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Energy Consumption in Households in 2009

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STATISTICAL INFORMATION AND ELABORATIONS

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Information presented in the publication reflect opinions of the authors. They are not official opinion of the European Communities.

PREFACE

Herewith we release the publication „Energy Consumption in Households in 2009".

The aim of the publication is to present the results of the cyclical survey of the fuels and energy consumption in households. The survey constituted a module associated with the household budget survey which has been systematically conducted by the Central Statistical Office. The survey results made it possible to prepare the detailed analysis and assessment of various aspects of the energy use in households. The publication contains also an attempt to present the energy consumption in Polish households against the background of the total national energy consumption in Poland and against the background of the other countries of the European Union. The changes in the household energy consumption which took place during the period 2002-2009 are also presented.

The publication contains detailed information on the energy consumption quantities and values, including the energy from the renewable sources, as well as on the household energy consumption by the purpose of use, on the ownership of the energy consuming devices and on the structural factors which influence the consumption characteristics. The information on fuel consumption by the passenger cars used in households is also presented.

The publication contains the methodical notes, analytical part and the tabular part. Methodical notes include a description of the survey goal and object, the survey organization, characteristics of the survey method and of the results generalization, data sources and scope as well as the basic definitions. The analytical part of the publication, enriched with the graphics, describes in synthetic way the survey results. The tabular part contains the generalized results of the survey and an information on the results precision.

We express the hope that the publication will be interesting for the wide circle of readers, including the institutions and organizations active in the field of energy as well as the wider public interested in these matters.

We express our thanks to all the respondents who participated in the survey – for the information which they gave and for the time which they devoted. We pass the words of gratitude also to the interviewers and the regional coordinators of the field work.

The tasks of the publication preparation and edition were made by the teams of the Energy Market Agency, Energy Department of the Ministry of Economy and Production Department of the Central Statistical Office supervised by Mrs. Wanda Tkaczyk, Deputy Director of the Production Department.

Passing the publication to the hands of the readers, we kindly ask the readers for their remarks which would be helpful for the improvement of the future surveys and for better presentation of the results in the future editions of the publication.

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Warsaw, April 2012

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METHODICAL NOTES

1. Survey objective

The aim of the survey on fuels and energy consumption in households in 2009 was to obtain detailed information on the consumption of fuels and energy (including energy from renewable sources), and to analyse the application of various energy consumption techniques and devices, exerting an influence on energy efficiency. The survey results have led to upgrading the quality of national energy balances, as well as to assessing an improved energy efficiency in households. They will further enable Poland to meet its information-related obligations towards international organisations, arising from legal regulations.

The survey covers various techniques and energy commodities used by households for space heating and water heating, as well as cooking. Its focus is also on quantities and values of energy, penetration of energy-efficient technologies and renewable energies, as well as on information concerning the use of passenger cars and related motor fuels consumption. A number of structural factors affecting the consumption volume of different fuels and energy commodities in households were also considered. These mainly included the floor area of dwelling, the number of inhabitants, building characteristics, and use of various equipment consuming fuels and energy.

2. Characteristics of survey method and survey implementation

The survey on fuels and energy consumption in households constituted a module associated with the household budget survey which has been systematically conducted by the Central Statistical Office.

The survey was conducted in 2010, covering all households included in the second sub-sample (originating from the survey), which were involved in the household budget survey in the 3rd quarter of 2010. The sampling method employed in the household budget survey was described in the annual publication entitled “Household Budget Surveys”.

The sample involved in the survey on fuels and energy consumption comprised 4698 out of approximately 13.3 million households existing in Poland. This was the minimum size of the sample that could ensure representativeness in the scope of the most important features of the population surveyed, including especially the location (urban/rural area, country), the dwelling area, the number of household persons, and the access to various fuels and energy commodities. Only 3% of all second sub-sample households which participated in the Household Budget Survey in the 3rd quarter of 2010 refused to take part in the survey on fuels and energy consumption.

The survey on fuels and energy consumption was conducted using a specially-designed E-GD questionnaire in paper form. The households sampled were visited by a group of trained interviewers, who were employees of statistical offices, in charge of conducting household budget surveys. Their professional experience in establishing contacts with respondents,

timely work management, and motivating respondents to auswer the interview was an important factor, which ensured good quality of the collected data.

Further stages of the survey consisted in questionnaires registration, their formal, arithmetical and logical control. The database comprising the E-GD questionnaire results was supplemented with a selected set of data obtained through household budget surveys. The results allowed for conducting analysis and drawing conclusions regarding fuels and energy consumption in households.

3. Survey tools

Questionnaire E-GD entitled: "*Questionnaire on fuels and energy consumption in households in 2009"* (available on pages 117 – 124) was the principal survey tool.

The questionnaire contained a set of questions regarding all major aspects of fuels and energy consumption in households, presented in 11 parts:

Part 1. Identification of household.
Part 2. Structural characteristics of dwelling.
Part 3. Use of fuels and energy commodities for thermal purposes.
Part 4. Use of space heating, water heating, air-conditioning and cooking equipment.
Part 5. Lighting and electrical appliances.
Part 6. Measurement and regulation equipment.
Part 7. Quantities and values of fuels and energy commodities consumed in 2009.
Part 8. Additional information on biomass fuels.
Part 9. Additional information on solar collectors.
Part 10. Additional information on heat pumps.
Part 11. Passenger cars.

The questionnaire design took into consideration:

- the EU guidelines included in the document entitled "Recommended scope of a data collection exercise in the households sector" attached to the minutes of the Working Group's meeting on energy consumption in households (Luxembourg, 8 December 2008),
- the needs related to energy efficiency surveys, resulting from the implementation of the Directive 2006/32/EC of the European Parliament and Council of 5 April 2006 on energy end-use efficiency and energy services, and repealing Council Directive 93/76/ECC, and other documents concerning the energy efficiency, including data sheet entitled „Energy Efficiency Indicators Template" of the International Energy Agency,
- the information campaign on the rational energy consumption, entitled "Time to Save Energy," conducted by the Energy Department of the Ministry of Economy. The campaign was aimed at disseminating knowledge on energy-efficient technologies, and at shaping social attitudes towards the rational and efficient use of energy in everyday life. The description of previous activities and publications compiled are available at: http://www.mg.gov.pl/Bezpieczenstwo+gospodarcze/Energetyka/Czas+na+oszczędzanie+energii),

- the practical knowledge of national institutions dealing with energy statistics, regarding the availability and ability to acquire data on fuels and energy consumption in households,
- the questionnaires used in other countries, mainly Austria and Norway, related to surveys on energy consumption in households.

Based on questionnaires E-GD, information was gathered from 4565 households (out of 4698 households selected to the survey), which accounted for 0.0343% of the entire national population of households.
The information concerning consumption expenditure on various energy commodities was obtained from 68% to 93% of all households (consumers) using a given commodity. The lowest percentage of responses was obtained from households which used district heat (68.3%, which corresponds to 27.4% out of 40.2% of all households using this commodity), and the highest from LPG consumers (93.1%, i.e. 35.8% out of 38.4% of all households using this commodity). A comparably high result was obtained from coal consumers (91% of the information obtained). Data regarding expenditure on other types of biomass (except fuel wood) was provided only by every third consumer (similar to quantity data).

Information regarding consumption quantities of various energy commodities was obtained from 42% to 91% of all households using a given commodity. The lowest number of consumers (42%-44%) indicated natural gas and hot water from district heating installation, and the highest number (89%-91%), as in the case of expenditure, indicated LPG and coal. As regards electricity, consumption data was obtained from 55% of all households using this energy commodity.
The degree of completeness of quantity information was considerably different for two groups of energy commodities:

- above 70% for solid and liquid fuels,
- below 60% for electricity, natural gas and heat (in the latter case, the degree of information completeness was below 5%).

At the survey design stage, it was assumed that selected information from the household budget survey, obtained through **questionnaire BR-01a,** entitled: *"Statistical Card of the Household"* and through **questionnaire BR-04,** entitled *"Additional Information on the Household,"* will be reused in order to avoid data duplication. This information concerned technical characteristics of buildings, access to the water supply system, to hot running water and gas, as well as the presence of selected durable goods in the household.

Information presented in the publication are **annual data and refers to year 2009** (in case of other situation it is clearly stated).

4. Generalization method and precision of the survey results

The results of the survey on fuels and energy consumption in households were generalized using the formulas from the household budget survey, which are based on the classical theory of representative methods.

The results of representative surveys are charged with sampling errors as the focus is on a small part of the population, and the results obtained are generalised for the entire population. This implies that the conclusions are drawn for the whole population, based on the responses obtained from a sample. The more observations are gathered, the more precise are the results obtained, hence the higher likelihood that they accurately reflect the reality. In the reference survey, the sampling (precision) errors are measured using the coefficient of variation (cv). The minimum error value usually concerns the results obtained for the entire population surveyed whereas the maximum value refers to the data concerning less numerous groups, or cases where the phenomenon surveyed is infrequent.

While analysing the data obtained through representative surveys, the impact of sampling errors on the results obtained should be taken into account.

The basic parameters estimated in the survey included structural indicators and average numbers. These take the form of random variable quotients, i.e.

$$(1)\quad R = \frac{X}{Y},$$

Given that the survey module involves only one sample (compared to two independent samples in the household budget survey), a modified method of balanced replication subsamples, as proposed by Rao and Shao,[1] was applied to estimate the *precision* of the results.

The Rao-Shao method entails dividing the sample, independently in each stratum, into two subsamples. Afterwards, the classical balanced subsamples method is applied. This procedure is repeated several times, after which the calculated variance assessments are averaged.

The following symbols are used:

x_{hik} – the value of variable X for i-th household in k-th area survey point of h-th stratum,

y_{hik} – as above, but this time for variable Y,

$i = 1, 2, \ldots, m_{whi}$,

$k = 1, 2, \ldots, n_{wh}$,

$h = 1, 2, \ldots, 98$,

m_{hk} – the number of households surveyed in k-th area survey point of h-th stratum,

n_h – the number of area survey point, in which at least one interview was conducted in h-th stratum,

W_{hik} – the weight assigned to i-th household in k-th area survey point of h-th stratum in w-th administrative region.

[1] J. Jakubowski "The replication subsamples method and generalisation"; Publication series entitled *"Based on the work of the Statistical and Economic Surveys Centre"* vol. 266. 1999, Warsaw

The area survey point stratum affinity was specified in the relevant file in field **h.** The reference file comprises the strata numbered separately in each administrative region.

Assessment precision **r** of estimator R is calculated as follows:

For each area survey point, values x_{hk} and y_{hk} are calculated, i.e.:

(2) $$x_{hk} = \sum_i W_{hik} * x_{hik},$$

(3) $$y_{hik} = \sum_i W_{hik} * y_{hik},$$

Then:

(4) $$x = \sum_h \sum_k x_{hk},$$

(5) $$y = \sum_h \sum_k y_{hk},$$

(6) $$r = \frac{x}{y},$$

In each stratum, the area survey point sample with the number of n_h is randomly divided into two subsamples with the number of n_{h1} and n_{h2}, respectively. Then:

(7) $$n_{h1} = INT\left(\frac{n_h}{2}\right),$$

(8) $$n_{h2} = n_h - n_{h1},$$

The area survey point sample was randomly divided into two subsamples, e.g. using sampling without replacement of n_{h1} integer numbers from the range of [1; n_h]. The numbers sampled were the area survey point numbers selected to the first subsample in h-th stratum whereas the remaining area survey point were included in the second subsample. The sample division into two subsamples and the further calculations, were repeated 100 times[2]. As a result, also symbol **z** means the number of iteration (z = 1, 2, ..., 100) was added to the previously calculated values for area survey point, i.e. x_{hk} and y_{hk}, apart from the number of the subsample to which k-t area survey point in h-th stratum was classified. In this way, the following values were obtained: x_{zh1k}, x_{zh2k} and y_{zh1k}, y_{zh2k}.

Then:

(9) $$x_{zh1} = \frac{n_h}{n_{h1}} \sum_k x_{zh1k}, \quad (i = 1, 2, \ldots, n_{h1})$$

[2] At each iteration, it is necessary to change the parameter initiating the generator of random numbers.

(10) $x_{zh2} = \frac{n_h}{n_{h2}} \sum_k x_{zh2k}$, (i = 1, 2, ... , n_{h2})

(11) $y_{zh1} = \frac{n_h}{n_{h1}} \sum_k y_{zh1k}$, (i = 1, 2, ... , n_{h1})

(12) $y_{zh2} = \frac{n_h}{n_{h1}} \sum_k y_{zh2k}$, (i = 1, 2, ... , n_{h2})

At the subsequent stage, the replicated values $\mathbf{x_{z\alpha}}$ and $\mathbf{y_{z\alpha}}$ were calculated, where α = 1, 2, ... , A. Value A, i.e. the number of replications, depends on the number of strata. If L = 98, then A = 128.

(13) $x_{z\alpha} = \sum_h \lfloor P_{\alpha h} * x_{zh1} + (1 - P_{\alpha h}) * x_{zh2} \rfloor$,

(h = 1, 2, ... , L)

(14) $y_{z\alpha} = \sum_h \lfloor P_{\alpha h} * y_{zh1} + (1 - P_{\alpha h}) * y_{zh2} \rfloor$,

Value $P_{\alpha h}$ in formulas (13) and (14) means the element of matrix **P**, located in the row **α** and column **h**.

(15) $r_{z\alpha} = \frac{x_{z\alpha}}{y_{z\alpha}}$,

(16) $d^2(r_z) = \frac{1}{A} \sum_{\alpha=1}^{A} (r_{z\alpha} - r)^2$,

As it was already mentioned, the sample division into subsamples and the calculations based on formulas (7) – (16) were repeated 100 times, after which the following formula was applied:

(17) $d^2(r) = \frac{1}{100} \sum_z d^2(r_z)$,

(18) $d(r) = \sqrt{d^2(r)}$,

d(r) is an absolute standard error of quotient **r**.

(19) $v(r) = \frac{d(r)}{r} * 100$,

whereas v(r) is a relative standard error.

For structural indicators, the absolute errors d(r) were calculated whereas for the quotient of two variables (e.g. consumption per household) the relative error v(r) was calculated.

5. Definitions and explanations of the major notions

Household – a group of related or unrelated persons, living at the same address with common house-keeping (multi-person household) or alone person, who maintains individually, regardless of whether he/she lives alone, or with other persons (one-person household). Family members living at the same address, but maintaining themselves individually form separate households. The household size is determined by the number of persons who form it.

Dwelling – a premise comprising one or several rooms including ancillary spaces, intended for the permanent residence of persons - built or remodelled for residential purposes, structurally separated by permanent walls within a building, into which a separate access leads from a staircase, passage, common hall or directly from the street, courtyard or garden. Ancillary spaces include: anteroom (vestibule), hall, bathroom, lavatory, pantry, dressing room, porch, storage and other facilities located within the housing, for residential and economic needs of residents.

Solid fuels – flammable solid fuels of natural or artificial origin, used as the source of thermal energy. Solid fuels include hard coal, coke, fuel wood, lignite and peat.

Other solid fuels – this group of energy commodities used in households includes hard coal and lignite briquettes, and peat briquettes.

Natural gas –is a product of natural origin, whose main component is methane (CH_4). Gas is distributed to users by pipeline systems. The Polish standard PN-C-04750 distinguishes high-methane gas and four subgroups of nitrified natural gas.

Liquefied Petroleum Gas (LPG) - light paraffinic hydrocarbons derived from the refinery processes, crude oil stabilisation and natural gas processing plants. They consist mainly of propane (C_3H_8) and butane (C_4H_{l0}) or a combination of the two. They could also include propylene, butylene, isopropylene and isobutylene. LPG are normally liquefied under pressure for transportation and storage.

Other liquid fuels – this group of energy commodities used in households included heavy fuel oil and paraffin oils.

Heating oil – the lightest fuel oils, characterised by a high content of saturated hydrocarbons, a relatively low temperature of boiling, and a low content of sulphur.

LPG – see *liquefied petroleum gas.*

Heat – can occur as a primary or a derivative (secondary) energy commodity. Primary heat is extracted from natural sources such as geothermal and solar energy. Heat as a secondary energy commodity is obtained in the processes of fuel combustion, it can also be the result of fission of nuclear fuels. Heat is also generated as the result of conversion of electricity into heat in electric heaters. Heat can be produced and consumed at the production site or distributed by a system of pipelines.

Solid biomass - includes organic, non-fossil material of biological origin, which can be used as fuel to produce heat or electricity.
The basic solid fuel from biomass is forest biomass (fuel wood) in the form of chunks, round timber, chips, briquettes, pellets, and waste from forestry, wood and paper industry, i.e. branches, poles, thinning, shrubs, brush-wood, rootwood, bark, sawdust, black liquor. A separate group consist of agricultural biomass fuels from energy crops (fast-growing trees, dicotyledonous perennials, perennial grasses, energy cereals) and organic remnants from agriculture and horticulture (e.g. wastes from horticultural production, animal manure, briquettes and pellets of straw and so on).
The group of solid biomass fuels also contains charcoal, understood more broadly as solid products of biomass degassing.
Fuel wood – wood gathered and processed in order to be used as fuel. It is classified as a renewable energy source.

Renewable energy – an energy derived from repeating natural processes, obtained from renewable non-fossil energy sources (energy of: water, wind, solar, geothermal, waves, currents and tides, and energy produced from solid biomass, biogas and liquid biofuels).
In Polish conditions energy from renewable sources includes energy from direct use of solar energy, wind, geothermal resources (from Earth interior), water, solid biomass, biogas and liquid biofuels.

Geothermal energy – thermal energy derived from inside the Earth, classified as a renewable energy source. Considering the density and temperature of energy commodities, geothermal energy sources can be divided into the following groups:

- land and rocks to the depth of 2500 m, the heat from which is collected using heat pumps,
- ground waters as the upper heat source for heat pumps,
- hot waters extracted through deep exploitation boreholes,
- steam extracted through boreholes, used to produce electricity,
- salt beds, the energy from which is collected using brines or salt-neutral liquids,
- hot rocks which induce high-pressured water circulation through porous rock structures, and where energy is extracted through boreholes into which cool water is injected, and hot water is received after heat exchange with hot rocks.

Solar energy – energy of solar radiation transformed into heat or electricity. Solar energy is used in:

- flat, vacuum-tube and other types of solar collectors (liquid or air) for heating running water, water in swimming pools, space heating, in drying processes, in chemical processes,
- photovoltaic cells for direct production of electricity,
- solar power stations for production of electricity.

Solar energy used in passive heating systems (by system of direct gains through windows, by annexed greenhouses, and other), cooling and lighting of rooms is not included in the statistical reporting.

Evaporative coolers – they serve a similar role to air-conditioning equipment. Similar to heaters, coolers consist of heat exchangers and ventilators. Air cooling can be compared to the functioning of a freezer, i.e. it involves compressed gas or liquid.

Double-function boiler (space + water) – these are combustion boilers using natural gas, LPG (propane-butane), heating oil or solid fuels, serving two simultaneous functions, i.e. heat energy production and water heating. Double-function boilers are mainly used in single-family houses, but they are also found in flats in blocks (this concerns blocks of flats constructed or considerably modernised during the last ten years).

Underfloor electric heating – a permanent underfloor heating system, comprising a set of special heating cables. It may cover the entire dwelling or selected rooms, e.g. a bathroom. The user controls the system operation using drivers or thermostats.

