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EFFICIENCY IN POLAND

IN YEARS 1998-2008

Warsaw, 2010

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PREFACE

This publication is successive edition of the study "ENERGY EFFICIENCY" published by the Central Statistical Office (GUS) as part of the series entitled "Information and statistical papers".

The aim of this publication is to present global and sector energy efficiency indicators with their analysis.

The development of energy efficiency indicators adapting statistics to changing economy conditions and present needs (monitoring of energy economy and controlling its management towards "sustainable development") is realized in answer to European Commission and IEA/OECD documents. These documents recommended joined actions of Eurostat and Member States, aimed at creation of statistical indicators system to assess trends in the field of energy efficiency and supporting decisions making and coordination of these actions with works carried by International Energy Agency.

Realization of this aim served works carried in frames of European Union projects SAVE I and SAVE II and carry at the present in frames of "Intelligent Energy for Europe" programme.

Presented results show potentiality of system created in the EU and IAE/OECD and are not full analysis of present state and trends of energy intensity of Polish economy.

The publication was elaborated by employees of the Polish National Energy Conservation Agency, Energy Market Agency and Central Statistical Office.

Wanda Tkaczyk
Director of Division

Warsaw, June 2010

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1. Introduction

The increase of energy efficiency of generation, transmission and use processes is a pillar of sustainable energy policy. It is reflected in the law and actions undertaken by national institutions and international organizations, among them in regulations connected with energy efficiency, including:

- Directives of the European Parliament and of the Council[1] (with the latest 2006/32/EC of 5 April 2006 on energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC),
- Renewed Lisbon Strategy,
- National Coherence Strategy for years 2007-2013.

The main aim of the latest directive is achieving economically reasonable improvement of fuels and energy end-use efficiency in Member States of the European Union through: setting goals, mechanisms and incentives; setting institutional, financial and legal frames to cancel existing market barriers having influence on energy end-use efficiency; promotion of programmes aiming at improving energy efficiency; development of high quality energy services for end users; harmonization of methodology of energy savings calculation and verification.

Above mentioned directive obliges Member States to collect and transmit data required to monitor, asses and plan actions towards energy end-use efficiency improvement.

There are two methods of measuring growth of energy efficiency (energy savings). These are: "top-down" method and "bottom-up" method.

- In method „top-down" aggregated data is used and therefore it is called energy efficiency indicators method. This method enables to set indicators of situation development, but it does not ensure detailed measuring on specific level. Mostly, sections, divisions, groups of economy, groups of devices, and types of transport means are the subjects of calculations. Calculated values of energy consumption or intensity are recalculated with reference to such external factors as number of degree days during heating season, structural changes, production profile, etc.

[1] See Attachment No. 3

- „Bottom-up" method is more precise way of energy savings calculations resulting from energy efficiency increase. Primary, energy consumption of single end user for instance refrigerator is calculated during defined time period before introducing pro-efficiency action, obtaining base value[2]. Next, the energy consumption in the following period is compared to the consumption during prior period. The difference between results measures energy efficiency increase. If similar calculations are made for all energy devices, and results sum up, precise result of energy efficiency growth is obtained. When making calculations, it should be remembered also in this case to take into account climate corrections and other factors outnumbered in the description of the method „top-down".

Central Statistical Office and Polish National Energy Conservation Agency take part since few years in successive projects aiming at assessment of energy efficiency trends and description of energy efficiency policy measures. At the moment they participate in 2.5 - years (2010-2012) project of the Intelligent Energy for Europe programme "Monitoring of European Union and national energy efficiency targets"**.**

The aim of the project is to provide results of monitoring and evaluation of progress in scope of energy efficiency as well as energy efficiency measures (NEEAP's).

The above objectives are compliant with requirements concerning energy efficiency measurements of the Directive 2006/32/EC. Under the project two tools will be developed and used: ODYSSEE[3] data base containing data and values of energy efficiency indicators, MURE[4] data base with data concerning measures for improvement of energy efficiency.

The present publication and energy efficiency indicators base on methodology developed during above mentioned projects.

Some data may slightly differ from data presented in previous edition, due to corrections.

[2] In calculations „bottom-up", in case there is no possibility to measure energy consumption earlier, the base level can be reconstructed using parameters of types and share of technologies, which were used when given action was not applied.

[3] www.odyssee-indicators.org

[4] www.mure2.com

2. Energy efficiency indicators for Polish economy and its sectors

2.1. Dynamic of development of the economy

Since 1992 all the basic economic indicators in Poland have been improving, after drop at the beginning of the 90's (Figure 1). The fastest rate of growth of value added at constant was achieved in the given period in industry sector though the growth was rather unequal with two declining years (2001 and 2002). Private consumption was increasing at the rate similar to the rate of growth of GDP (Table 1), except for year 1991. The lowest rate of growth was observed in agriculture sector (Figure 2).

Figure 1. Dynamics of basic macro-economic indicators (1990=100)

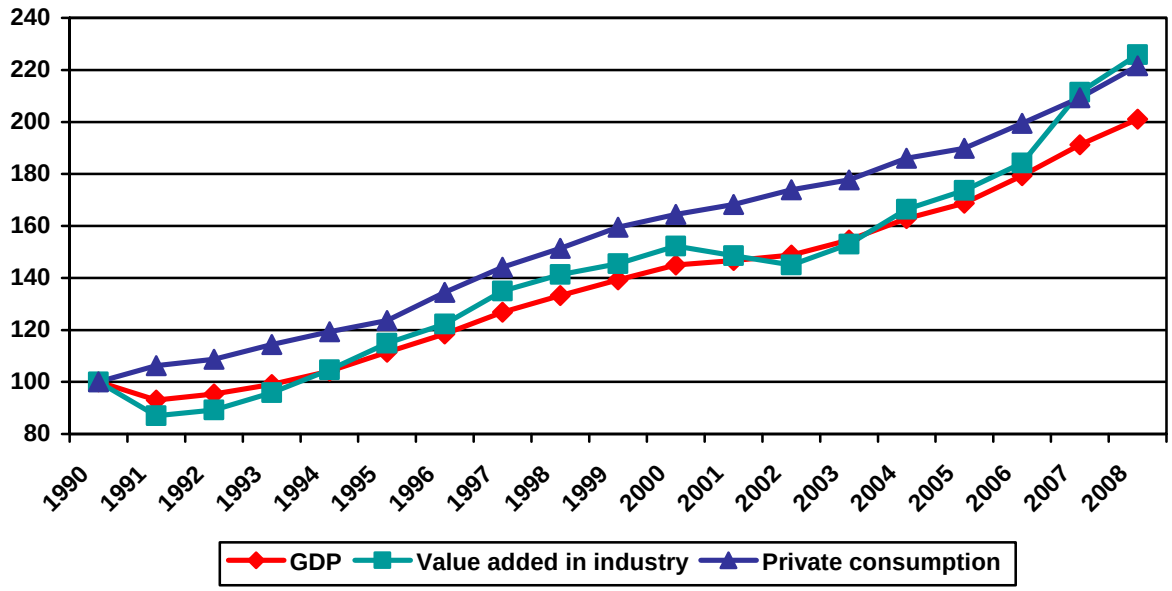
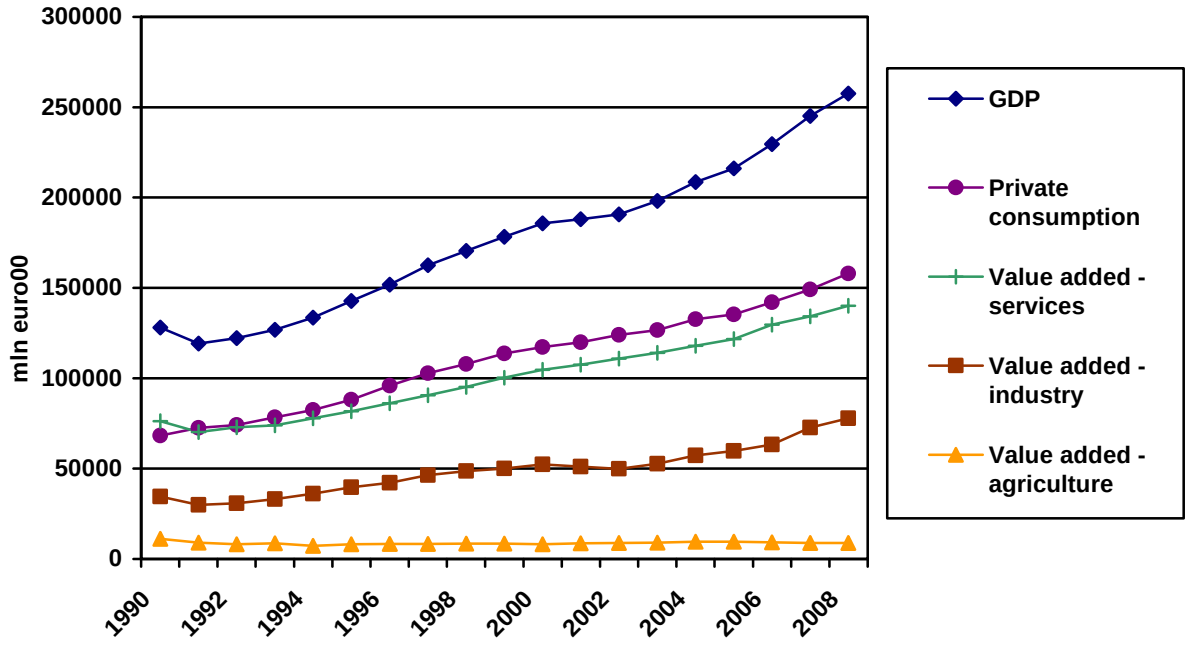


Table 1. Dynamics of basic macro-economic development indicators in Poland in 1990-2008 (%/year)

Specification	1991-2001	2001-2008	1990-2008
GDP	4.66	4.60	3.95
Value added in industry	5.50	6.17	4.63
Private consumption	4.70	4.02	4.52

Figure 2. Changes of GDP, value added in main economy sectors and private consumptions at constant prices

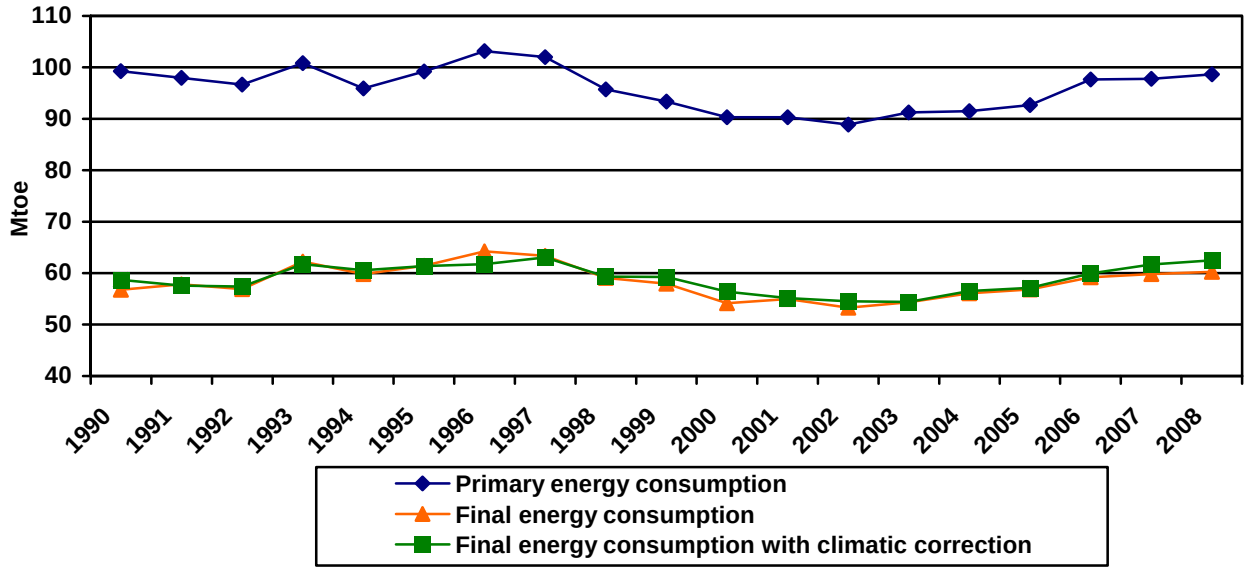


2.2 Energy consumption and prices of energy

After growth in first half of the 90's and reaching top in 1996, total primary and final energy consumption was decreasing between 1996-2002 (Figure 3). Since then growth of consumption has began and was continued in year 2008.

Decrease of energy consumption resulted from realization of modernization programmes, restructuring of economy and seasonally lower economic activity. Programmes of energy efficiency improvement and liberalization of energy prices produced also had their share.

Figure 3. Primary and final energy consumption



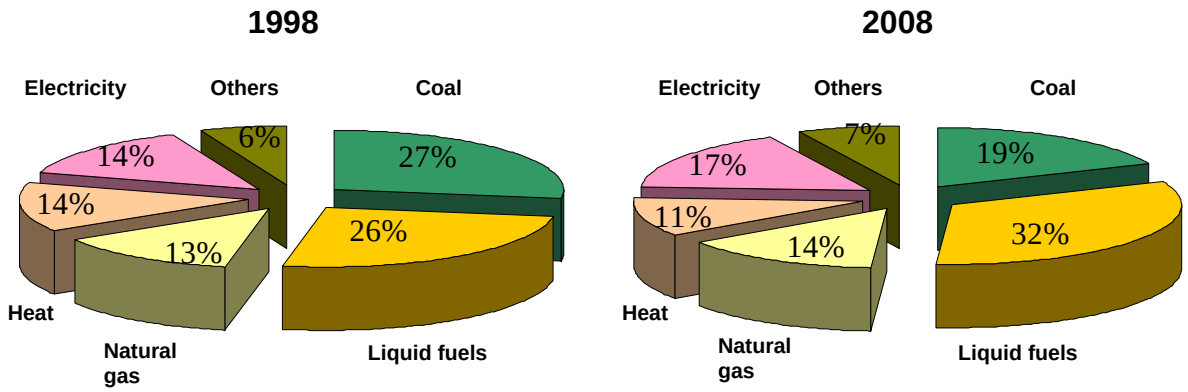
Function of final energy consumption is slightly modified by climatic correction which increases its value for winters characterized by lower degree days value (warmer). Climatic correction concerns households and service sector. Energy consumption with climatic correction describes its theoretical value for a given year, if the weather conditions were similar to long-term average.

Final energy consumption with climatic correction is counted by deducting from final energy consumption the energy consumption in households and service sector and adding energy consumption in these sectors with climatic correction[5].

In the energy field, Poland has traditionally been a supply-oriented country with important hard coal and lignite sector. However, the share of coal in country energy consumption decreased from 27% in 1998 to 19% in 2008 (Figure 4). Comparison of final energy consumption by energy carriers between 1998 and 2008 shows the increase role of oil fuels which became dominant in the balance with the share of 32% in 2008. Share of gas consumption slightly rose and reached 14% of energy consumed in 2008. Similarly, share of consumption of electricity increased between 1998 and 2008 and amounted to 17% in 2008.

[5] detailed methodology of climatic correction calculation was presented in chapter 2.5

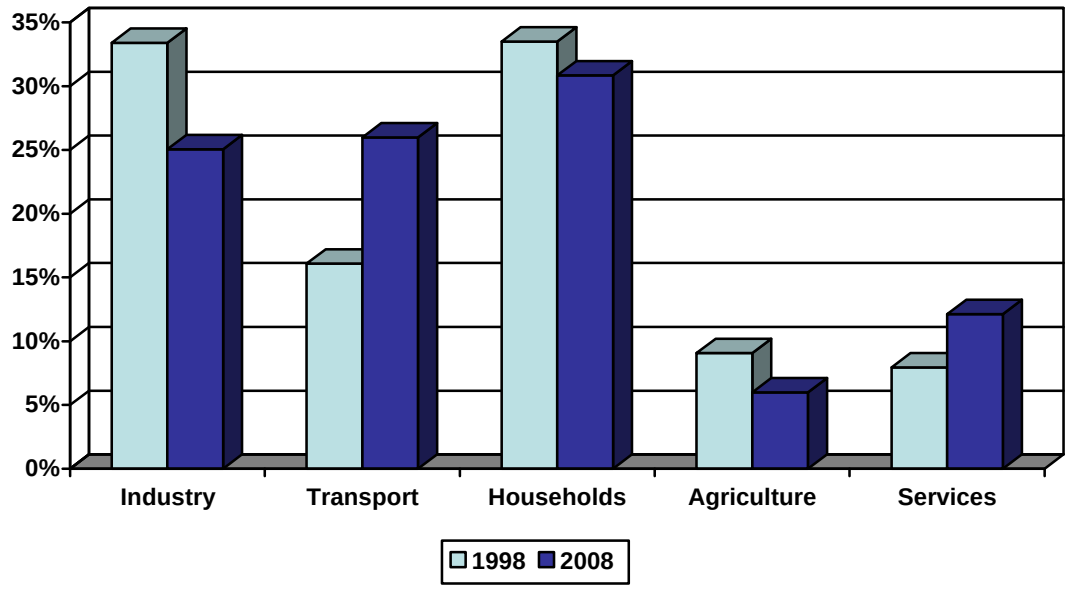
Figure 4. Final energy consumption by energy carrier



Changes of final consumption structure in main sectors of economy (Figure 5) reflect the directions of economy development. Restructuring of industry affected the energy consumption reduction, which was also accompanied by energy saving measures in companies. The development of road transport and services influenced the increase of energy consumption of these sectors. The households experienced the activities as thermo-modernization, improving efficiencies of heating systems and totally obtained 6% reduction of its energy consumption during 1998-2008.

