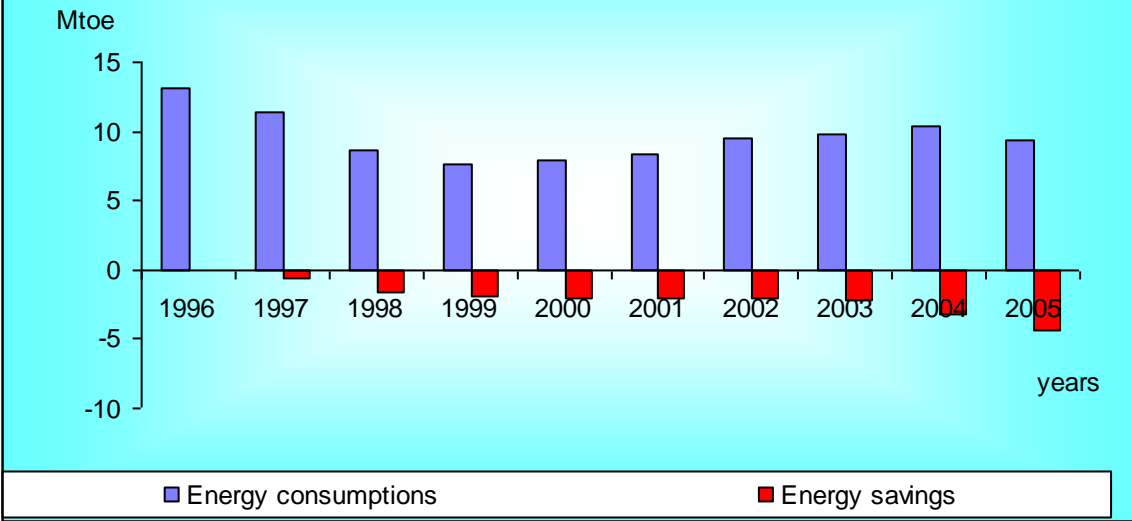
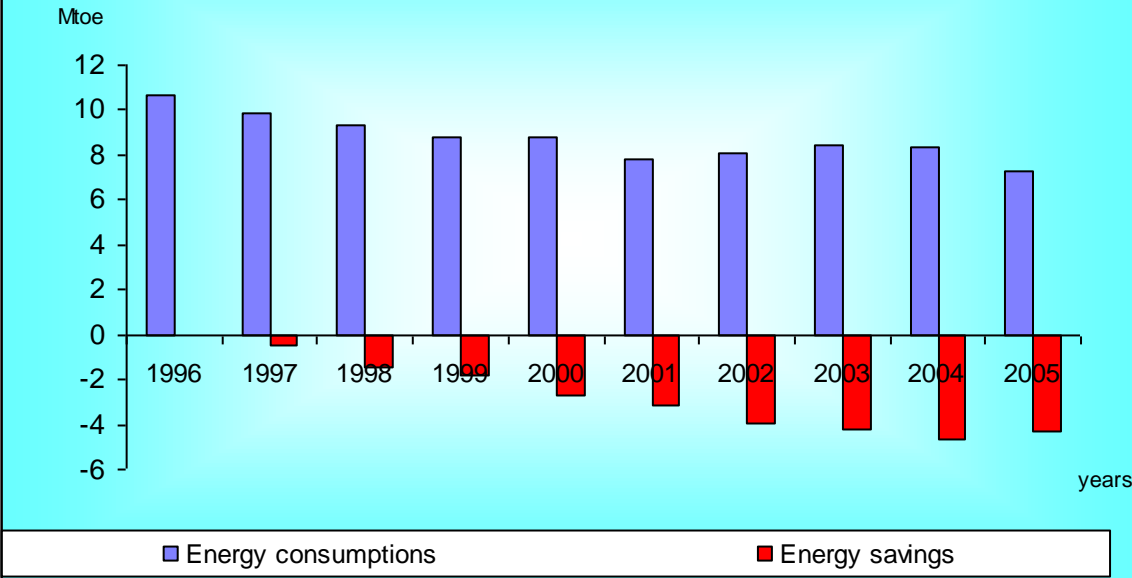
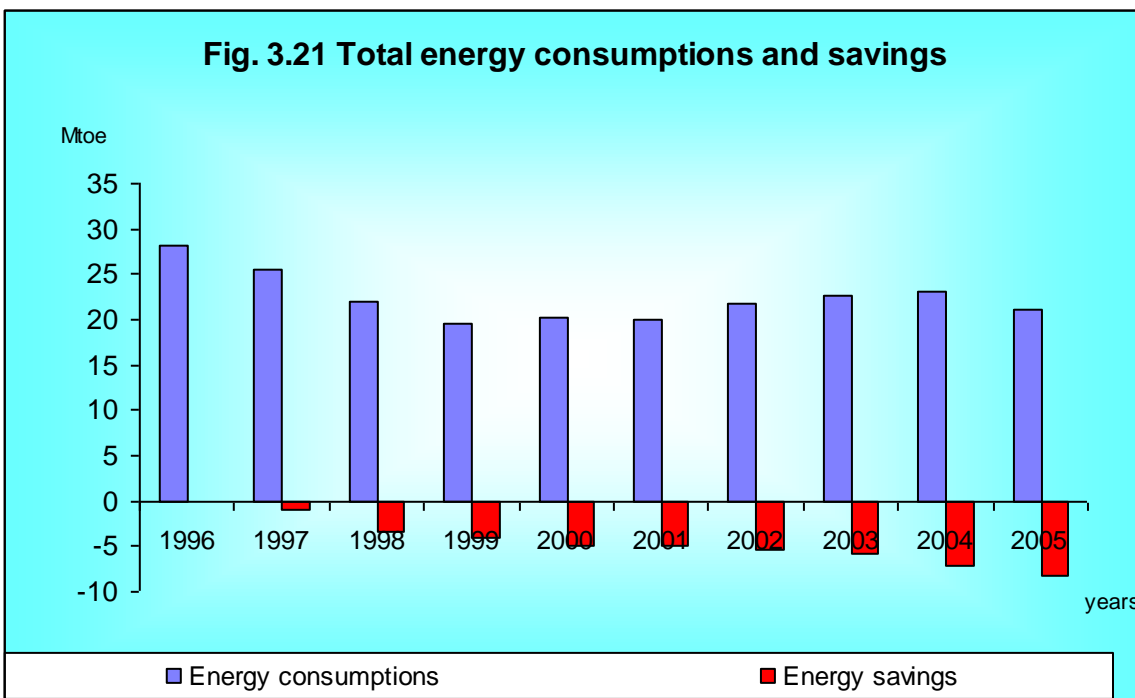
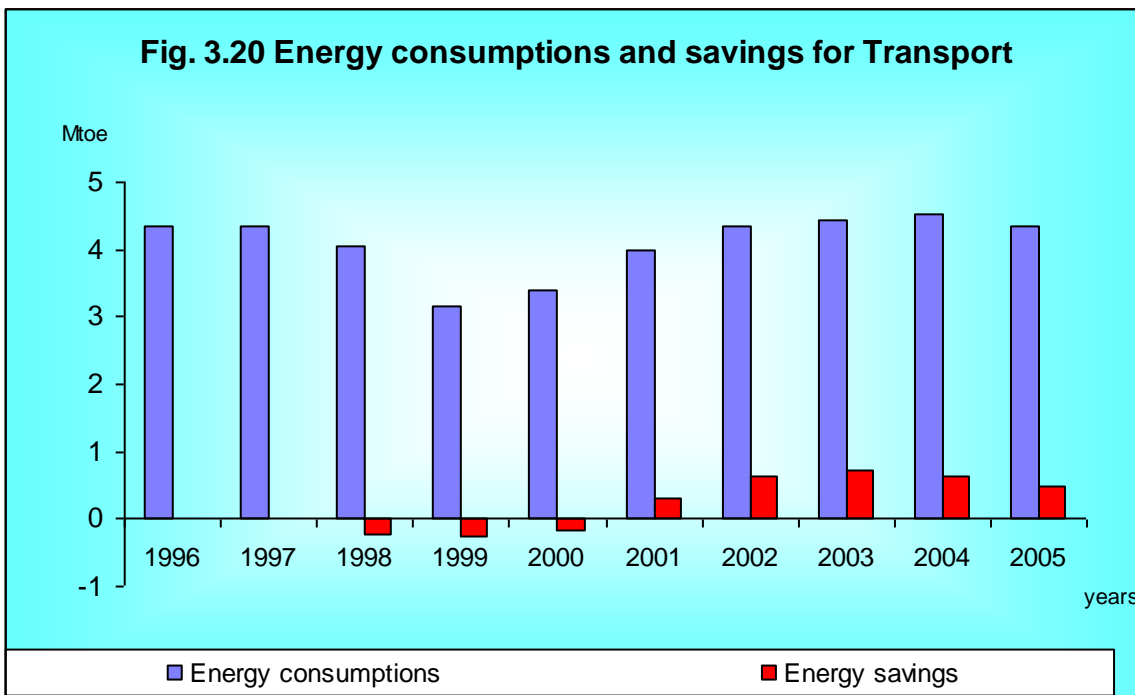


Fig. 3.19 Energy consumptions and savings for Households





It should be underlined that the energy efficiency increases in the manufacturing industry and in the household sector have generated energy savings and that these energy savings have continuously increased. In 2005 (the last year for which the values have been calculated) the energy savings amounted to 4.3 mil toe, both in industry and in the household sector.