Central heating boiler – these are combustion boilers using natural gas, LPG (propane-butane), heating oil or solid fuels (coal, coke, wood, other types of biomass; in some boilers all types of solid fuels can be used interchangeably while in others only one or two fuel types are suitable), feeding water heating systems, consisted of pipes and radiators. This category only includes single-function boilers, used to heat premises. Central heating boilers using natural gas are the most common in single-family houses, but they are also found in flats in blocks (this concerns blocks of flats constructed or considerably modernised in recent years).

Solar collector – device used to convert solar energy into heat. Input energy is exchanged into heat energy of the commodity which can be a liquid (glycol or water) or gas (e.g. air).

Fireplace – brick hearths, usually built in a niche within a premise wall. The most common fuel is fuel wood. There are three types of fireplaces:

1. open-fire fireplaces, visually resembling a conventional fire,
2. closed-insert fireplaces, containing a metal fireplace insert,
3. fireplaces with water jackets, containing heat exchangers which supply water to central heating systems.

Type 1 and 2 fireplaces heat spaces directly through heat energy radiation and/or hot air blasts. Type 3 fireplaces supply water to heating systems, which comprise a set of pipes and radiators, thereby serving the function identical to central heating boilers.

Electric-only cooker without oven – this category comprises electric cookers equipped only with heating panels. These panels may be traditional (with separate heating rolls), ceramic (in which heating roles are placed under a flat ceramic panel) or inductive (the most modern type with very high energy efficiency, in which the heating panel and the cooker casing do not heat up, and almost the entire heat is transmitted to pots using magnetic field technologies).

Electric-only cooker with oven – this category comprises cookers powered by electricity, containing a heating panel and an oven. The heating panel in older models consists of separate heating rolls (usually four) while in the more recent ones it can be glass or ceramic (i.e. heating rolls are placed under a flat glass or ceramic panel).

Gas-only cooker - this category comprises cookers powered by gas, containing only burners (usually four), or both burners and an oven. They can be powered by natural gas or LPG (bottled).

Combined gas-electric cooker – this category comprises cookers powered by both gas and electricity. Such cookers usually consist of electric ovens and gas burners, though other configurations, e.g. two gas burners and two electric ones, are also possible.

Solid fuel fired cooking stove – often referred to as coal stoves; they are mainly used to heat spaces, to cook and to boil water, using a heat exchanger or a heating panel. They are made of ceramic materials or metal, and they have a heating panel on which pots are placed. The fuels used include coal, wood and other types of biomass. In small dwellings and single-family houses, solid fuel cookers may be the only source of heat.

Fan heaters – devices used to heat the air inside the spaces. They consist of ventilators and heaters (e.g. electric heaters or heat exchangers). They function in a similar way as the common electric forced air heaters. The air heated inside the exchanger is distributed around the premises through ventilators.

Water heater – this category comprises electric water heating devices and the devices using LPG, natural gas or solid fuels, including tank or capacitive devices (commonly referred to as boilers), and flow devices (referred to as water flow heaters).

Solid fuel fired stoves – they are usually made of ceramic materials (tiles); they are not connected to water heating systems, but they are directly used to heat spaces through the energy radiation. Coal, wood and other types of biomass can be used in solid fuel stoves. There may be one or more stoves in a dwelling or building. Solid fuel stoves should not be confused with:

1. central heating boiler (see *central heating boiler*),
2. solid fuel fireplace (see *fireplaces)*,
3. solid fuel fired cooking stove (see *solid fuel fired cooking stove*).

Electric stoves or heaters:

Non-portable – this category comprises electric heaters, permanently fixed to the wall or floor, electric heat accumulation stoves and other types of electric stoves which are not movable, due to their fixture, size or weight;

portable – this category comprises small-size electric heaters, not permanently fixed to the wall or floor, easy to carry or move.

Separate electric oven – oven without a heating panel which, in this case, constitutes a separate device. In modern kitchens, such ovens are often built-in on higher levels than traditional floor cookers with ovens, which makes them more convenient to operate.

Heat cost allocators – devices assembled on radiators, visually resembling thermometers. They serve the function of a simplified measuring device which allows for calculating relative heat consumption proportions in particular rooms and flats in a building.

Heat pump – a device that extracts thermal energy from the environment i.e.: air, soil (shallow geothermal), surface water and groundwater. Heat pump transfers energy from the

environment of the lower temperature (lower source) to the environment with higher temperature (upper source), using energy from the outside (in the form of electricity).

Recuperators – counter-flow heat recovery devices. They are used in extended mechanical ventilation systems. Their functioning involves heat exchange between the air removed from the building and the external fresh air entering the ventilation system circulation. In the case of single-family buildings, recuperators prevent excessive heat losses caused by ventilation. Due to their considerable efficiency in reducing heat losses, recuperators are used in energy-efficient buildings.

Washing and drying machines are divided into four groups:

1. Automatic washing machines without dryer – this category comprises all automatic washing machines, equipped with a washing programmer, without a drying function,
2. Combined washer-dryer – compared to automatic washing machines, they have an additional drying function,
3. Clothes dryer – devices used only to dry clothes, without a washing function,
4. Non-automatic washing machines – older types of washing machines, not closed for the duration of the washing process, not equipped with a washing programmer.

Air-conditioning equipment – equipment powered by electricity, used to maintain a desirable temperature and moisture level in a flat or building, especially in summer when the outside temperature is higher than desired. The air-conditioning system may be central to the entire flat or building, or it may consist of separate devices installed only in selected rooms.

Mechanical ventilators – they are used in forced air ventilation systems (referred to as mechanical). They force air flows, ensuring proper air exchange inside the premises. Mechanical ventilation systems are used obligatorily in multi-family buildings with more than 9 storeys.

Compact fluorescent lamps – advanced lamps equipped with a thread identical to incandescent bulbs, hence suitable to the same lighting frames (fixtures). Compact fluorescent lamps may have various shapes, including round shapes resembling incandescent bulbs, coiled-tube shapes or spiral-tube shapes. In principle, they belong to energy efficiency class A.

Energy transformation means a technological process in which one form of energy (e.g. coal) is converted into the other, derived or secondary form (e.g. electricity).

Direct consumption means the consumption of energy commodities, finally consumed without the further transformation into other commodities.

Global consumption means the total amount of an energy commodity supplied to the national market (indigenous production + imports – exports – stock changes).

Total national consumption means the total consumption of different energy commodities used as energy transformation input, and in all end-use devices (direct consumption) in the country.

Energy transformations input means the consumption of energy commodities to transformation into other (derived) commodities in the technological processes of energy transformation.

Measures of position in data set (median, quantiles, quartiles, deciles)

Measures of position in data set constitute very useful addition to average values (arithmetic, harmonic, geometric and other averages). Measures of position and the average values have a complementary meaning, describing the characteristics of the numerical data set from different viewpoints.

Measures of position are particularly useful for a description of data sets in which the outlying values are extremely distant up and/or down from the average values. Such data sets are in principle obtained in the survey of the energy consumption in households.

Measures of position are the values of the selected items of data set. In some cases a measure of position may be the arithmetic average of the two neighbouring items of data set.

In order to understand the ideas of the measures of position and to calculate their values it is necessary to arrange all the observations in the increasing direction, from the lowest to the highest value of the surveyed variable.

The median is a value, above and below which the same numbers of data series elements are located. In many cases the median better describes the central tendency of the survey results than the average, because the average may be strongly deviated by the outlying values. Exactly 50% of data items are located below and above the median. For example, median of the salary equal to 3000 zl means that a half of surveyed people earn the amount $\leq$ 3000 zl and the second half the amount $\geq$ 3000 zl. The calculation of median is easier when a data set is composed of the odd number of observations, and slightly more difficult for a set which has the even number of elements. For data series composed of N elements the median is defined as:

- the value of the element located at the position (N + 1) / 2, when N is an odd number,
- the arithmetic average of the elements at the positions (N / 2) and (N / 2) + 1, when N is an even number.

The most basic way of understanding the pair (average, median) is as follows: when both values are similar, this means that the surveyed population is quite uniform concerning the selected characteristics, contains the similar number of observations which have relatively high and relatively low values of the surveyed characteristics, and contains few or almost not at all the observations which would have the non-typically high or non-typically low values. If however the average and the median are substantially different, this means that the population contains, besides the typical objects, also some number of the objects with the non-typically high and/or the non-typically low values of the surveyed characteristics (e.g. dwellings which are very large or have the exceptionally high consumption of energy, or dwellings in which, for various reasons the energy consumption, is very low).

Quartiles and deciles are in general called the **quantiles**. **The q-quantile** ($0 < q < 1$) is the number x_q selected in a way that $q \cdot 100$ % of data series elements have the value $\leq x_q$.

The first quartile (0.25-quantile) is an item selected in a way that 25% of the items have the value lower or equal to that item. For example, the first quartile of the salary equal to 1500 zl means that 1/4 of the surveyed people earn the amount ≤ 1500 zl, and ¾ the amount ≥ 1500 zl.

The third quartile (0.75-quantile) is an item selected in a way that 75% of the items have the value lower or equal to that item. For example, the third quartile of the salary equal to 4000 zl means that 3/4 of the surveyed people earn the amount ≤ 4000 zl, and 1/4 the amount ≥ 4000 zl. A very practical way of finding the first quartile and the third quartile is that the medians are found in two parts of data series which were created after finding the median of the full series. Median of the lower part is the first quartile, and median of the upper part is the third quartile.

The first decile (0.1-quantile) is an item selected in a way that 10% of the items have the value lower or equal to that item. For example, the first decile of the salary equal to 1000 zl means that 1/10 of the surveyed people earn the amount ≤ 1000 zl, and 9/10 the amount ≥ 1000 zl.

The ninth decile (0.9-quantile) is an item selected in a way that 90% of the items have the value lower or equal to that item. For example, the ninth decile of the salary equal to 5000 zl means that 9/10 of the surveyed people earn the amount ≤ 5000 zl, and 1/10 the amount ≥ 5000 zl.

Interdecile range of a variable is the interval in which the first decile is the lower endpoint and the ninth decile is the upper endpoint. The interval constructed in this way contains 80% of data items which have the most typical values. First decile and ninth decile of a variable may be considered as the lower, and correspondingly the upper, limitation of the typical range of the surveyed variable. The values of the first and ninth decile, computed for a given variable, may constitute good reference points for the further analyses of the certain sub-populations of households, the single households or the eventual future data sets which would be derived from the other sources. The simplest way of understanding such information is the following: a single object or a group of objects for which a value of the surveyed parameter is located within the interval <first decile, ninth decile> (i.e. within the interdecile range) belongs to the typical objects. If however the value of the parameter is outside the so-defined interdecile range, then data should be treated with a caution because they may be mistaken or they belong to the objects which have the non-typical characteristics.

Percentage points (ppts) – units reflecting the difference between two values of the same variable, expressed in percentage terms.

Empirical distribution – the frequency of occurrence of a given feature, determined through a statistical survey.

SURVEY RESULTS – SYNTHESIS

Chapter 1. General characteristics of households

1.1. Characteristics of Polish households

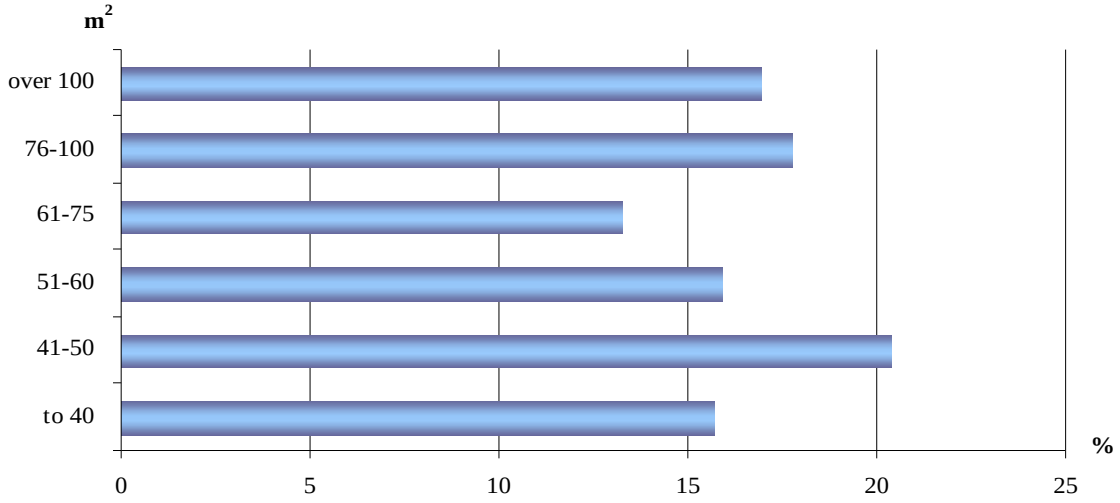
At the end of 2009, the number of households in Poland reached 13.3 million. The average number of household inhabitants was 2.9. The most numerous group was formed by one-person and two-person households (23.7% and 23.0%, respectively), and the least numerous by five-person households (6.4%).

The average floor area of a dwelling amounted to 74.9 m^2. Dwellings with the floor area of 41-50 m^2 were the most numerous (20.4%), and dwellings with 61-75 m^2 were the least common (13.3%). The average total cubic volume of a dwelling amounted to 193.6 m^3. In terms of the cubic volume, the most numerous group was formed by dwellings where it ranged between 101-150 m^3 (34.6%), and the least numerous by dwellings with 251-300 m^3 (8.2%). The dwelling structure by floor area and cubic volume is shown in Fig. 1.1. and 1.2.

Most dwellings were located in multi-family buildings (56.2%). The largest number of dwellings (35.7%) was constructed in the years 1961-1980. Insulated buildings accounted for 46% of all dwellings. Access to running cold water was provided in 99% of dwellings, 93% of which received cold water from network. Around 70% of dwellings used hot water which was locally heated, and 25% had water from district heating installation.

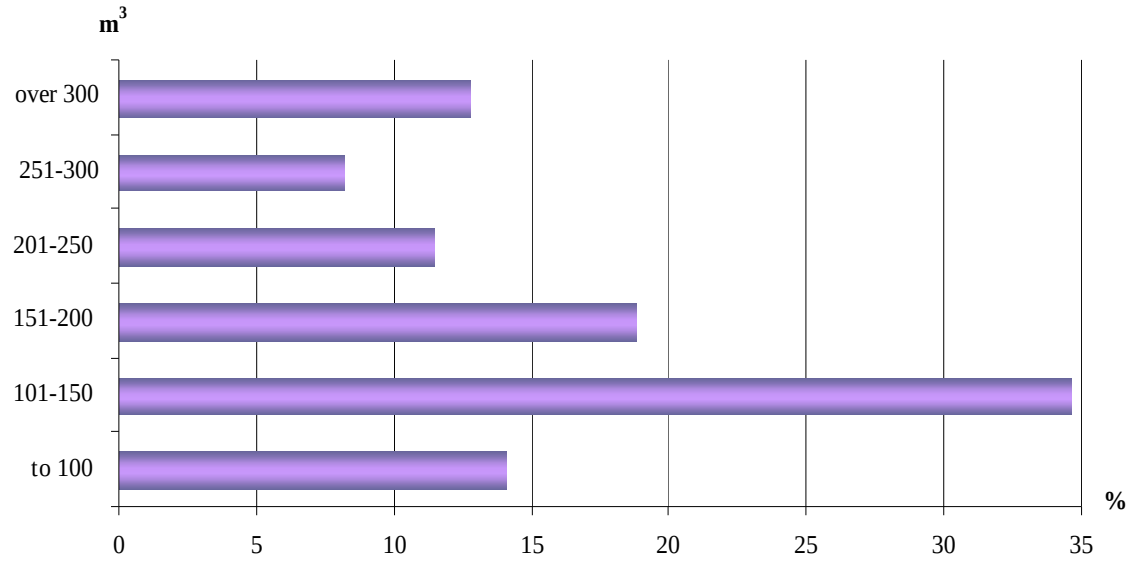
Information concerning the number of households, and a detailed characteristics of the factors influencing the level of consumption and expenditures on energy commodities in households is shown in Tables 1-4[3].

Fig. 1.1. Structure of dwellings by floor area



[3] Tables from 1 to 39 are included in the tabular section of this publication.

Fig. 1.2. Structure of dwellings by cubic volume



1.2. Households in Poland against the background of the EU countries

Information concerning the population, the number of households and the average number of persons per household in Poland against the background of the other EU countries, is presented in Table 1.1.

At the end of 2009, the population of Poland accounted for 7.6% of the total population residing in the EU-27 countries, as a result of which Poland was rated 6th among the EU countries, following Germany (16.4%), France (12.9%), the United Kingdom (12.3%), Italy (12%) and Spain (9.2%).

The number of households in Poland accounted for 6.4% of all households in the EU-27 countries. In terms of the number of households, Poland was also rated 6th among the EU countries. The largest number of households was found in Germany (18.9% of all EU-27 households), followed by France (13%), the United Kingdom (12.9%), Italy (11.8%) and Spain (8.2%).

The average number of persons per household in Poland amounted to 2.9 (similar to Malta, Romania and Cyprus), and it was higher than the EU average of 2.4 persons. The lowest average number of persons concerned households in Sweden (2 persons), as well as Germany and Denmark (2.1 persons).

Table 1.1. Population, number of households and average number of persons per household in Poland and in the EU countries

Country	Population	Number of households	Average number of persons per household
	in thous.		
EU-27	**499687**	**207725**	**2.4**
EU-15	396340	169420	2.3
Austria	8355	3598	2.3
Belgium	10753	4568	2.4
Bulgaria	7607	2901	2.6
Cyprus	797	275	2.9
Czech Republic	10468	4366	2.4
Denmark	5511	2584	2.1
Estonia	1340	549	2.4
Finland	5326	2482	2.2
France	64350	27024	2.4
Greece	11260	4318	2.6
Spain	45828	17076	2.7
Ireland	4450	1642	2.7
Lithuania	3350	1393	2.4
Luxembourg	494	202	2.4
Latvia	2261	863	2.6
Malta	414	142	2.9
Netherlands	16486	7270	2.3
Germany	82002	39311	2.1
Poland	**38136**	**13302**	**2.9**
Portugal	10627	3926	2.7
Romania	21499	7396	2.9
Slovakia	5412	1933	2.8
Slovenia	2032	791	2.6
Sweden	9256	4660	2.0
Hungary	10031	3791	2.7
United Kingdom	61595	26753	2.3
Italy	60045	24610	2.4

Source: Eurostat, statistical offices in the EU countries

Chapter 2. Households ownership of the energy consuming equipment

2.1. Ownership of heating equipment, cooking equipment, mechanical ventilation and air-conditioning equipment

2.1.1. Heating equipment (used for space heating and water heating)

Households make use of various techniques of space and water heating. Depending on the energy type, they are equipped with appropriate devices – Tables 6-8 (the use of energy commodities for heating purposes is described in detail in Chapter 3, Point 3.1.1).

Space heating

The space heating systems are clearly dominated by the use of solid fuels and district heat. More than a half of all households (i.e. 51.1%) made use of various heating devices using solid fuels, among which double-function **central heating boilers**, used to produce heat and warm water, were the most frequent. Such boilers were found in 40.5% of households using solid fuels. The single-function boilers were used in 29.6% of households using solid fuels. The most traditional heating devices, such as **stoves in rooms** (mostly made of tiles), were used in 22.4% of households. 6.8% of households using solid fuels had **fireplaces**, usually with closed insert. In the remaining 0.7% of households, solid fuel fired cooking stoves were the only heating devices.