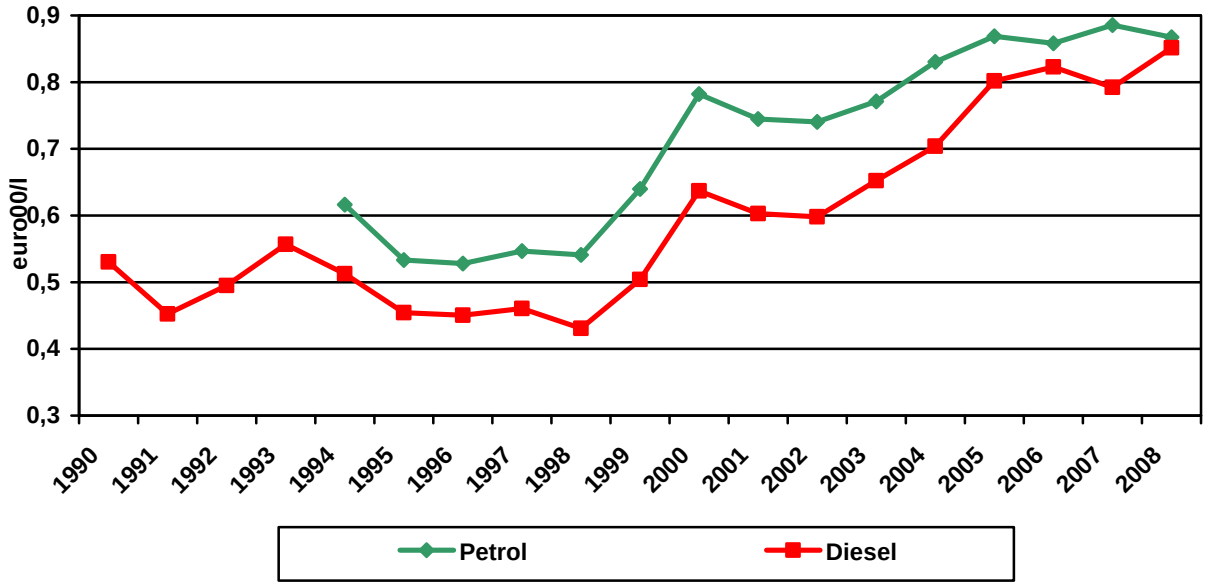
Changes in agriculture sector, consisting in liquidation and privatisation of state-owned agriculture holdings, and building modern large-size farms, did not contribute to save energy. However, since year 2000 energy consumption in agriculture began to decrease.

Figure 5. Final energy consumption by sectors



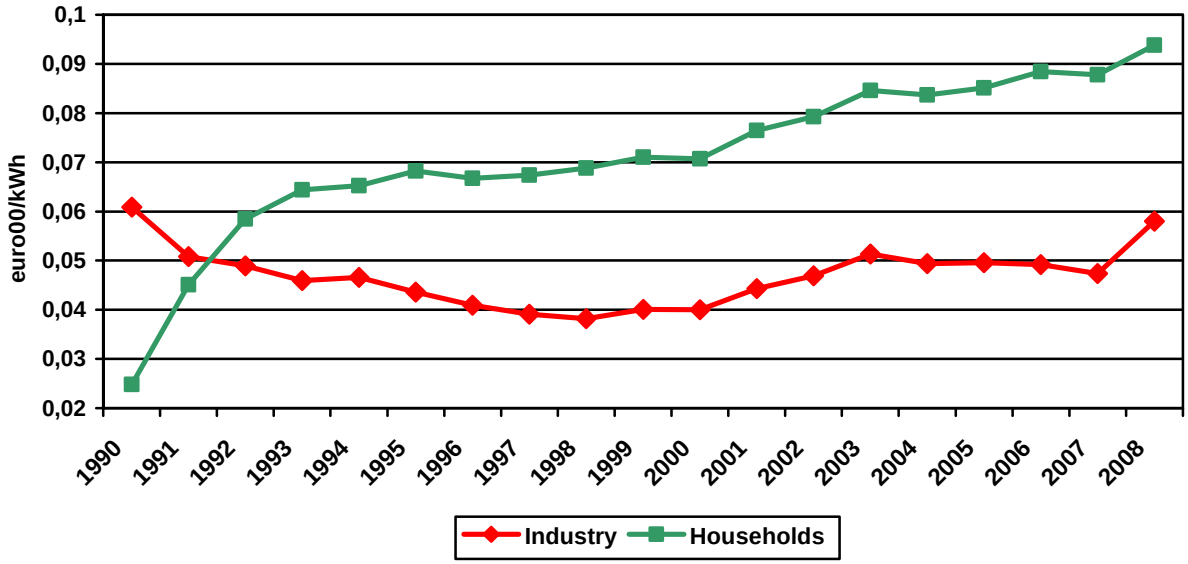
Prices of gasoline and diesel expressed in constant of 2000 have dynamically grown since 1998 with the periodical corrections of the trend (Figure 6). The main factors influencing level of these prices is the level of tax contained in fuel prices (significant increased of excise tax took place at the end of the 90's) and prices of crude oil on world markets (oil prices have been growing since 1999).

Figure 6. Changes of gasoline and diesel oil prices



At the beginning of the 90's subsidies to electricity were eliminated, what has been achieved by increasing the tariff for household from 0.0248 for 1 kWh in 1990 up to 0.0664 in 1993: 160% of growth expressed in Euro in constant. Since then the price of electricity for households has been increasing and reached level of 0.094 euro00/kWh in 2008. Price of electricity for industry has been decreasing during the years 1990-2000 (4.1%/year) – Figure 7. In years 2001-2003 the prices increased by 28% and then started to decline slightly. In 2008 prices increased sharply to 0.058 euro00/kWh.

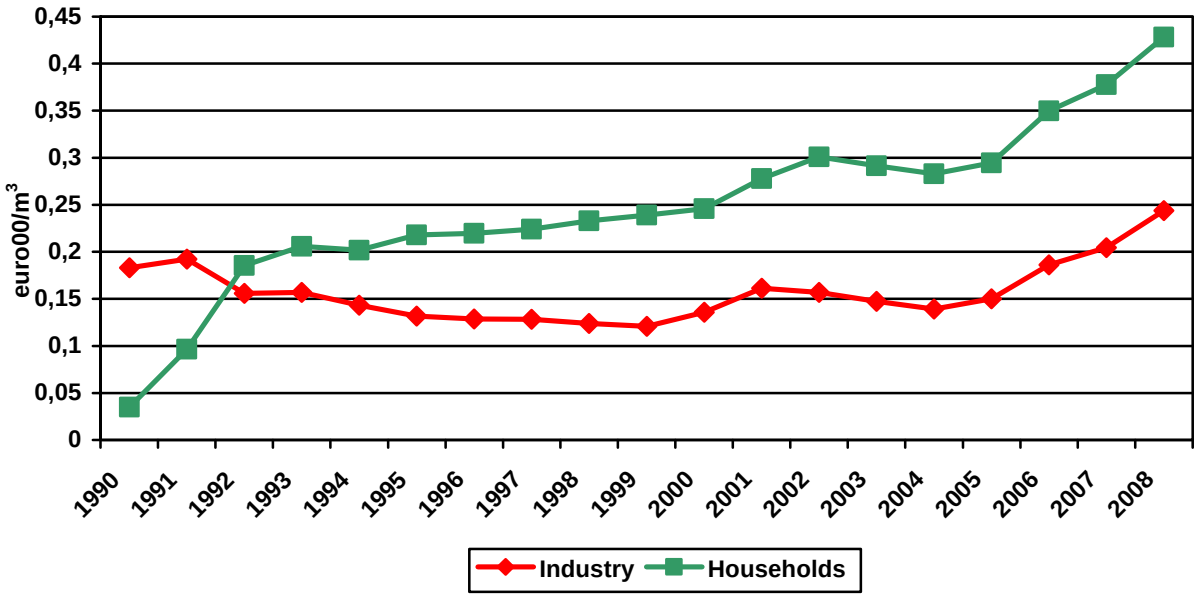
Figure 7. Changes of electricity prices for households and industry



The changes of prices of gas reflected the tendencies observed for electricity prices. In case of gas price the growth for households expressed in constant Euro 2000 was much sharper: from 0.0349 in 1990 up to 0.2058 in 1993 (490% of growth at constant Euro 2000 (Figure 8) and up to year 2000 price was steadily growing. In 2001 and 2002 gas price jumped and next years the prices fluctuated. In 2004 prices returned to increasing trend which fastened in 2006 and was continued in next year.

In years 1990-1999 gas price for industry declined systematically, then it jumped in 2000-2001. After decreasing until 2004, prices began to grow.

Figure 8. Changes of gas prices for households and industry



2.3. Macro-economic indicators

Stable level of energy consumption and increasing value of Gross Domestic Product caused decrease of primary and final energy intensity of GDP (Figure. 9-11, table 2). Initial growth of intensity until year 1993, was followed by the period of dynamic improvement which lasted until year 2000. Since that time, gradual improvement of intensity at the rate of 2% per year had taken place, which accelerated in year 2007. In 2008 energy intensity of GDP fell by 4 %.

Table 2. An average annual rate of changes in GDP energy intensity indicators (%/year)

Rate of change	1990-1993	1993-2000	2000-2008	1993-2008	1990-2008
Final intensity of GDP	3.46	-7.16	-2.71	-4.81	-3.48
Primary intensity of GDP	0.84	-6.77	-2.94	-4.75	-3.84

Figure 9. Energy intensity of GDP

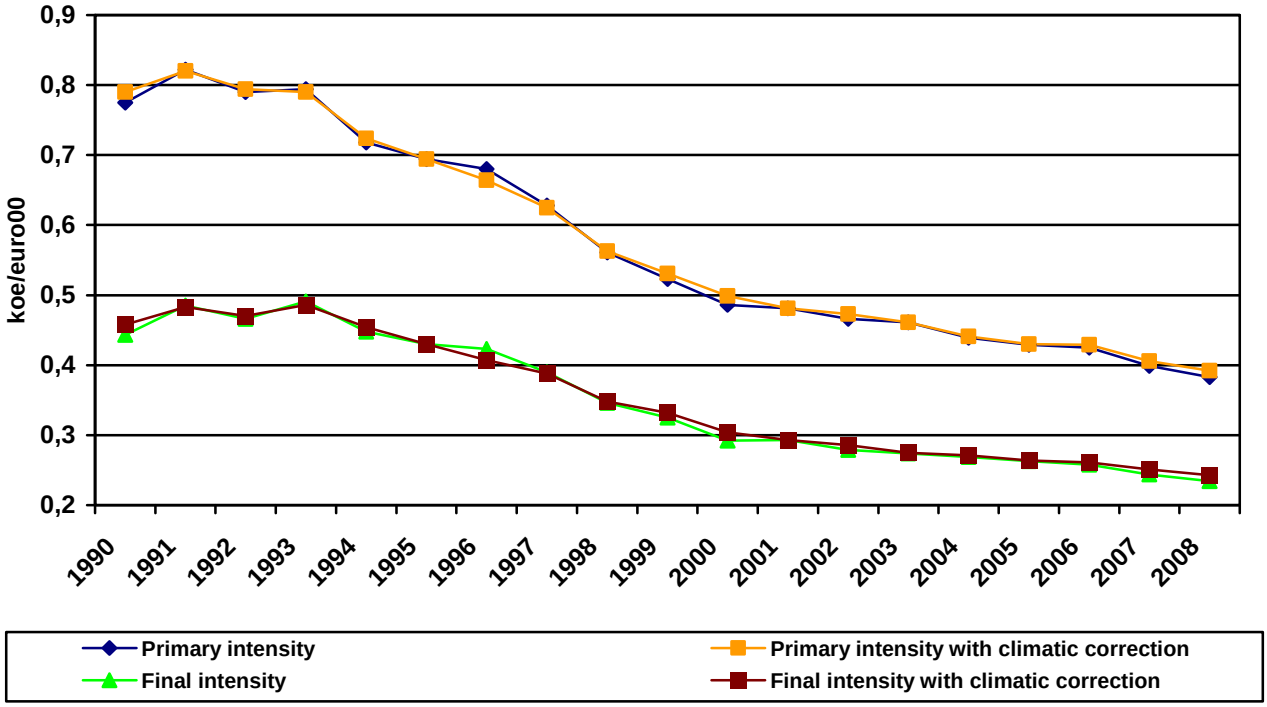
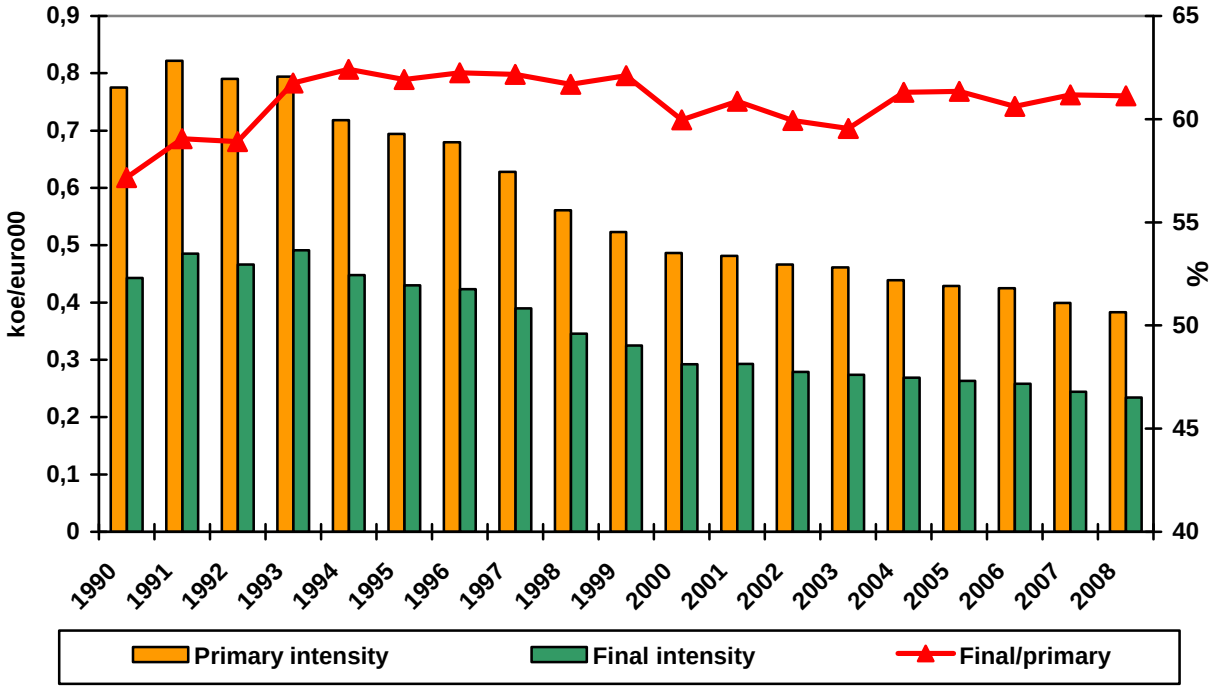


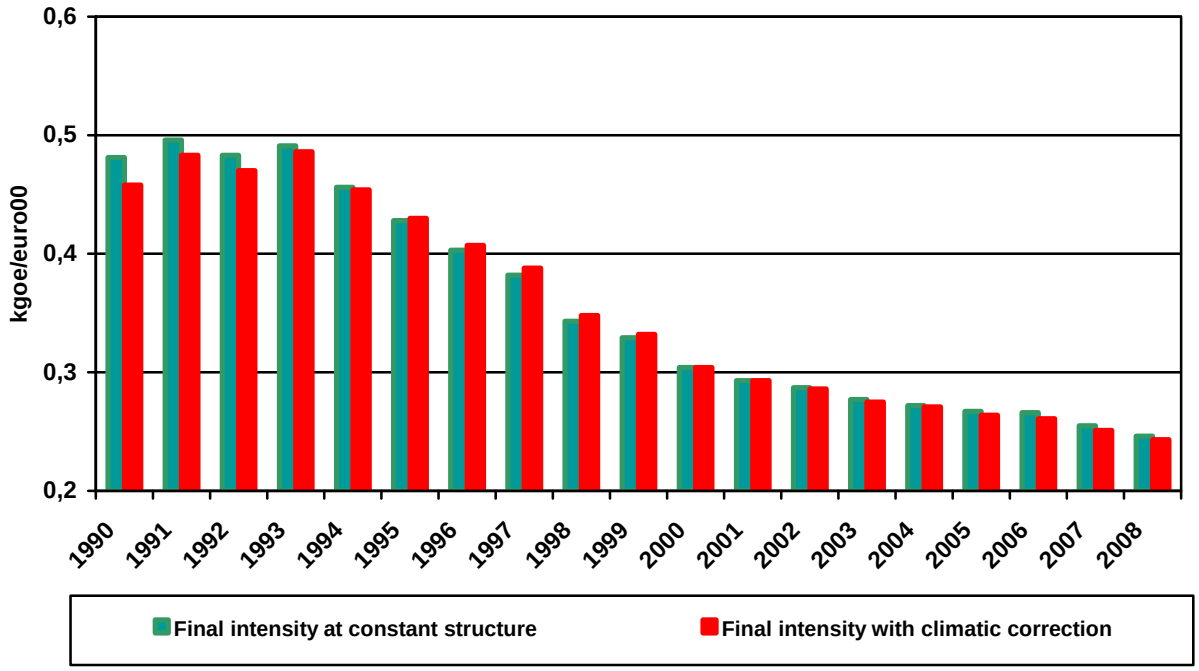
Figure 10. Ratio of final to primary intensity



The rate of improvement of primary intensity indicator was higher than final intensity in early 90's, what resulted in increase of ratio final to primary. Since that time, ratio remains at stable level, with little declining tendency. It is shaped by average efficiency of energy transformations (the higher efficiency the higher ratio) and by pace of growth of electricity

consumption (the higher pace the lower ratio).