The value of these savings should be considered in comparison with the energy consumption that would have been registered in the absence of the energy efficiency measures. A less favorable situation is registered in the transport sector where energy efficiency has lowered registering supplementary energy consumption of 0.5 mil toe in 2005. A favorable evolution between 2003 and 2005 may, nevertheless, translate into a guarded optimism concerning the future.

At the level of the entire analyzed consumption (manufacturing industry + household + transport) the total registered energy savings amounted to 8.1 mil tonnes.

3.7 CO₂ - emissions trends

3.7.1 Trends in GHG emissions

The evolution of GHG emissions is presented in table 3.1

Table 3.1 Evolution of GHG emissions

(mil t CO₂ eq)

Year	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007
Total GHG	243.0	180.7	135.5	140.5	146.7	153.5	155.4	149.4	153.8	152.3

Source: site EUROSTAT

The structure of GHG emissions did not change significantly during the analyzed period of time (Table 3.2).

Table 3.2 Evolution of GHG emission structure

(%)

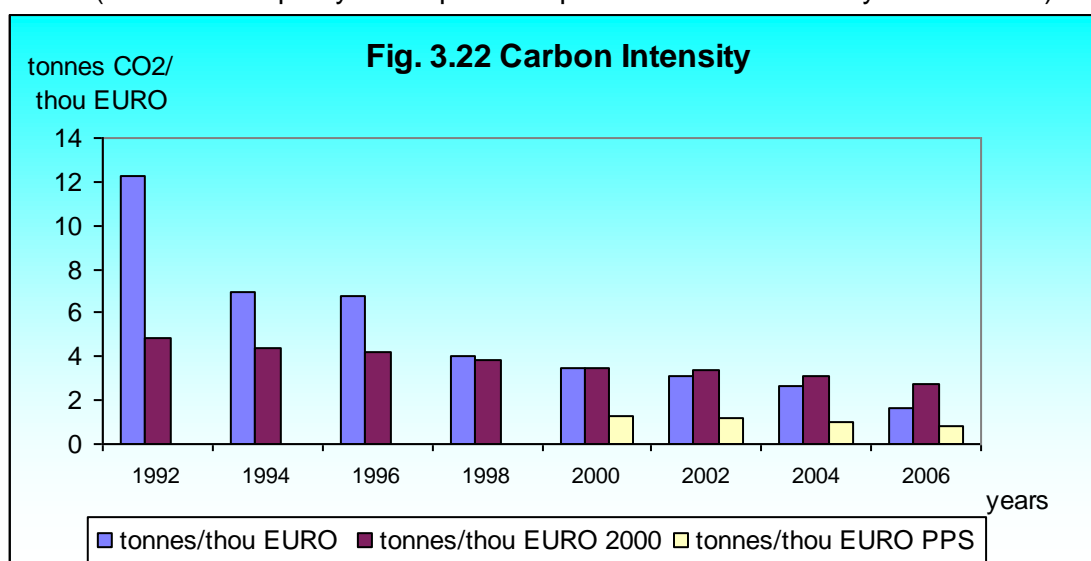
Year	Total	CO ₂	CH ₄	N ₂ O	Fluorine compounds
1989	100	68.51	18.46	11.85	1.19
2006	100	70.85	18.55	10.20	0.39

Source NIR- Romania's GHG Inventory March 2008

Romania still has important reserves concerning CO₂ emissions against its commitments under the Kyoto Protocol. According to this, GHG emissions in Romania between 2008 and 2012 should represent 92 % of those of the reference year, 1989. In 2006 these emissions represented only 56 %.

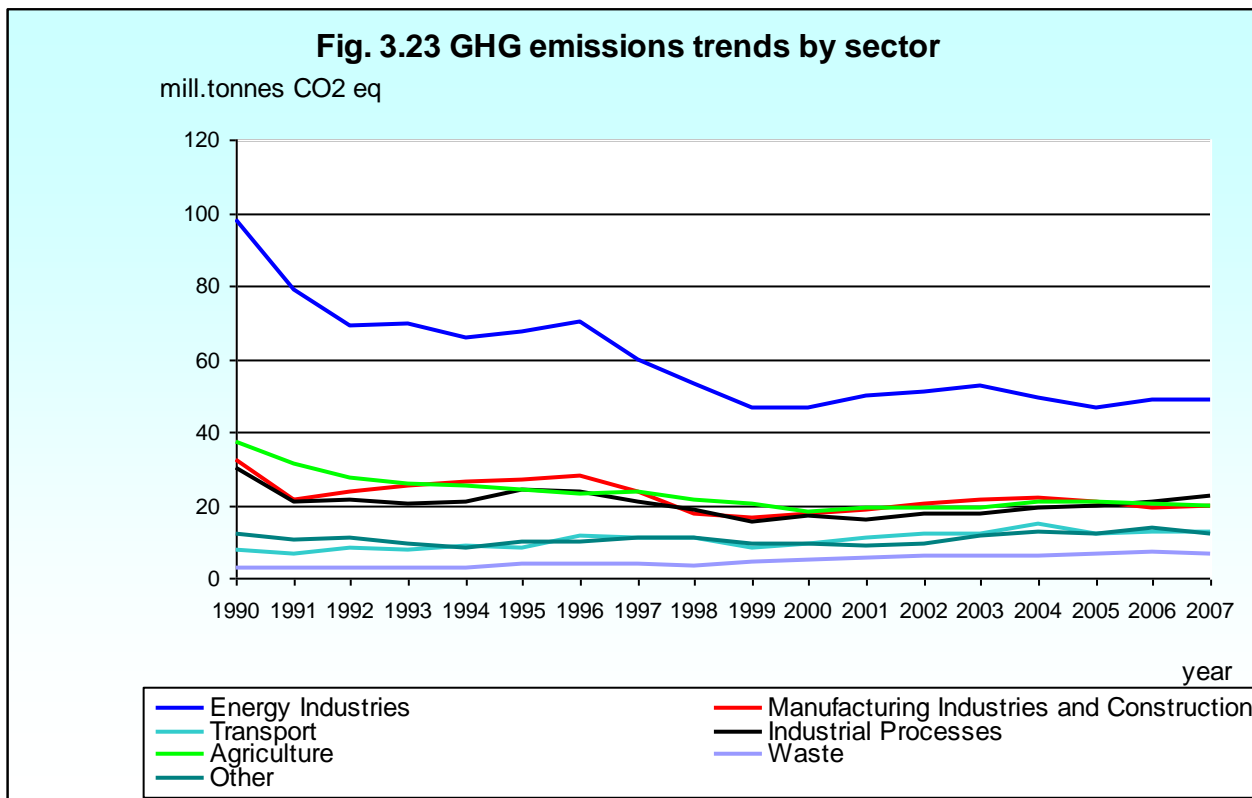
A significant indicator to the national economy is carbon intensity. The figure 3.22 presents the evolution of this indicator (t CO₂ /thousand EURO), the GDP being calculated in three measurement units:

- Current EURO, utilizing the official exchange rate of the NBR;
- EURO 2000;
- EURO PPS (EURO at the parity of the power of purchase established by EUROSTAT).



3.7.2 Trends by sector

Figure 3.23 shows the GHG emissions trends by each sector for the period 1990-2007.



Source: Eurostat site

CO₂ emissions from fuel combustion in energy industries amounted to 48.61 mil. tonnes of CO₂ equivalent in 2007. During the entire analyzed period emissions tended to reduce in this sector. The trend reflects the changes that occurred in the Romanian economy, the decrease in production, respectively, in the 1990-1996 period. After 1996 emissions continued to diminish as a result of Cernavoda NPP Unit I starting operation. After 1999, the emissions have started to increase as a consequence of economy revitalization. The reduction in 2005 resulted from the increase in the energy production of the hydroelectric power stations in the conditions of a very rainy year.