District heat was used by 40% of all households. Residents of blocks of flats predominated among district heat consumers whereas the use of district heat in single-family houses was marginal.

60% of all district heat consumers also used this energy commodity to heat up water. This relatively small share of the heating system used for this purpose resulted from two major factors:

- district heating supplies to older buildings, equipped with central heating systems, without internal hot water systems,
- the functioning of small local central heating systems, the use of which in the summer season was not appropriate.

These factors both applied to many households. There is a certain trend of “an additional provision” of heat water systems in buildings, provided that the technical capacities of heating systems allow for doing so, but any such modernisation is an expensive and strenuous process.

Gas fired central heating boilers were also used to heat spaces, and 10% of households opted for this solution. Double-function boilers accounted for 2/3 of all such devices, and single-function for the remaining 1/3.

Heating devices applying electricity were used by 7.8% of households. However, electrical heating is usually considered a secondary, rather than primary, heating solution. Non-portable **electric heaters** were found in 2.5% of households, and underfloor heating systems were applied by only 0.4% of households. Portable electric heaters were available in 5% of households, and they were mostly used as secondary heating in emergency situations, or on a temporary basis.

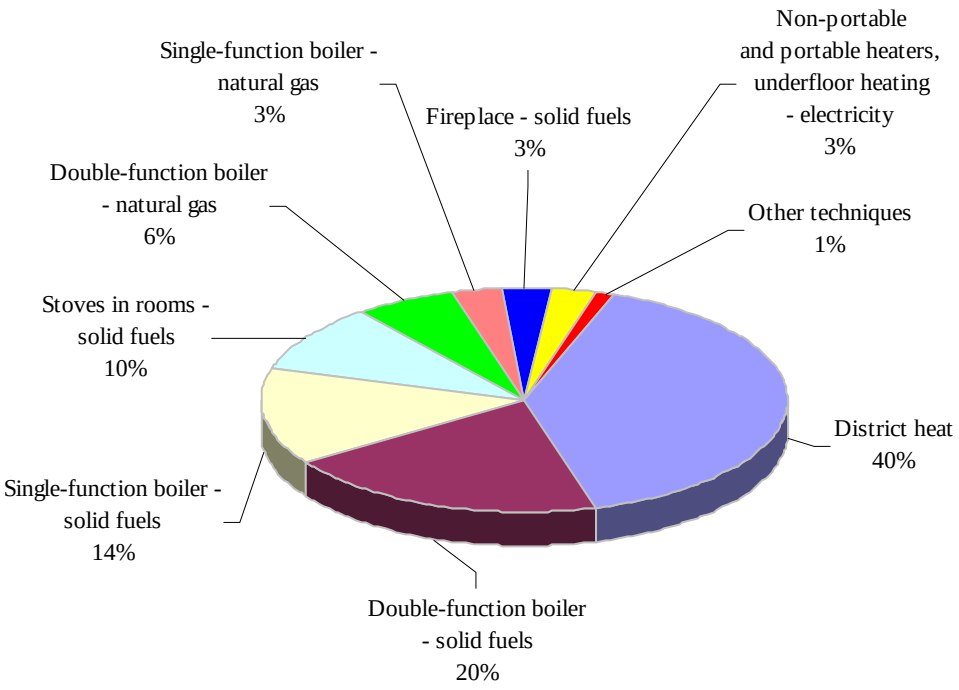
Liquid fuel fired boilers were the least frequent solution, i.e. 0.6% of households used heating oil fired boilers, and 0.4% LPG fired boilers. Also in this case, double-function boilers were the most common (82.3%), compared to single-function ones (17.7%).

Solar devices and **heat pumps,** used to heat spaces, were very infrequent. The survey revealed that only 0.04% of households used solar energy for space heating, and 0.03% had heat pumps.

Some households (i.e. over 5%) made a simultaneous use of two heating technologies, either applying one of them as primary and the other as secondary, or using both technologies on an equal or nearly equal basis.

Therefore, considering the fact that dwellings division by heating technologies is non-exclusive, the shares of various technologies applied in households were approximately like in the figure below.

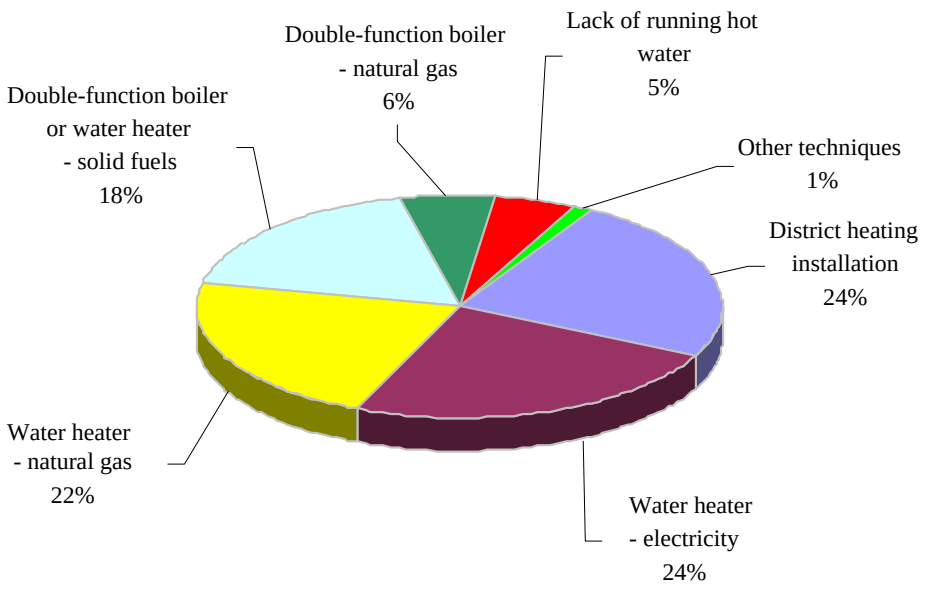
Fig. 2.1. Space heating by technologies



Water heating

As in the case of space heating, water heating solutions applied by households for residential purposes were diversified. Assuming the non-exclusivity of various classes, i.e. a simultaneous use of two or more water heating devices by many households (this concerns 11.2% of households), the following shares can be identified like in the figure below.

Fig. 2.2. Water heating by technologies



The item "lack of running hot water" practically means that water could only be warmed using kitchen devices, usually solid fuel fired cooking stove. Such residential conditions concerned around 5% of all households (i.e. 600 thousand), which accounts for nearly 2 million of inhabitants of the country.

Average age of devices

The average age of devices for space and water heating available in dwellings fell within the range from 7 to 12 years (Tables 6 and 7). Only the devices using renewable sources and modern fireplaces were younger, their average age ranging from 1 year for heat pumps, through 3 years for solar collectors, to 5-6 years for closed-insert fireplaces and fireplaces with water jacket.

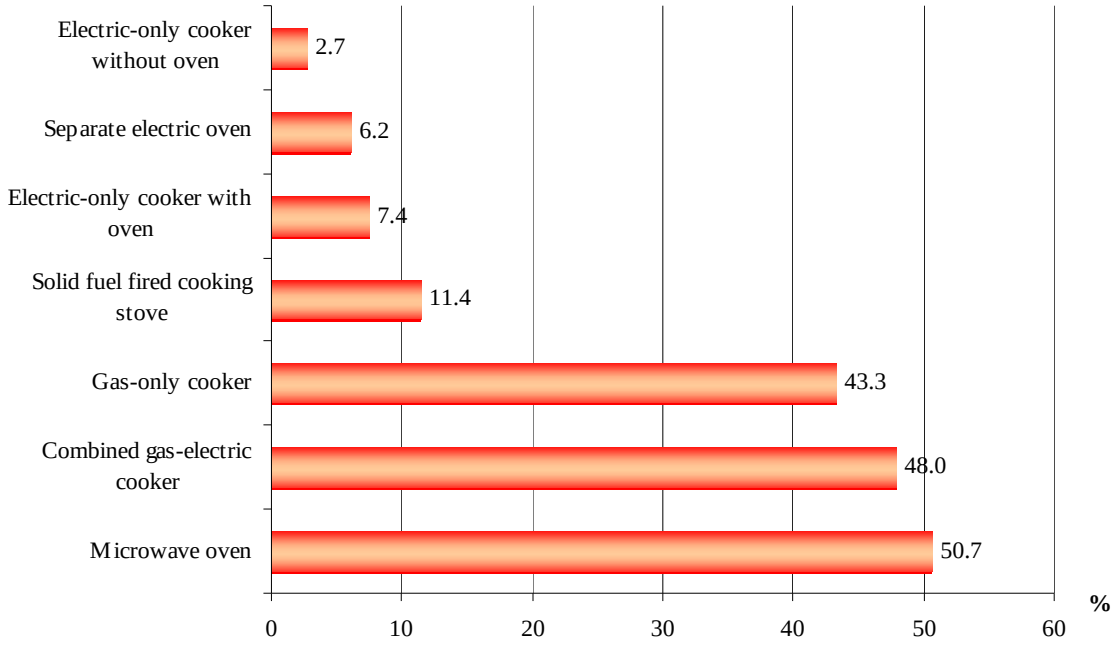
The oldest devices included solid fuel boilers, the average age of which exceeded 23 years.

2.1.2. Cooking equipment

Apart from space and water heating, cooking is the third most important goal of energy consumption in household.

Information about equipment used by households for cooking are presented in Tables 9 and 10 as well as in the figure below.

Fig. 2.3. Shares of households using various cooking equipment



For cooking purposes, as in the case of heating devices, households also make use of several technologies, based on various energy commodities.

The inseparability of household classes using various energy commodities, i.e. applying several solutions simultaneously, is even higher in the case of cooking than in the case of space and water heating. This stems from the fact that **combined gas-electric cooker**, the most typical of which consists of gas burners and electric oven, are the most popular cooker types in Poland. Such devices were used nearly by every second household (48.0%) whereas **gas-only cooker** was available in 43.3%. In turn, 14.9% households were equipped with **electric-only cooker**, which occurred in three functional versions:

- complete cooker, comprising burners (or a heating panel) and an oven – the most frequent type, found in 49.9% of all households using electric cookers,
- separate oven, usually built into kitchen furniture – a less common type, found in 41.5% of all households using electric cookers,
- separate cooker without an oven – the least frequent type, found in 18.0% of all households using electric cookers.

Apart from the main cooker, over a half of all households (i.e. 50.7%) also had **a microwave oven**, serving as an additional cooking device. It did not fully replace electric or gas cookers and, except for a very few cases, it was not the only cooking appliance available in the household.

LPG cookers were another type of cooking devices. Cookers where both the heating panel and oven were powered by LPG were used by 18.2% of households, and cookers where burners were powered by LPG and an oven was electric were available in 20.5% of households.

Solid fuel fired cooking stoves were available in 11.4% of households, though in many cases they were not the only cooking devices. Solid fuel fired stoves are hardly found in dwellings with access to natural gas, in contrast to the old housing stock, in which LPG cookers were commonly used, and the old solid fuel fired stoves were kept as the reserve devices, to be used temporarily, e.g., in case of inability to purchase gas.

Average age of devices

The average age of cookers amounted to 7-8 years for all types of electric, as well as combined gas-electric cookers. For gas cookers without an electric oven, the average age was higher, reaching 12 years. In turn, the average age of solid fuel fired cooking stoves amounted to 24 years, which was almost equal to solid fuel fired stoves in rooms.

2.1.3. Mechanical ventilation and air-conditioning equipment

Mechanical ventilation and air-conditioning equipment is presented in Tables 11 and 12.

Air-conditioning equipment was available in 0.35% of households. In terms of numbers, air-conditioners cooling separate rooms, installed in these rooms, proved to be the most prevailing technical solution (applied by 0.24% of households). These were followed by air-conditioners cooling separate rooms, but installed outside of building (0.08%), and then by central air-conditioning systems (0.03% of households).

Mechanical ventilation equipment were dominated by ventilators, which were used by over 2% of households, followed by fan heaters and evaporative coolers (0.08% each), as well as recuperators (devices used in ventilation systems, which enable heat recovery from the air transferred outside the building) which were the most infrequent solution applied by 0.04% of households.

Average age of equipment

Central air-conditioning systems were generally older (the average age of 5 years) than the equipment cooling separate rooms (the average age of 2.5 years for both air-conditioner types).

The average age of mechanical ventilation equipment was much higher than for air-conditioning one, ranging from over 15 years for evaporative coolers, through 8 years for fan heaters and 7 years for ventilators, to 5 years for recuperators.

2.2. Ownership of lamps, electrical appliances and electronic devices

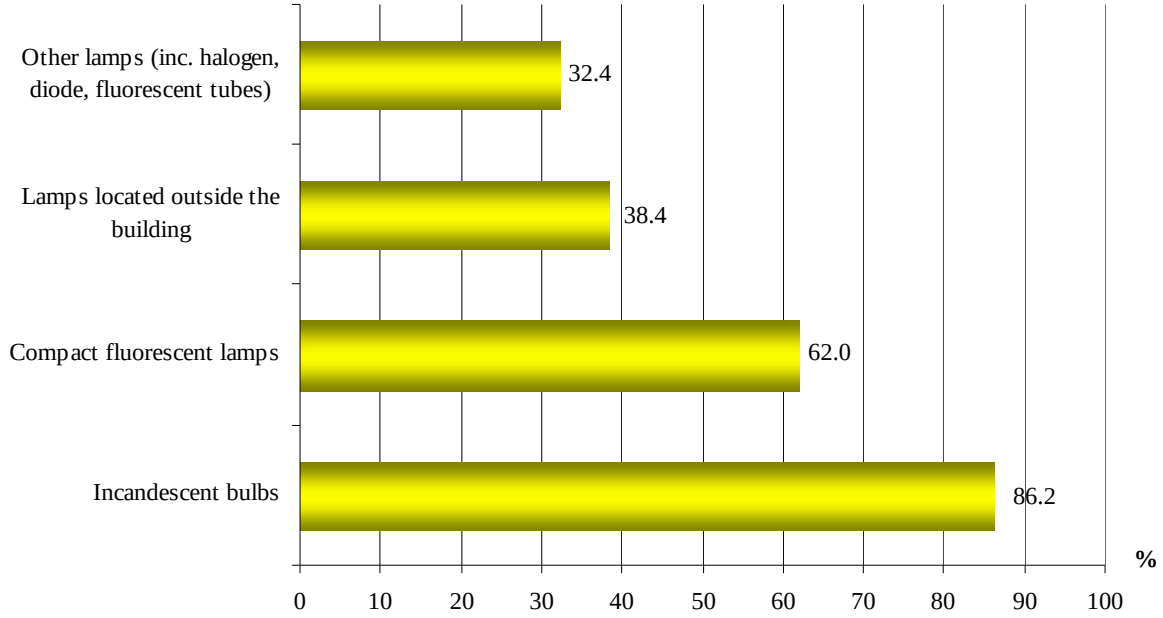
2.2.1. Lighting of dwellings

The lighting systems in dwellings (lamp types and power) are presented in Tables 13 and 14.

Most households made use of at least two lamp types, with the prevalence of incandescent bulbs. The information presented concerns 2009, which was when the withdrawal of incandescent bulbs from the market had already begun.

Data was divided into three categories of lamps used inside dwellings. Lamps located outside the building (lighting gardens, entrance, etc.) constitute an additional fourth category. The shares (%) of households using particular lamp types are presented in figure below.

Figure 2.4. Shares of households using various types of lamps



Incandescent bulbs prevailed in terms of numbers. An average household used 9 such bulbs with the average power of 56 W each, though 60 W bulbs were the most common.

An average household used 7 **compact fluorescent lamps** with the average power of 14 W each. Similar to compact fluorescent lamps, an average number of **other lamps** (including other available lamp types) also amounted to 7, and the average power was 27 W. Data concerning all three types of **lamps used inside dwellings** revealed that the average number of all lamps per dwelling amounted to nearly 14, and the average power was close to 40 W. As regards **lamps used outside buildings,** their average number was close to 2 with the average power of one equal to 67 W.

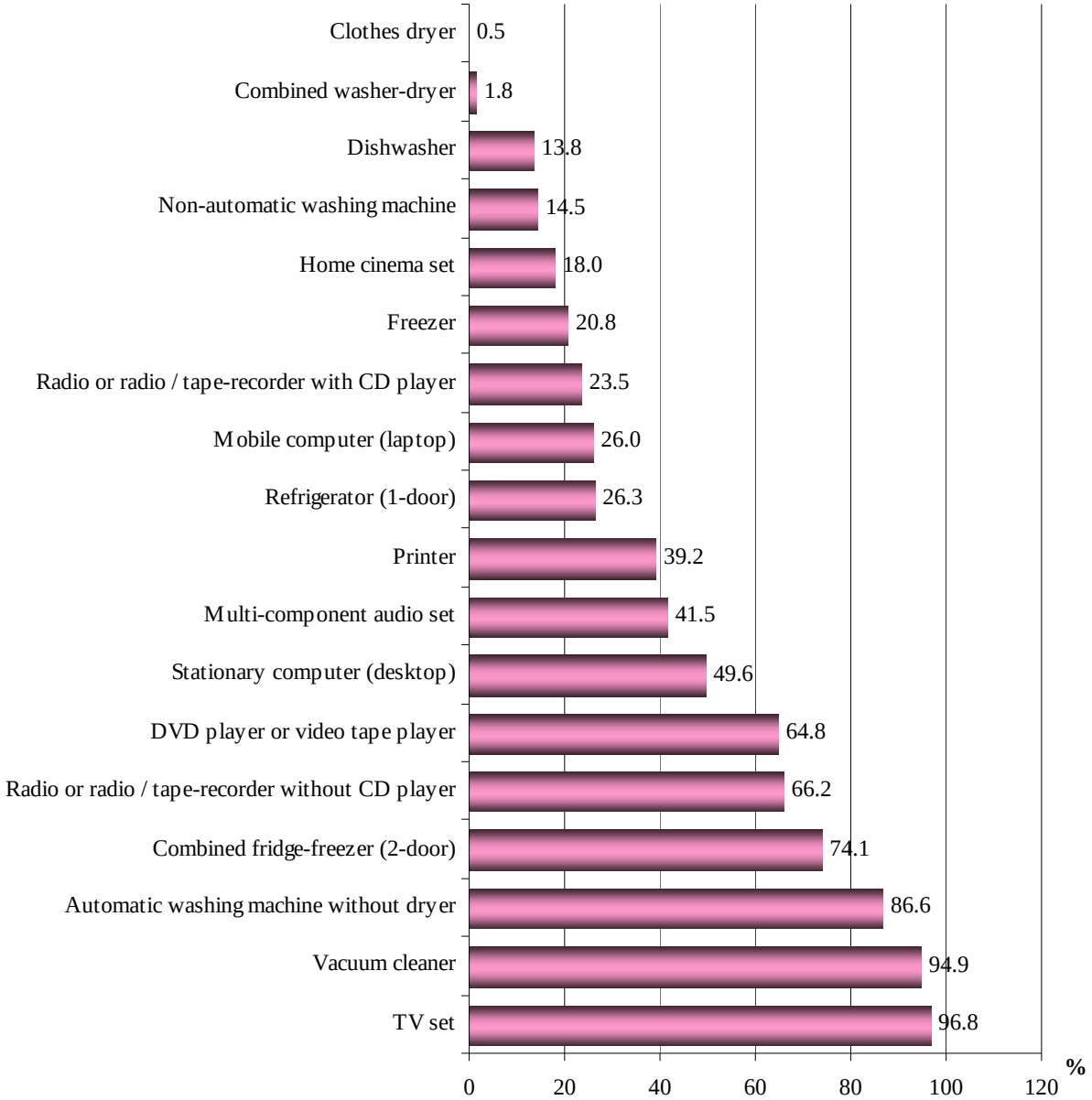
2.2.2. Electrical appliances and electronic devices

The categories of electrical appliances surveyed include refrigeration, clothes washing, dish washing and vacuum cleaning devices whereas the electronic devices categories comprise TV sets, audio-visual devices and computer equipment.