Figure. 11. Final intensity of GDP

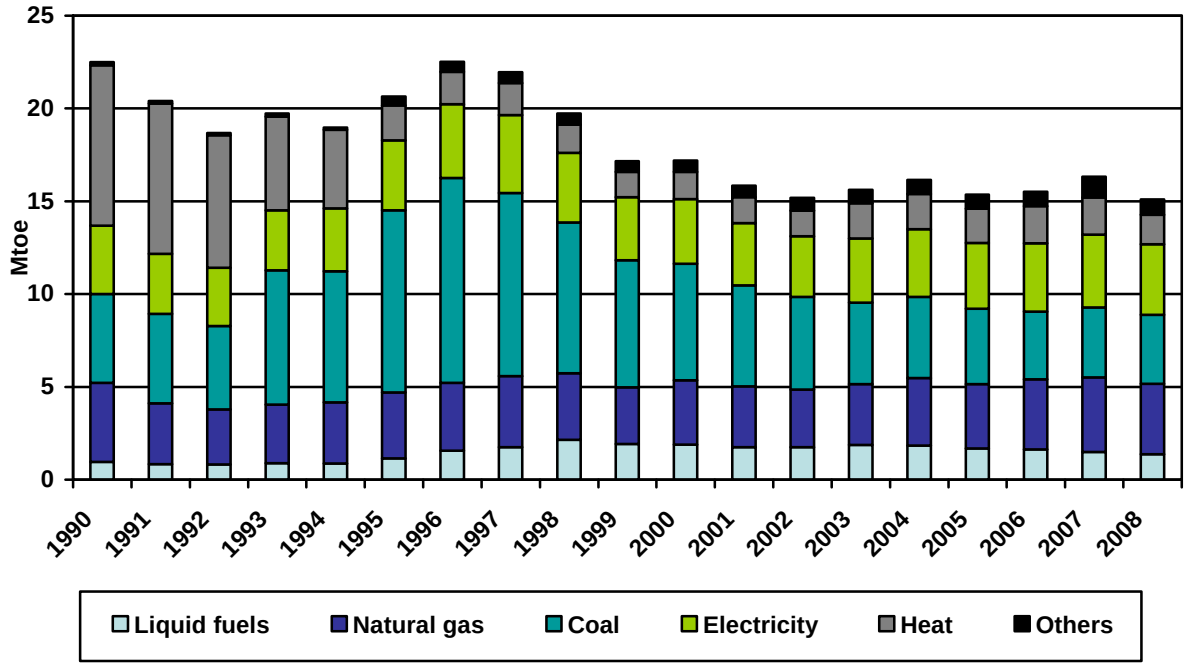


While analysing changes in energy intensities, it is necessary to bear in mind the specific situation before 1990s in the Central European countries, including Poland. In those countries of the central planning, energy prices were very low, which resulted in energy wastage reaching in extreme cases even 60 to 70% of the energy consumed. This caused a habit of excessive energy consumption, difficult to overcome but creating the possibilities to save. Drop of energy intensity was caused partly by use of these simple reserves.

2.4. Industry

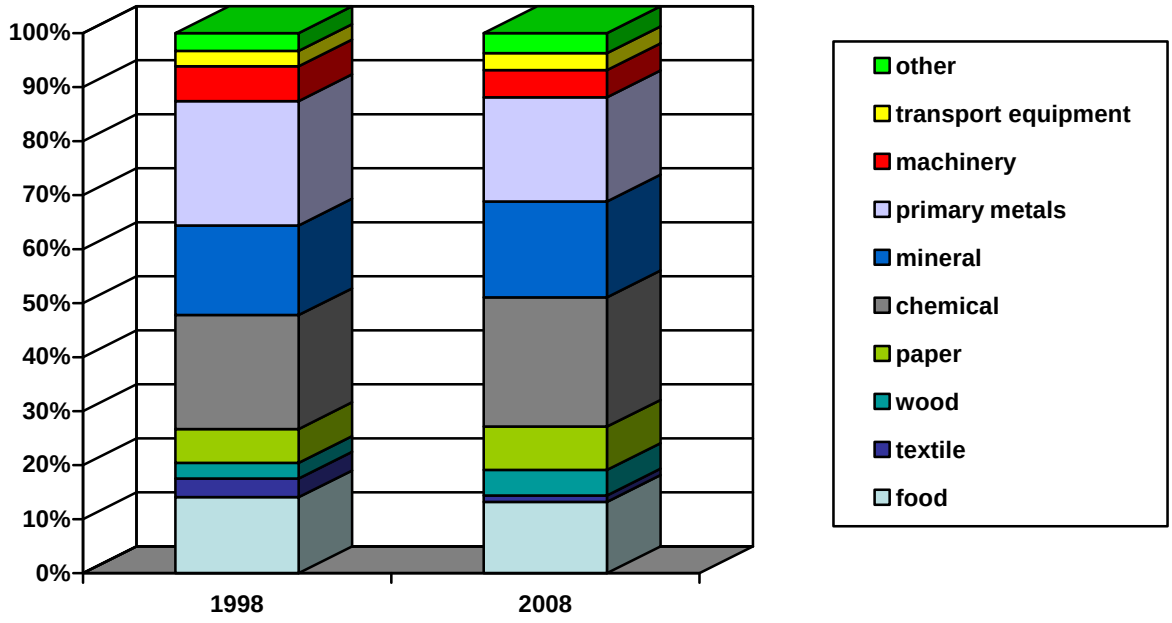
Final energy consumption in industry varied similar to total final consumption. In second half on the 90's began decrease of consumption which reached the bottom at the level of 15 Mtoe in year 2002. Since then consumption has remained at similar level.

Figure 12. Final energy consumption in industry by energy carrier



Energy consumption of manufacturing by branch presents Figure 13. About 60% of energy is consumed by primary metals (iron and non-ironic metals), chemical and mineral production, their share did not change much during 10 years. Chemical and paper industry increased their share. Consumption of energy by food, textile and machinery industry slightly declines. Significant drop of energy consumed was observed in case of steel industry. The drops are caused partly by limiting production, and not by modernization of enterprises aiming at reduction of energy consumption. Structural changes are rather small and do not exceed few percentage points.

Figure 13. Energy consumption in manufacturing by branch



Figures 14 and 15 present energy intensity (final energy consumption/value added) of selected industrial branches in years 1993-2008.

Figure 14. Changes of energy intensity indicators in energy intensive industry branches

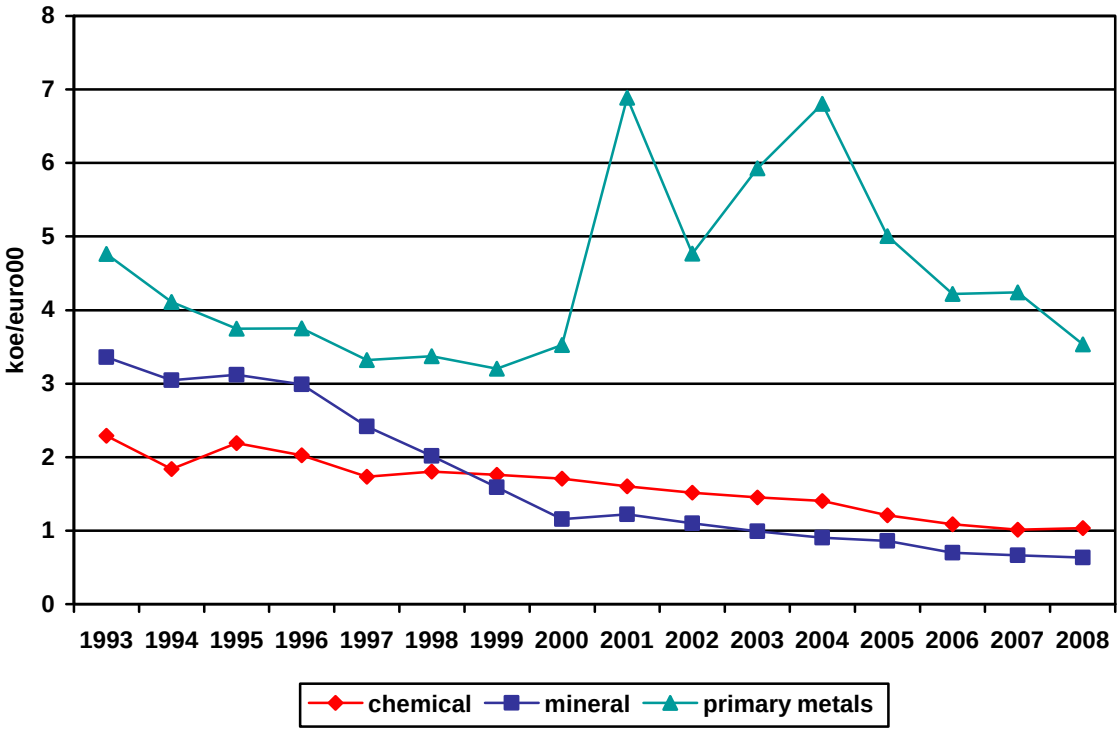
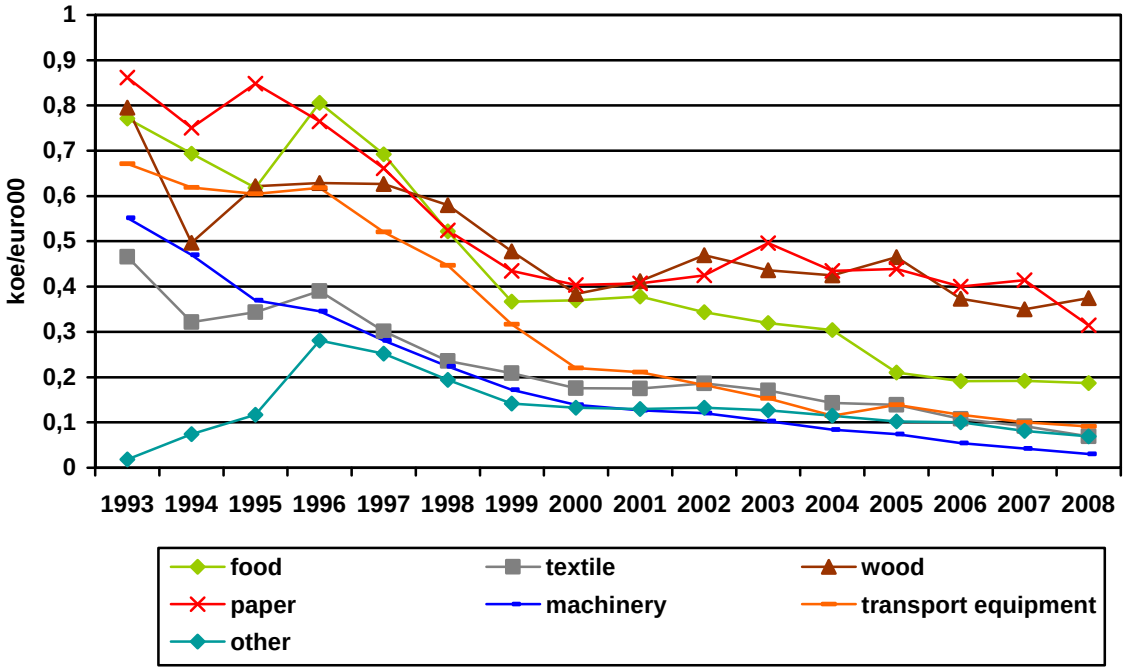


Figure 15. Changes of energy intensity indicators in low energy intensive industry branches



The highest dynamic of improvement was achieved by machinery and transport equipment industry, as well as food and textile industry. The slowest improvement took place in primary metals, paper, wood and chemical industry. Intensity of majority of branches was improving fastest between year 1996 and 2000. In 2008 in all branches, except for wood and chemical industry energy intensity decreased.

Changing shares of manufacturing divisions in final energy consumption and value addend, i.e. changing structure has impact on intensity of manufacturing. Values presented below assessing impact of structural changes in manufacturing on level of energy intensity were obtained using DIVISIA method.

Intensity of manufacturing was improving in longer periods at very high, exceeding 9%/year rate. But the rate of improvement at constant structure, showing individual progress at the level of branches differs between periods. It is higher before year 2000 when amounted to 8.1%, later it decreased to 6.3%/year. On the other hand impact of structural changes is 3 times higher after year 2000 in comparison with previous period. In years 1994-2008 structural changes caused fall of energy intensity by 3.2% on average annually.

Figure 16. Changes of energy intensity of manufacturing - role of structural changes

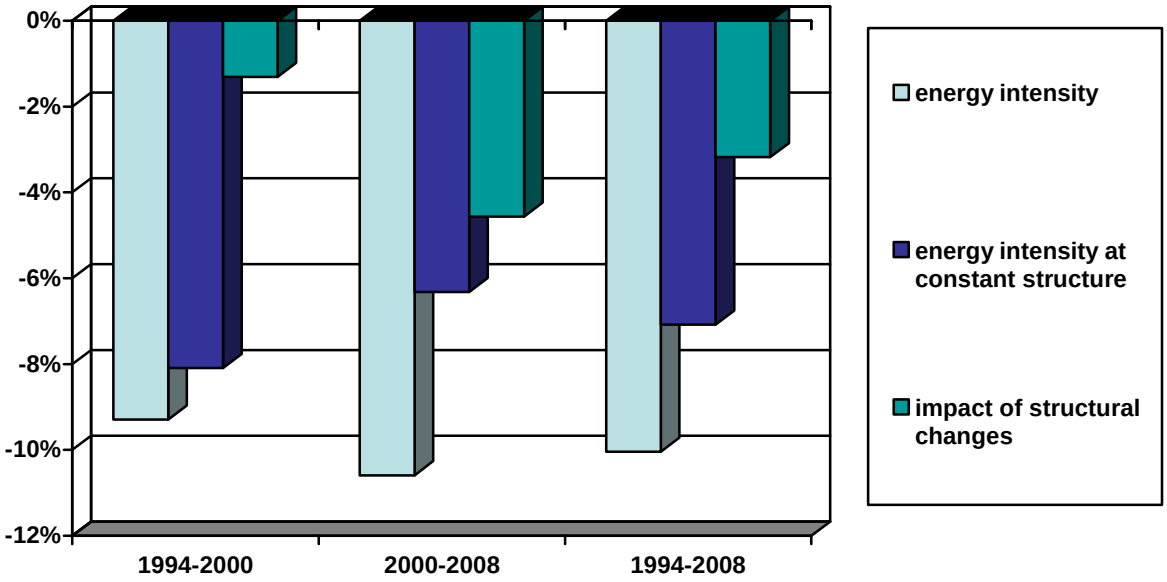


Table 3. Dynamics of changes of energy intensity and impact of structural changes (%/year)

Specification	1994-2000	2000-2008	1994-2008
Energy intensity	-9.29	-10.59	-10.04
Energy intensity at constant structure	-8.09	-6.32	-7.08
Impact of structural changes	-1.31	-4.56	-3.18

Effect of structural changes was influenced strongest by primary metals. It was result of drop of importance of division which consumes a lot of energy and did not improve much its energy efficiency. On the other hand constant development of machinery industry and increasing importance of this branch caused opposite impact on structural changes.

Impact of primary metals on effect of structural changes was strongest after year 2000.