GHG emissions from the Manufacturing Industries and Construction accounted for 19.62 mil. tonnes CO₂ equivalent in 2007. The emissions in this sector in the analyzed period of time registered a decreasing trend.

In Transport emissions increased as a consequence of the increase in the number of vehicles and of mobility. In 2007, emissions in the transport sector amounted to 12, 85 mil. tonnes CO₂ eq. Over the period 1990-2007 the GHG emissions resulting from agriculture decreased.

4 Energy efficiency measures

4.1 Recent Energy Efficiency Measures

The recent energy efficiency measures and the innovative measures from NEEAP by sector, for the 2005-2009 period, are:

Residential Sector

RO28 *The promotion of the use of energy-efficient household electrical appliances and lamps*

The promotion of – and support for – the replacement of incandescent light bulbs with energy-efficient light bulbs, as well as the replacement of older household appliances (refrigerators, washing machines, etc) with more efficient models designed with reduced energy consumption in mind.

Energy-efficiency labels have a positive effect on consumer behavior as they supply information that allows consumers to purchase appliances on the basis of the product's energy efficiency.

RO29 *Energy efficiency improvement of heating-cooling systems on individual housing*

The reduction of energy consumption in individual dwellings through the use of renewable energy resources and the use of appliances and equipment which respect minimum energy efficiency standards.

RO30 *Energy Performance of existing Buildings-obligatory energy efficiency*

It is estimated that, through the implementation of thermal renovation measures set out in the multi-year plan, energy savings of up to 25% can be achieved in comparison with the situation prior to renovation. The heat insulation of buildings can be carried out in phases, thus its effects, from the point of view of the reduction of the consumption of energy, will be seen on a cumulative basis. A complete return on the investment will be achieved in approx. 6- 8 years, depending on the type of work carried out.

Transport Sector

RO3 *Pollution tax for motor vehicles*

According to the Romanian legislation entered into force in February 2009, cars pertaining to the EURO 4 category and with a cylinder capacity of less or equal to 2.000 cmc are exempt from pollution tax in Romania if registered for the first time anywhere within the EU during the period from 15 December 2008 to 31 December 2009.

RO6 *Promotion of biofuel use – innovative measure*

According to Government Decision No 1844/2005 (which fully transposes the provisions of Directive 2003/30/EC) regarding the promotion of biofuels and other renewable fuels for use in transport, a minimum of 5.75% of biofuels or other renewable fuels should be in use by 2010. This will be calculated on the basis of the energy content of all types of petrol and diesel used in transport.

Government Decision No 456/2007, which amends and updates Government Decision No 1844/2005, foresees the gradual introduction of a minimum percentage of biofuel content in conventional fuels.

According to Ordinance No 44/2006 regarding the modification of Special Government Ordinance No 25/2006, agricultural producers were accorded 1 leu for every liter of diesel acquired / biodiesel produced.

RO7 *National program for replacing the old cars*

Romanian "Old Cars" (Rabla) Program Allows Loans, Leasing On For Purchases Romanian people who replace their cars through the car park renewal program "Old Cars" will be able to use leasing and lending to finance the purchase, according to an order by the environment minister, which also states that one owner can receive the bonus from the state for each vehicle scrapped. Romania's government granted 91.4 million lei through the "Old Cars"(Rabla) program last year.

Industrial Sector

RO2 *Long Term Agreements with Industry-* innovative measure

The improvement of energy efficiency in industrial operators through the management of demand for energy and the drawing up of energy balance sheets

Through these LTA-s, industry must undertake to adopt measures for the saving of energy with a view to reducing demand for energy and to reaching its full potential for energy savings. This will be achieved through the modernization of technological processes and equipment as well as the efficient use of energy. According to estimates provided by EU states that have implemented LTA`s, energy savings were 10-20%.

RO5 *Implementation of investment projects co-financed by community funds*

The financing of projects under the auspices of Point 4 of the Operational Sectoral Programme using community funds and other resources is to be carried out by end-use industrial consumers for the purposes of reducing energy consumption. These funds may be used in order to invest in the modernization of equipment and facilities.

The carrying out of these investments will have the following effects:

- the reduction of energy consumption through the replacement of inefficient equipment with equipment designed with reduced energy consumption in mind.
- the promotion of highly efficient co-generation for industrial consumers
- the reduction of the impact on the environment.

RO6 *Promoting energy efficiency and RES utilization at energy final consumers*

Renewable resources have great energy potential and there are ample opportunities for their use on both the local and regional levels. They are advantageous not only from the economic point of view, but also with regard to the environment and society.

Promotion of the use of renewable resources for the generation of heat and electricity:

-the use of biomass:

- heating systems using sawdust equipped with their own distribution systems.
- the converting of district heating systems into sawdust-fuelled Central Heaters (CH)

-the use of solar energy:

- the production of hot water at the district CH through the installation of solar panels
- the production of domestic hot water through the use of solar panels.

-the use of hot water pumps

-the use of biogas in purification stations

RO8 *The promotion of ESCO's-* innovative measure

Energy Efficiency Contract to be issued by the ESC-o. This would ensure the putting in place of measures to ensure energy efficiency and provide guarantees of energy savings.

ESCo-style companies draw up and implement energy-efficiency projects for a wide variety of clients. They ensure the reduction of energy costs, with the end result being that savings will cover the entire cost of financing the project. ESCo-style services offer numerous advantages to their clients, such as guarantees as to the success of energy efficiency projects, the implementation of these projects while respecting the annual operating budget set by the beneficiary, and flexible methods of financing.

RO9 *The promotion of CHP's*

There exists great potential for co-generation in Romania, and this can be exploited through the promotion of highly-efficient co-generation based on the demand for thermal energy. The promotion of highly efficient co-generation will lead to the following benefits:

- savings of primary sources of energy when compared to the separate generation of electrical energy;
- reduction of greenhouse gas emissions, especially emissions of CO₂.

The effectiveness of these measures will be greater if renewable resources, especially biomass, are used as fuel in the co-generation process.

The provisions of Directive 2004/8/EC (which modifies Directive 92/42/EEC) regarding the promotion of co-generation on the basis of demand for useable heat energy in internal energy markets were transposed into national legislation by Government Decision No 219/2007.

Tertiary Sector

RO7 *Improvement of public lighting system*

Replacement of old lighting devices with new, energy efficient devices.

-The continuation of the process of replacing old, inefficient equipment.

- Introduction of devices to reduce the luminous flux on the main arteries of the cities in periods of reduced traffic

In Cluj-Napoca city municipal area, the active and reactive consumption of energy will drop by about 40% as a result of the replacement of old lighting devices. In Brasov city, it is estimated that specific electrical energy consumption can be reduced by 10% per year with the installation of devices to reduce the luminous flux on the city's main arteries during periods of reduced traffic.

The continuation of the programme to replace inefficient equipment;

- the installation of devices to reduce the luminous flux on the city's main arteries during periods of reduced traffic, to be completed by the end of 2009.

RO8 *Renewable energy use*

Promotion of the use of renewable resources for the generation of heat and electricity:

Renewable resources have great energy potential and there are ample opportunities for their use on both the local and regional levels. They are advantageous not only from the economic point of view, but also with regard to the environment and society.

2008-2010 period:

Government Decision will be drawn up aimed at the promotion of investment in the use of renewable energy sources for the production of electrical energy and heat. This will lead to an increase in energy efficiency and is to be implemented in 2008.

The use of structural funds supports projects involving the use of renewable sources of energy.

4.2 Patterns and Dynamics of Energy Efficiency Measures

In this chapter the spider graphs, are used to show in a graphic way the patterns of different kind of measures and policy elements found in MURE database for Romania. The spokes of the spider webs represent the different measure types. The greater a country's preference for a certain measure type, the more the pattern will resemble the hands of a watch indicating the preferences. The broader the policy in the sector, the more equally spread the measures on the different axes so that the pattern resembles a curve or other curves depending on the number of categories.

In all the sectors the predominant measure type is Legislative-Informative-Normative, measures (mainly Energy efficiency agreements (or voluntary agreements)) can also be found from industry sectors.

When interpreting the spider graphs one must take into account, that measures found in the MURE database do not cover all measures effecting energy efficiency or CO₂ emissions in Romania. In the future more work is needed to include all the measures effecting energy efficiency in the MURE database.

Another point that must be considered when interpreting the spider graphs is that they are based on the number of measures, not to the impact of a measure. There may be a lot of low impact measures in some category, which makes that category seem the predominant one, when one or two high impact measures in some other category may in truth have much bigger effect than all the low impact measures together.