The most common devices available in households included fridge-freezers, automatic washing machines, vacuum cleaners, TV sets and different kinds of audio-visual devices. Every second dwelling had a stationary computer (desktop), and a mobile computer (laptop) was found in every fourth. A clothes dryer and combined washer-dryer proved the least common household appliance.

The characteristics of electric appliances and electronic devices used by households is presented in Tables 15 and 16 and in the figure below.

Fig. 2.5. Ownership of electric appliances and electronic devices



Electrical appliances

Refrigeration appliances were divided into three types, namely refrigerators, fridge-freezers and freezers. Almost each household (99.5%) had at least one of these devices. Fridge-freezers, i.e. two-door devices comprising a separate cooling chamber (the temperature of a few degrees above zero) and a freezing chamber (the temperature of around -18º C), were the most common. Fridge-freezers are the most universal freezing devices, available in nearly 75% of households. Refrigerators, i.e. usually smaller one-door devices without a freezer, or with a small freezer inside the cooling chamber, were available in 26% of households, and separate freezers in 21% of them.

Clothes washing appliances are comparably common in households. Automatic washing machines without a dryer were definitely the most prevalent, being used by over 86% of households. Combined washer-dryer, as well as clothes dryer machines were infrequent. They were found in only slightly more than 2% of households, though combined washer-dryers were the more common type of these two. Nearly 15% of households had non-automatic washing machines. These are older washing machine models which were popular 30-40 years ago before the growth in popularity of automatic machines. They are still manufactured and used in some households as supplementary devices, or in case the automatic machine breaks down.

Dishwashers were relatively infrequent, being used by around 14% of households.

Electric vacuum cleaners were common devices, available in 95% of households.

Electronic devices

TV sets proved the most common audio/video devices, found in 97% of households. This does not imply that the remaining 3% did not have an opportunity to watch TV programmes. In some of those cases, computer screens served this function. TV sets were the only one of the large-size devices which were available in a household in more than one piece. Namely, an average of 1.4 TV set were present in one household.

Information on TV sets was also compiled separately for cathode-ray tube (CRT) TV sets and flat-screen TV sets. 80% of households had at least one CRT set, and 33% at least one flat-screen set, i.e. 137 TV sets fell on 100 households, 100 of which were CRT sets and 37 flat-screen sets.

Audio-visual devices were available in the vast majority of households.

Audio devices include radios, tape recorders and CD players, either separate or compact devices with various sets and component combinations. Respondents were inquired about three types of devices. However, due to a fairly unclear distinction between them, the results were presented synthetically. As such, audio devices were available in nearly 90% of households, with an average of 1.6 devices per household using that. Devices without a CD player function were as common as devices equipped with this function, though this tendency is likely to change in the nearest future, considering the fact that the magnetic tape technology is now becoming obsolete.

Visual devices include DVD players and video tape players. They are considered supplementary to TV sets, and serve practically no function on their own, but are only useful in combination with a TV screen on which the images appear. DVD players and video tape players proved relatively common since 65% of all households had at least one of them.

A home cinema set is a set of audio-video devices. It comprises several electronic devices in various configurations. Any such set must either be compatible with a TV screen on which the images appear, and with a video player that generates them, or it must contain these two devices. Home cinema sets were available in 18% of households.

In the last several years, **computers** have become common. The survey revealed that 63% of households had at least one computer, and 15% had more than one – these were often a stationary computer (desktop) and a mobile one (laptop). Every second household had at least one stationary computer (desktop), and every fourth used a mobile one (laptop). It is estimated that 82 computers were present for 100 households, 53 of which were stationary computers (desktops) and 29 mobile ones (laptops).

About 40% of all households had printers, which corresponded to 63% of households using computers.

Average age of appliances

The average age of electrical appliances identified was around 7 years for fridge-freezers and automatic washing machines. It was higher for one-door refrigerators (12 years), freezers (10 years) and non-automatic washing machines (16 years). Only dishwashers proved younger, their average age reaching 4 years.

The average age of electronic devices amounted to 8 years for TV sets, 5 years for stationary computers (desktops), around 3 years for mobile computers (laptops) and nearly 4 years for printers.

2.2.3. Energy efficiency classes of electrical appliances and lamps

Questions regarding energy efficiency classes applied to a number of devices used by households, including refrigeration appliances, washing appliances, dishwashers, electric ovens, bulbs and air-conditioning equipment, i.e. all devices for which the labelling is required under the Regulation of the Minister of Economy and Labour of 20 May 2005 *on the requirements concerning technical documentation, labelling and technical characteristics, as well as device label models* (Journal of Laws of 2005 No. 98, Item 825).

Table 2.1. provides estimated shares (%) of devices in various energy efficiency classes, in synthetic terms, divided into the following categories: class A, other classes (from B to G) combined, and no information available. Drying machines and air-conditioning equipment, which were very infrequent in the surveyed sample, as well as incandescent bulbs, for which the typical structure of energy efficiency classes is much different from other equipment (i.e. clear bulbs belong to class E and frosted bulbs to class F), were not included. A detailed presentation of equipment by class is shown in Table 17.

Table 2.1. Shares of the equipment in different classes of energy efficiency

Devices types	Class A devices	Class B to G devices	No information available
	in %		
Combined fridge-freezers	64	10	26
Refrigerators	32	13	55
Freezers	37	11	52
Automatic washing machines	62	8	30
Combined washer-dryers	59	14	27
Dishwashers	79	5	16
Ovens in electric cookers	56	10	34
Separate electric ovens	42	6	52
Ovens in combined gas-electric cookers	52	11	37
Compact fluorescent lamps	76	5	19

The above compilation reveals that:

- the share of labelled equipment, other than class A, did not exceed 15% for any of the surveyed households; this stems from both labelling requirements and consumer preferences towards more energy-efficient equipment;
- in the case of both types of the most common appliances, i.e. fridge-freezers and automatic washing machines, the share of class A and class B to G appliances was similar as above, amounting to around 60% and 10%, respectively;
- the shares of class A equipment were the highest, exceeding 75%, for relatively the youngest equipment (dishwashers) or for devices with a relatively short useful life (lamps);
- the shares of class A equipment were the lowest, and the cases of no information available the highest, for those devices whose useful life was the longest, i.e. refrigerators and freezers; in such cases, the lack of data hardly implies that consumers had no knowledge on the efficiency of such equipment, but rather than they had been purchased before the labelling requirements were introduced.

Data collected through the questionnaire allows for estimating the impact of the energy efficiency classes of household equipment on the electricity consumption volume. To this end, an additional data analysis was performed by dividing households into two groups:

- Group 1 had all major equipment labelled (i.e. refrigeration appliances, automatic washing machines and electric ovens), which belonged to class A; the average dwelling area was 75 m^2 and the average number of household persons - 3; this group comprised 31.4% of all households surveyed,

- Group 2 had all major devices belonging to classes other than A; the average dwelling area was 68 m^2 and the average number of household persons - 2.7; this group comprised 6.7% of households.

The analysis of the results obtained reveals that:

- the average consumption of electricity per person differs considerably between these two groups, in favour of the group having class A equipment; the average consumption in this group amounted to 767.7 kWh while in the other group it was 831.8 kWh; the relative difference in the consumption volume amounted to 7.7% in favour of Group 1,
- the average consumption of electricity per 1 m^2 of the dwelling area also differs between these two groups, in favour of the group having class A equipment; the average consumption per 1 m^2 in Group 1 amounted to 29.2 kWh, and in Group 2 to 30.9 kWh, which reflects a difference in the consumption volume of 5.5% in favour of the former.

2.3. Presence of measurement and regulation equipment

Information on 6 types of measurement devices (5 types of meters, and heat cost allocators) and 3 types of automatic regulators of the temperature in dwelling, is shown in Table 18.

Measurement equipment

Electricity meters are common devices, found in over 98% of households. The remaining instances, where no electricity meter was found, usually stem from the fact that the household used only part of a larger dwelling which was equipped with one central meter. This may concern a situation in which the dwelling was divided into separate parts, occupied by separate families or generations of one family, whereas in construction terms, it functions as a single dwelling.

Gas meters are not as common as electricity meters. Among gas consumers, constituting 55% of all households surveyed, nearly one out of nine dwellings (6% with reference to the national dwelling population) was not equipped with such a device. This mainly concerns dwellings in multi-family buildings, in which gas is only used to cook. Such a situation is conditioned by technical and historic factors. Namely, in the peak period of constructing blocks of flats, i.e. mostly in 1961-1980, the blocks that were built in urban areas were, in principle, equipped in gas systems exclusively intended for cooking.

In some blocks of flats, compromised solutions were adopted, which entailed constructing simplified gas systems without individual meters, having only one central meter for the whole building. The costs of gas consumed are then divided between dwellings on the basis of the number of persons, dwelling size, or any other algorithm applied by the building administrator. This is consistent with the heat costs settlement model in multi-family buildings, which are not equipped with individual heat meters. However, it did not promote an efficient gas use. Regardless of the foregoing, around 800 thousand households in multi-family buildings consumed gas without using a gas meter (approximately 6% of the national population of households).

Heat meters are measurement devices rarely used in dwellings. Among district heat consumers, constituting a total of 40% of all households, individual meters were available in as few as every-twelfth household (3.5% of households). These were mainly single-family houses connected to district heating installation, as well as flats in modern recently constructed blocks, in which district heating installation were designed and built in a different way than it had been done in a more distant past.

Traditionally-constructed district heating installation comprise a number of mains that supply heat to the radiators in particular dwellings. Such technologies make it impossible to install individual heat meters. As a result, there is only one central meter for the whole building, which is similar to gas meters in the aforementioned type of multi-family buildings (without individual gas meters). The costs of heat consumed are then divided between dwellings on the basis of heat cost allocators installed on radiators, or dwelling sizes. The settlement algorithms are complicated, taking into consideration not only the indications based on heat cost allocators, or on the dwelling area, but also a number of other variables, related to heating staircases, basements or other jointly-used sections of residential buildings. In such cases, reconstructing the district heating installation into ones equipped with individual meters proves virtually impossible. The annual heat charges in such dwellings (5 millions of households) are usually high (Chapter 3).

Heat cost allocators are devices installed on radiators. They are intended to replace heat meters in case their use is not possible. Although cost allocators are not as accurate as meters, in absence of the latter, they allow for calculating an estimated amount of heat consumed in particular dwellings. Their function is to register the radiator surface temperature in a longer time span (at least one heating season). There are two principal types of cost allocators:

- evaporation-type allocators, in which the temperature "record" function is performed through evaporation of a special liquid,
- electronic allocators, equipped with temperature sensors which measure the radiator temperature, or with electronic clocks which measure the time in which a given temperature was maintained. Double-sensor allocators, which also measure the internal room temperature, are the most accurate.

At the end of each heating season, all heat cost allocator indications are read out, and the settlement algorithm, taking into consideration the allocator type, the size of radiators and the construction features of a given building, is applied with a view to calculating what amount of the overall heat consumed can be assigned to particular radiators and, in consequence, to individual dwellings. In principle, the settlement algorithm takes into account the adjustment indicators for the premises located at the corner walls, as well as heating jointly-used spaces, such as staircases or drying rooms.

The survey revealed that heat cost allocators were available in 40% of all dwellings using district heat. More than 8%, i.e. 460 thousand dwellings, had individual heat meters, and over 51% used alternative heat cost settlement models, among which the most straightforward method, based on the dwelling area, turned out the most frequent.

Hot water meters were available in 22% of all households, 90% of which had supplied hot water from external sources, i.e. from district heating installation. The use of hot water meters is advisable only in the case of external supplies, as otherwise the inhabitant him/herself bears the costs of fuels or electricity consumed for this purpose.

Cold water meters were available in 85% of all households.

Regulation equipment

Thermostats which control temperature in the whole dwelling, or in particular rooms, and maintain it at a certain level, were used by 8% of households. Central thermostats were more frequent (in 5.8% of households) than room thermostats, available in 2.2% of households. In those dwellings which use thermostats, they usually perform the role of devices cooperating with gas boilers, oil boilers, electric heating installation or air-conditioning systems.

2.4. Passenger cars in households

The technical and statistical characteristics of vehicles used, i.e. data on the number of cars, fuel types and consumption volumes, annual distances driven, age of cars and engine capacity is shown in Tables 32-34. Information on the fuels consumption volumes is given in Chapter 3, Point 3.2.

The following methodological assumptions were made in the survey regarding cars:

- the survey scope covered only passenger cars; other vehicles used by households, e.g. vans, were not considered,
- the survey focused on the use of cars by households only for private purposes, irrespective of the passenger car ownership form (cars owned by natural persons, cars leased, etc.).

Passenger cars were used by approximately 58% of households. Around 48% of households had only one car, 9% had two cars, and more than 1% had three cars. Around 42% of households neither owned nor used any passenger car.

Among car-using households, an average of 1.2 car fell on one household. As regards all households surveyed, 0.7 car fell on one household, and with regard to the number of inhabitants in the country (approximating 38.2 million), 0.2 car fell on one household person, which corresponds to 239 cars per 1000 inhabitants. Around 9.2 million passenger cars were used by households.

Nearly 3/4 of passenger cars used by households are cars with gasoline engines (20% of which were adapted to LPG), and the remaining 1/4 had Diesel engines. Gasoline cars were owned by 47% of households used cars (13% of which were LPG cars), while 16% of households used Diesel oil cars.

The average annual distance driven per car exceeded 13000 km. The distances driven by non-LPG gasoline cars were lower, reaching 11800 km, than the distances driven by LPG and Diesel cars, which amounted to 13900 and 15000 km, respectively. The differences in the annual distances driven stem from the fact that LPG and Diesel oil are cheaper fuels than gasoline, and they are chosen by drivers who travel the longer distances.

The median annual distance driven by cars was lower than the arithmetic average, amounting to 10000 km, and the interdecile range was between 3000 and 25000 km. These parameters were higher for LPG and Diesel oil cars. The median value being lower than the arithmetic average implies that there was a more numerous group of drivers using their cars relatively rarely, and a less numerous group with large or extremely large annual distances driven.

The average engine capacity per car amounted to 1567 cm^3, with the following distinction between fuel categories: gasoline – 1400 cm^3, LPG – 1600 cm^3, Diesel oil – 1870 cm^3. The median engine capacity does not differ considerably from the average, and the interdecile range is from 1000 to 2000 cm^3. The interdecile range diversification between fuel categories is consistent with the arithmetic average diversification, namely: for gasoline from 900 to 1800 cm^3, for LPG from 1200 to 2000 cm^3, and for Diesel oil from 1500 to 2200 cm^3. The values of statistical parameters listed reveal that Diesel engines had considerably higher capacities than gasoline engines, and the share of Diesel engines with relatively low capacities (below 1500 cm^3) was insignificant.

The average age of passenger cars used by household was 11 years. In the LPG cars category it reached nearly 13 years while for Diesel oil cars it was 10 years. The median age did not differ from the arithmetic average, and the interdecile range was between 5 and 18 years. The median values and interdecile ranges age did not vary considerably between different fuel categories, except LPG cars for which the first decile was 7 years, which implies that there were very few new cars of this type.
The value of the third quartile describing the age of passenger cars was 15 years. It was especially significant in terms of the previous analysis concerning the number of passenger cars in Poland. The value of the third quartile indicates that 25% of all cars were at least 15 years old.

Chapter 3. Quantities and values of fuels and energy commodities consumed in households

3.1. Consumption of energy commodities for thermal purposes

3.1.1. Energy commodities used for the purposes of space heating, water heating and cooking

Information concerning the purposes of using energy commodities by households is presented in Table 5.

Space heating

In quantity terms, solid fuels and district heat were the two leading energy commodities. Solid fuels are the principal thermal energy commodities in single-family houses whereas in multi-family buildings (blocks of flats) district heat prevails.

Solid fuels were used by 51.1% of households. The two most significant and frequently used solid fuels include hard coal and fuel wood whereas other fuels (other types of biomass, lignite and coke) are much less common. Hard coal and fuel wood are usually used together or interchangeably in the same boilers or stoves. A smaller number of households used only coal (6.1%) or only fuel wood (4.8%). The two typical heating strategies are as follows:

- two fuels are used interchangeably, depending on the present, availability and prices,
- fuel wood is used in warmer periods and coal, having a higher calorific value, in colder ones.

Various flammable types of waste, not being biomass, produced by households or as part of economic activity, are often used in combination with solid fuels.

District heat was used to heat spaces by around 40% of households (this issue is discussed in further detail in Chapter 2, Point 2.1.1).

In this respect, **natural gas** was rated third among all energy commodities. It was used by 10% of households.

Electricity was yet another commodity, used to heat spaces by 6.9% of households. However, it was often used on a secondary basis, rather than on the primary one.

Liquid fuels were the least frequent commodity, used to heat spaces in households. Heating oil was used by 0.5% of households and LPG by 0.4%.

Water heating

The following fuels were mainly used to heat up water for residential purposes: **natural gas** – 28.7% of households, **district heat** – 24.2% and **electricity** – 24.6% while **solid fuels** were used by 17.3% of households.

Cooking

The following fuels were mainly used by households for cooking purposes: **electricity** (61.0%), **natural gas** (52.6%) and **LPG** (38.4%).

LPG, the most "mono-functional" of all household fuels, was used mainly for cooking. Its use for other purposes was very rare (0.4% of households used LPG to heat spaces and 2.4% to heat up water), mainly due to its high prices. Most consumers use this fuel only for cooking purposes since the consumption and expenditure volumes are in such case relatively moderate.

The order of frequency of using particular energy commodities for cooking purposes does not correspond to their consumption volumes. This stems from the fact that in the case of combined gas-electric cookers, being the most popular cooker type, only the oven is electric, and its use is usually less frequent than the use of burners. For this reason, natural gas is rated first in terms of the energy volume consumed for cooking, followed by LPG, and only then by electricity.

Since microwave ovens operate in short time cycles, using relatively small amounts of energy, the massive use of these devices does not change the aforementioned order of using energy commodities for cooking, in which electricity is rated third.

3.1.2. Characteristics of biomass fuels and the renewable energy equipment (solar collectors, heat pumps)

The survey provided in-depth information on renewable energy sources used in households for thermal purposes. Data were presented by three commodity/renewable technology groups, namely biomass (including wood), solar energy and heat pumps (Tables 29-31 and Table 5).

Biomass

Fuel wood was divided into 4 categories according to the source of origin:

- formed national forests,
- from private forests,
- from in-field and near-house trees,
- purchased from trading intermediary.

Other biomass fuels were divided into 6 types which also reflect the source of origin:

- formed wood (briquettes, pellets),
- wood waste from industrial plants (e.g. sawdust),
- wood waste from processed wood (e.g. old furniture, packages),
- plants from energy plantations,
- straw,
- other waste fuels of agricultural or forest origin.