Figure 17. Structural changes – impact of manufacturing branches by period

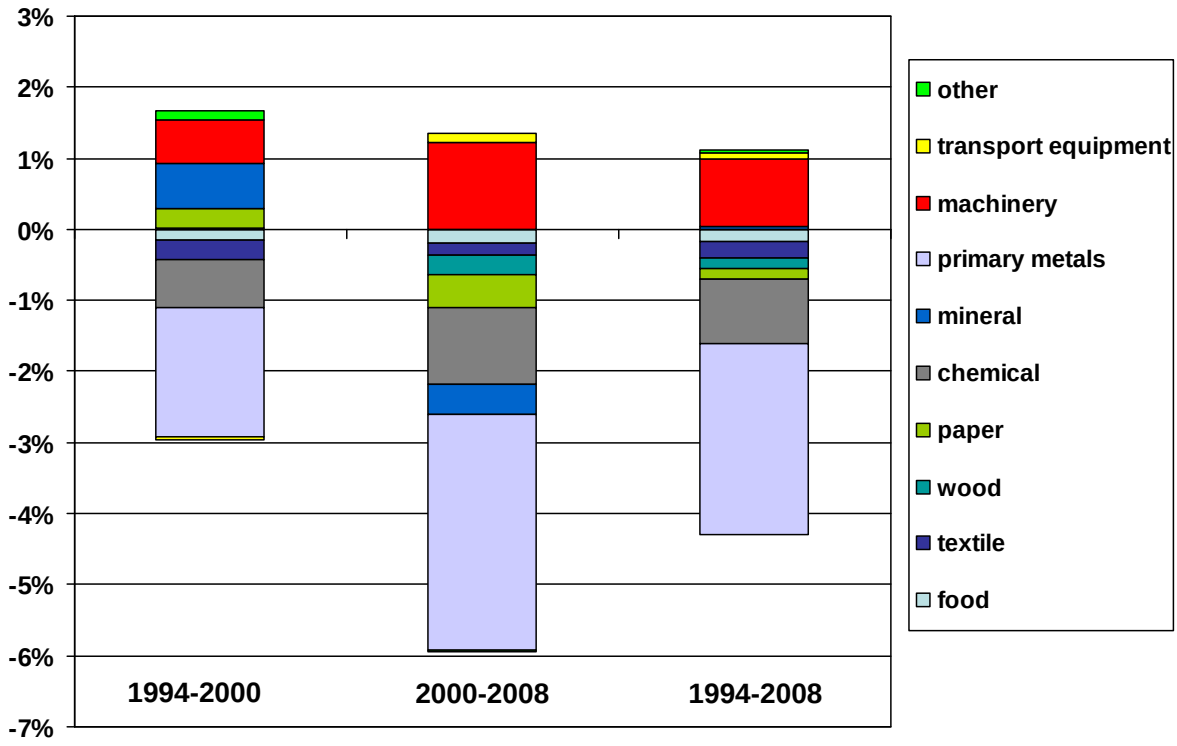
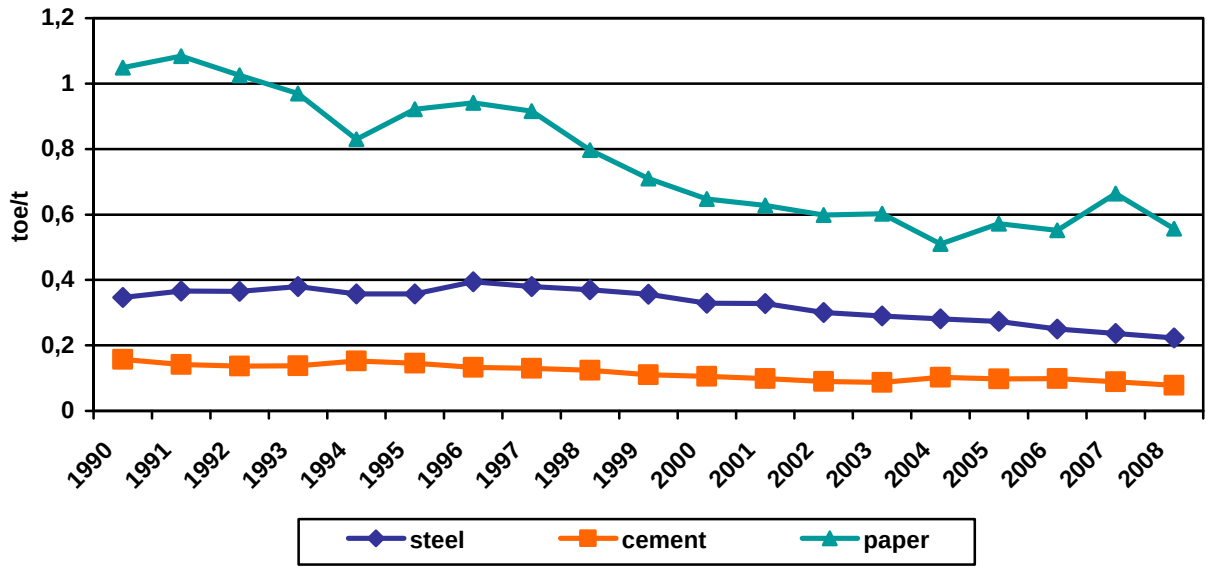


Figure 18 presents energy intensity of steel[6], cement[7] and paper[8] production in years 1990-2008. Energy used to produce these three products amounted to 31% of energy consumption in manufacturing in 2008. Energy intensity of cement production declines systematically. Old-fashioned wet method of production was abandoned what resulted in decline of energy intensity below 0.1 toe/t i.e. value close to European average. Little decline of energy intensity of steel production results from delays in privatisation process and modern technologies implementing. Paper industry was thoroughly modernized after privatisation, which resulted in decrease of intensity to 0.51 toe/t in 2004. Since then intensity of paper production has increased to 0.56 toe/t in 2008. In years 1990-2008 energy intensity of crude steel production declined by 35.67% (2.42%/year), paper production by 46.98% (3.46%/year) and cement production by 50.38% (3.82%/year).

[6] Calculated as final energy consumption in groups 27.1, 27.2, 27.3 and classes 27.51 and 27.52 divided by steel production
[7] Calculated as final energy consumption in group 25.6 divided by cement production
[8] Calculated as final energy consumption in group 25.6 divided by paper production

Figure 18. Unit consumption of selected industrial products



2.5. Households

Share of energy consumption in households in final energy consumption amounted to 31% in 2008. The structure of consumption by end use, surveyed by CSO in 1993 and 2002 presents Figure 19 and Table 4. Decreasing share of energy consumption for heating and cooking results from replacing low-efficient coal with gas and electric ovens. Growth of consumption by electrical appliances and lighting is connected with richer equipment of households in electrical appliances and behaviour changes (e.g. changes in intensity of appliances use - washing machines, dish washers, TVs, computers).

Figure 19. Structure of energy consumption in households by end use

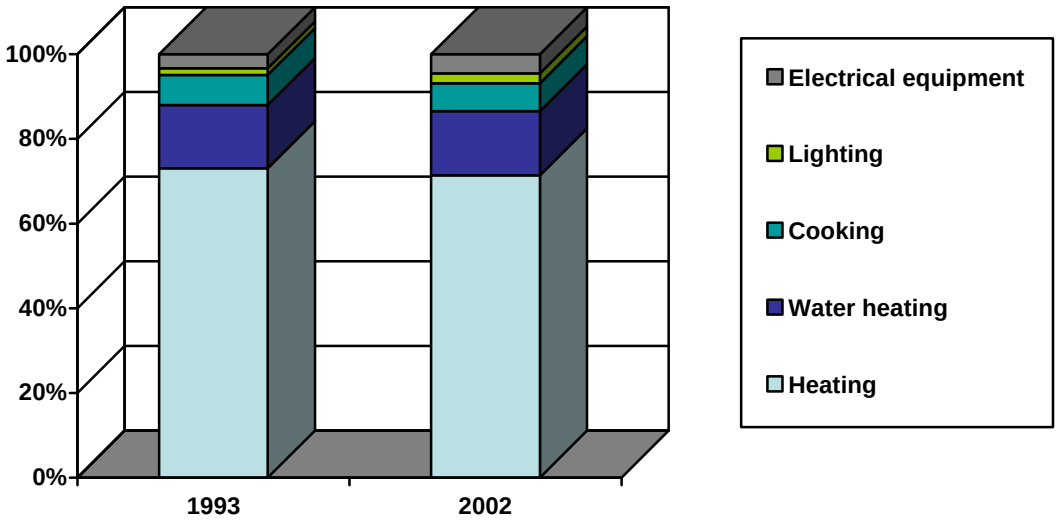
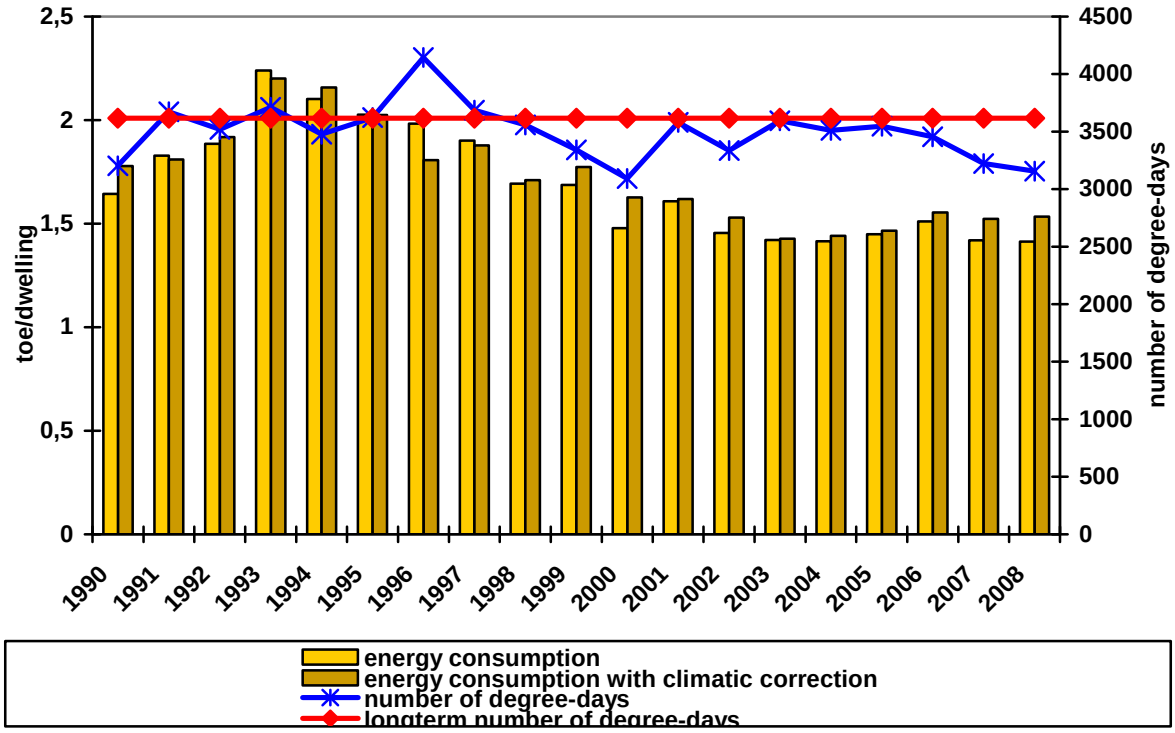


Table 4. Changes in structure of energy consumption in households by end use

Items	1993	2002
Total	100.0	100.0
Heating	73.1	71.2
Water heating	14.9	15.1
Cooking	7.1	6.6
Lighting	1.6	2.3
Electrical equipment	3.3	4.5

Figure 20 presents changes of energy consumption per dwelling. The value of indicator with climatic correction tends to decrease with annual decrease rate of 1.1% since 1998. Decrease of unit energy consumption in dwellings is related to buildings thermo modernization, reduction of losses in central heating systems, improvement of efficiency of newly installed devices.

Figure 20. Changes in indicator of energy consumption in households per dwelling



source: Eurostat and Joint Research Center, GUS

The method for the climatic correction of final energy consumption is based on the correlation between energy consumption and outdoor temperature. The consumption is proportional to the Heating Degree Days (SD). The constant heating share approach in calculating of final energy consumption with climatic correction ZEF^{kk} is based on the following formula:

$$ZFF^{kk} = \frac{ZFF}{1 - 0{,}9 \cdot \alpha \cdot \left(1 - \frac{Actual\ SD}{Long - term\ average\ SD}\right)}$$

where: ZEF - final energy consumption, SD - degree days number, α - heating share in total energy consumption in dwelling sector.

Heating Degree Days is introduced to enable control and comparison of energy consumption for heating. It expresses a product of number of heating days and difference between the average temperature of heated room and average outdoor temperature. Numbers of SD degrees in a given year according to Eurostat methodology is calculated as follows:

$$Sd = \sum_{n=1}^{N} \begin{cases} 18^{o}\mathrm{C} - t_{śr}(n) & dla \quad t_{śr}(n) \le 15^{o}\mathrm{C} \\ 0 & dla \quad t_{śr}(n) > 15^{o}\mathrm{C} \end{cases}, \text{[day} \cdot \text{deg/year]}$$

where: $t_{śr}(n) = \frac{t_{\min}(n) + t_{maks}(n)}{2}$ - mean outdoor temperature for *n* day, [^{o}C]; $t_{\min}(n)$, $t_{maks}(n)$ - minimum and maximum temperature of the *n* day, [^{o}C]; N - number of days per year. According to formula and the Eurostat assumption, the mean outdoor temperature of the heating day should be less than 15^{o}C.

The values of heating degree days (*SD*) for 1992-2006 are presented in the table below (long-term average calculated for years 1980-2004 amounts to 3615.77).

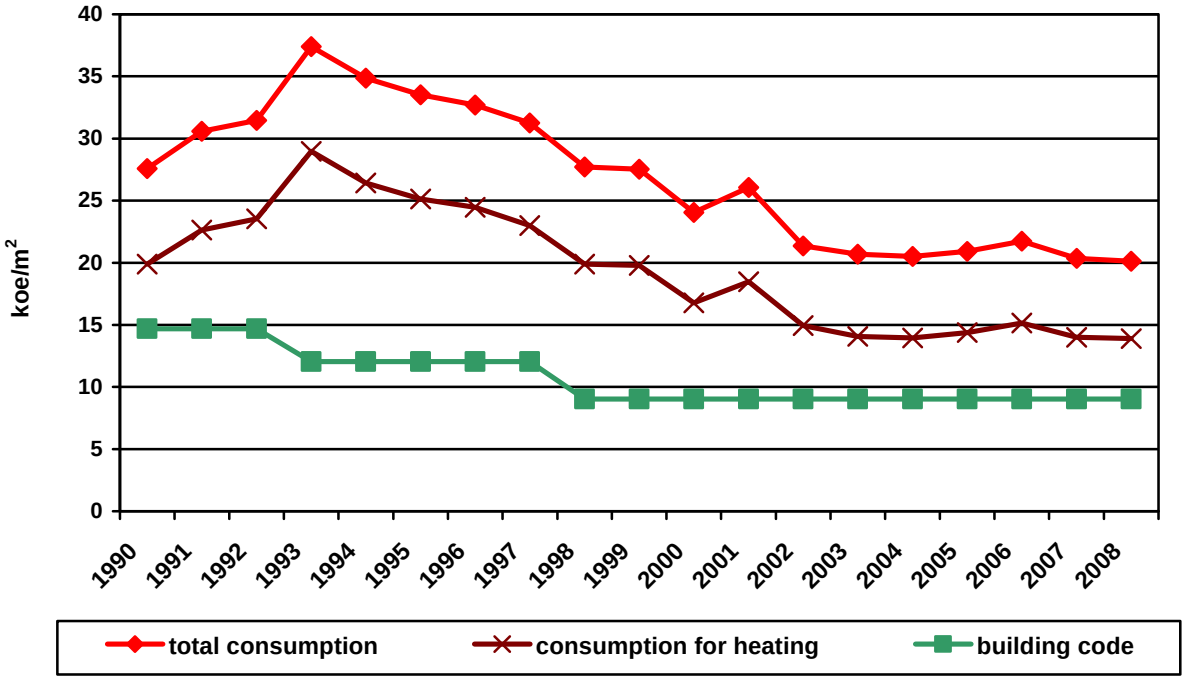
Table 5. Heating degree-days in years 1994-2008

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Sd - annual	3477	3622	4144	3686	3559	3341	3092	3581	3337	3594	3510	3547	3454	3222	3154

source: Eurostat and Joint Research Center

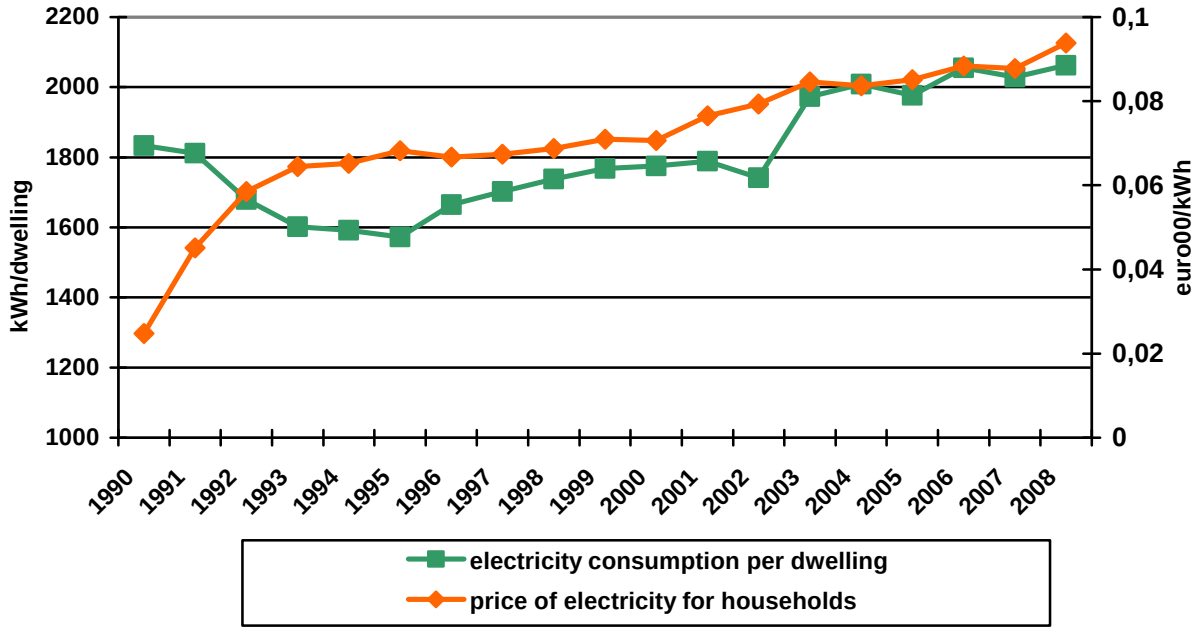
Trend of energy consumption per m^2 looks similar, however dynamic of improvement is higher by 1%, what results from increasing average floor space. Although building code for new buildings allows for twice lower use of energy than present use, the impact of this factor on energy efficiency improvement in whole buildings is little. Figure below presents energy consumption in household dwellings per m^2.

Figure 21. Energy consumption in households per m^2



Energy consumption by the households is shaped by various factors. The most significant are price level and economic situation of households which is reflected in so called behaviour changes resulting *inter alia* in different intensity of household appliances. Increase of prices at the beginning of the 90's resulted in sudden drop of electricity consumption which was compensated thanks to increasing incomes of population at the beginning of the next decade. Subsequent increases contributed to another limitation of electricity use. Growth of consumption in year 2003 resulted from methodological issues (adding electricity consumption by farmers).