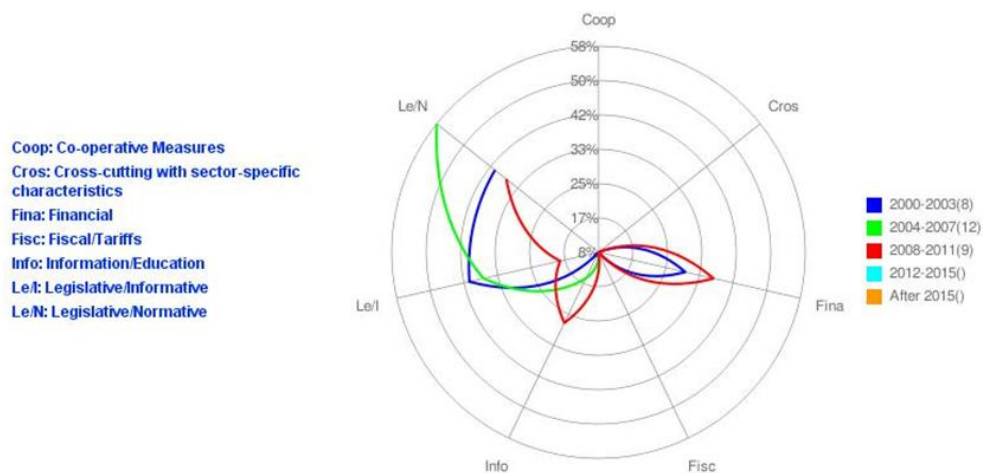
Because in 2007 Romania joined the European Union, we considered three major periods:

- 2000-2003 pre-accession period
- 2004-2007 period of accession
- 2008- 2011 post-accession period

Residential Sector

- 2000-2003 41% Legislative-Normative measures
41% Legislative-Informative measures
18% Financial measures
- 2004-2007 57% Legislative-Normative measures
37% Legislative-Informative measures
6% Information / Education
- 2008- 2011 28% Legislative-Normative measures
34% Financial measures
8% cross-cutting with sector specific characteristics
8% Legislative-Informative measures
8% Information / Education

Fig. 4.1 Energy efficiency measure patterns residential sector: development of measure by type over time (RO)



In the 2000-2007 periods, Legislative-Normative measures and Legislative-Informative measures both cover more 80% of measures and the remaining of measures are Information / Education and financial measures.

After 2008, in residential sector we can see that the emphasis in MURE database is on the distribution of information; 8% of measures are classified as Information-Education measures and another 8% are Legislative-Informative measures.

Transport Sector

- 2000-2003 11-56 % Legislative-Normative measures
33% Information / Education measures
33% Infrastructure measures
- 2004-2007 11-21% Legislative-Normative measures

22% Legislative-Informative measures
 38% Infrastructure measures
 38% Financial measures

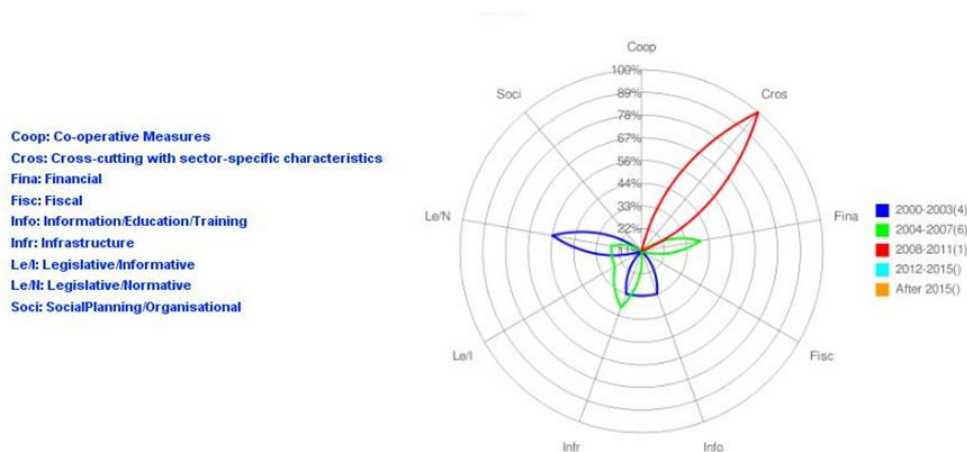
➤ 2008- 2011

11-100 % cross-cutting with sector specific characteristics

In the 2000-2007 periods, the predominant measures were Legislative-Normative and Infrastructure, with medium impact and Infrastructure measures with high impact.

After 2000, in the transport sector we can see that the emphasis in MURE database is on the distribution of information; 33% of measures are classified as Information-Education measures and another 8% are Legislative-Informative measures.

Fig. 4.2 Energy efficiency measure patterns transport sector: development of measure by type over time (RO)

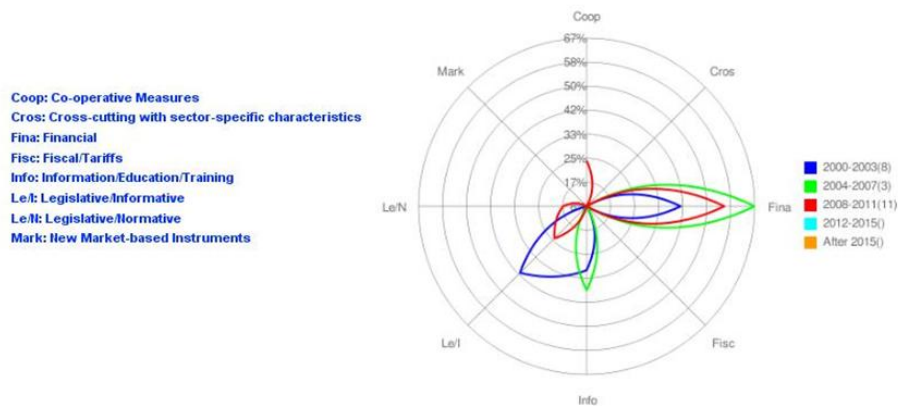


Industrial Sector

In the industrial sector the set of policies and measures is divided in three measure types:

- Financial, with high impact 67% 2004-2007, 55 % 2008-2011
- Legislative-Informative, with high impact in the 2000-2003 period, 25% 2008-2011
- Information-Education, medium impact, 25% after 2008

**Fig. 4.3 Energy efficiency measure patterns industry sector:
development of measure by type over time (RO)**

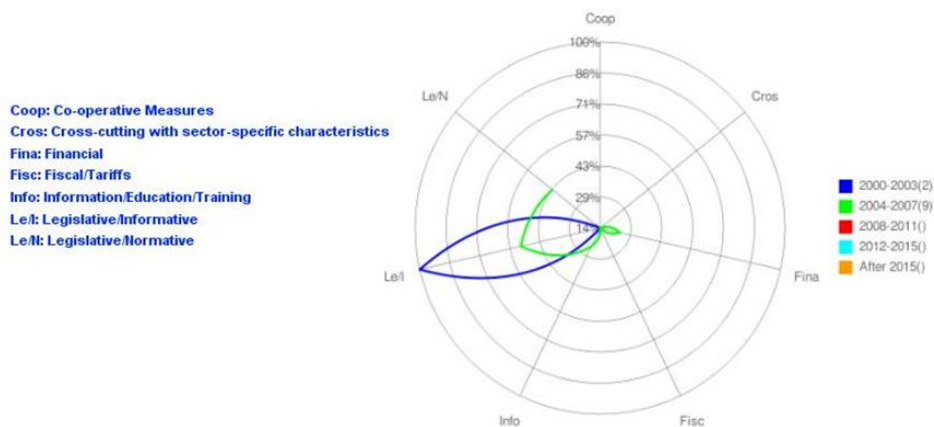


Tertiary Sector

In the tertiary sector the set of policies and measures is divided in three measure types:

- Financial
- Legislative-Informative
- Legislative-Normative measures

**Fig. 4.4 Energy efficiency measure patterns tertiary sector:
development of measure by type over time (RO)**



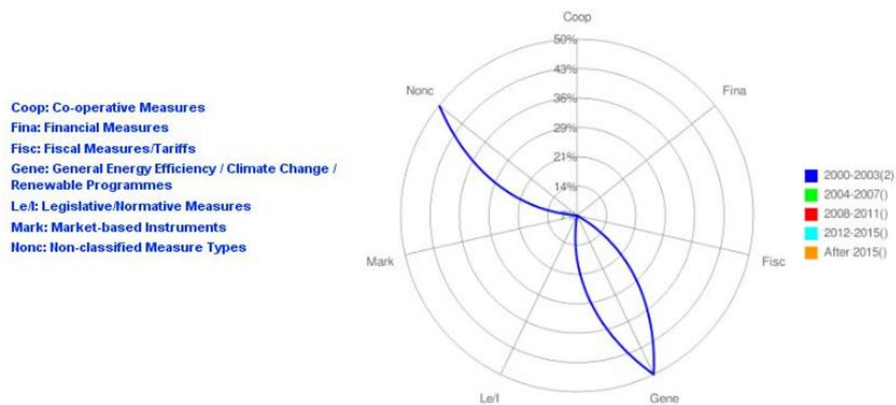
In the 2000-2003 period there are only Legislative- Informative measures -100% with medium impact. In 2004-2007 periods are : 43% Legislative-Normative measures, 49% Legislative- Informative measures, 8% Information / Education and financial measures, all with medium impact.