Additionally, all types of fuels, except for "wood purchased from trading intermediary" were defined by respondents as "fully purchased", "fully free-of-charge", or "partly purchased and partly free-of-charge".

The most frequent sources of **fuel wood** (Table 29) included national forests (indicated by 15.4% of households) and trading intermediary (13.7%). The shares of wood from private forests, as well as from in-field and near-house trees, totalled 17.8%. Fuel wood was "fully purchased" by around 70% of households which used it, "fully free-of-charge" in 24% of households, and "partly purchased and partly free-of-charge" in less than 7%.

The most frequent types of **biomass other than fuel wood,** used in households, included waste from processed wood (3.3%) and wood waste from industrial plants (2.4%). Plants from energy plantations and straw were the least frequent of all. Waste from processed wood was obtained for free by 80% of households, whereas waste from industrial plants was purchased by two out of three households.

Solar collectors and heat pumps

Solar collectors were used by 0.3% of households (Table 30), 0.04% of which used them to heat spaces, and 0.3% to heat up water (Table 5). Over a half of all installations, for which information concerning the type was obtained, are glazed flat plate collectors (in 45.3% of all households using solar collectors). Evacuated tube collectors were less common (30.9%), and unglazed flat plate collectors were the least frequent of all (4.7%). The average surface area of solar collectors amounted to 5.7 m^2 (their total area is 235 thous. m^2), the median area to 5 m^2, and the interdecile range from 4 to 10 m^2.

Based on the survey conducted, **heat pumps** in Poland were used to heat spaces only by 0.03% of households (Table 31 and Table 5). The investment price acts as a discouraging factor, as the cost of a heat pump ranges from zl 20 to 50 thousand, depending on its type (data concerning 2009).

3.2 Motor fuels consumption by passenger cars

The average unit consumption of motor fuels (taking into consideration all passenger cars) amounted to 7.6 litre per 100 km (Table 35). The median for this variable equalled 7 litres, and its interdecile range was between 6 and 10 litres (Table 33). In various fuel categories, these parameters had the following values:

- Gasoline – the arithmetic average of 7.3 l, the median of 7 l, the interdecile range from 6 to 9 l,
- LPG – the arithmetic average of 9.8 l, the median of 10 l, the interdecile range from 7 to 12 l,
- Diesel oil – the arithmetic average of 6.7 l, the median of 6 l, the interdecile range from 5 to 8 l.

3.3 Prices and values of fuels and energy commodities

Information regarding quantities, values and prices of fuels and energy is shown in Tables 20-28 and in Table 36.

As regards all energy commodities discussed below, households were divided into 6 groups, according to their annual consumption volumes (Table 24).

The figures included in this subsection represent the consumption empirical distribution of various energy commodities for more detailed consumer categories.

The table below provides a synthetic compilation of the annual quantities of energy commodities consumed, and the expenditure incurred per household and on the national scale.

Table 3.1. Quantities and values of energy consumed in households

Specification	Average annual consumption in household		Total consumption in households [1)]	
	quantity	value	quantity	value
	in GJ	in zl	in TJ	in mln zl
Energy commodities [2)]	93	3630	1243362	48284
Motor fuels [3)]	38	4053	295357	31161

[1)] data concerning the total consumption of energy commodities was compiled on the basis of the survey results (see footnote 7, Chapter 5).

[2)] except for hot water.

[3)] data on motor fuels concerns only those households which used passenger cars.

Table 36 presents the above information by energy commodities.

Electricity

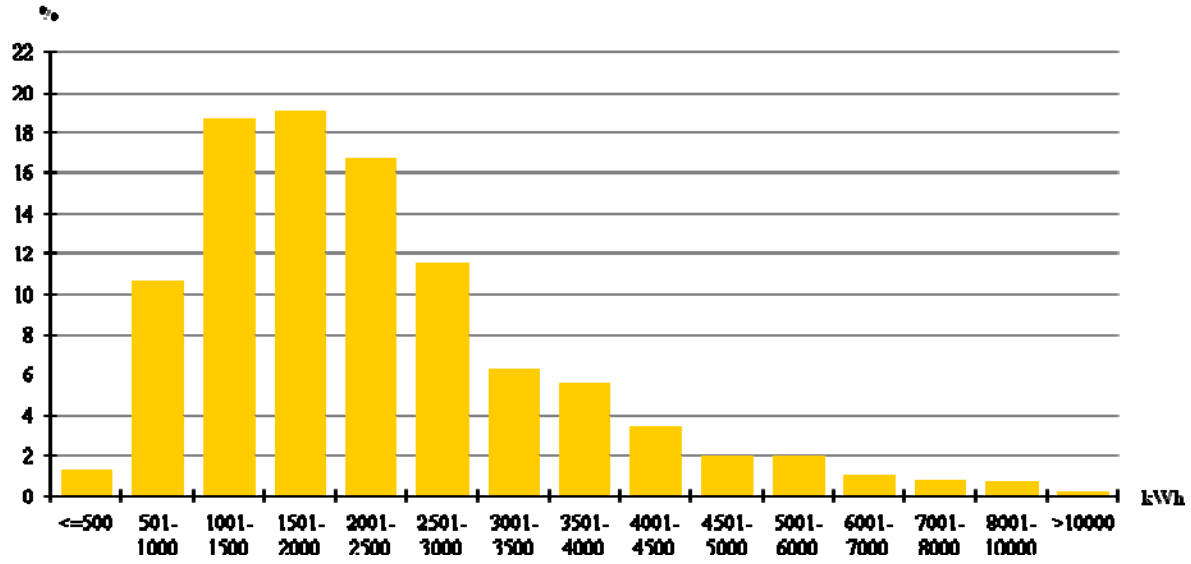
The diversification of electricity prices for household consumers is insignificant. The differences between the prices applied by various suppliers are not considerable. Particularly low prices may apply to some consumers, for example, in case they are entitled to special employee tariffs, whereas considerably higher prices may occur for very low consumption, mainly due to fixed charges which are incurred irrespective of the consumption volume.

Basic information on average consumption, values and prices of electricity is as follows:

Table 3.2. Electricity consumption in households - quantities, values and prices

Statistical measures	Quantity				Value	Price	
	total		of which households conducting agricultural activity				
	in kWh	in GJ	in kWh	in GJ	in zl	in zl/kWh	in zl/GJ
Arithmetic average	2303	8.3	2983	10.7	1245	0.53	147.2
Median.....	2039	7.3	2558	9.2	1105	0.52	144.4
Interdecile range.	956 – 4080	3.4 – 14.7	1240 – 4800	4.5 – 17.3	520 – 2160	0.48 – 0.60	133.3 – 166.7

Fig. 3.1. Empirical distribution of electricity consumption



Applying the criterion of annual consumption, the largest number of households (nearly 30% out of 55% of all households for which data on electricity consumption was obtained) fell within the consumption range of 2001-3000 kWh whereas the following ranges were slightly less numerous: 1001-1500 kWh, 1501-2000 kWh and 3001-5000 kWh (17-19% of households each). The lowest number of households (less than 5% of the entire population) occurred in the highest consumption range over 5000 kWh.

District heat and hot water from district heating installation

The diversification of heat prices for household consumers is considerable. It stems from the fact that each heating company applies its own tariff, based on the actual level of heat production, transmission and distribution costs, as approved by the President of the Energy Regulatory Office (ERO). The President of ERO analyses the situation of each company on a separate basis, in compliance with the so-called Tariff Regulation adopted by the Minister of Economy. In consequence, heat prices are particularly low in large cities, supplied by modern heating systems, whereas higher prices concern a number of smaller, non-modernised heating systems.

Table 3.3. District heat consumption in households - quantities, values and prices

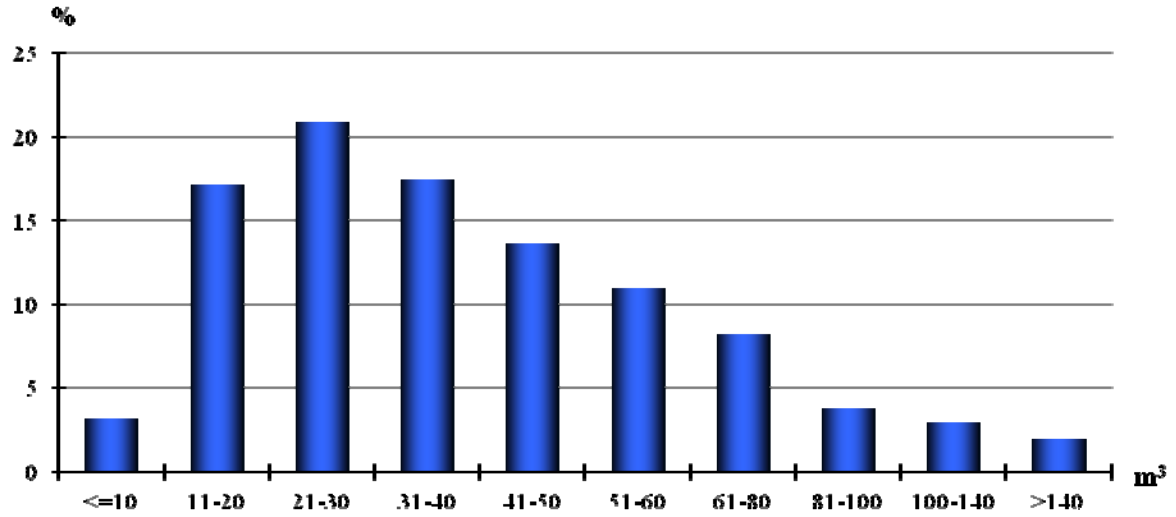
Statistical measures	Quantity	Value	Price
	in GJ	in zl	in zl/GJ
Arithmetic average	37	1434	39
Median	35	1391	40
Interdecile range	13-60	680-2280	24-53

As regards hot water, price diversification is not as high as in the case of district heat prices. This is caused by the fact that the prices of hot water supplied to inhabitants are, in most cases, determined by building administrators, and not by heating companies. Heating companies supply heat to buildings for the purposes of space and water heating, for which they collect summary charges without making a distinction into particular space and water heating components. The cost allocation to these two purposes is an internal matter dealt with by building administrators.

Table 3.4. Hot water consumption in households - quantities, values and prices

Statistical measures	Quantity	Value	Price
	in m^3	in zl	in zl/m^3
Arithmetic average	43	663	15
Median	36	558	14
Interdecile range	14-72	224-1200	10-20

Fig. 3.2. Empirical distribution of hot water consumption



Natural gas

The diversification of the actual gas prices paid by households is relatively high. It results from the fact that the structure of existing tariffs is degressive, and it gives the benefit of lower unit prices to the consumers of large quantities of fuel, hence mainly to those consumers who heat spaces. In the case of low consumption (for cooking purposes only), the large share in total payments is attributed to fixed charges which are incurred irrespective of the consumption volume. The mechanism of applying high actual prices to low gas consumption is the same for electricity, though in the case of gas it concerns a considerably bigger number of consumers who use this fuel only for cooking purposes.

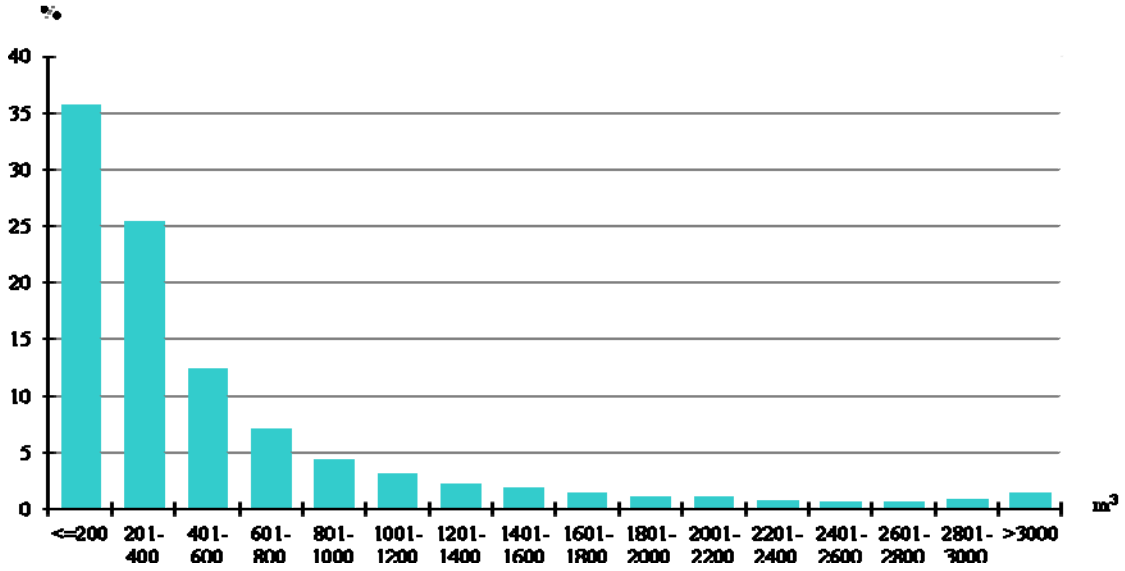
Table 3.5. High-methane natural gas consumption in households - quantities, values and prices

Statistical measures	Quantity		Value	Price	
	in m^3	in GJ	in zl	in zl/m^3	in zl/GJ
Arithmetic average	542	19.3	1000	2.37	66.4
Median.....	307	11.0	596	2.26	63.3
Interdecile range	85 – 1458	3.0 – 52.1	209 – 2500	1.56 – 3.13	43.7 – 87.7

Table 3.6. Nitrified natural gas consumption in households - quantities, values and prices

Statistical measures	Quantity		Value	Price	
	in m^3	in GJ	in zl	in zl/m^3	in zl/GJ
Arithmetic average	495	12.9	872	1.94	74.6
Median.....	269	7.0	483	1.89	72.7
Interdecile range	91 – 1359	2.4 – 35.3	216 – 2140	1.23 – 2.77	47.3 – 106.5

Fig. 3.3 Empirical distribution of high-methane natural gas consumption



Natural gas consumption in households is characterised by a considerable diversification in quantity terms, which is much higher than in the case of electricity and district heat consumption. This stems from the fact that there are three major purposes of natural gas consumption in the households, namely space heating, water heating and cooking. They exhibit a significant difference in the demand volume. Strictly speaking, the typical demand related to heating a single-family house is approximately 20 times higher than the typical cooking-related demand of that family. At the same time, it has been revealed (see Chapter 3, Point 3.1.1.) that practically all gas consumers use this energy commodity for cooking, a half of them for water heating, and only 18% for space heating. For this reason, the distribution of the gas consumption variable is close to exponential distribution, i.e. there are many entities with low variable values,

and much less entities with large values. The arithmetic average of the consumption volume is considerably higher than the median, because the numerous subpopulation using gas only in cookers is accompanied by a significantly less numerous subpopulation using gas to heat spaces, and some consumers who heat large dwellings are characterised with high consumption volumes.

In contrast to the distribution of the natural gas consumption variable, the distributions of electricity and heat consumption variables are closer to the normal distribution, in which the variable values for individual entities are distributed symmetrically in relation to the average or median value.

Table 24 show the shares of households in particular ranges of the annual consumption of high-methane natural gas and nitrified natural gas (the ranges reflect the current structure of tariff groups). High-methane natural gas consumption accounts for over 90% of total gas consumption in Poland.

The highest shares of the households surveyed were recorded in the following ranges of annual high-methane natural gas consumption: 101-200 m^3 and 301-600 m^3 (in each range around 22% of all households for which consumption data was obtained). However, in the remaining four intervals, i.e. up to 100 m^3, 201–300 m^3, 601–1200 m^3 and over 1200 m^3, the number of households was only slightly lower. In total, households belonging to the first four intervals accounted for around 3/4 of all gas recipients, and together with the fifth range – for over 85% of recipients. Practically speaking, consumers in the first two or three intervals can be identified with the use of gas for cooking, in the fourth and fifth intervals with the use for both cooking and water heating (in the fifth intervals possibly also for heating up small dwellings), and in the sixth intervals with the use for space heating.

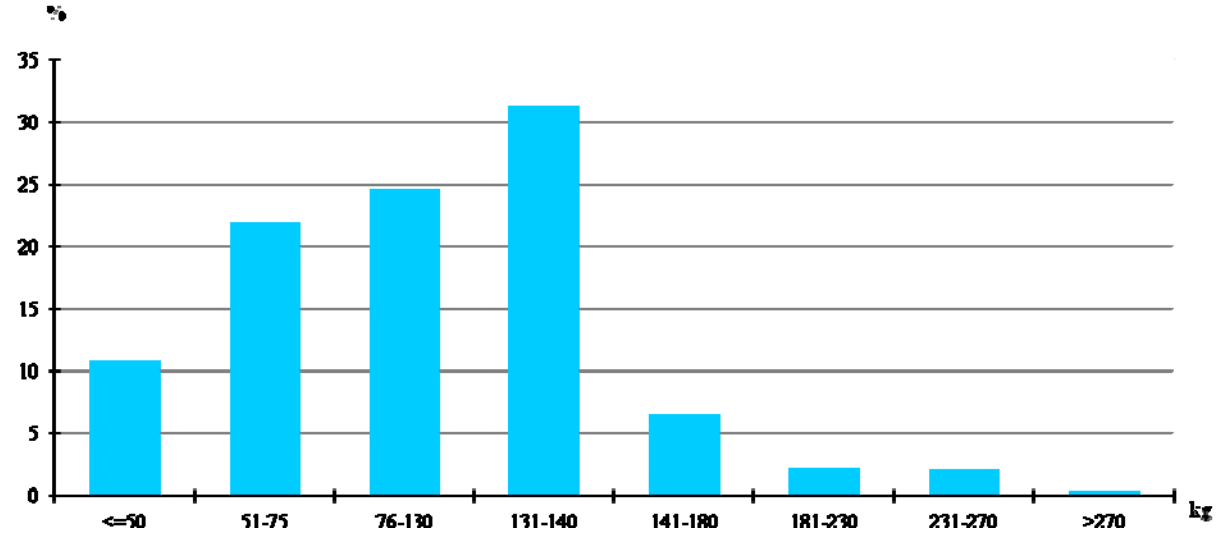
Liquid fuels (LPG and heating oil)

Two liquid fuels are used for household purposes, namely LPG and heating oil. Both have high calorific values and bear considerable ecological advantages, though their competitiveness and comfort of use is limited for certain reasons. In effect, these fuels are mostly used by those consumers who have no access to the natural gas installation, due to local conditions. These two fuels differ significantly in terms of popularity. According to the tendencies that have settled in the last 10-20 years, LPG is commonly used for cooking purposes in households with no access to natural gas. On the contrary, the use of heating oil is marginal, and it is limited to space heating in a small number of buildings. The principal reason for such a low popularity of heating oil is its very high price, subject to the same fluctuations as motor fuels used in vehicles.

Table 3.7. LPG consumption in households - quantities, values and prices

Statistical measures	Quantity		Value	Price	
	in kg	in GJ	in zl	in zl/kg	in zl/GJ
Arithmetic average	107	5.1	414	3.82	80.8
Median.....	110	5.2	405	3.82	80.8
Interdecile range	44 – 143	2.1 – 6.8	186 – 574	3.45 – 4.36	72.9 – 92.2

Fig. 3.4. Empirical distribution of LPG consumption



LPG consumed by households shows a very small diversification in terms of consumption quantities and prices. This results from the fact that this product is mostly used for one standard purpose (it is "mono-functional") and has a uniform market organisation. In most households it is only used for cooking, and it is purchased in typical 11 kg capacity bottles. Comparing the LPG market to the markets of other energy commodities, one can spot a very far-reaching standardisation of the consumption purpose and sales market organisation, which occur only in the case of other liquid fuels, such as motor fuels or heating oil used to heat buildings. Any other markets of fuels and energy commodities used for household purposes operate on more complicated principles, or the purposes of using such commodities are less uniform.