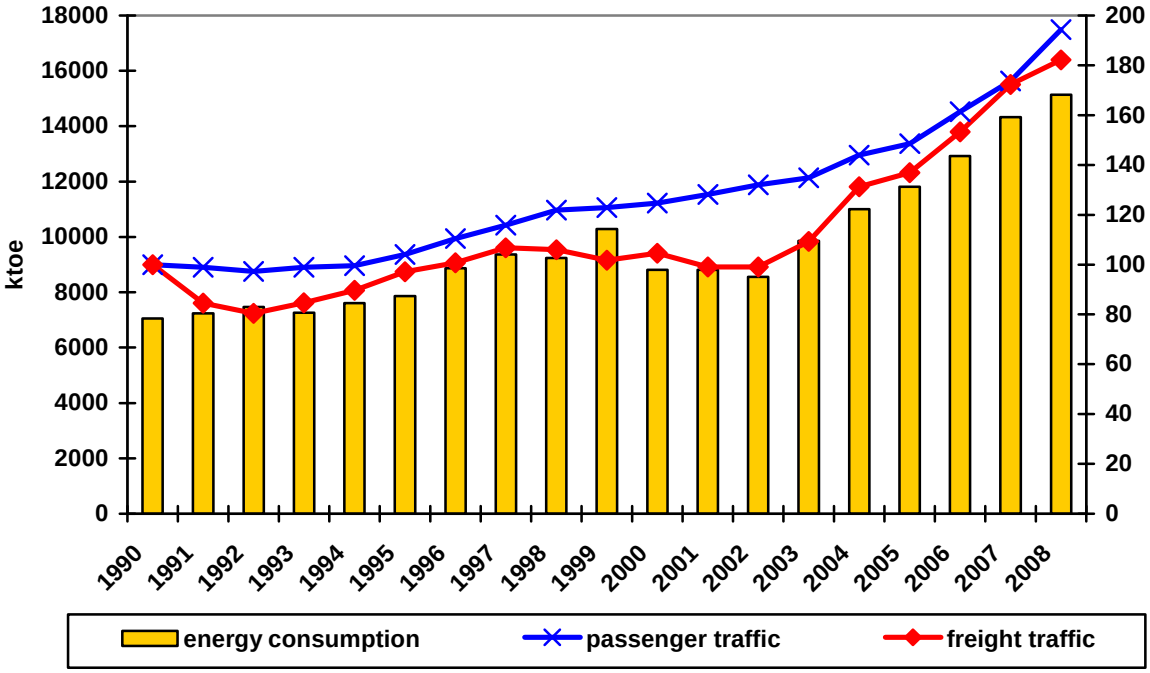
Figure 22. Changes of price and electricity consumption in households per dwelling



2.6. Transport

In Poland almost 94% of energy consumed in transport consumes road transport, around 3% rail transport. Another 3% is consumed by airplanes and the rest is consumed by inland and inshore water transport.

Figure. 23. Passenger and freight traffic and energy consumption in transport*



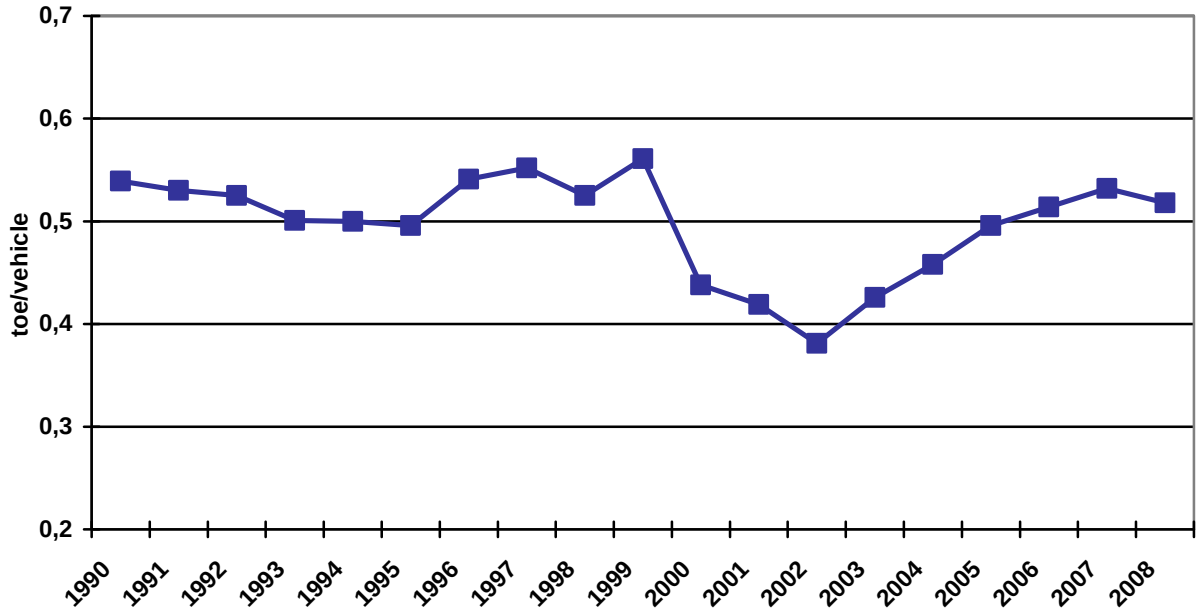
** excluding air transport, source: DG TREN, GUS*

In years 1990-2008 growth of fuel consumption in road transport (5.2% annually) is observed, accompanied by significant drop of energy consumption by rail transport. It is the result of transport modal shift from rail transport to road transport. Since 1990 road traffic has tripled while rail transport decreased by 60% in case of passenger traffic and 38% in case of freight traffic. Totally, since year 1990, 80-percentage growth of freight traffic (124900 Mio tonne-km in 1990) and more than 90-percentage passenger traffic (164800 Mio passenger-km in 1990) has taken place, accompanied by doubled energy consumption. The biggest discrepancies between trends were at the beginning of the 90's, later on the rates of growth were similar.

Figure 24 presents unit consumption of fuels per equivalent car[9]. The indicator is influenced mainly by economical situation of the country, fuels prices and increasing efficiency of new cars.

[9] stock of equivalent cars was calculated as: Ec = 0.15*M + C + 4*T + 15*B, where Ec – stock of equivalent car, M – stock of motorcycle, C – stock of car, T – stock of truck, B – stock of bus. Parameters are calculated as relation of estimated annual fuel consumption by type of vehicle to annual fuel consumption by car.

Figure 24. Fuel consumption per equivalent car



2.7. Service sector

Service sector has the most stable energy efficiency indicators. Value added energy intensity[10], after drop at the beginning of the 90's shows slight fluctuation and in 2008 it has the same value as in 1994. Improvement rate is lower than the global value and is significantly lower than improvement e.g. in industry but at the same time it is the sector of national income creation that is the most efficient in respect of energy. The electricity intensity indicator is characterized by larger variations and remains in uptrend since 1997 (Figure 25).

In case of changes of unit consumption of energy and electricity per employee irregular decrease trend which ended in the second half of the 90's can be observed (Figure 26). Afterwards, consumption of energy and electricity started to rise. The rate of growth of electricity consumption was higher by one percentage point since 1994, due to increasing amount of electrical devices used by service sector enterprises.

[10] Calculation of this indicator excludes energy consumption of transport but includes value addend of transport. The same procedure concerns electricity intensity indicator.

Figure 25. Changes of energy intensity and electricity intensity indicator in service sector

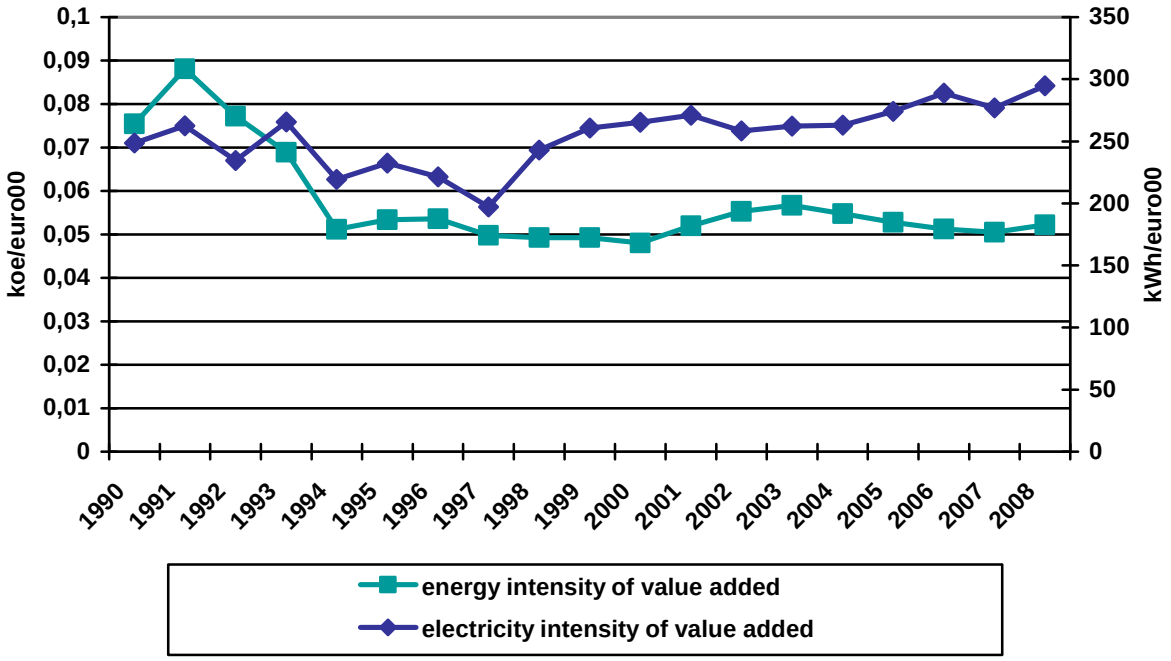
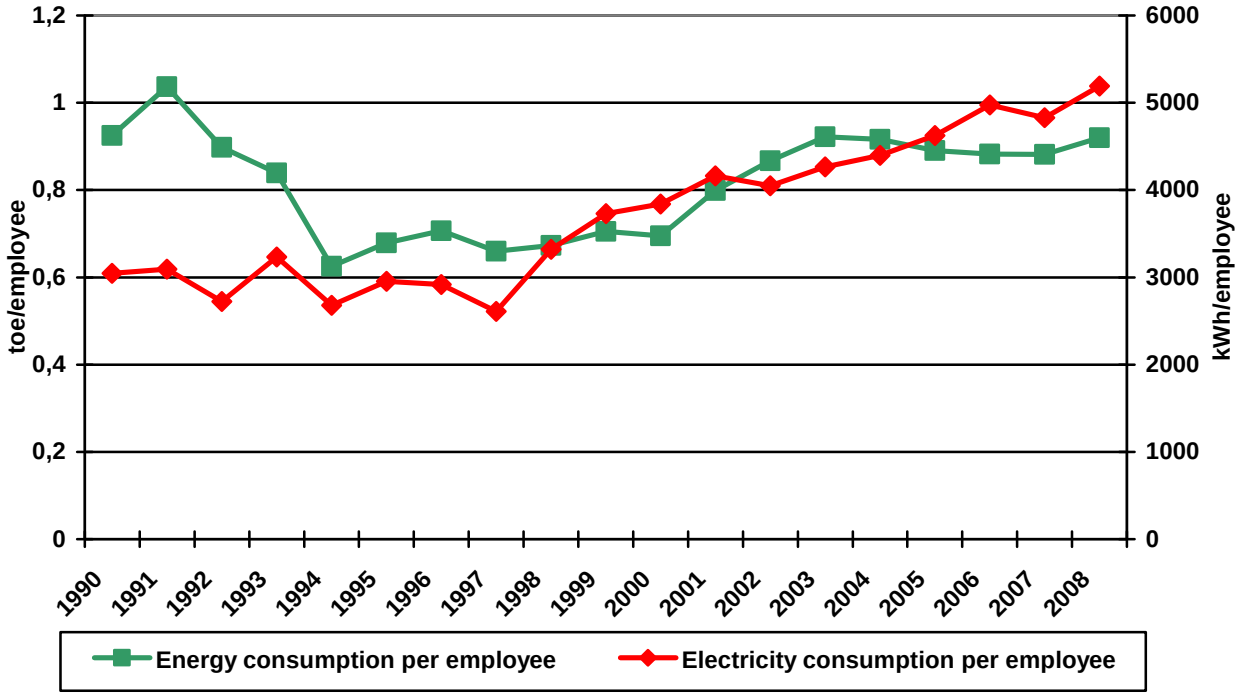


Figure 26. Changes of energy consumption and electricity consumption per employee of the service sector

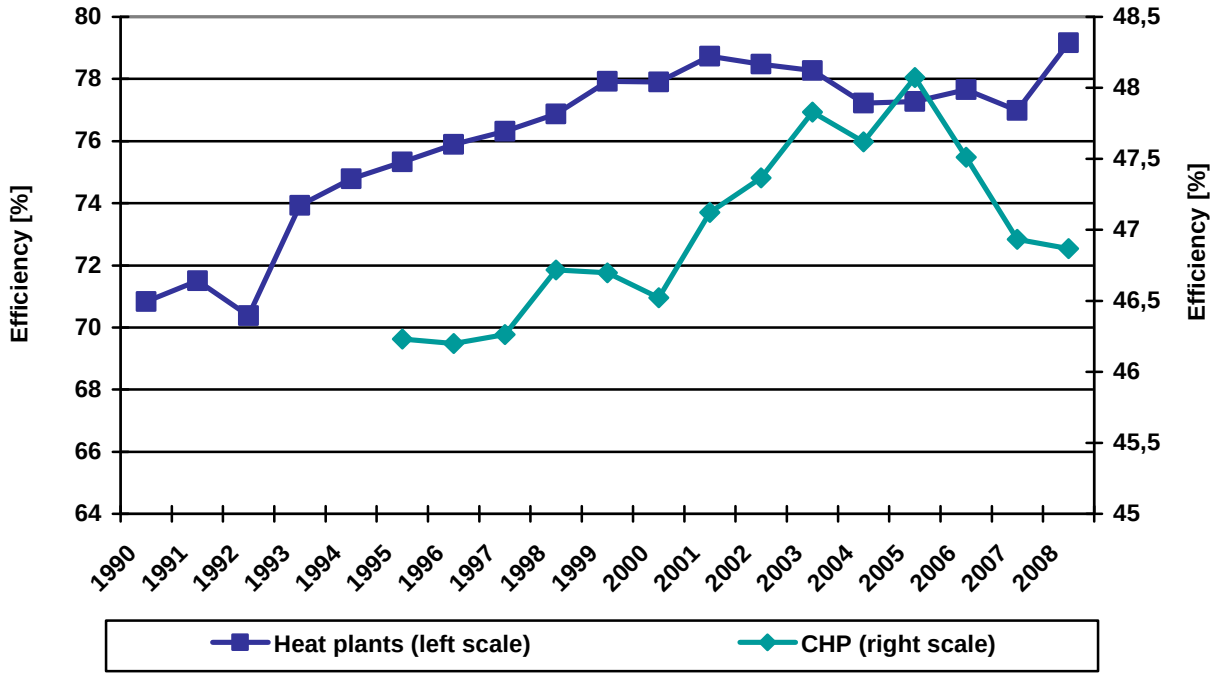


2.8. Heat plants and heat and power generating plants

Figure 27 present changes of efficiency of heat plants and combined heat and power plants.

The efficiency of heat plants grew significantly in year 2008 and exceeded 79%. Earlier, since 2001 efficiency of heat plants had decreased. In case of heat and power-generating plants, in year 2008 efficiency decreased for third consecutive time. Before that, efficiency of CHP was generally growing, with single exceptions.

Figure 27. Efficiency of heat plants and CHP



2.8. ODEX indicator and energy savings

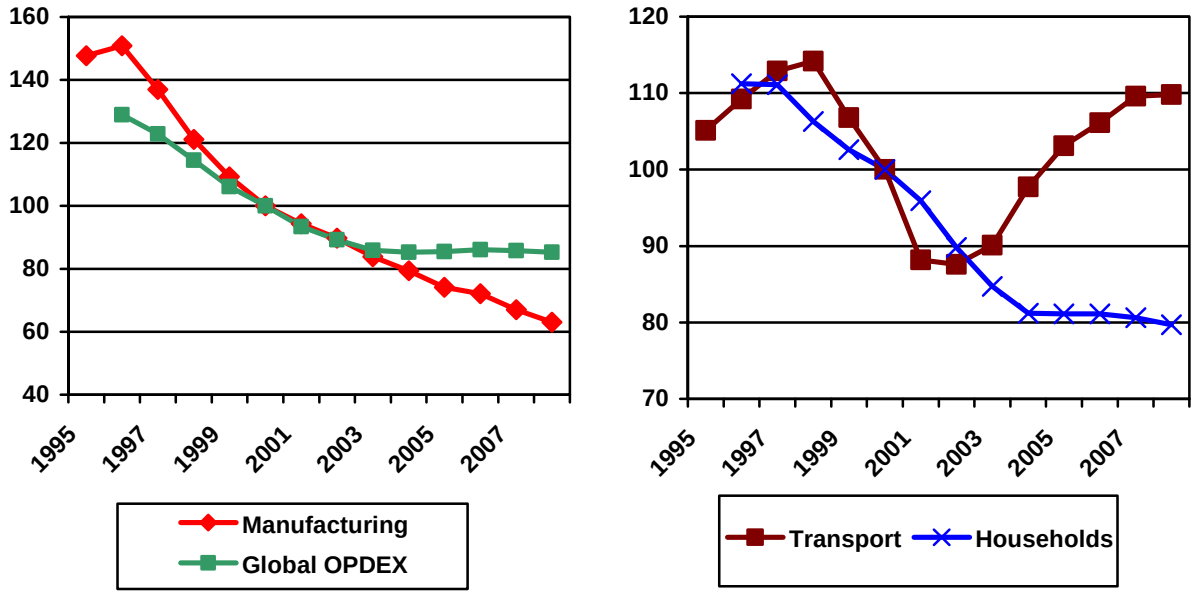
ODEX indicator is an aggregated energy efficiency indicator. It was elaborated to meet the needs related to monitoring of energy effectiveness and in order to obtain understandable, simple to elaborate and comparable indicator reflecting progress in respect of energy efficiency in the European Union Member States. The indicator is obtained through aggregation of changes in unit energy consumption observed in a given period of time at the specified levels of end-use. By application of reference physical parameters, the ODEX indicator illustrates progress in respect of energy efficiency. ODEX is an alternative for monetary indicators of energy intensity which depend on many factors related - not directly - to energy efficiency. ODEX indicator does not show current level of energy intensity but the progress in respect of the base year. The ODEX indicators are useful for monitoring of

indicative target implementation in the scope of energy efficiency laid down in Directive 2006/32/EC.