Cross-cutting measures

In cross-cutting sector of MURE there are two measures for Information Campaigns Regarding Improvement Energy Efficiency, non-classified measures, with high impact and one general energy efficiency measure – The Law on Efficient Energy Use, with high impact.

We note that the classification categories of the cross-cutting measures are not very flexible and make it difficult to classify all measures.

Fig. 4.5 Energy efficiency measure patterns general cross-cutting sector: development of measure by type over time (RO)



4.3 Innovative Energy Efficiency Measures

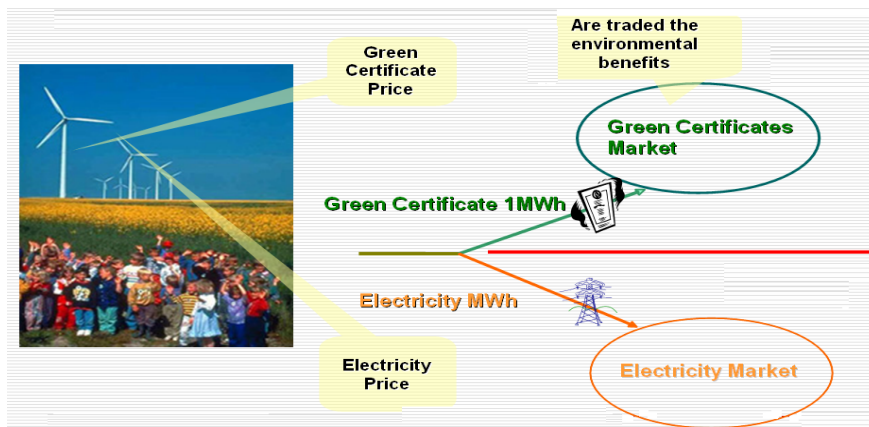
The most innovative energy efficiency measures in ROMANIA

A. Promotion system of renewable energy sources in Romania

The promotion of electricity produced from renewable sources is based on the mandatory quota combined with green certificates' transaction

In the field of electricity regulation and market, competent Authority is The Romanian Energy Regulatory Authority – ANRE. According to the Energy Law, all producers of electricity have equal access to the network. The tariffs are regularly adapted to the actual production costs by the Romanian Regulatory Authority, ANRE.

For each MWh of renewable electricity delivered to the grid, producers receive from the System and Transport Operator a green certificate which can be traded on the green certificates market (bilateral and/or centralised) for prices between established limits of EUR 2-55 Euros/ certificate. Producer may sell the E-RES on the electricity market, as any other electricity producer, obtaining the market price. For covering the entire generation costs and for obtaining a reasonable profit, the producer receives a green certificate for each MWh of electricity supplied in the electricity network. This green certificate may be traded within the price limits legally set-up.



Until December 2008, in Romania, all the sources from renewable were getting 1 green certificate/1 MWh delivered. In December 2008, the law no. 220 was adopted, and thus is a differential allocation of GC..

1 green certificate for each 1 MWh delivered in the electricity grid by the generators of hydroelectricity from new HPP or HPP with max. 10 MW installed power and rehabilitated;

b. 1 green certificate for each 2 MWh delivered in the electricity grid by the generators of hydroelectricity from HPP (installed power 1- 10 MW) (which don't correspond conditions to letter a.)

c. 2 green certificate for each 1 MWh delivered in the electricity grid by the generators of hydroelectricity from HPP with max. 1 MW/unit installed power

d. 2 green certificates for each 1 MWh delivered in the electricity grid by generators from wind-until 2015

1 green certificate -starting with 2016

e. 3 green certificates for each 1 MWh delivered in the electricity grid by generators from biomass, biogas, bioliquid, gas of waste fermentation, geothermal energy

f. 4 green certificates for each 1 MWh delivered in the electricity grid by generators from solar sources

B. Improvement of Energy Efficiency amongst industrial operators through the signing of long-term agreements (LTAs)

Category: Voluntary agreements and instruments for co-operation – Industrial companies

Target group: Representatives of industry (industrial operators and/or professional and employers' associations)

End-use EE action targeted:

The replacement of equipment with a view to reducing the consumption of energy through investments designed to modernise the following systems:

- production and supply of steam/hot water
- heat recovery;
- electric motors;
- compressed air;
- automatic control of energy demand, by cost centres;
- drying;
- water cooling;
- industrial furnaces.
- others.

Effectiveness: Through these LTAs, industry must undertake to adopt measures for the saving of energy with a view to reducing demand for energy and to reaching its full potential for energy savings. This will be achieved through the modernisation of technological processes and

equipment as well as the efficient use of energy. According to estimates provided by EU states that have implemented LTAs, energy savings were 10-20%.

New measures:

The signing of preliminary agreements and the opening of negotiations between government authorities and representatives of industry for the 2007 LTAs.

The signing of voluntary agreements between government and industry in order to reach targeted energy savings in industry on the basis of the LTA model.

Authority responsible for implementation of EE measures:

Ministry of Economy, ARCE, MMDD

C. The promotion of the development of Energy Service Companies (ESCO)

Category: Energy services designed to produce energy savings

- One-third financing
- Energy efficiency contracts

Target group: Central and local public authorities, Industrial sector

End-use EE action targeted

Energy Efficiency Contract to be issued by the ESCo. This would ensure the putting in place of measures to ensure energy efficiency and provide guarantees of energy savings.

Effectiveness of EE measures

ESCO-style companies draw up and implement energy-efficiency projects for a wide variety of clients. They ensure the reduction of energy costs, with the end result being that savings will cover the entire cost of financing the project. ESCo-style services offer numerous advantages to their clients, such as guarantees as to the success of energy-efficiency projects, the implementation of these projects while respecting the annual operating budget set by the beneficiary, and flexible methods of financing.

New measures:

In place:

The drawing up of a study by the Ministry of Finance under the auspices of the research and development programme in relation to means for the implementation of measures set out in Directive 32/2006/EC. These include:

- Analysing means to support programmes designed to increase energy efficiency: (white certificates, ESCos, Energy Efficiency Contracts)
- The drawing up of Energy Efficiency Contracts as a means of supporting the activities of ESCos.
- Identifying the barriers preventing ESCos from functioning to their full potential in Romania and the implementation of measures to remove these barriers.

Authority responsible for implementation of EE measures

Responsible authorities: Ministry of Economy, ARCE

D. Promotion of the use of biofuels for transport

Category: Financing Rules

Area of application of EE measures: National level

Target group: Producers and importers of biofuels

End-use EE action targeted - According to Government Decision No 1844/2005 (which fully transposes the provisions of Directive 2003/30/EC) regarding the promotion of biofuels and other renewable fuels for use in transport, a minimum of 5.75% of biofuels or other renewable fuels should be in use by 2010. This will be calculated on the basis of the energy content of all types of petrol and diesel used in transport. Government Decision No 456/2007, which amends and updates Government Decision No 1844/2005, foresees the gradual introduction of a minimum percentage of biofuel content in conventional fuels.

New measures:

On the basis of Government Special Ordinance No 125/2006, the following will be adopted:

- Order of the minister of agriculture and rural development regarding financial support of 50 lei/ha accorded to agricultural producers for the cultivation of sunflower, rapeseed, soy and

corn under the Surface Area Payment Scheme (SAPS), and support amounting to 30 lei/ha under the Complimentary National Direct Payment (CNDP) scheme.

- Order of the minister of agriculture and rural development regarding direct payments for crops destined for energy use – (financial support of 45 euros/ha for energy-use crops within the framework of the 2 million ha approved at EU level).