Heating oil shows a small diversification of the consumption purpose, and a slight diversification of prices, whereas the consumption quantities are hugely varied. A vast majority of the household consumers of heating oil use it in double-function boilers, to heat spaces and water. There is a uniform competitive domestic market of heating oil, which leads to a low price diversification. On the other hand, the diversification of the consumption quantities is considerable, since the dwellings heated are of various sizes, and heating oil can be used either as the primary or secondary fuel.

Table 3.8. Heating oil consumption in households - quantities, values and prices

Statistical measures	Quantity		Value	Price	
	in l	in GJ	in zl	in zl/l	in zl/GJ
Arithmetic average	1710	61.4	4378	2.61	72.7
Median.....	1607	57.7	4500	2.60	72.4
Interdecile range	300 – 3000	10.8 – 107.7	690 – 7200	2.40 – 2.80	66.8 – 78.0

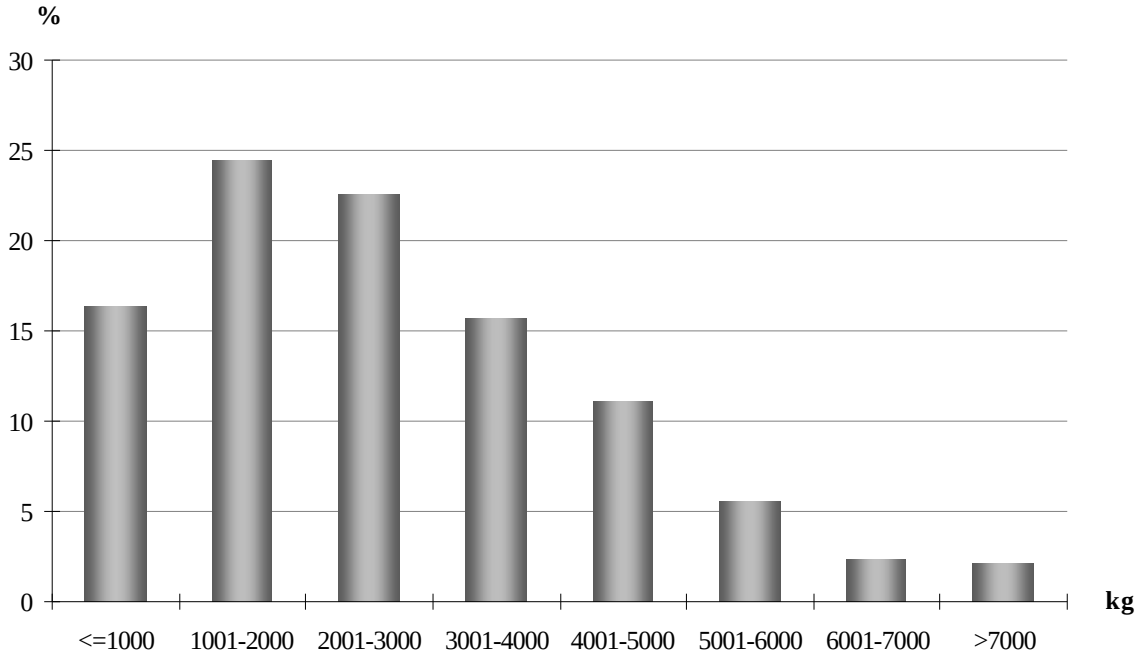
Solid fuels (hard coal, lignite, coke, fuel wood and other biomass)

Together with fuel wood, hard coal plays the principal role among solid fuels.

Table 3.9. Hard coal consumption in households - quantities, values and prices

Statistical measures	Quantity		Value	Price	
	in t	in GJ	in zl	in zl/t	in zl/GJ
Arithmetic average	3.0	78.0	1894	640.0	24.6
Median.....	3.0	78.0	1800	650.0	25.0
Interdecile range	1.0 – 5.5	26.0 – 143.0	650 – 3400	510.0 – 750.0	19.6 – 28.8

Fig. 3.5. Empirical distribution of hard coal consumption



The other two fuels, i.e. lignite and coke are of marginal significance for households, and they are used in a very limited scope.

Table 3.10. Lignite consumption in households - quantities, values and prices

Statistical measures	Quantity		Value	Price	
	in t	in GJ	in zl	in zl/t	in zl/GJ
Arithmetic average	3.1	31.0	742	220.0	22.0
Median.....	2.0	20.0	520	200.0	20.0
Interdecile range	1.0 – 5.0	10.0 – 50.0	192 – 1200	190.0 – 300.0	19.0 – 30.0

Table 3.11. Coke consumption in households - quantities, values and prices

Statistical measures	Quantity		Value	Price	
	in t	in GJ	in zl	in zl/t	in zl/GJ
Arithmetic average	1.7	47.6	1530	820.0	29.3
Median	2.0	56.0	1550	820.0	29.3
Interdecile range	0.3 – 3.0	8.4 – 84.0	250 – 3000	500.0 – 1000.0	17.9 – 35.7

Table 3.12. Fuel wood consumption in households - quantities, values and prices

Statistical measures	Quantity		Value	Price	
	in m^3	in GJ	in zl	in zl/m^3	in zl/GJ
Arithmetic average	7	49.0	554	81.0	11.6
Median	5	35.0	400	90.0	12.9
Interdecile range	2 – 15	14.0 – 105.0	0 – 1300	0.0 – 150.0	0.0 – 21.4

For fuel wood (as well as for other biomass fuels), the monetary values which are equal to zero imply that this energy commodity was obtained entirely for free.

The measurement in volume units (cubic metres) and in mass units (tonnes or kilograms) is the characteristic feature of **other biomass fuels**. The application of volume or mass units depends on a concrete fuel type, and on local transaction conditions. During the survey, respondents using such fuels could choose the unit in which they preferred to indicate their consumption quantity. Cubic metres were opted for nearly three times more often than kilograms.

Table 3.13. Other biomass consumption in households - quantities, values and prices

Statistical measures	Quantity		Value	Price	
	in m^3	in GJ	in zl	in zl/m^3	in zl/GJ
Arithmetic average	7	49.0	251	29.0	4.1
Median	4	28.0	130	20.0	2.9
Interdecile range	1 – 15	7.0 – 105.0	0 – 800	0.0 – 90.0	0.0 – 12.9
	in kg	in GJ	in zl	in zl/kg	in zl/GJ
Arithmetic average	1235	14.8	156	0.14	11.7
Median	200	2.4	0	0.00	0.0
Interdecile range	20 – 2000	0.2 – 24.0	0 – 350	0.00 – 0.44	0.0 – 36.7

The median values and prices which are equal to 0 reflect the fact that more than a half of households obtained those fuels for free.

Household expenditure per floor area unit and cubic volume unit of a dwelling

Defining the average annual household expenditure (values of energy commodities consumption) for thermal purposes, using various energy commodities, is one of the most significant synthetic results of the survey. Such information is presented in Table 26. The expenditure included comprises only the purchase costs of energy commodities, excluding any other costs (such as the costs of investment or exploitation of heating systems). Including data on fuel wood and other biomass was not possible as these fuel types are obtained by a large number of households on non-commercial principles.

In terms of the floor area unit and cubic volume unit of a dwelling, the most common energy commodities can be divided into the following three cost groups:

1. energy commodities with relatively low purchase costs – hard coal and natural gas,
2. energy commodities with moderate purchase costs – district heat,
3. energy commodities with high purchase costs – heating oil and electricity.

The average annual value of hard coal used to heat 1 m^2 of the dwelling area amounted to approximately zl 20, and in relation to 1 m^3 of its cubic volume to approximately zl 8. Higher values were recorded for natural gas used to heat 1 m^2 of the dwelling area (approximately zl 27), or 1 m^3 of its cubic volume (approximately zl 10).

The average annual value of district heat used to heat 1 m^2 of the dwelling area reached the level of approximately zl 30, and in relation to 1 m^3 of its cubic volume approximately zl 12. This value was 50% higher than the coal value.

As regards heating oil or electricity, the average value of energy commodities used to heat 1 m^2 of the dwelling area was considerably higher than in the case of coal, natural gas or district heat. For both heating oil and electricity, it exceeded zl 40, and in relation to 1 m^3 of the cubic volume it reached zl 15-16.

The average value of electricity used per 1 m^2 of the dwelling area, in the cases where electricity was not used for heating purposes, amounted to approximately zl 15. In relation to 1 m^3 of the dwelling cubic volume, it was approximately zl 6.

Motor fuels

The average annual fuels consumption per car and the average annual expenditure on fuels per car, both in total and by fuel category, was calculated using the survey information concerning the average unit consumption of fuels per 100 km of the distance driven, as well as the average annual distance driven.

The results of these calculations are available in Table 35.

An average passenger car used by a household consumed in 2009 nearly 1000 litres of fuels, and the average expenditure for this purpose reached zl 3336.

In various fuel categories, the results are as follows:

- Gasoline – annual consumption of 864 litres, expenditure of zl 3584,
- LPG – annual consumption of 1362 litres, expenditure of zl 2507,
- Diesel oil – annual consumption of 1008 litres, expenditure of zl 3669.

In 2009, a household using a passenger car(s) (an average of 1.2 car per one car-using household) spent nearly zl 4000 on motor fuel(s).

As regards LPG, the purchase costs were lower than in the case of gasoline, since the price of 1 litre remained at a low level in Poland for several years, corresponding to a half of the price of 1 litre of gasoline, due to a considerably lower excise tax. Higher gas consumption per 100 km of the distance driven, as compared to gasoline consumption, does not result in the loss of these benefits by the owners of LPG cars. In turn, the price of 1 litre of Diesel oil is nowadays close to gasoline, or even temporarily higher, but for the last 10-15 years it was considerably lower, and an additional benefit for drivers arose from the average lower consumption of Diesel oil, compared to gasoline, per 100 km of the distance driven.

3.4. „Typical" urban and rural households

A "typical" urban household was defined as a household located in a block of flats and using district heat. In 2009, this household group comprised 35.9% of all households in Poland. In relation to households residing in urban areas, this was 55.5%.

Based on the survey results, it was concluded that a "typical" household residing in a block of flats, using district heat, exhibits the following characteristics:

- **The average dwelling floor area** amounted to 49.7 m^2.
- **The average number of household persons** was 2.4.
- A half of all dwellings were constructed in 1961-1980, and 15% before 1961.
- Two-thirds of dwellings were located in **insulated buildings.**
- **Cold water** was obtained exclusively from network.
- **Hot water** was either obtained from district heating installation (in 60% of dwellings), or was locally heated (40%).
- **The fuel structure for water heating purposes** was as follows: heating installation 60%, natural gas 33%, electricity 7%.
- **The fuel structure for cooking purposes** was as follows: natural gas 81%, LPG 9%, electricity 60% (a half of all dwellings used both gas and electricity, they were usually equipped with a combined gas-electric cooker comprising gas burners and an electric oven).
- Households **did not use solid fuels, heating oil, or any form of renewable energy;** the share of renewable energy in such households may only be increased in an indirect way, through the supply of electricity and heat produced entirely or partly from renewable sources.
- Modern lighting sources were frequently found – **compact fluorescent lamps** were used by 68.4% of households.

- The average **total lamps power** was relatively low, but not compatibly with the dwelling size; as a result, the lighting power per 1 m^2 of the dwelling area was high and amounted to 8.5 W (the average for the whole population of households – 7.2W).
- Most households (77.8%) had **combined fridge-freezers**, and only 6.0% had freezers, which was connected with a small dwelling area and the location in urban areas which offer an easy access to the retail stores.
- Most households (93.0%) had **automatic washing machines.**
- Part of households had flat-screen **TV sets** (39.0%) and **mobile computers (laptops)** - 33.6%.
- Many dwellings (18.3%) where natural gas was used did not have individual gas meters.
- Many dwellings (42.3%) were equipped with **heat cost allocators** on radiators; even more dwellings (69.4%) had **thermostatic valves** on radiators.
- **Cold water meters** were available in 92.3% of dwellings.
- **Hot water meters** were available in 91.7% of dwellings using hot water from district heating installation.
- **Heat meters** were used by only 8.6% of households.
- **The average annual consumption of energy commodities** per dwelling was low – for electricity by 20% lower than the national average for all dwellings, for natural gas by 60%, and for LPG by 20%; such a low consumption results from a small dwelling area and a small number of household persons, and in the case of natural gas also from the fact that it is not used to heat spaces.
- **The average annual consumption of electricity per 1 m^2** of the dwelling floor area was high, amounting to 36.9 kWh, which is dependent on a higher "density" of dwelling equipment, i.e. a typical set of electricity-consuming devices is located in a relatively small dwelling area.
- **Passenger cars** were owned by 51.7% of households, 32.6% of which had cars with gasoline engines, 11.5% Diesel oil cars and 10.6% LPG powered cars.
- **The average annual distance driven per car** was relatively high, amounting to 14343 km.

A "typical" rural household was defined as a household residing in a single-family house heated with solid fuels. In 2009, this group comprised 22.6% of all households, and with respect to rural areas this was 69.8% of households.

The survey results indicate that a household residing in a single-family house heated with solid fuels, bears the following characteristics:

- **The average house floor area** amounted to 101.2 m^2.

- **The average number of household persons** was 3.5.
- 40% of all houses were constructed before 1961.
- **Cold water** was obtained in 79.1% of dwellings from network, and in 26.7% from own source (or in some cases from both sources altogether); as many as 2.7% of households did not have access to cold running water, i.e. they used water from a well located in the yard, or delivered from external sources.
- **Hot water** was locally heated in 90% of households; as many as 10% of all households did not have access to hot running water.
- 41% of households conducted **agricultural production activity**, and another 48.3% cultivated agricultural land or a garden for their own purposes.
- **The equipment structure for space heating purposes** was as follows: double-function boilers 50%, single-function boilers 30%, stoves and fireplaces 20%.
- **The fuel structure for water heating purposes** was as follows: solid fuels 70%, electricity 33%, natural gas 9% (in some cases two different energy commodities were used, e.g. solid fuels in the winter season and electricity in the summer season).
- **The fuel structure for cooking purposes** was as follows: LPG 75%, electricity 60%, natural gas 17% (a half of all dwellings used both gas and electricity, they were usually equipped with a combined gas-electric cooker comprising gas burners and an electric oven).
- Modern lighting sources, **compact fluorescent lamps**, were used by 55.2% of households.
- The average **total lamps power** was high, but not compatibly with the houses size; as a result, the lighting power per 1 m^2 of the house area was low – 6.4 W (the average for the whole population of households – 7.2 W).
- Many households (46.1%) used **freezers**, which is connected with the food supply methods, i.e. the acquisition of food products from own or local sources, and with a more difficult access to shopping centres than in urban areas.
- Relatively few households were equipped with flat-screen **TV sets** (23.7%) and **mobile computers (laptops) -** 15.8%.
- **Cold water meters** were available in 76.7% of dwellings, i.e. in almost all dwellings obtaining water from network.
- **The average consumption of electricity** was by 16% higher than the national average for all dwellings; this results from a large dwelling area, a large number of household persons, and the conduction of agricultural activity by a vast majority of households.
- **The average consumption of electricity per 1 m^2** of the dwelling floor area was however low, amounting to 25.9 kWh.
- Most households (91%) used **fuel wood**, and 10.7% also other biomass fuels.

- **Passenger cars** were owned by 67.4% of households, 36.3% of which had cars with gasoline engines, 21.3% Diesel oil cars and 19.7% LPG powered cars.
- **The average annual distance driven per car** amounting to 12196 km.

3.5. Differences in structural and energy parameters between urban and rural households

Based on the survey results, the following conclusions were formulated, regarding the most significant differences between the population of households in urban and rural areas:

- In average terms, rural dwellings were by 50% bigger than the urban ones. **The average dwelling floor area** in rural areas amounted to 95.9 m^2, and in the urban ones to 64.4 m^2.
- An average rural household was **more numerous** than the urban one. The former comprised an average of 3.4 persons and the latter 2.6.
- Urban areas are dominated by **multi-family buildings** whereas single-family houses prevail in the rural ones. In urban areas, 77.7% of dwellings were located in multi-family buildings, and 22.3% in single-family ones. In rural areas, **single-family houses** accounted for 86.8% of all rural dwellings.
- In urban areas, more dwellings (51.5%) were located in **insulated buildings** whereas in rural areas this was only 35.1%. The prevalence of urban areas results from the fact that the large building insulation campaign, conducted in Poland for 15 years, concerns mostly blocks of flats belonging to housing cooperatives.
- Urban buildings and dwellings obtain **cold water** almost entirely from network – this concerned 98.0% of dwellings. The use of own water sources in urban areas is very uncommon. In rural areas, 82.6% of households used water from network, and 22.3% had their own sources. The lack of access to cold running water concerned only 0.2% of urban households, and as many as 2.1% of the rural ones.
- Considerable differences were observed in terms of the **hot running water** supply method. In urban areas, 36% of households obtained hot water from district heating installation, and 61% heated it up locally. In rural areas, only 2% of households used hot water from district heating installation, and 89% heated it up locally. The lack of access to hot running water concerned 3% of urban dwellings, and as many as 9% of the rural ones.
- The conduction of **agricultural production activity** is very uncommon in urban areas – such an activity was conducted by 1.5% of households. In rural areas, agricultural production activity was conducted by 32.9% of households (54.7% cultivated land or a garden for own purposes). The conduction of agricultural activity influenced the consumption volume of energy commodities in households, as a single electricity and/or heating installation usually serves household and production purposes, and the allocation of the consumption volumes to these two purposes is, in such cases, usually impossible.

- Rural and urban households are characterised with a different **fuel structure for space heating purposes**. In urban areas, there is a mainly district heat for this purpose, which was used in 56.8% of dwellings, whereas natural gas was used in 12% and solid fuels less in than 30% of households. In rural areas, there is a strong prevalence of solid fuels which were used in nearly 90% of households, whereas district heat was used in 3.4% of dwellings and natural gas in 6.2%.
- **The fuel structure for water heating purposes** is considerably different. In urban areas, 35.3% of households used district heating installation for this purpose, 36.5% natural gas, 20.5% electricity and less than 10% solid fuels. In rural areas, hot water from district heating installation was obtained by only 1.9% of households, whereas 13.3% of households used natural gas for this purpose, 32.7% electricity and around 50% solid fuels.
- **The fuel structure for cooking purposes** differs between urban and rural areas in terms of the gas type used. Both in urban and rural areas gas was used for this purpose by over 90% of households, though in the former case 69.3% of households used natural gas and 21.3% LPG while the proportion in the latter case is reversed – natural gas was used in 19.3% of households and LPG in 72.6%.
- A higher share of modern sources in the lighting structure was observed in urban areas. **Compact fluorescent lamps** were found in 65.3% of urban households and in 55.5% of the rural ones.
- Rural dwellings had a higher number and **total power of lamps**, though it did not compensate the difference in the dwelling size. As a result, the average lighting power per 1 m^2 of a dwelling was higher in urban areas – 7.97 W than in the rural ones – 6.54 W.
- The structure of **refrigeration devices** available in households differed between urban and rural areas. Combined fridge-freezers dominated in urban areas (over 3/4 of households had such devices). In rural areas, there were much more freezers and refrigerators (1-door). This is connected with the food supply methods, i.e. the acquisition of food products from own or local sources.
- **Automatic washing machines** were available in more households in urban areas than in the rural ones – namely, 91.5% and 82.3%, respectively.
- The presence of **TV sets** did not differ between urban and rural areas in terms of the number, but there were certain differences regarding the technological structure, similar to lighting sources. More modern flat-screen TV sets were available in 36.8% of urban households, and in 25.7% of rural ones.
- Similar differences between urban and rural areas were observed in the case of **computers**. The frequency of having stationary computers (desktops) in urban and rural areas was identical (49.6% of households), with the difference concerning the provision of mobile computers (laptops) – in urban areas 30.2% of households, and in the rural ones 17.8%.