The methodology of ODEX indicators calculation is currently being elaborated *inter alia* under the programmes of the European Commission named ODYSSEE which is participated by GUS and KAPE S.A. At present, two alternative methods of ODEX calculation are applied which give the same result. The first method (aggregation method based on unit consumption effect) combines the progress in energy efficiency achieved in all sub-sectors on the basis of saved energy quantity (e.g. Mtoe): it is based on „unit consumption effect". The second method (weighted indicator method) weighs a separate unit consumption indicator of each sub-sector on the basis of its share in energy consumption for the entire sector.

We can observe decreasing trend of ODEX indicators in years 1996-2008 what means improvement of energy efficiency. The rate of improvement for Poland amounted to 3.4% annually. The fastest rate was achieved by manufacturing, which amounted to 7.0% and was higher before 2000. In household sector ODEX indicator (technical) started to fall in 1997, since 2004 the improvement has been relatively small. Average annual improvement in years 1996-2008 amounted to 2.7% in this sector. In transport sector ODEX indicator was dynamically falling in years 1999-2002 and grew with similar dynamic during consecutive years[11].

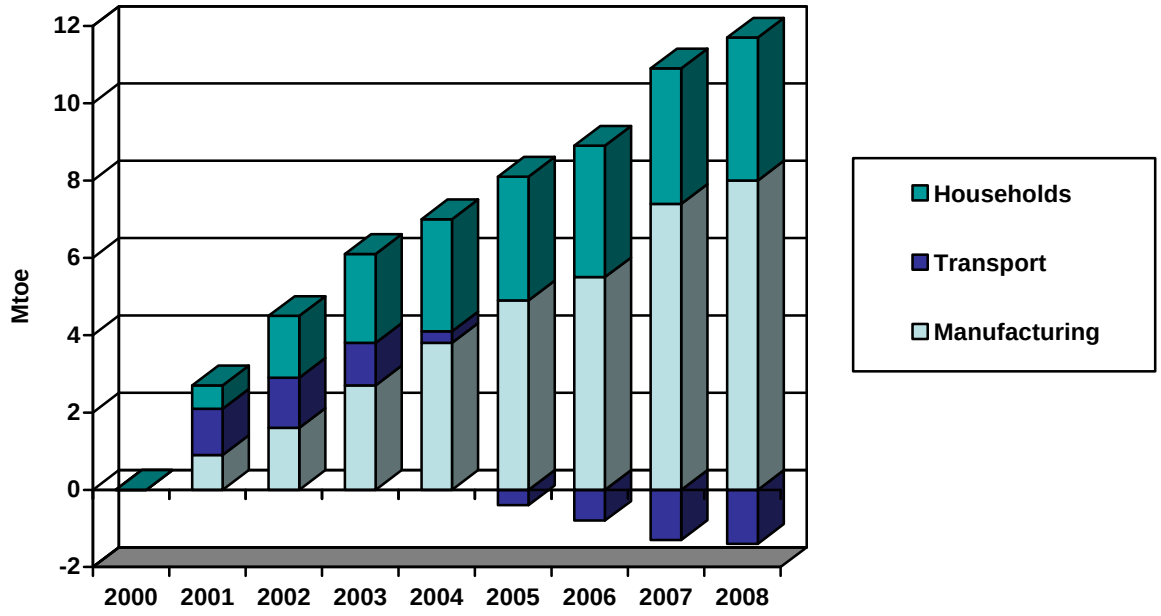
Figure 28. ODEX indicator



[11] Because of lack of official data on specific consumption of different types of transport, calculation of indicator for transport is based on estimated and constant parameters and therefore can be burdened with a mistake

ODEX indicator, apart from energy efficiency assessment can be used to calculate energy savings. Figure below presents cumulated energy savings in manufacturing, households and transport since year 2000.

Figure 29. Cumulated energy savings

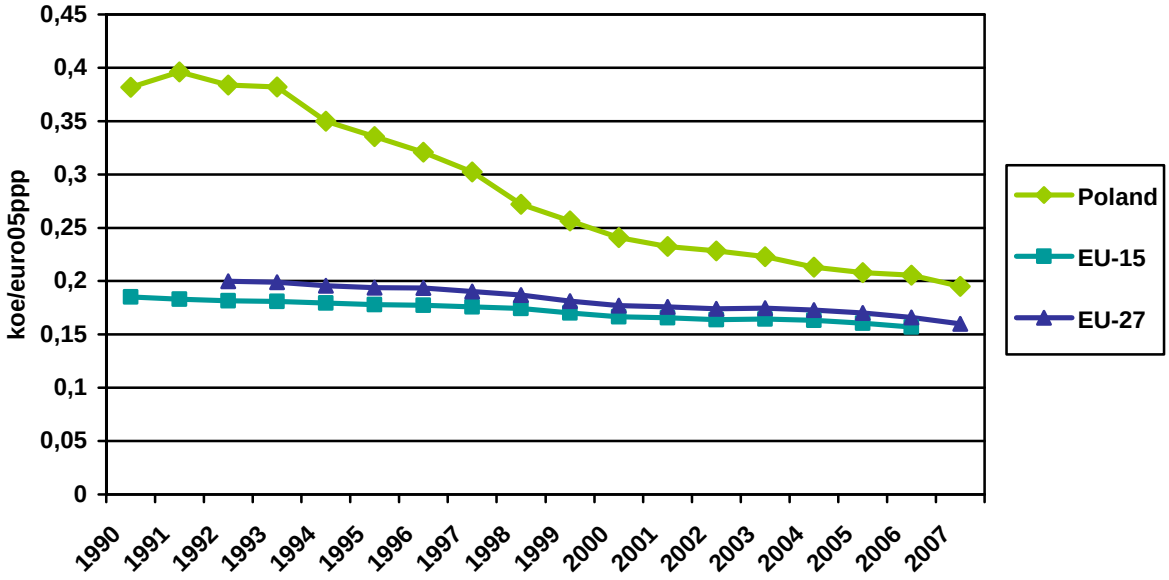


Cumulated energy savings since year 2000 amounted to 10.3 Mtoe in 2008, i.e. about 17% of annual final energy consumption in Poland. This amount includes savings made by sectors covered by European Trading Scheme which should not be counted in, according to Energy Service Directive.

3. Poland against a background of other EU countries[12]

Primary intensity of GDP with climatic correction at constant prices and purchasing power parity amounted in Poland in 2007 to 0.195 koe/euro05ppp and was 22% higher than European average. High dynamic of energy efficiency improvement before year 2000 can be observed, in contrast with little and stable improvement in "old" Member States.

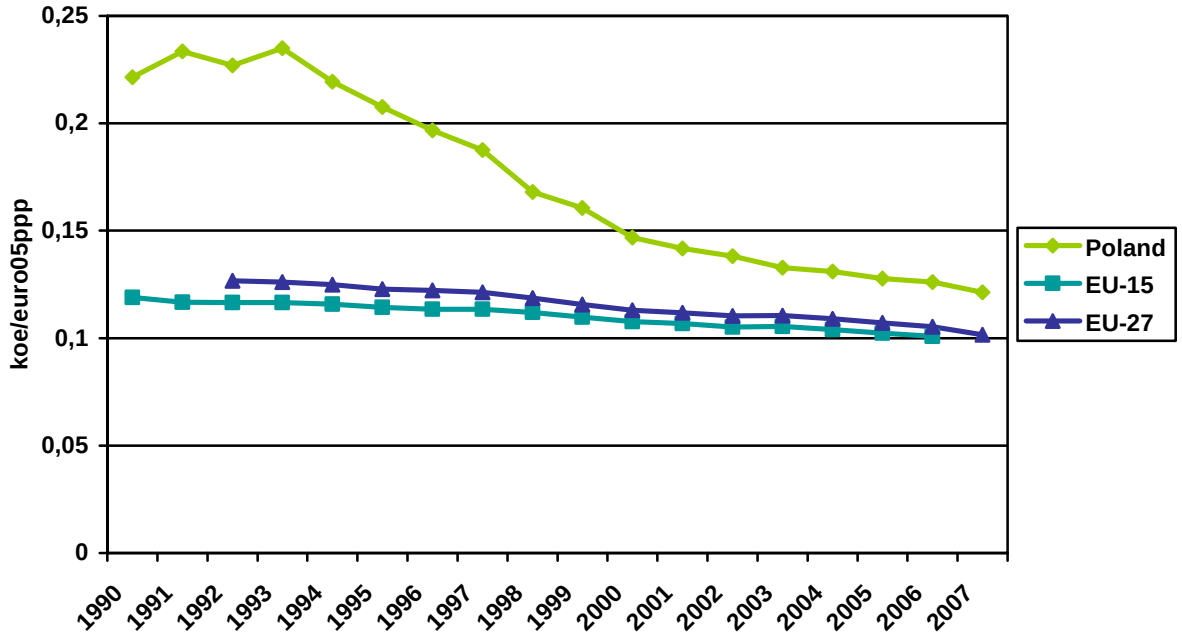
Figure 30. Primary intensity of GDP with climatic correction (euro05, ppp)



In case of final energy intensity difference is smaller and amounts to 19% between Poland (0.121) and EU-27 average (0.102). It is the result of the fact, that ratio of final to primary energy consumption is lower in Poland than in Europe.

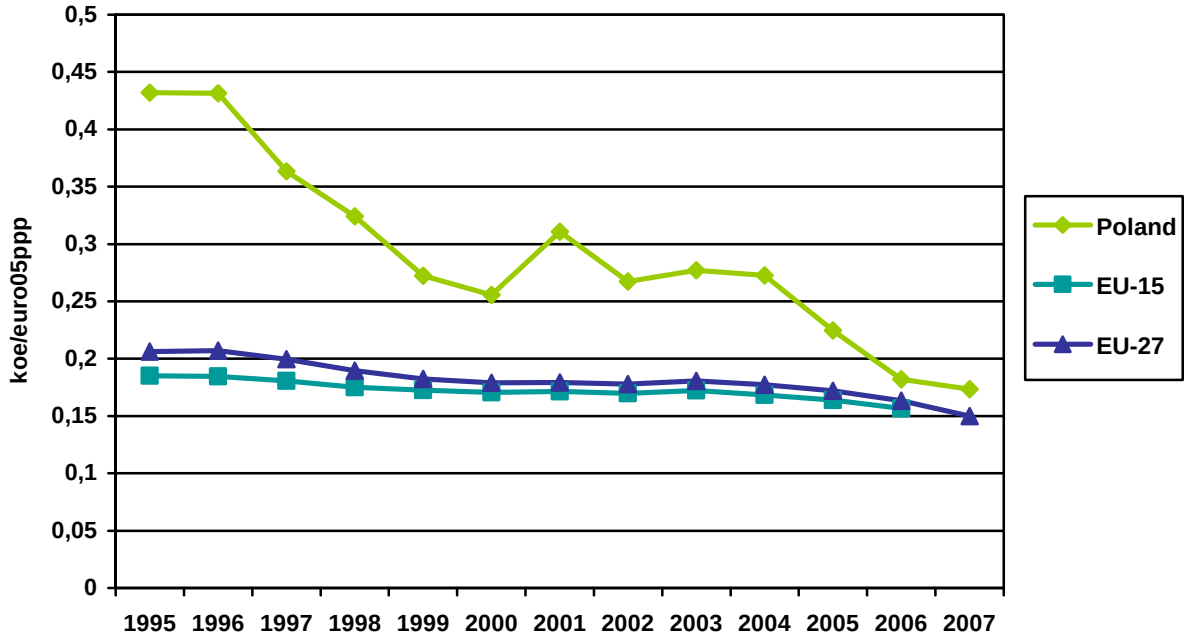
[12] Data comes from Odyssee database

Figure 31. Final intensity of GDP with climatic correction (euro05, ppp)



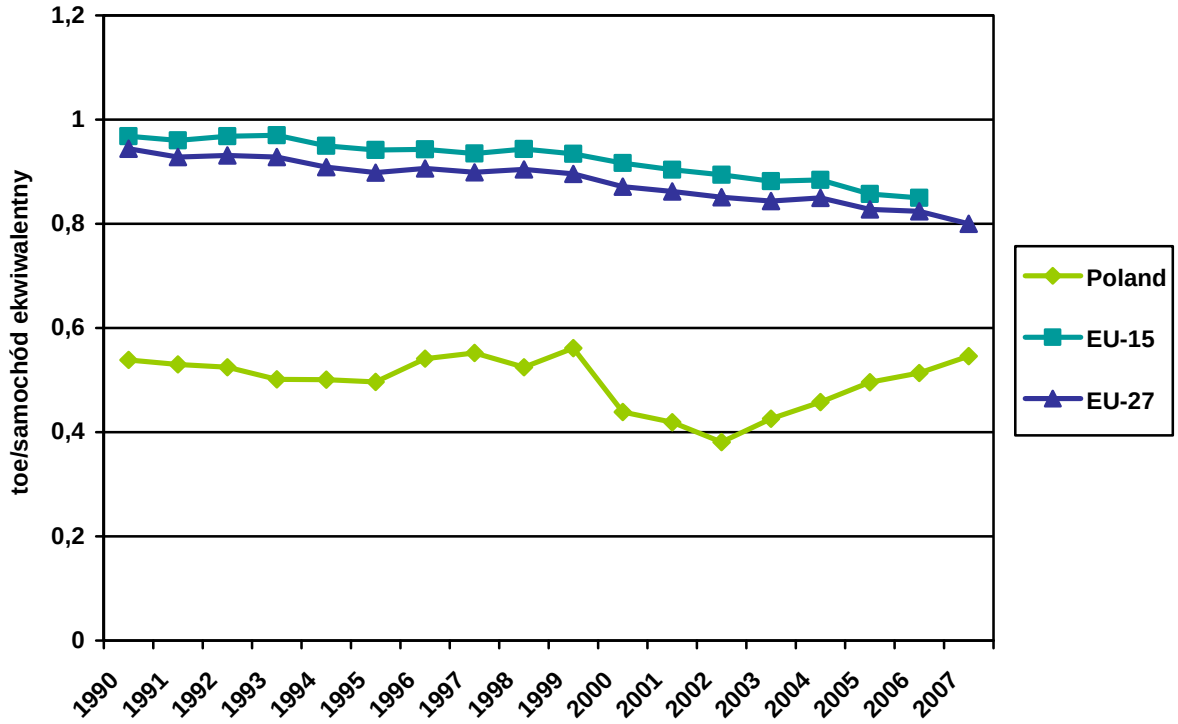
Final energy intensity of manufacturing at EU-27 structure in Poland was higher by 16% in comparison with European average in 2007. Using average European structure aims at elimination of differences between countries resulting from different shares of branches. Strong fluctuations in years 2000-2002 result from structural changes.

Figure 32. Final intensity of manufacturing at EU-27 structure (euro05, ppp)



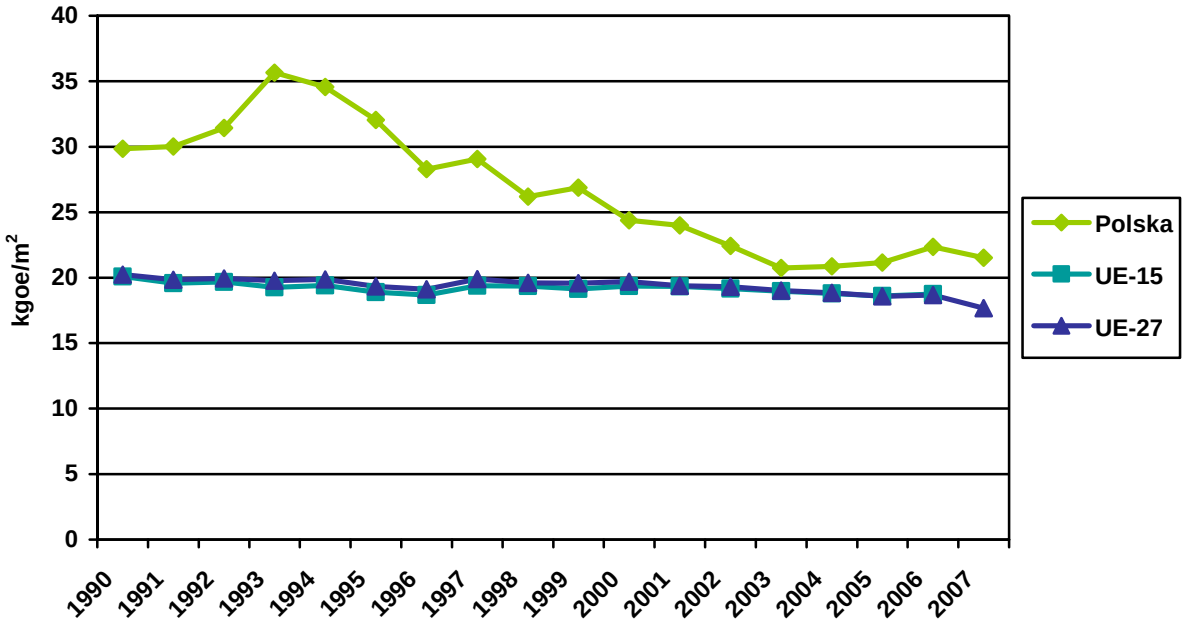
Energy consumption per equivalent car was at almost the lowest level in Europe and amounted to 0.55 toe per equivalent car in 2007, in comparison to 0.8 toe per car equivalent in EU-27.