Authority responsible for implementation:

Ministry of Economy and Ministry of Agriculture and Rural

4.4 Energy efficiency measure evaluations

4.4.1 Semi-quantitative Impact Estimates of Energy Efficiency Measures

Residential Sector

For this sector there are fourteen measures: two – 14,3% with low impact, two -14,3% with high impact and the rest – 71,4% with medium impact.

Table 4.1 Energy efficiency measures in Residential Sector

Code	Title	Status	Type	Starting Year	Ending Year	Semiquantitative Impact
RO6	Minimum efficiency standards for refrigerators	Ongoing	Legislative/Normative	2002		Low
RO7	Minimum efficiency standards for fluorescent lighting ballasts	Ongoing	Legislative/Normative	2004		Medium
RO9	Using promotion of efficient householder appliances	Ongoing	Legislative/Informative	2001		Medium
RO13	Energy labeling of electric lamps	Ongoing	Legislative/Informative	2002		Medium
RO17	Energy labeling of air-conditioners	Ongoing	Legislative/Informative	2004		Medium
RO21	Minimum efficiency requirements of new hot-water boilers fired with liquid or gaseous fuels	Ongoing	Legislative/Normative	2003		Medium
RO22	Individual billing of the consumers supplied by public district heating systems	Ongoing	Legislative/Normative	2009		High
RO24	Regulation of heat supply and use	Ongoing	Legislative/Normative	1994		Low
RO25	Energy Performance of New Buildings-building code	Ongoing	Legislative/Informative, Legislative/Normative	2007		Medium

Code	Title	Status	Type	Starting Year	Ending Year	Semiquantitative Impact
RO27	Programs for thermal rehabilitation of the multi-level residential buildings built-up 1950-1990	Ongoing	Financial	2002		Medium
RO28	The promotion of the use of energy-efficient household electrical appliances and lamps	Proposed (advanced)	Financial, Information/Education, Legislative/Informative	2009		Medium
RO29	Energy efficiency improvement of heating-cooling systems on individual housing	Ongoing	Information/Education, Legislative/Informative, Legislative/Normative	2005		Medium
RO30	Energy Performance of existing Buildings-obligatory energy efficiency certificates	Ongoing	Financial, Information/Education, Legislative/Normative	2009		High
RO31	Energy labeling of new hot water boilers fired with liquid or gaseous fuels	Ongoing	Legislative/Informative, Legislative/Normative	2003		Medium

Transport Sector

For this sector there are ten measures: one – 10% with low impact, two -20% with high impact and the rest – 70% with medium impact.

Table 4.2 Energy efficiency measures in Transport Sector

Code	Title	Status	Type	Starting Year	Ending Year	Semiquantitative Impact
RO1	Mandatory speed limits	Ongoing	Legislative/Normative	2003		Medium
RO2	Mandatory technical inspections	Ongoing	Legislative/Normative	2000		Medium
RO3	Pollution tax for motor vehicles	Ongoing	Cross-cutting with sector-specific characteristics	2008		Medium
RO4	Mandatory programs for monitoring the fuel consumption for enterprises and public administration	Ongoing	Information/Education/Training, Infrastructure	2001		Low

RO5	Modernization of rail transport	Proposed (advanced)	Infrastructure	2004	2015	High
RO6	Promotion of bio-fuel use	Ongoing	Financial, Legislative/Normative	2006		High
RO7	National program for replacing the old cars	Ongoing	Financial	2005		Medium
RO8	Modernization of subway transport	Proposed (advanced)		2004	2010	Medium
RO9	Modernization of subway transport	Ongoing		2004	2010	Medium
RO10	Mandatory labeling of vehicles	Ongoing	Legislative/Informative	2005		Medium

Industrial Sector

For this sector there are nine measures: four -44,4% with high impact and five – 55,6% with medium impact.

Table 4.3 Energy efficiency measures in Industry

Code	Title	Status	Type	Starting Year	Ending Year	Semi-quantitative Impact
RO1	The Law on Efficient Energy Use	Completed	Financial, Information/Education/Training, Legislative/Informative	2001	2008	Medium
RO2	Long Term Agreements with Industry	Ongoing	Co-operative Measures	2008	2010	High
RO3	Management of energy demand and development of the energy balance sheets	Ongoing	Financial, Information/Education/Training, Legislative/Informative	2001	2010	High
RO4	Financial support for investment projects to reduce energy consumption	Ongoing	Financial	2001	2008	High
RO5	Implementation of investment projects co-financed by community funds	Ongoing	Financial	2008	2010	High
RO6	Promoting energy efficiency and RES utilization at energy final consumers	Completed	Co-operative Measures, Financial, Legislative/Informative, Legislative/Normative	2008		Medium

RO7	Grant-supported credit line for Romania that has been established by the European Commission and the European Bank for Reconstruction and Development.	Ongoing	Financial	2008	2010	Medium
RO8	The promotion of ESCO's	Ongoing	Financial, Information/Education/Training	2007	2010	Medium
RO9	The promotion of CHP's	Ongoing	Financial	2007		Medium

Tertiary Sector

For this sector all measures are with medium impact.

Table 4.4 Energy efficiency measures Tertiary Sector

Code	Title	Status	Type	Starting Year	Ending Year	Semiquantitative Impact
RO1	Law on efficient energy use	Ongoing	Legislative/Informative	2001		Medium
RO2	Energy Performance of existing Buildings-obligatory energy efficiency certificates	Ongoing	Legislative/Informative	2007		Medium
RO3	Energy Performance of New Buildings	Ongoing	Legislative/Informative	2007		Medium
RO4	Energy Performance of Buildings-energy efficiency certificates	Ongoing	Legislative/Informative	2007		Medium
RO5	Energy Performance of Buildings-inspection of boilers, air conditioners and heating systems	Ongoing	Legislative/Normative	2007		Medium
RO6	Energy Performance of Buildings- energy audits	Ongoing	Legislative/Informative	2007		Medium
RO7	Improvement of public lighting system	Ongoing	Legislative/Normative	2007	2009	Medium
RO8	Renewable energy use	Ongoing	Financial, Information/Education/Training	2006	2010	Medium

Cross-cutting measures

For this sector there are two measures: one - 50% with medium impact and one – 50% with high impact.

Table 4.5 Cross cutting energy efficiency measures

Code	Title	Status	Type	Starting Year	Ending Year	Semiquantitative Impact
RO2	Information campaigns regarding improvement energy efficiency	Ongoing	Non-classified Measure Types	2003		Medium
RO1	The Law on Efficient Energy Use	Completed	General Energy Efficiency / Climate Change / Renewable Programmes	2001		High

4.4.2 Lessons from Quantitative Energy Efficiency Measure Evaluations

Evaluation of energy audits in the building sector

National budget for the transposition of the Directive

Taking into consideration the ambitious energy savings target that Romania has been assumed in the First National Action Plan for Energy Efficiency 2007-2010, National Programmes co financed from state budget have been elaborated and implemented:

- The National Program for reducing energy costs for the population elaborated in 2007 and financed in January 2008 having allocated around 9 million euros. The programme was implemented by the Ministry of Economy through ARCE (Romanian Agency for Energy Conservation)
- The National Programme for housing rehabilitation implemented by the Ministry of Regional Development and Housing having allocated in 2008 around 6 million euros. In the period 2006-2008, around 12.5 million euros have been used for a number of 684 energy audits from which 372 technical projects and 89 blocks of flats rehabilitated and another 39 in an advanced stage of rehabilitation.
- The National Program for increasing the EE and promoting the RES in public sector 2009-2010. It addresses to schools, hospitals, municipalities aiming among other the EE behaviour change. In 2009 the amount allocated is around 6 million Euros for investment projects in public lighting, building rehabilitation and heating. The programme is implemented by the Ministry of Economy through ARCE (Romanian Agency for Energy Conservation).

Table 4.6 Industrial energy audits

No.	The measure proposed to be implemented	The energy savings estimated toe/year
1.	Furnace Foundry: refractory masonry restoration, restoring insulation, replacement burners, heat recovery installation of the burnt gas	3100

2.	Steam boiler boilers equipped with automatic combustion analyzers (1852 toe / year), adjust the operation of boilers (254 toe), maintenance and repair degazor (67 toe / year); recovery steam foam (362 toe / year)	2535
3.	Energy Plant of 330t / h avoiding operation energy bloc at low loads, keep firing in optimal conditions, sealing steam condenser	5256
4.	Clingherit installation Alternative fuels (Fluff - plastic) in clinker burning at a rate of 8.38%.	5731
5.	DH Plant and network heating system transport acquisition and operation of a group of cogeneration of heat engine operating MWe 1.85 vegetable oil fuel (70%) and biodiesel (30%), rehabilitation and modernization heating system, upgrading point heating plants	1767
6.	DH Plant The introduction of plate heat exchangers, steam - water (heating boilers)	1500
7.	Heat transport networks Replacement of existing underground pipelines with Pre-insulated pipes. Rehabilitation of pipelines and piping insulation	5122

5 National Developments under the EU Energy Efficiency Directive and the 20% Energy Efficiency Target of the EU

According to the EU Energy Efficiency Directive provisions, on June 30, 2007 Romania submitted the European Commission the first NEEAP.