- **The average annual consumption of almost all energy commodities** was lower in urban households than in the rural ones. For electricity, it amounted to 2140 kWh in urban areas, and to 2620 kWh in the rural ones (households conducting agricultural activity – 3020 kWh, and other rural households – 2400 kWh). For high-methane natural gas, it was 509 m^3 and 708 m^3, respectively (households conducting agricultural activity – 500 m^3, and other rural households – 860 m^3), and for hard coal – 2835 kg and 3172 kg (households conducting agricultural activity – 3244 kg, and other rural households – 3127 kg). Such a higher consumption of energy commodities in rural areas is caused by a larger dwelling area, a bigger number of family persons, and the conduction of agricultural production activity.
- **The consumption of energy commodities per 1 m^2 of the dwelling floor area, or per person**, looks slightly different. For instance, the average consumption of electricity per 1 m^2 amounted to 33.33 kWh in urban areas, and to 26.84 kWh in the rural ones. This is caused by a higher "density" of dwelling equipment, i.e. a similar set of electricity-consuming devices is distributed over a smaller dwelling area in urban households, as compared to the rural ones.
- Much more households in rural areas, than in the urban ones, used **fuel wood and other biomass types for heating purposes.** In rural areas, fuel wood was used by 54.1% of households, and other biomass fuels by 6.1%. In urban areas, there were 8.5% of households using wood, and 1.0% using other biomass types. This is caused by a considerably better access to local wood and biomass sources in rural areas and by the technical characteristics of the heating equipment which allows to burn biomass fuels.
- More households had **passenger cars** in rural areas than in the urban ones – 65.8% and 53.8%, respectively. In rural households, cars have in many cases become objects indispensable to life, especially in those areas where public transport is marginal or non-existent. The average number of cars per rural household was also higher (0.8 car) than in urban areas (0.6 car). The difference in this parameter mostly arises from the higher number of household members in rural areas, with the average number of cars per 1000 inhabitants amounting to 230 in urban areas, and to 250 in the rural ones.
- In rural areas, cars powered by LPG and Diesel oil were more frequent, whereas in urban areas there were more gasoline cars.
- The average **annual distance driven per car** was slightly higher in urban areas – 13530 km, than in the rural ones – 12400 km.
- The average **age of car** was slightly higher in rural areas, amounting to 11.9 years, than in the urban ones – 10.4 years.
- The average **annual expenditure on fuels per car** was higher in urban areas, due to higher annual distances driven, whereas the average annual expenditure on fuel per household did not differ between urban and rural households, due to the larger average number of cars per household, observed in rural areas.

Chapter 4. Comparison of households energy surveys for the years 2002 and 2009

Information on the production and acquisition of all types of energy, as well as data on energy consumption by commercial entities have been regularly collected in Poland for several years. In contrast, direct household surveys have been infrequent so far.
In the previous years, only two such studies were carried out:

- the survey conducted by the CSO in cooperation with the Energy Information Centre in 1994-1995[4],
- the survey conducted jointly by the CSO and the Energy Market Agency S.A. in 2003[5].

In recent years, due to the lack of regular surveys, data regarding the consumption of certain energy commodities by households have been obtained through estimation and extrapolation.

The previous survey on fuels and energy consumption in households, conducted in 2003, concerned data for 2002. The survey methodologies in 2003 and 2010, as well as the subjective and objective scope, were similar, as a result of which it was possible to directly compare information.

During the seven-year period of 2002-2009, considerable changes occurred as regards certain household-specific features and the energy-related characteristics of dwellings (Tables 4.1. and 4.2.).

Housing conditions

In the period of 2002-2009, housing conditions in Poland improved considerably. The average dwelling area increased in the reference period from 66 m^2 to 75 m^2, i.e. by 13.5%. However, the average number of household persons dropped from 3.1 to 2.9, i.e. by 6.8%. In consequence, the average dwelling area per person, constituting the measure of housing conditions, grew by 22.1%, from 21.3 m^2 to 26.0 m^2.

A considerable improvement has been observed in terms of the access to running water in dwellings. The share of dwellings with no cold water installation dropped from 4.4% to 0.9%. This is currently a marginal phenomenon. A similar improvement concerned the provision of hot running water. The share of dwellings with no hot running water dropped from 15.2% to 5.3%.

Space heating, water heating and cooking technologies

No significant changes occurred as regards space and water heating, as well as cooking technologies. Nevertheless, a certain development was observed in terms of a more extensive

[4] Fuels and energy consumption in households, in urban and rural areas, in 1993. Central Statistical Office, Warsaw 1995.

[5] Fuels and energy consumption in households and private farms. Survey results. Energy Market Agency, Warsaw 2003.

use of innovative and energy-efficient technologies (including especially double-function boilers).

The share of households using district heat dropped by 1.6 ppts (from 41.8% to 40.2%), and so did the share of households obtaining hot water from district heating installation (from 25.7% to 24.2%). This phenomenon results from the structure and location of new dwellings. Dwellings constructed in 2002-2009 are both single-family and multi-family buildings, often located in suburban areas, at a certain distance from the existing district heating installation.

The percentage of dwellings using natural gas also dropped. Locating new residential buildings in the areas with no access to natural gas distribution networks is the reason behind it. As regards dwellings connected to gas networks, the share of dwellings using natural gas to heat spaces increased (from 6.4% to 10.0%).

In the reference period of 2002-2009, the percentage of household using solid fuels increased, including especially fuel wood (by 3.1 ppts), which is renewable, and in many regions of the country it is the most cost-efficient and easily available fuel.

In the group of dwellings equipped with own heat sources, there was a considerable shift towards the use of more convenient and innovative double-function boilers which allow for heating spaces and water simultaneously. The share of households equipped with double-function boilers grew nearly two times, both in the segment of solid fuel boilers (from 11.9% to 20.7%) and the natural gas ones (from 2.8% to 6.4%). The shares of single-function boilers remained at similar levels in both fuel segments while the share of households using traditional solid fuel stoves declined (from 19.6% to 11.4%).

In the period of 2002-2009, thermal applications of electricity became more popular. However, no significant growth in thermal consumption of this energy commodity was observed in households, given that electricity is usually considered a secondary, rather than primary heat commodity. The percentage of households using combined gas-electric cookers grew from 25.0% to 48.0%, and the share of households using electric space heating devices (usually on a secondary basis) grew from 3.7% to 6.9%.

Electrical appliances, electronic devices and lighting equipment

In the last decades of the 20th Century, most households already had a full set of basic electrical appliances and electronic devices, such as a fridge, an automatic washing machine, a vacuum cleaner and a TV set. Changes that occurred in 2002-2009 in terms of electrical appliances and electronic devices entailed mainly the popularisation of new devices (especially computers) and equipment replacement into a more innovative and energy-efficient one. The number of TV sets and refrigeration devices also increased – much more households in 2009 had two pieces of these.

In the analysed period, many households purchased previously unavailable or rarely used devices. In 2009, households used them in the following proportions: compact fluorescent lamps 62%, flat-screen TV sets 33.1%, mobile computers (laptops) 26% and dishwashers 13.8%.

The percentage of households using computers, irrespective of their type, grew in 2002-2009 from 24.7% to 63.0%.

The consumption structure of energy commodities by purpose of use is shown in the table below. The dropping shares of energy used for space and water heating are connected, among others, with the use of more innovative and energy-efficient heating technologies. A similar tendency regarding lighting reflects a more widespread use of compact fluorescent lamps. In turn, the growing share of energy consumed by electric devices results from a wider use of such devices in households.

Table 4.1. Energy consumption in households by purpose of use

Purpose of use	2002		2009	
	in GWh	in %	in GWh	in %
Total	**211945**	**100.0**	**217806**	**100.0**
Space heating	151111	71.3	152889	70.2
Water heating	31889	15.0	31278	14.4
Cooking	15139	7.1	17889	8.2
Lighting	4778	2.3	3944	1.8
Electrical appliances	9028	4.3	11806	5.4

Source: Energy statistics, estimations of the Energy Market Agency S.A.

Consumption of energy commodities

The average annual consumption of various energy commodities in households did not undergo any radical changes in 2002-2009. A growth in average consumption was observed in the case of electricity (of 10.3%, as a result of more equipment available in households) and natural gas (of 18.1%, as a result of a wider use of gas in space heating). For other energy commodities included in the survey, the average consumption per household declined, though this decline was insignificant, falling within the range of 5-10%, depending on the energy commodity.

Despite a growth in the average annual consumption of electricity per household, the electricity consumption expressed as the use of electricity per 1 m^2 of the dwelling area decreased by 9.1% (from 33 to 30 kWh/m^2). A similar drop occurred in the case of heat (by 6.5%, from 0.77 to 0.72 GJ/m^2).

A decrease in the average annual consumption of various energy commodities, or its slight increase, occurred in the event of increasing the dwelling area and providing new equipment.

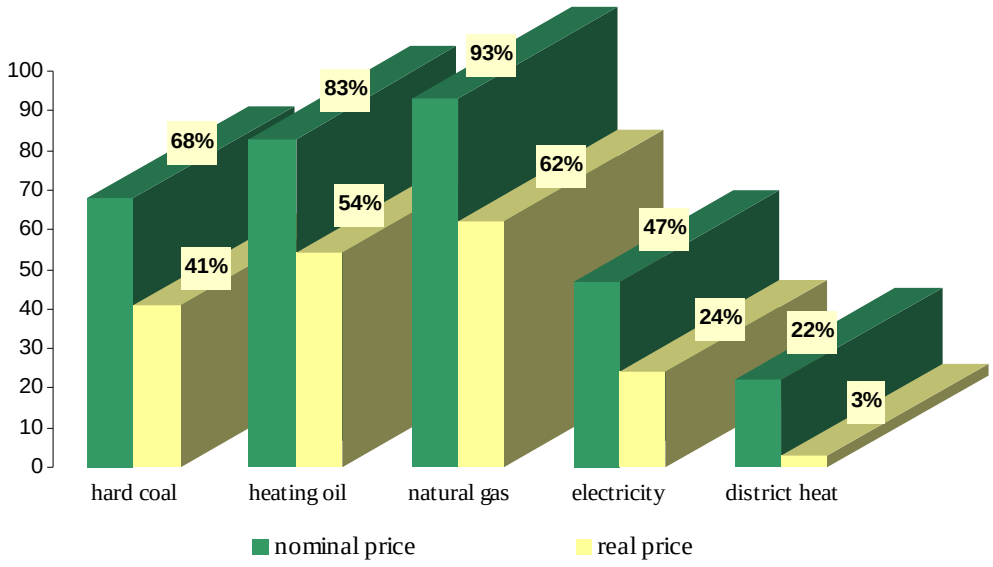
Prices and expenditure on energy commodities

In 2002-2009, the prices of most energy commodities in households grew considerably, which was caused by both changes in fuel prices on global markets and changes on the domestic

market, regarding the amount of excise tax applicable to various energy commodities. In consequence, the highest price growth concerned all types of fuels while the growth in electricity and heat prices, for which fuel is a significant element of costs, but it is not decisive to the price level, was lower.

The nominal (current) price of hard coal for households grew by 68%, and the real price, i.e. comprising the inflation, by 41% (the accumulated price index in the seven-year period grew by 19%). For heating oil, the nominal price growth reached 83%, and the real one 54%. For high-methane natural gas, it was 93% in nominal terms, and 62% in real terms. The price of electricity grew to a lower extent – by 47% in nominal terms and by 24% in real terms. The lowest price growth concerned district heat – by 22% in nominal terms and only by 3% in real terms. Such a low growth in heat prices resulted from an improved efficiency of the heating companies operation.

Fig. 4.1. Nominal and real growth of energy prices in the period 2002-2009



Given the insignificant changes in the quantitative consumption of energy commodities by households, the growth in expenditure on energy commodities was principally similar to the price growth. For fuels, the expenditure growth was lower than the price growth, because of a drop in the average consumption volume of most fuel types. A growth in the average nominal expenditure per household in 2002-2009 amounted to 51% for hard coal, to 66% for heating oil and to 82% for high-methane natural gas. The expenditure growth for electricity reached 63%, and it was higher than the price growth, due to an increase in average consumption. The growth in expenditure on heat was as little as 2%, due to an insignificant growth in heat prices and a decreased average heat consumption per household resulting from thermo-modernisation.

Passenger cars

Passenger cars became more common during the years 2002-2009, though the growth rate of their number was not as fast as in the 1990's. The basic automotive needs of a large number of national population were satisfied before 2002.

The percentage of households in possession of passenger cars increased in the reference period from 46.5% to 57.8%. The number of cars per 100 households grew from 49 to 69. This was accompanied by a growth in the number of households with more than 1 car, from 3% to 10%.

A significant change occurred in the fuel structure of cars. In 2002, gasoline cars were prevalent, accounting for 85.2% of all passenger cars used by households. LPG cars constituted only 6.9%, and Diesel cars 7.9% of all cars held by households. This structure changed considerably in favour of LPG and Diesel cars, as these fuels were cheaper than gasoline in the entire reference period. In 2009, the share of gasoline cars dropped to 53.3% of all passenger cars held by households, and the shares of LPG and Diesel oil cars grew to 20.5% and 26.2%, respectively.

Other structural parameters of the existing car fleet, such as average annual distances driven and average fuels consumption per 100 m, did not change significantly.

To summarise both surveys, the table below presents a detailed compilation of the results obtained in the surveys for the years 2002 and 2009.

Table 4.2. Comparison of the survey results for the years 2002 and 2009 [1)]

Household parameter	Unit of measure	Survey results for 2002	Survey results for 2009	2009/2002 [2)]
Average dwelling floor area	m^2	66.0	74.9	13.5
Average number of household persons	person	3.1	2.9	-6.8
Shares of households with no access to cold running water	%	4.4	0.9	-3.5
Shares of households with no access to hot running water	%	15.2	5.3	-9.9
Shares of households with electricity connections	%	100.0	100.0	0.0
Shares of households using district heat	%	41.8	40.2	-1.6
Shares of households obtaining hot water from district heating installation	%	25.7	24.2	-1.5
Shares of households using:				
natural gas	%	56.1	54.6	-1.5
LPG	%	37.2	38.4	1.2
heating oil	%	0.3	0.5	0.2
hard coal	%	42.1	42.8	0.7
coke	%	3.5	0.8	-2.7
fuel wood	%	39.6	42.7	3.1
Shares of households using electric space heating (usually on a secondary basis)	%	3.7	6.9	3.2
Shares of households equipped with:				
air-conditioning	%	0.1	0.4	0.3
electric water heaters	%	27.7	24.6	-3.1
combined gas-electric cookers	%	25.0	48.0	23.0
dishwashers	%	2.8	13.8	11.0
solid fuel fired single-function boilers	%	16.1	15.1	-1.0
solid fuel fired double-function boilers	%	11.9	20.7	8.8
solid fuel fired stoves	%	19.6	11.4	-8.2
natural gas fired single-function boilers	%	3.6	3.6	0.0
natural gas fired double-function boilers	%	2.8	6.4	3.6
natural gas water heaters	%	22.1	22.3	0.2
hot water meters in relation to all households obtaining hot water from district heating installation	%	77.0	90.9	13.9
computers	%	24.7	63.0	38.3

[1)] The consumption volumes of energy commodities are given per one household actually using a given commodity.

[2)] In the case of comparing data expressed in percentage terms, the results obtained are given in percentage points (ppts) whereas in other cases these are percentage changes reflecting a growth or a drop.

Table 4.2. Comparison of the survey results for the years 2002 and 2009 (cont.)

Household parameter	Unit of measure	Survey results for 2002	Survey results for 2009	2009/2002 [2)]
Average number of lamps per dwelling	pcs	12.5	14.3	14.4
Average annual consumption of electricity:				
per household	kWh	2087	2303	10.3
	GJ	7.5	8.3	
per 1 m^2 of the dwelling floor area	kWh	33	30	-9.1
	GJ	0.12	0.11	
per person	kWh	742	801	8.0
	GJ	2.7	2.9	
Average annual consumption of district heat:				
per household	GJ	39	37	-5.1
per 1 m^2 of the dwelling floor area	GJ	0.77	0.72	-6.5
per person	GJ	17	15	-11.8
Average annual consumption per household of:				
hot water from district heating installation	m^3	54	43	-20.4
high-methane natural gas	m^3	459	542	18.1
	GJ	16.4	19.3	
LPG	kg	118	107	-9.3
	GJ	5.6	5.1	
heating oil	l	1850	1710	-7.6
	GJ	72.9	67.4	
hard coal	t	3.29	3.04	-7.6
	GJ	85.5	79.0	
coke	t	1.86	1.73	-7.0
	GJ	52.1	48.4	
Average price of:				
electricity	zl/kWh	0.36	0.53	47.2
	zl/GJ	100.0	147.2	
district heat	zl/GJ	32	39	21.9
hot water from district heating installation	zl/m^3	10	15	50.0
high-methane natural gas	zl/m^3	1.23	2.37	92.7
	zl/GJ	34.5	66.4	
LPG	zl/kg	2.63	3.82	45.2
	zl/GJ	55.6	80.8	
heating oil	zl/l	1.43	2.61	82.5
	zl/GJ	39.8	72.7	

Table 4.2. Comparison of the survey results for the years 2002 and 2009 (cont.)

Household parameter	Unit of measure	Survey results for 2002	Survey results for 2009	2009/2002 [2)]
hard coal	zl/t	380	640	68.4
	zl/GJ	14.6	24.6	
coke	zl/t	470	820	74.5
	zl/GJ	16.8	29.3	
Average annual expenditure of household on:				
electricity	zl	762	1245	63.4
district heat	zl	1404	1434	2.1
hot water from district heating installation	zl	572	663	15.9
high-methane natural gas	zl	550	1000	81.8
LPG	zl	310	414	33.5
heating oil	zl	2638	4378	66.0
hard coal	zl	1255	1894	50.9
coke	zl	866	1530	76.7
Shares of households using passenger cars with:				
gasoline engines	%	39.9	33.9	-6.0
LPG engines	%	3.4	13.4	10.0
Diesel engines	%	3.8	16.4	12.6
Average number of passenger cars per car-using household	pcs	1.05	1.20	14.3
Average annual distance driven per passenger car with:				
gasoline engine	km	11600	11800	1.7
LPG engine	km	14200	13900	-2.1
Diesel engine	km	15300	15000	-2.0
Average fuels consumption per passenger car with:				
gasoline engine	l/100 km	7.3	7.3	0.0
LPG engine	l/100 km	9.9	9.8	-1.0
Diesel engine	l/100 km	6.9	6.7	-2.9

Chapter 5. Share of households in the total national energy consumption and the energy efficiency of households

5.1. Consumption of fuels and energy

This chapter presents data on fuels and energy consumption by households in relation to the total national consumption of these energy commodities, and in comparison with other European Union countries.
The volumes given were estimated using the energy balance data for the country[6], verified and supplemented with information obtained through this survey[7].