Figure 33. Energy consumption per equivalent car



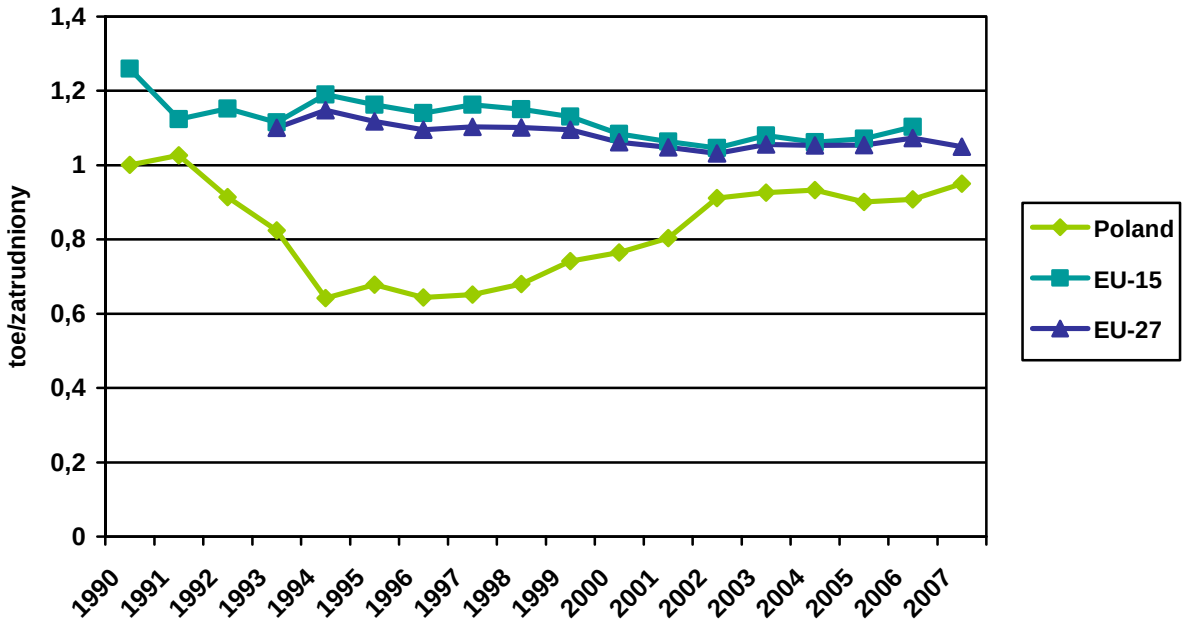
Average consumption per m^2 of dwelling with climatic correction was in year 2007 higher than European average by 22%. This indicator can be shaped not only by technology (efficient ovens, isolations), but also by inhabitants behaviour (temperature of heating and cooling, usage of domestic appliances, etc.).

Figure 34. Energy consumption per m^2 of dwelling with climatic correction



Energy consumption per employee in service sector in Poland was lower by 10% in 2007 in comparison with EU average. Since 2002 those trends have been similar.

Figure 35. Energy consumption per employee in service sector with climatic correction



4. Conclusions

During last 20 years Poland has achieved one of the greatest progress in scope of efficient energy use. It was industry sector that contributed most, due to improvements at branches level and structural changes. Improvements were mainly autonomous decisions based on economical calculation. Modernizations were also conducted after privatization of state-owned enterprises. One of the biggest national program of energy efficiency support is Thermomodernization Fund addressed to household and service sector. In 2007 positive trends were continued and in some cases accelerated. The distance to the European averages of major energy efficiency indicators has decreased to less than 20%, but to most efficient countries remains significant.

New policy of the EU, expressed through new directives, especially directive on energy end-use efficiency and energy services, obliges to monitor energy efficiency. According to the articles energy savings should be counted as decrease of energy consumption as a result of organization activities and achieved as a result of realization of investments or modernizations.

At the present, statistical data obtained in frames of public statistics statistical surveys, do not allow to calculate all proposed in the directive indicators.

The necessity of monitoring effects of actions towards energy efficiency improvement, described in Directive 2006/32/EC, endeavour to harmonization and making international comparisons possible, force to introduce changes in respect of collection of statistical data i.e. enlarge subject and object scope of surveys, as well as to supplement administrative data bases (administrative sources).

5. Abbreviations

koe - kilogram of oil equivalent

toe - ton of oil equivalent

euro2000 - market value of euro in 2000

kWh - kilowatt hour

Names of branches used in publication are colloquial and mean:

Lp.		NACE rev. 1.1
1.	Food	15-16
2.	Textile	17-19
3.	Wood	20
4.	Paper	21-22
5.	Chemical	24
6.	Mineral	26
7.	Primary metals	27
8.	Machinery	28-32
9.	Transport equipment	34-35
10.	Other	25, 33, 36-37

Attachment No. 1: Data presented in the brochure

#	Specification	Unit	1997	1998	1999
1	Primary energy consumption	Mtoe	102.0	95.7	93.3
2	Final energy consumption	Mtoe	63.4	59.1	58.0
3	Final energy consumption with climatic correction	Mtoe	63.0	59.3	59.2
4	Primary energy intensity	kgoe/euro00	0.628	0.561	0.523
5	Final energy intensity	kgoe/euro00	0.390	0.346	0.325
6	Final energy intensity with climatic correction	kgoe/euro00	0.388	0.348	0.332
	Final intensity in industry:				
7	Food	kgoe/euro00	0.692	0.522	0.367
8	Textile	kgoe/euro00	0.301	0.236	0.209
9	Wood	kgoe/euro00	0.627	0.580	0.478
10	Paper	kgoe/euro00	0.661	0.524	0.435
11	Chemical	kgoe/euro00	1.734	1.805	1.759
12	Mineral	kgoe/euro00	2.417	2.015	1.591
13	Primary metals	kgoe/euro00	3.319	3.373	3.201
14	Machinery	kgoe/euro00	0.281	0.224	0.172
15	Transport equipment	kgoe/euro00	0.521	0.447	0.317
16	Other	kgoe/euro00	0.252	0.194	0.142
	Energy intensity of production:				
17	Steel	toe/t	0.379	0.370	0.356
18	Cement	toe/t	0.130	0.124	0.111
19	Paper	toe/t	0.915	0.797	0.710

2000	2001	2002	2003	2004	2005	2006	2007	2008	#
90.3	90.3	88.9	91.2	91.5	92.7	97.7	97.8	98.6	1
54.2	55.0	53.3	54.3	56.1	56.8	59.2	59.8	60.3	2
56.4	55.1	54.5	54.4	56.5	57.1	59.9	61.7	62.5	3
0.486	0.481	0.466	0.461	0.439	0.429	0.425	0.399	0.383	4
0.292	0.293	0.279	0.274	0.269	0.263	0.258	0.244	0.234	5
0.304	0.293	0.286	0.275	0.271	0.264	0.261	0.251	0.243	6
0.370	0.378	0.344	0.320	0.304	0.210	0.191	0.192	0.187	7
0.176	0.175	0.186	0.171	0.143	0.139	0.108	0.092	0.069	8
0.384	0.412	0.469	0.436	0.425	0.465	0.373	0.350	0.375	9
0.404	0.407	0.425	0.496	0.435	0.439	0.400	0.414	0.315	10
1.708	1.604	1.517	1.453	1.405	1.206	1.088	1.012	1.035	11
1.154	1.223	1.099	0.992	0.903	0.861	0.701	0.664	0.634	12
3.524	6.886	4.767	5.929	6.803	5.004	4.218	4.240	3.533	13
0.139	0.127	0.121	0.103	0.084	0.074	0.054	0.042	0.030	14
0.220	0.211	0.183	0.153	0.115	0.139	0.117	0.100	0.091	15
0.133	0.130	0.133	0.127	0.115	0.102	0.100	0.081	0.069	16
0.329	0.328	0.300	0.290	0.281	0.273	0.250	0.237	0.223	17
0.105	0.098	0.090	0.087	0.102	0.098	0.098	0.089	0.078	18
0.647	0.628	0.598	0.603	0.510	0.572	0.552	0.664	0.556	19

#	Specification	Unit	1997	1998	1999
	Households:				
1	Energy consumption per dwelling	toe/dwel.	1.902	1.693	1.686
2	Energy consumption per dwelling with climatic correction	toe/dwel.	1.878	1.710	1.773
3	Energy consumption per m^2	kgoe/m^2	31.3	27.7	27.5
4	Energy consumption for heating per m^2	kgoe/m^2	23.0	19.9	19.8
5	Electricity consumption per dwelling	kWh/dwel.	1702.2	1737.7	1767.9
	Services:				
6	Energy intensity	kgoe/euro00	0.050	0.049	0.049
7	Electricity intensity	kWh/euro00	197.1	243.0	260.8
8	Energy consumption per employee	toe/emp.	0.660	0.673	0.705
9	Electricity consumption per employee	kWh/emp.	2609.7	3318.9	3732.0
	Transport:				
10	Fuels consumption per equivalent car	toe/eq.car	0.552	0.525	0.561
	Energy sector:				
11	Heat plants efficiency	%	76.32	76.87	77.92
12	CHP efficiency	%	46.26	46.72	46.70
	ODEX indicator:				
13	Manufacturing		137.0	121.1	109.2
14	Transport		112.9	114.2	106.8
15	Households		111.1	106.3	102.6
16	Global ODEX		122.8	114.5	106.1

* since 2003, consumption of electricity by farmers is included

2000	2001	2002	2003	2004	2005	2006	2007	2008	#
1.479	1.609	1.455	1.422	1.415	1.449	1.511	1.420	1.413	1
1.626	1.618	1.529	1.427	1.441	1.466	1.554	1.523	1.535	2
24.1	26.1	21.4	20.7	20.5	20.9	21.7	20.3	20.1	3
16.8	18.5	14.9	14.1	14.0	14.4	15.2	14.0	13.9	4
1775.5	1789.1	1741.0	1972.7*	2008.3	1976.2	2055.0	2029.0	2062.0	5
0.048	0.052	0.055	0.057	0.055	0.053	0.051	0.051	0.052	6
265.3	271.0	258.5	262.3	263.0	274.1	288.8	277.0	294.8	7
0.695	0.799	0.867	0.922	0.916	0.891	0.883	0.882	0.919	8
3841.7	4162.4	4050.1	4265.9	4396.5	4625.3	4973.4	4829.9	5191.8	9
0.438	0.419	0.381	0.426	0.458	0.496	0.514	0.532	0.518	10
77.90	78.73	78.48	78.27	77.22	77.27	77.65	76.99	79.17	11
46.52	47.12	47.36	47.83	47.62	48.07	47.51	46.93	46.87	12
100.0	94.3	89.7	83.9	79.4	74.1	72.1	67.0	63.0	13
100.0	88.2	87.6	90.1	97.7	103.1	106.1	109.5	109.8	14
100.0	95.9	89.8	84.7	81.2	81.1	81.1	80.6	79.7	15
100.0	93.4	89.2	85.9	85.3	85.5	86.1	85.8	85.3	16

Attachment No. 2. Measures towards energy efficiency improvements

In November 2009 the Council of Ministers adopted a resolution on the Polish Energy Policy until 2030. The document, prepared in accordance with Article 13-15 of Energy Law, presents the country strategy with a view to respond to major challenges facing the Polish energy sector, both in the short term and until year 2030.

As a Member State of the European Union, Poland actively participates in devising the Community energy policy, it also implements its main objectives under the specific domestic conditions taking into account the protection of interests of customers, the energy resources and technological conditions of energy generation and transmission.

In line with the above, the primary directions of Polish energy policy are as follows:

- To improve energy efficiency;
- To enhance security of fuel and energy supplies;
- To diversify the electricity generation structure by introducing nuclear energy;
- To develop the use of renewable energy sources, including biofuels;
- To develop competitive fuel and energy markets;
- To reduce the environmental impact of the power industry.

Improving energy efficiency is one of the priorities of the EU energy policy, whose goal is a 20% reduction in energy consumption by 2020 as compared to the "business as usual" scenario. Energy efficiency is given priority in the energy policy; and progress in this respect will be of key importance to realization all of its objectives. The main energy policy objectives in the field are as follows:

- To achieve zero-energy economic growth, i.e. economic growth with no extra demand for primary energy;
- Reducing the energy intensity of Polish economy to the EU-15 level.

Specific objectives in the area are as follows:

- To enhance efficiency of power generation by building highly efficient generation units;
- To achieve a twofold increase (as compared to 2006) in power generation with the use of highly efficient cogeneration technology by 2020;
- To limit grid loss during transmission and distribution by i.e. modernising the existing and building new grid, replacing low efficiency transformers, and developing distributed generation;
- To increase efficiency of end-use of energy;
- To increase the ratio of annual demand for power to the maximum demand for power at peak usage hours, which allows to limit the total cost of meeting the demand for power.

The measures to improve energy efficiency include:

- Setting the national objective of enhancing energy efficiency;
- Introduction of systemic mechanism to support measures aimed at attaining the national objective of enhancing energy efficiency;
- Stimulating development of cogeneration through support mechanisms, taking into account cogeneration from sources up to 1 MW and appropriate commune policy;
- Using mandatory energy performance certificates for buildings and apartments upon their marketing or renting;
- Determining energy intensity of devices and power-consuming products, introducing minimum standards for power-consuming products;
- Committing the public sector to serve as a role model of economical energy usage;
- Supporting investments in energy saving through preferential loans and grants from domestic and European funds, also under the Act on supporting thermo-modernisation and renovations, the Operational Programme Infrastructure and Environment, and the National Fund for Environmental Protection and Water Management;
- Supporting research and development on new solutions and technologies reducing energy consumption, in all kinds of its processing and use;
- Applying Demand Side Management techniques, stimulated by diversification of distribution prices during the day and of electricity prices on the basis of reference prices as a result of introduction of an intra-day market and sending price signals to customers with the use of remote bilateral communication via electronic meters;
- Informational and educational campaigns promoting efficient energy use.

In addition, the indicative target stemming from the Directive 2006/32/EC2 will be implemented, which assumes energy savings of 9% of the annual average amount of end-use energy consumption from the period 2001–2005 by 2016 (i.e. by 53,452 GWh) laid down in the National Action Plan for Energy Efficiency, adopted by the European Committee of the Council of Ministers on 31 July 2007 and other measures stemming from the document, which are not listed herein.

The Directive 2006/32/EC on energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC entered into force on the 17th May 2006. The purpose of the Directive is to enhance the cost-effective improvement of energy end-use efficiency in the Member States by providing the necessary indicative targets as well as mechanisms, incentives and institutional, financial and legal frameworks to remove existing market barriers and imperfections that impede the efficient end use of energy and by creating the conditions for the development and promotion of a market for energy services and for the delivery of other energy efficiency improvement measures to final consumers. The Polish National Energy Efficiency Action Plan (NEEAP) fulfils the provisions of Art. 14(2) of Directive

2006/32/EC of the European Parliament. This document describes the indicative energy savings target adopted for 2016 in absolute units. This is to be achieved over nine years starting from 2008 in accordance with Art. 4 of the Directive mentioned above. A national intermediate energy savings target of 2% has also been adopted for 2010, which is indicative in nature and constitutes a path for the attainment of the target adopted for 2016 and which will help in assessing progress towards it. In addition, the document provides a description of the funds and the national measures that are to be implemented or planned on the basis of these funds aimed at achieving the national indicative targets within the projected timescale.

The Energy Efficiency Law in Poland would be the primary instrument for implementing the Directive 2006/32/EC. The draft of this law, prepared by Ministry of Economy, was presented for ministerial and public consultation in 2009. Reduction of energy consumption, reduction of energy losses during transmission and distribution, increase of energy security and reduction of environmental pollution are the main objectives set out in the draft law. The proposed Act imposes the exemplary role of the public sector in activities towards energy efficiency improving. Offices and institutions will be required to save annually not less than 1 percent of the average energy consumption by taking relevant actions, and results achieved will be informed on its website. The Act will introduce the white certificates as a main support system. The certificates will confirm the realization of pro energy savings measures, which resulted in saving of the specific amount of energy. A detailed catalogue of measures, which will be awarded a certificate of energy efficiency, will be developed. In Poland there are currently being realized some measures to improve energy efficiency e.g. support for thermo-modernisation investments undertaken under the scheme determined by Thermo-modernisation law and Fund. There are activities planned or initiated and presented in the National Energy Efficiency Action Plan, which list was presented in the previous edition of the Central Statistical Office publication from 2008 entitled "Energy efficiency in the years 1996-2006".