The energy efficiency increase measures included in the first NEEAP fall into the following categories:

- Regulations
- Information and legislative measures (energy audit)
- Voluntary agreements and cooperation instruments
- Energy services for energy savings (financing with the third party, energy efficiency agreements)
- Financial instruments (subsidies, tax exemption for the issuing of the construction authorization in order to carry out thermal rehabilitation works, co-financing of works)
- The energy efficiency mechanisms and other combinations between the other subcategories (energy efficiency funds)

Romania's energy saving target is given in the following table:

Table 5.1 Romania's energy saving target

	[thousand toe]
Average in the 2001-2005 period	20, 840
The 9% target of energy savings by 2016	1,76*
The target of energy savings adopted by Romania by 2016	2800**
The intermediate target for 2010	940***

* *The minimum value according to the Directive 2006/32/EC*

** *13.5 % of the average consumption 2001 – 2005, 1.5 % annually, respectively*

*** *4.5 % of the average consumption 2001 – 2005, 1.5 % annually, respectively*

In order to improve the energy efficiency of the industrial consumers the following measures are envisaged for the industrial sector:

- Conclusion of long-term agreements -LTA
- Management of energy demand and development of energy balances
- Support given to the investment project financing designed to reduce energy demand
- Development of certain investment projects co-financed from the Community funds

In the residential and tertiary sector the following measures are envisaged:

- Thermal insulation and ventilation of the multi-storey residential buildings built in the 1950-1990 period
- Increase in the energy efficiency of the heating / cooling systems in the individual buildings
- Promotion of highly efficient cogeneration
- Improvement in the public lighting system
- Promotion of the energy efficient household appliances and lamps
- Promotion of the energy services company development - ESCO
- Utilization of the renewable energy sources

Measures for improving energy efficiency in the transport sector:

- Modernization of the railway transport
- Modernization of the underground transport
- Promotion of the bio- fuel utilization for transport

At the same time, the document includes horizontal and trans-sectoral measures in the legislation field:

- Translation into the national legislation of the provisions of the Directive 2005/32/CE of the European Parliament and Council of July 6, 2005 on the setting up of a framework for establishing the eco-design requirements for the energy consuming products;
- Adoption of the energy efficiency measures by the public sector, the focus being on the measures that generate the highest energy savings;
- Obligation to utilize the financial instruments aiming at obtaining energy savings, especially the energy efficiency contracts stipulating energy savings that can be measured and predetermined (including the cases where the administrations have externalized the public services);
- Obligation to buy equipment on the basis of the lists that mention the specifications on the energy efficiency of the different categories of equipment. To this goal, in 2008, the Ministry of Environment and Sustainable Development will develop the National Action Plan for the Public Green Acquisitions, according to which every public institution will have the obligation to buy a percentage of ecological bulbs. The Action Plan will include such targets for other products and services, e.g. computers, printers, cars and ecological machines;
- The obligation to carry out energy audits and apply their recommendations relating to profitability.

In the same category of transectoral measures are included the information campaigns carried out through the Romanian Energy Conservation Agency, as well as through the Ministries of Environment and Housing. The financial instruments, the credit lines for the energy efficiency projects (EBRD agreement), respectively, are also mentioned (EBRD agreement).

On August 29, 2008 the Government Ordinance no. 22/2008 on energy efficiency and promotion of end-use RES utilization was published in the Official Bulletin of Romania. The Ordinance translates the provisions of the Directive 2006/32/CE of the European Parliament and Council of April 5, 2006 on the end-use energy efficiency and energy services into the Romanian legislation, aiming at establishing a legal framework for the development and application of the national energy efficiency policy.

It addresses the providers of energy services, the energy distribution companies, the operators of the distribution systems, the retail energy companies and the final consumers.

The Ordinance specifies the obligations of the final energy consumers and energy distribution companies. Among other things, the Document stipulates that the economic operators whose annual energy consumption surpasses 1000 toe shall develop an annual energy audit, carried out by a physical or legal person authorized by the Romanian Energy Conservation Agency. The economic operators whose annual energy consumption ranges between 200 and 1000 toe shall carry out an energy audit every two years. The economic operators shall also have an energy consumption measurement, recording and monitoring system in place and shall send the Romanian Energy Conservation Agency the required information on energy consumption and energy efficiency indicators. The Ordinance also stipulates the obligations of the central and local public administration authorities relating to energy efficiency increase, as well as the obligations of the energy distribution companies, energy distribution system operators and retail energy companies.

At the end of the year 2008 the Romanian Government adopted the Government Decision no. 1661 through which the National Programme for increasing energy efficiency and utilizing renewable energy sources in the public sector between 2009 and 2010 was approved.

Annex 1

Energy Efficiency Measure Summary by Country

Residential Sector

Code	Title	Status	Type	Starting Year	Ending Year	Semiquantitative Impact
<u>RO6</u>	Minimum efficiency standards for refrigerators	Ongoing	Legislative/Normative	2002		Low
<u>RO7</u>	Minimum efficiency standards for fluorescent lighting ballasts	Ongoing	Legislative/Normative	2004		Medium
<u>RO9</u>	Using promotion of performant household appliances	Ongoing	Legislative/Informative	2001		Medium
<u>RO13</u>	Energy labelling of electric lamps	Ongoing	Legislative/Informative	2002		Medium
<u>RO17</u>	Energy labelling of air-conditioners	Ongoing	Legislative/Informative	2004		Medium
<u>RO21</u>	Minimum efficiency requirements of new hot-water boilers fired with liquid or gaseous fuels	Ongoing	Legislative/Normative	2003		Medium
<u>RO22</u>	Individual billing of the consumers supplied by public district heating systems	Ongoing	Legislative/Normative	2009		High
<u>RO24</u>	Regulation of heat supply and use	Ongoing	Legislative/Normative	1994		Low
<u>RO25</u>	Energy Performance of New Buildings-building code	Ongoing	Legislative/Informative, Legislative/Normative	2007		Medium
<u>RO27</u>	Programs for thermal rehabilitation of the multi-level residential buildings built-up 1950-1990	Ongoing	Financial	2002		Medium
<u>RO29</u>	Energy efficiency improvement of heating-cooling systems on individual housing	Ongoing	Information/Education, Legislative/Informative, Legislative/Normative	2005		Medium

RO30	Energy Performance of existing Buildings-obligatory energy efficiency certificates	Ongoing	Financial, Information/Education, Legislative/Normative	2009		High
RO31	Energy labelling of new hot water boilers fired with liquid or gaseous fuels	Ongoing	Legislative/Informative, Legislative/Normative	2003		Medium

Transport Sector

Code	Title	Status	Type	Starting Year	Ending Year	Semiquantitative Impact
RO1	Mandatory speed limits	Ongoing	Legislative/ Normative	2003		Medium
RO2	Mandatory technical inspections	Ongoing	Legislative/ Normative	2000		Medium
RO3	Pollution tax for motor vehicles	Ongoing	Cross-cutting with sector-specific characteristics	2008		Medium
RO4	Mandatory programs for monitoring the fuel consumption for enterprises and public administration	Ongoing	Information/ Education/ Training, Infrastructure	2001		Low
RO6	Promotion of biofuel use	Ongoing	Financial, Legislative/ Normative	2006		High
RO7	National program for replacing the old cars	Ongoing	Financial	2005		Medium
RO9	Modernisation of subway transport	Ongoing		2004	2010	Medium
RO10	Mandatory labelling of vehicles	Ongoing	Legislative/Informative	2005		Medium

Industrial Sector

Code	Title	Status	Type	Starting Year	Ending Year	Semiquantitative Impact
RO2	Long Term Agreements with Industry	Ongoing	Co-operative Measures	2008	2010	High

RO3	Management of energy demand and development of the energy balance sheets	Ongoing	Financial, Information/ Education/ Legislative/ Informative Training,	2001	2010	High
RO4	Financial support for investment projects to reduce energy consumption	Ongoing	Financial	2001	2008	High
RO5	Implementation of investment projects co-financed by community funds	Ongoing	Financial	2008	2010	High
RO7	Grant-supported credit line for Romania that has been established by the European Commission and the European Bank for Reconstruction and Development.	Ongoing	Financial	2008	2010	Medium
RO8	The promotion of ESCO's	Ongoing	Financial, Information/ Education/ Training	2007	2010	Medium
RO9	The promotion of CHP's	Ongoing	Financial	2007		Medium