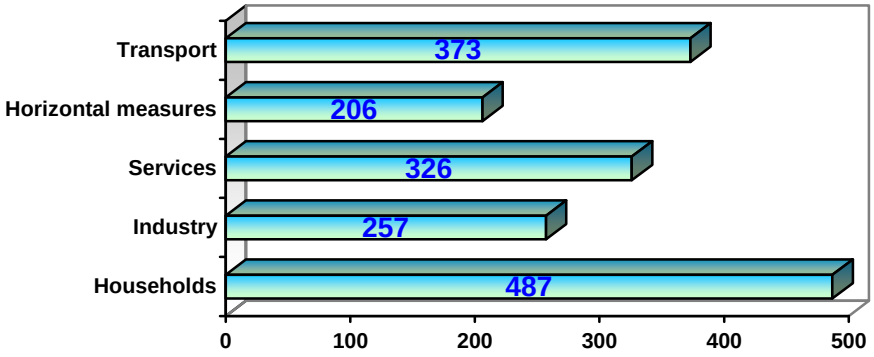
Actions and measures to improve energy efficiency that have been undertaken or are being planned in all European countries, including Poland, are presented in the database MURE: http://www.mure2.com/. MURE database was developed under the SAVE program of "Intelligent Energy - Europe" by a team of European experts. The database is coordinated by the ISIS (Institute of Studies for the Integration of Systems, Rome) and the Fraunhofer Institute for Systems and Innovation Research ISI (Germany). MURE database is also supported by national funds of Member States. MURE Project was adopted by the Directorate General for Energy and Transport (Directorate General for Energy and Transport) as a database containing data on rational use of energy (RUE) and energy efficiency policies.

MURE (Mesures d'Utilization rationnelle de l'Energie) provides information on energy policy, and includes data on the measures taken to improve the energy efficiency of the EU Member States. MURE database provides descriptions of actions, their assessment, and also allows comparison of the activities implemented in Member States. MURE database is an

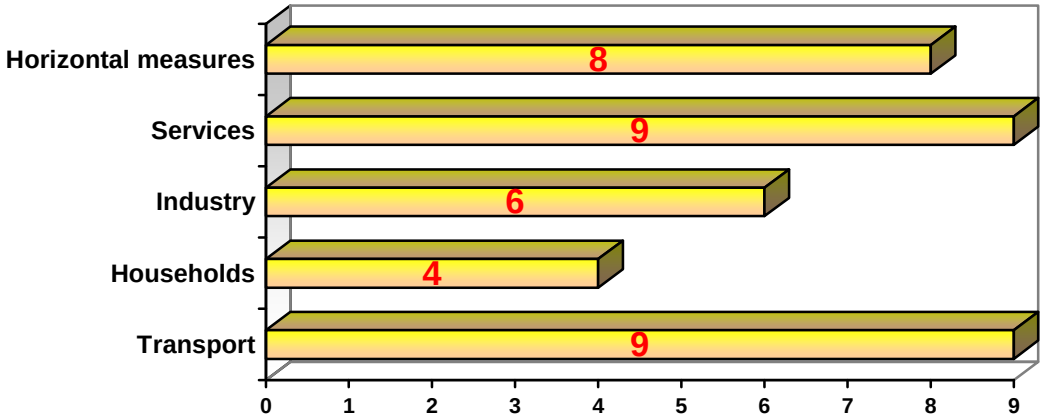
essential tool showing "evident progress" in reducing emissions by improving energy efficiency, in accordance with the requirements of the Kyoto Protocol. The network of energy agencies of the European Union guarantees the continuous updating of the database.

MURE database, including some statistics and an overview of the issues of energy efficiency in each country consists of sections containing information on programs to improve the efficiency of basic economic sectors: industry, households, transport, services and cross-cutting programs, covering all sectors. Actions towards energy efficiency improvement are classified in such categories as: legislative, fiscal, financial support, information activities, etc. The effects are assessed qualitatively and also, if possible, quantified.

The number of presented in the database MURE measures to improve energy efficiency, for all European countries and the Poland are presented in the figures below (state on 30th June 2010).



The number of energy efficiency improvement measures implemented or planned in European countries, as described in the MURE database



The number of energy efficiency improvement measures implemented or planned in Poland, as described in the MURE database

Selected energy efficiency improvement measures in Poland described in the MURE database are listed below. Entries in this field are being provided by the Polish National Energy Conservation Agency, a partner in the project "ODYSSEE-MURE 2010" of programme Intelligent Energy for Europe.

Residential Sector

Main instruments to improve energy efficiency in the residential sector in Poland, described in the MURE database are as follows:

- Thermo-Modernisation Fund;
- Standards for thermal protection of buildings imposed by Minister of Infrastructure Ordinance from 2008 on Technical Requirements for Buildings and theirs Location (Journal of Law 2008, No 201, item 1238);
- Obligatory minimum efficiency standards for a large number of equipment and appliances (following the EU standards);
- Implementation of building energy certification system;
- Promotion of rational energy consumption in residential houses;
- Information and Advisory Services, Local and Regional Energy Agencies.

The Act of 21 November, 2008 on Support for Thermo-Modernisation Projects (Journal of Laws 2008, No 223, item 1459) and the Thermo-Modernisation Fund, created on the basis of provisions of the Act, covers the rules of providing to the investors (building owners or administrators) of the financial support, in the form of the premium which can cover up to 20% of credit loan taken out for realisation of the thermal modernisation investments. Premium is paid by Bank of National Economy to the crediting investment commercial bank directly from the premium fund (owned and managed by Bank of National Economy) by as a repayment of the part of credit instalment just after the all the modernisation works are completed. The scheme is available to all investors, such as owners or administrators of buildings, local heat sources and local heat distribution networks. The 2008 Act replaced the previous one from 1998 (Journal of Laws 1998, No 162, item 1121). The Table below shows the number of submitted and accepted applications for thermo-modernisation investments.

	1999-2006	2007	2008	2009	TOTAL
Amount of government's contribution to the Fund (mil. of PLN)	343,39	298,0	270,0	109,3	1 020,69
Number of applications	8 351	3 314	2 859	3 363	17 887
Number of granted thermo-modernisation bonuses	6 328	4 201	2 759	3 267	16 555
Amount of granted thermo-modernisation allowances (mil. of PLN)	336,60	247,86	170,06	193,58	947,97

Total value of investments supported by all applications (mil. PLN)	2 571,77	1 111,03	1 047,79	1 314,93	6 045,96
Value of running projects (mil. PLN)	2 324,22	961,11	909 567,	1 150,45	5 579,09

Thermo-modernisation and renovation funds in numbers (dated 31 December 2009)

The Ministry of Regional Development and Buildings has introduced new standards for buildings, which are described in details in Ordinance of the Minister of Infrastructure "Technical Requirements for Buildings and theirs Location". Scope of Ordinance of Infrastructure dated November 6, 2008 "Technical Requirements for Buildings and theirs Location" covers general requirements - how buildings have to be planned, designed, built and modernised as well as requirements for thermal renovation of all types of buildings.
Relevant regulations, following the EU standards, established obligatory minimum efficiency standards for a large number of equipment and appliances (including central heating boilers, air conditioning equipment, electrical welding and bonding equipment, household appliances, gas ovens, radiators, asynchronous electric motors, light bulbs and fluorescent lamps, etc.).

Transport Sector

Main instruments to improve energy efficiency in the transport sector in Poland, described in the MURE database are as follows:

- Introduction of management systems for traffic and transport infrastructure;
- Promotion of sustainable transport system and efficient use of fuel in transport;
- Speed limits;
- Fuel Tax;
- Technical inspection of vehicles;
- Toll on highways;
- Vehicle taxation;
- The Cities for Bicycles project.

Transport policies of the Government are in general market oriented, both on the State government and territorial Self-Governments level. The essence of the policy is searching the balance between needs and possibilities for satisfying them on the base of reconciling technical, spatial, economic, social and ecological factors.
Key actions are directed at:

- management of transport demand, leading to rationalisation of the use of transport,
- moving transport activities towards less polluting transport modes;
- using the best available technologies.

Guiding premises of the Government's transport policy are:

- for the rationalisation of freight carriage, market factors react most efficiently;

- for the rationalisation of individual passenger traffic: promotion of alternative transport modes and behaviour patterns as well as fiscal factors.

Among the measures targeted transport sector, the Cities for Bicycles initiative could be mentioned. The Cities for Bicycles are the advocacy group for cyclists. By standing up for the rights of cyclists, the Cities for Bicycles are in fact working for the general public interest.
The Cities for Bicycles:

- organize public opinion by supporting grass root initiatives, lobbying local authorities, government and legislators, co-operation with universities and other institutions, by organizing exhibitions, street actions and other events;
- run the rowery.org.pl clearinghouse, the source of knowledge for individuals and institutions interested in cycling issues, cycling facilities, traffic calming, laws regarding cyclists, in work for change and improvement for cyclists as well as cycling touring and bicycle touring routes.
- offer expertise and consulting services on best available solutions to improve safety and comfort for cyclists.
- developed the Gdańsk Cycling Infrastructure and Promotion Project and fundraised 1 million US dollars from Global Environment Facility to implement it. Currently the Cities for Bicycles are working with other local authorities on similar projects development and fundraising.

Industrial Sector

Main instruments to improve energy efficiency in the industrial sector in Poland, described in the MURE database are as follows:

- 2007 to 2013 Infrastructure and Environment Operational Programme and Regional Operations Programme;
- Development of an energy management system and an energy audit system for industry;
- Poland – Japan Energy Conservation Technology Centre (ECTC) of the Polish National Energy Conservation Centre;
- Polish Energy Efficient Motor Program – PEMP.
- Support of energy efficiency investments and factories energy audits by the National Fund for Environmental Protection and Water Management.

The purpose of the Infrastructure and Environment Operational Programme, 2007-2013, the Regional Programmes is financial support for actions relating to high efficiency electricity generation and support for enterprises for the introduction of best available technologies (BAT).
Poland – Japan Energy Conservation Technology Centre (ECTC) of the Polish national Energy Conservation Agency started operation in 2005 as a result of the project between

Polish and Japanese Governments with aims at contributing to further promotion of the energy conservation technology in the Polish industry making the best use of the Japan's knowledge and experience. ECTC laboratory consists of the compressor, pump, fan, burner, boiler, and steam traps units. ECTC continuously offers services:

- training courses for management of factories,
- training courses for engineers and technical staff responsible for energy management in factories,
- training courses for energy auditors,
- performing the energy audits of industrial enterprises,
- consulting services for factories on marketing, investment and finance of energy efficiency projects,
- dissemination of information on energy efficiency and energy conservation.

The Polish Energy Efficient Motor Programme (PEMP) was five years (2004-2009) programme financed by Global Environment Facility. The main objective of the project was to reduce domestic GHG emissions in Poland by overcoming existing barriers for increased market penetration of energy efficient motors and related efficiency improvements in the electric motor system (including variable speed drives), particularly, but not exclusively, in the manufacturing industry, the energy sector (heating), the utility sector (water supply and sewage treatment) and mining.

Another of the measures to improve energy efficiency is a proposal to development of energy management system and an energy audit system for industry (under the support of the NFOŚiGW), whose goal is to raising the qualifications and skills of employees involved in the management of energy, equipment and staff in industrial facilities and carrying out energy audits in industry.

Tertiary Sector

Selected instruments to improve energy efficiency in the tertiary sector in Poland, described in the MURE database are:

- Competition for the most energy efficient Polish municipality;
- Increasing the proportion of energy saving products available in the market;
- Economic energy management programme in the public sector;

First edition of "Competition for the most energy efficient Polish municipality" has started 30th of May 2005, during conference: "Rational energy management in region and company – planning and financing". The invitation to take part in the competition was sent to all municipalities in Poland (about 2500 municipalities). Competition is based on the successful experience with yearly ranking of municipalities in Denmark (about 60% of municipalities

participated in it). The initiator of the competition and now the organizer of this project is the Polish National Energy Conservation Agency (KAPE S.A.). Municipalities should present in application form confirmed energy savings compared to those achieved subsequently in three years before taking into consideration only public buildings and local energy saving initiatives (e.g. street lighting).

Increase of share of available energy saving products is achieved by setting minimum energy efficiency requirements for new energy consuming products that enter the market (implementation of Directive 2005/32/EC).

Programme of economic energy consumption in the public sector will be achieved through state administration to undertake energy saving measures in order to provide an example.

General cross-cutting measures

Instruments to improve energy efficiency in the general cross-cutting measures in Poland, described in the MURE database are:

- Green certificates for electricity production from renewable energy sources;
- Quota system for the promotion of CHP;
- The National Fund for Environmental Protection and Water Management (NFOiGW);
- Information campaigns, training and education.

Issues of energy efficiency and renewable energy sources (RES) are closely related to each other. Support mechanism for RES-E are mainly based on system of Green Certificates which is legalized (by art 9a) in Energy Law Act. Green Certificates were introduced on 1st of October 2005 with the main aim to support electricity generated from RES. In Poland there are two institutions that control system of Green Certificate which are the Polish Regulatory Energy Office and the Polish Power Exchange (TGE). Exchange provides a platform on which market participants (buyers, sellers and financial intermediaries) can trade with Green Certificates. Main aim was to create possibilities to monitor and control the wholesale power exchange and to adopt it to competitive environment and requirements of the EU.

The National Fund for Environmental Protection and Water Management is the largest institution financing environmental protection projects in Poland. The mission of the Fund is to provide financial support for undertakings of a national or interregional scale. The financial resources of the National Fund constitute of the funds designated to investments serving environmental protection and to the improvement of the state of the natural environment in our country. The primary aim of the environmental protection funds is pollution control. Every year around 800 projects receive support from the National Fund. Usually 200 projects receive loans and the rest grants.

Energy efficiency improvement measures include also organization of information and education campaigns in the area of energy efficiency improvements. Since 2007, the Ministry

of the Economy has been conducting an information campaign for energy efficiency under the slogan "Time to save energy". The aim of campaign is to present issues related to the principles and cost effectiveness of energy efficiency and bringing to Polish society issues reflected in the activities of the Ministry of Economy to increase the energy efficiency of the Polish economy.

Attachment No. 3. List of legal acts

EU documents concerning issues related to energy efficiency are as follows:

1) Gren paper for a European Union Energy Policy (1995)
2) Energy Charter Treaty and Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects (PEEEREA). (1994)
3) White Paper Energy for the Future: RES. (1997)
4) Council Resolution on energy efficiency in the European Community (1998).
5) Action Plan to Improve Energy Efficiency in the European Community. (2000)
6) European Climate Change Programme (ECCP). (2000)
7) A sustainable Europe for a better world – A European Union strategy for sustainable development. *Gothenburg European Council (2001)*
8) Green Paper - Towards a European Strategy for Energy Supply Security. (2001)
9) White Paper. European Transport Policy for 2010: Time to Decide.(2001)
10) Directive 2006/32/EC of the European Parliament and of the council of 5 April 2006 on energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC.

Directives concerning energy efficiency of appliances:

1. Council Directive 78/170/EEC of 13 February 1978 on the performance of heat generators for space heating and the production of hot water in new or existing non - industrial buildings and on the insulation of heat and domestic hot-water distribution in new non-industrial.
2. Council Directive 79/531/EEC of 14 May 1979 applying to electric ovens Directive 79/530/EEC on the indication by labelling of the energy consumption of household appliances.
3. Council Directive 92/42/EEC of 21 May 1992 on efficiency requirements for new hot-water boilers fired with liquid or gaseous fuels.
4. Council Directive 92/75/EEC on the indication by labelling and standard product information of the consumption of the energy and other resources by household appliances.

5. Commission Directive 94/2/EC of 21 January 1994 implementing Council Directive 92/75/EEC with regard to energy labelling of household electric refrigerators, freezers and their combinations.
6. Commission Directive 95/12/EC of 23 May 1995 r. implementing Council Directive 92/75/EEC with regard to energy labelling of household washing.
7. Commission Directive 95/13/EC of 23 May 1995 implementing Council Directive 92/75/EEC with regard to energy labelling of household electric tumble driers.
8. Directive 96/57/EC of the European parliament and of the council of 3 September 1996 on energy efficiency requirements for household electric refrigerators, freezers and combinations thereof.
9. Commission Directive 96/60/EC of 19 September 1996 implementing Council Directive 92/75/EEC with regard to energy labelling of household combined washer-driers.
10. Commission Directive 96/89/EC of 17 December 1996 r. amending Directive 95/12/EC implementing Council Directive 92/75/EEC with regard to energy labelling of household washing machines.
11. Commission Directive 97/17/EC of 16 April 1997 implementing Council Directive 92/75/EEC with regard to energy labelling of household dishwashers.
12. Council Directive 98/11/EC of 27 January 1998 implementing Council Directive 92/75/EEC with regard to energy labelling of household lamps.
13. Directive 2000/55/EC of the European Parliament and of the Council of 18 September 2000 on energy efficiency requirement for ballasts for fluorescent lighting.
14. Commission Directive 2002/31/EC of 22 March 2002 implementing Council Directive 92/75/EEC with regard to energy labelling of household air-conditioners.
15. Commission Directive 2002/40/EC of 8 May 2002 implementing Council Directive 92/75/EEC with regard to energy labelling of household electric ovens.
16. Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings.
17. Commission Directive 2003/66/EC of 3 July 2003 implementing Council Directive 92/75/EEC with regard to energy labelling of household electric refrigerators, freezers and their combinations.
18. Directive 2005/32/EC of the European Parliament and of the Council of 6 July 2005 establishing a framework for the setting of ecodesign requirements for energy-using

products and amending Council Directive 92/42/EEC and Directives 96/57/EC and 2000/55/EC of the European Parliament and of the Council.