Tertiary Sector

Code	Title	Status	Type	Starting Year	Ending Year	Semiquantitative Impact
RO1	Law on efficient energy use	Ongoing	Legislative/ Informative	2001		Medium
RO2	Energy Performance of existing Buildings-obligatory energy efficiency certificates	Ongoing	Legislative/ Informative	2007		Medium
RO3	Energy Performance of New Buildings	Ongoing	Legislative/ Informative	2007		Medium
RO4	Energy Performance of Buildings-energy efficiency certificates	Ongoing	Legislative/ Informative	2007		Medium

<u>RO5</u>	Energy Performance of Buildings-inspection of boilers,air conditioners and heating systems	Ongoing	Legislative/ Normative	2007		Medium
<u>RO6</u>	Energy Performance of Buildings-energy audits	Ongoing	Legislative/ Informative	2007		Medium
<u>RO7</u>	Improvement of public lighting system	Ongoing	Legislative/ Normative	2007	2009	Medium
<u>RO8</u>	Renewable energy use	Ongoing	Financial, Education/ Training Information/	2006	2010	Medium

Cross-cutting measures

Code	Title	Status	Type	Starting Year	Ending Year	Semiquantitative Impact
<u>RO2</u>	Information campaigns regarding improvement energy efficiency	Ongoing	Non-classified Measure Types	2003		Medium

Annex 2
Country Profile



Energy Efficiency Profile: Romania

Energy Efficiency Trends

Overview

Between 1996 and 2005 the energy efficiency index (ODEX) decreased by 27 % at the level of the entire economy in Romania. This was better than the EU 27 average (10 % improvement between 1997 and 2005). All the sectors participated in this improvement.

Industry

Most of the industrial branches registered an improvement in energy efficiency. The most impressive evolutions were registered in the textile and food processing industries whose overall evolution was very favorable. In the great energy consuming branches (chemicals, steel, etc.) some vacillations were registered but, in general, the trend was positive. Some branches had a poor performance (non metallic).

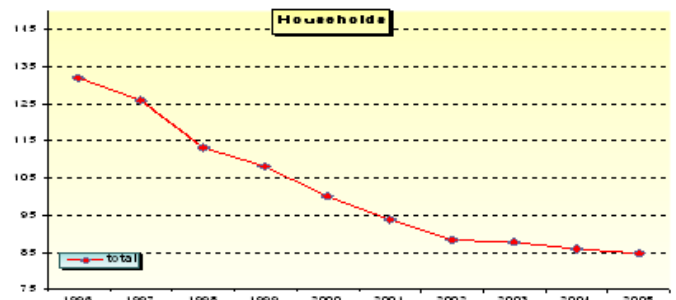
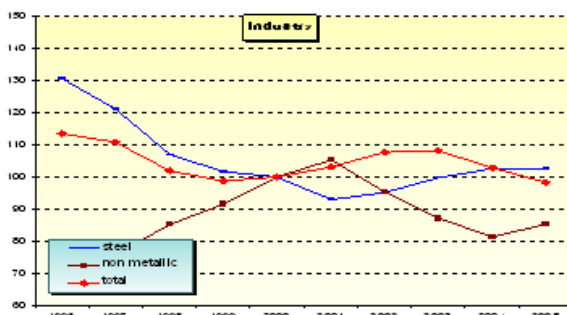
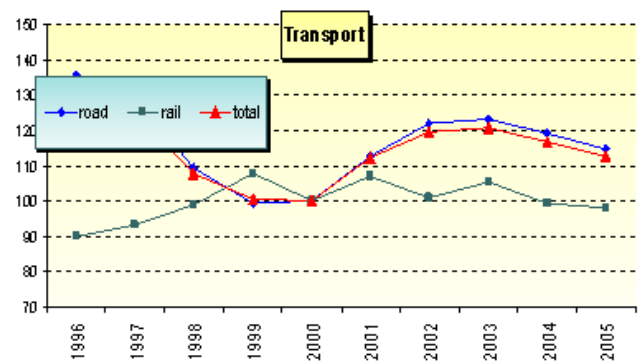
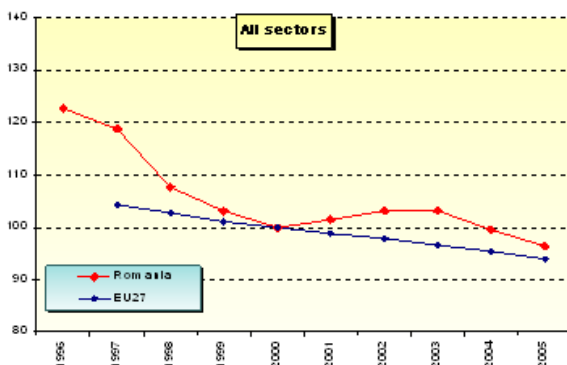
To conclude with, in the 1996-2005 period energy efficiency in industry increased by 16 %.

Households

In the household sector, energy efficiency improved considerably between 1996 and 2005 (by 47 %). This was possible due to the low level of efficiency at the beginning of the period considered. Measures for improving the performances of the existing buildings have been taken. Improved standards for the new dwelling places have been developed. Energy labeling of the household appliances and receivers have been extended. The elimination of subsidies and increase in the energy price for population have led to changes in behavior and facilitated energy efficiency increasing measures.

Transport

Between 1996 and 2005 the share of road transport increased continuously and its efficiency decisively influenced the efficiency of the entire sector. Energy efficiency diminishing between 2001 and 2003 was determined by the boom of activity (on the background of economy re-launching) that led to the utilization of non-efficient means of transport. The measures adopted led to performance improvement after 2003 and the trend is considered irreversible.



Energy Efficiency Policy Measures

Institutions and programmes

In Romania the body specialized in energy efficiency is the Romanian Energy Conservation Agency (ARCE) subordinated to the Ministry of Economy and Finance. ARCE participates in the development of energy efficiency policies and is the institution responsible for the policy implementation and monitoring.

From the technical point of view, the actions aiming at increasing the building energy performances are coordinated by the Ministry of Development, Public Works and Dwellings.

In 2007 the first National Energy Efficiency Action Plan was developed according to the provisions of the Directive 2006/32/EC. Romania has committed itself to diminishing final energy consumption by 2800 thousand toe by 2016, which corresponds to an annual average rate of 1.5% between 2008 and 2016.

Industry

All the economic operators whose annual consumption surpasses 1000 toe shall:

- carry out an energy audit every year developed by a physical or legal person authorized by ARCE;
- develop energy efficiency programmes including measures on the short, medium and long term;
- appoint an energy manager authorized by ARCE or conclude an energy management contract with a physical or legal person accredited by ARCE.

The main component of the energy efficiency programme for industry coordinated by ARCE is implementation of Voluntary Agreements on

long term to be developed in co-operation with SENTER NOVEM (the Netherlands).

Households and Services

The local public authorities from the localities with more than 20,000 inhabitants shall develop energy efficiency improvement programmes.

Energy labeling of household appliances has been introduced.

In the period 2006-2008 ARCE participated in the CEECAP European programme on the implementation of the EU policy relating to household appliances in Central and Eastern Europe.

The national programme for diminishing the population expenses with energy in the period 2005-2007 resulted in the selection of 113 projects to be co-financed from the budget.

Transport

The companies and the units of the local and central public administration that own more than 25 vehicles shall develop fuel consumption monitoring and management programmes for the respective group of vehicles.

Energy prices and taxes

Since July 1, 2007, all the electric energy and natural gas consumers have become eligible consumers and can choose their own supplier.

The Romanian Energy Efficiency Fund has been established for financing the energy efficiency investments in a revolving system.

The Government Ordinance OG no. 22/2008 on energy efficiency and promotion of renewable energy source utilization by the final consumers explicitly stipulates the allocation of funds from the budget for subsidizing the energy efficiency programmes and measures.

Selected Energy Efficiency Measures

Sectors	Title of Measure	Since
Industry	Energy audits	1999
	Energy efficiency investment financing through the Romanian Energy Efficiency Fund	2005
	Setting up of the Info- Energy Points network in the main towns of the country	2005
	Quota Allocation Plan	2007
Households and Tertiary	Energy labeling of household appliances	2001
	National Program for Renovation of the Multi Flat Buildings	2003
Transport	Programme for the acquisition of obsolete cars older than 10 years on condition that the amount received be used for acquiring new cars.	2006