5.1.1. National energy balance

The national energy supply[8] amounted to 3970 PJ, and energy consumption in households (including the passenger cars)[9] reached the level of 1085 PJ. Energy consumption in households accounted for approximately 27% of the national energy supply.
Information on energy commodities consumption for household purposes (space heating, water heating, cooking, consumption by audio/video devices, and lighting), and on fuels consumption by passenger cars used in those households, in relation to the national consumption of energy, is shown in Tables 5.1. and 5.2.

Energy consumption for household purposes

Households constituted a large group of consumers of wood, heat, natural gas, LPG (used both for thermal and transport purposes), geothermal energy, solar energy and gasoline.

As regards network energy commodities, households consumed over 53% of heat, 25% of natural gas, and 20% of electricity. Among other commodities of non-renewable energy, the highest share, in relation to the total national consumption, was attributable to LPG used for space heating and cooking (23%). This was followed by hard coal (approximately 12%). An insignificant share of households in coal consumption stems from its considerable consumption by the power and heating industry (especially as regards lignite). Hard coal is the energy commodity consumed most of all in households, with its share in total fuels and energy consumption for household

[6] Energy statistics *2009, 2010.*

[7] Comparing the results of the household survey in terms of the total energy consumption and related expenditure with information contained in other available sources, such as energy balances and the results of previous household surveys, it has been found that in most cases they are consistent to a good or very good extent. The inconsistency concerns the volume of coal consumption. Explicit statement of reasons for these differences will be possible after obtaining results of next survey concerning energy consumption in households in 2012.

[8] The information on the domestic supply (the energy balance item: *Global consumption of total energy*) and on the total national consumption (the sum of energy balance items: T*ransformations input* and *Direct consumption*) of various energy commodities comes from the synthetic energy balance included in the publication entitled *Energy statistics 2009,2010*.

[9] The information on energy consumption in households was compiled on the basis of survey data and data included in Table 1(66), contained in the publication entitled *Energy statistics 2009,2010*.

purposes[10] amounting to approximately 30%. Heating oil and coke are not massively used energy commodities in households. Their share in the total national consumption did not reach 10% each.

As regards energy from renewable sources, a considerable share of households in the total national consumption was observed for wood (around 61%) and geothermal energy (77%.).

The survey results imply that in 2009 a small group of households was equipped with solar collectors (0.31%), and the volume of solar energy obtained, in relation to the total national consumption of solar energy, amounted to around 71%.

Table 5.1. Energy consumption in households

Energy commodities	Unit of measure	Households consumption			Share of households in the total national consumption
		in natural units	in PJ	in %	
Total		**x**	**789.9**	**100.0**	**x**
Electricity	TWh	28	99.1	12.5	20.1
District heat	PJ	178	178.0	22.5	53.4
Natural gas	PJ	135	135.0	17.1	25.1
LPG[1)]	thous. t	549	26.0	3.3	22.7
Heating oil	thous. t	104	4.6	0.6	9.1
Hard coal	thous. t	9000	234.0	29.6	12.2
Lignite	thous. t	493	4.4	0.6	0.9
Coke	thous. t	183	5.1	0.6	7.7
Fuel wood	PJ	103	103.0	13.0	61.3
Solar energy	TJ	200	0.2	0.0	70.6
Geothermal energy[2)]	TJ	460	0.5	0.1	76.7

[1)] Consumption for household purposes only (excluding fuels consumed by cars).

[2)] Households use geothermal energy obtained indirectly from a heating company network.

Fuels consumption by cars

The share of households in the total national consumption of transport fuels (gasoline, Diesel oil, LPG) amounted to around 38%. The highest share of households was observed for gasoline – nearly 75%, i.e. approximately 3.2 million tonnes (48% of transport fuels consumption in households), which results from the facts that households mostly use cars with gasoline engines.

[10] Excluding consumption for transport purposes (cars).

As regards LPG, the share of households accounted for over 57%, i.e. approximately 1.4 million tonnes (22% of transport fuels consumption in households). At the same time, over 70% of the LPG used by households was consumed by passenger cars. The lowest share of households was recorded for Diesel oil – approximately 19%, i.e. 2 million tonnes (30% of transport fuels consumption in households), the vast majority of which was used by trucks, also in agriculture.

Table 5.2. Fuels consumption by passenger cars owned by households

Fuel	Consumption by passenger cars in households			Share of households in the total national consumption
	in thous. t	in PJ	in %	
Total	**6582**	**295.4**	**100.0**	**38.2**
LPG	1387	65.6	22.2	57.5
Gasoline	3167	141.9	48.0	74.7
Diesel oil	2028	87.9	29.8	18.8

5.1.2. Poland against the background of the European Union

Data regarding the energy consumption structure for Poland and other European Union countries were presented in Tables 37-39.

The share of households in the total national energy consumption[11] in the EU countries in 2009 ranged from 8% – Malta to 35% – Latvia. The average rate for 27 EU countries amounted to 17%, and it was lower than in Poland (20%). The share of households in the total national energy consumption was similar to Poland in Germany, Ireland, the United Kingdom and Austria. The second indicator, i.e. energy consumption per capita in the household sector, indicated that Poland, with the rate of 21GJ/1Ma, belonged to the group of countries with average consumption. To compare, the reference rate in Germany amounted to 34GJ/1Ma, in Austria – to 31GJ/1Ma, in the Czech Republic – to 24GJ/1Ma, in Hungary – to 23GJ/1Ma, in Lithuania – to 20GJ/1Ma, and in EU-27 – to 25GJ/1Ma.

For most EU countries, natural gas was the prevalent energy commodity used in households, accounting, in average terms, for 39% of the gross consumption for EU-27 (42% for EU-15 and 17% for Poland). The consumption of this energy commodity per 1Ma in UE-27 was nearly three times higher than the corresponding consumption in Poland.

Electricity occupied the second position (24% for EU-27, 26% for EU-15 and 13% for Poland). The consumption of this energy commodity per 1Ma in EU-27 was twice as high as in Poland.

The third position in the EU was taken by **fuel wood** (11% for EU-27, 9% for EU-15 and 13% for Poland).

Heating oil was rated fourth (11% for EU-27, 13% for EU-15 and 1% for Poland). The consumption of this energy commodity per 1Ma in EU-27 was ten times as high as in Poland.

The share **of energy from renewable sources** in the consumption in the household sector for the whole EU amounted to 12% (for EU-15 – to 10%). In Poland, it reached a similar level (13%).

The analysis of the energy consumption structure in households, according to various energy commodities, indicates that Poland was the leader in terms of **hard coal** consumption in the reference sector, and it differed considerably from other EU countries. Hard coal consumption per 1Ma in Poland was ten times higher than in EU-27. The share of this commodity in total energy consumption in households reached the level of 30%. To compare, for the second most frequent user of hard coal, Ireland, this rate amounted to 8%, and the average EU-27 rate in 2009

[11] The information concerning energy consumption for the EU countries comes from the Eurostat database, where the gross inland consumption is the sum of the primary energy obtained and the balance of foreign trade, as well as the change in stocks of all energy commodities decreased by a bunker. Data on energy consumption in households, expressed in energy units, may differ from the figures presented in Table 5.1. This results from the fact that information in the reference table was verified in relation to those published in *Energy statistics* and to those included in the Eurostat database. Additionally, the calculation of data in TJ, according to the Eurostat methodology, is based on average calorific values.

was 3%. The share of Poland in the consumption of hard coal in the EU household sector amounted to 73%.

District heat was the second most important energy commodity used by Polish households, accounting for 23% of the total national consumption in the household sector. To compare, the average EU-27 rate was 7%. The consumption of this energy per 1Ma in Poland was three times as high as in EU-27.

Fig. 5.1. Share of Poland, EU-15 and the other EU countries in the energy consumption in EU-27 households

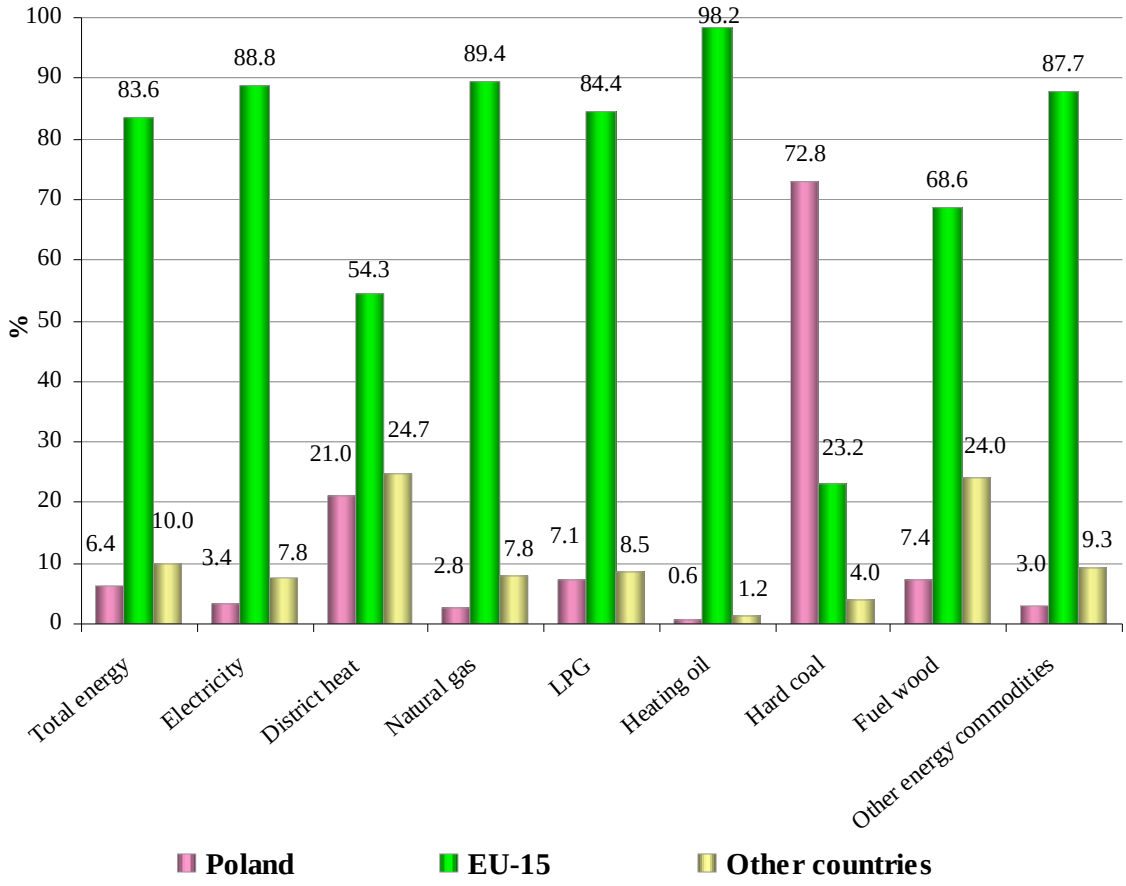


Fig. 5.2. Structure of households energy consumption per 1 inhabitant in the EU-27, EU-15 and in Poland

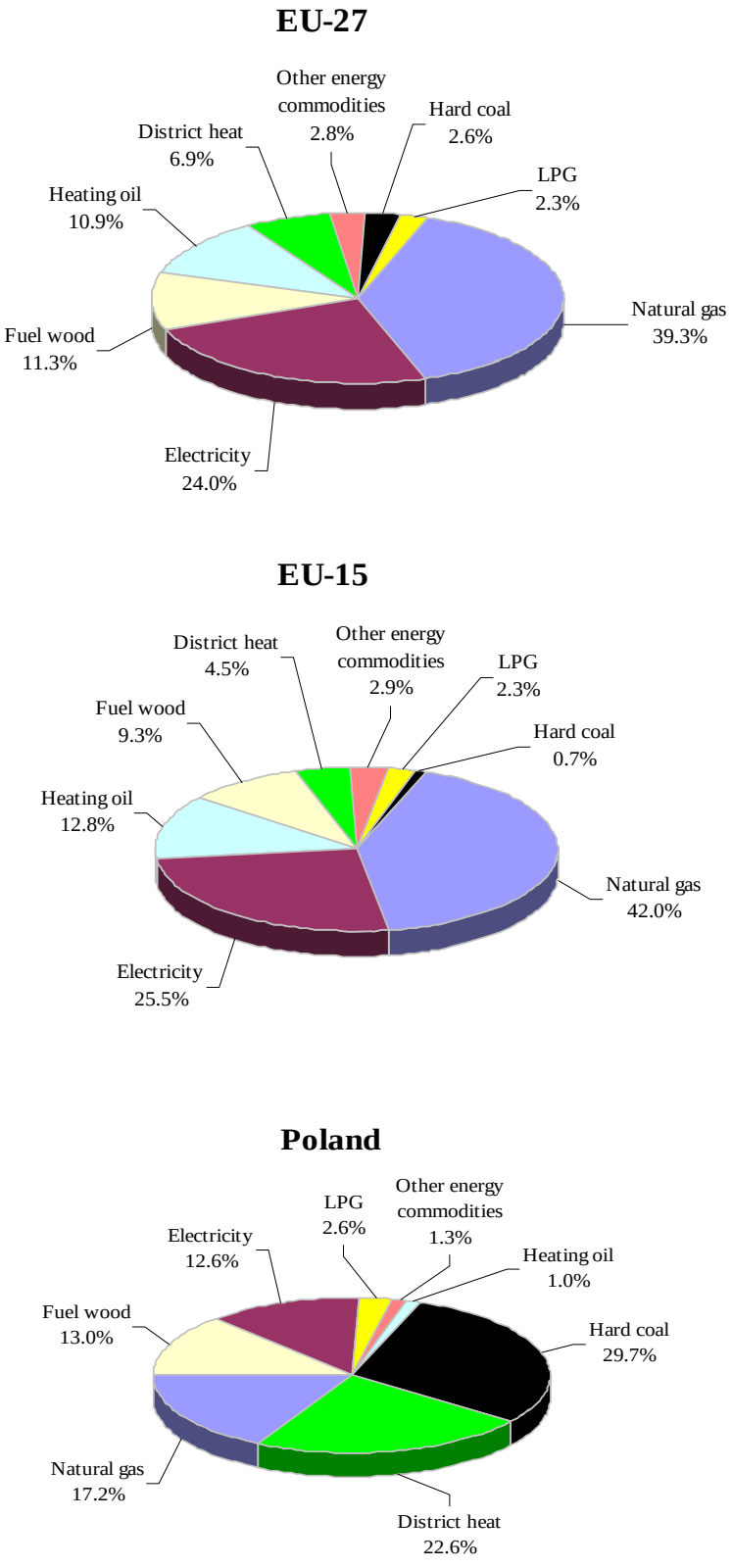


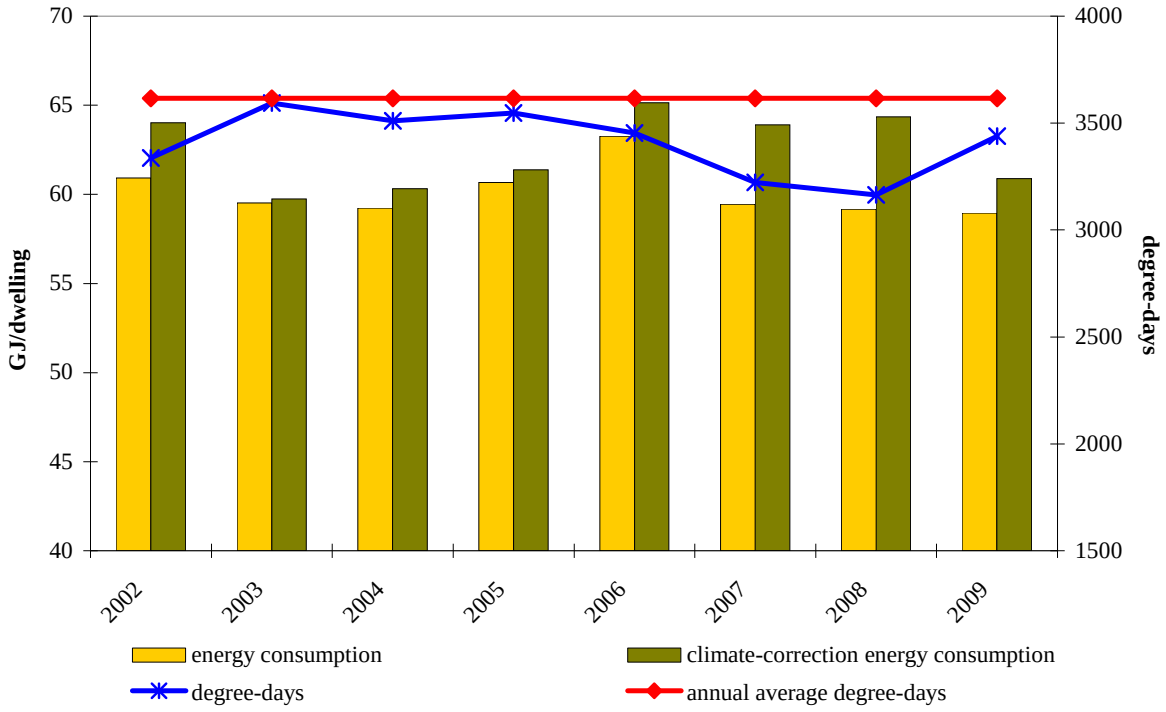
Fig. 5.3. Energy consumption in households in GJ/1 inhabitant and the share of households in the total national energy consumption

5.2 Energy efficiency

5.2.1. Energy efficiency of households

Energy efficiency of households indicated slight fluctuations between 2002 and 2009. Energy consumption per dwelling dropped by 3.2%, from 60.9 GJ/dwelling in 2002 to 59.0 GJ/dwelling in 2009. Having considered the diversified weather conditions, energy consumption per dwelling (including climate-correction) dropped by 4.9%.

Fig. 5.4. Energy consumption in households per 1 dwelling



Source: CSO, Eurostat and Joint Research Center

The climate-correction method is based on the relationship between energy consumption and external temperatures. It is assumed that the relationship between energy consumption for heating, and the number of degree-days (Sd) is directly proportional. Based on this assumption, it can be stated that the final energy consumption, after climate-correction (ZEF^{kk}), can be calculated as follows:

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

where: ZEF – final energy consumption, Sd – number of degree days, α – share of energy consumption for heating purposes in the total energy consumption in the housing sector.

The number of degree-days is introduced with a view of facilitating the control and comparison of heat consumption for heating purposes. It represents a product of the number of heating days, and the difference between the average temperature in a heated

premise and the average external temperature. The number of degree-days (Sd) in a given year, according to the Eurostat methodology, is calculated in the following way:

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

where: $t_{śr}(n) = \frac{t_{\min}(n) + t_{maks}(n)}{2}$ - average external air temperature in *n*-this day of the year, [^{o}C]; $t_{\min}(n)$, $t_{\max}(n)$ – minimum and maximum air temperature in day *n* of the year, [^{o}C]; *N* –number of days in the year. Based on the formula, and according to the assumption made by Eurostat, heating days are those in which the average daily external temperature is below 15^{o}C.

The degree-day values in 2002-2009 are included in the table below (the long-term average calculated for the period of 1980-2004, adopted in the calculations, amounts to 3615.77):

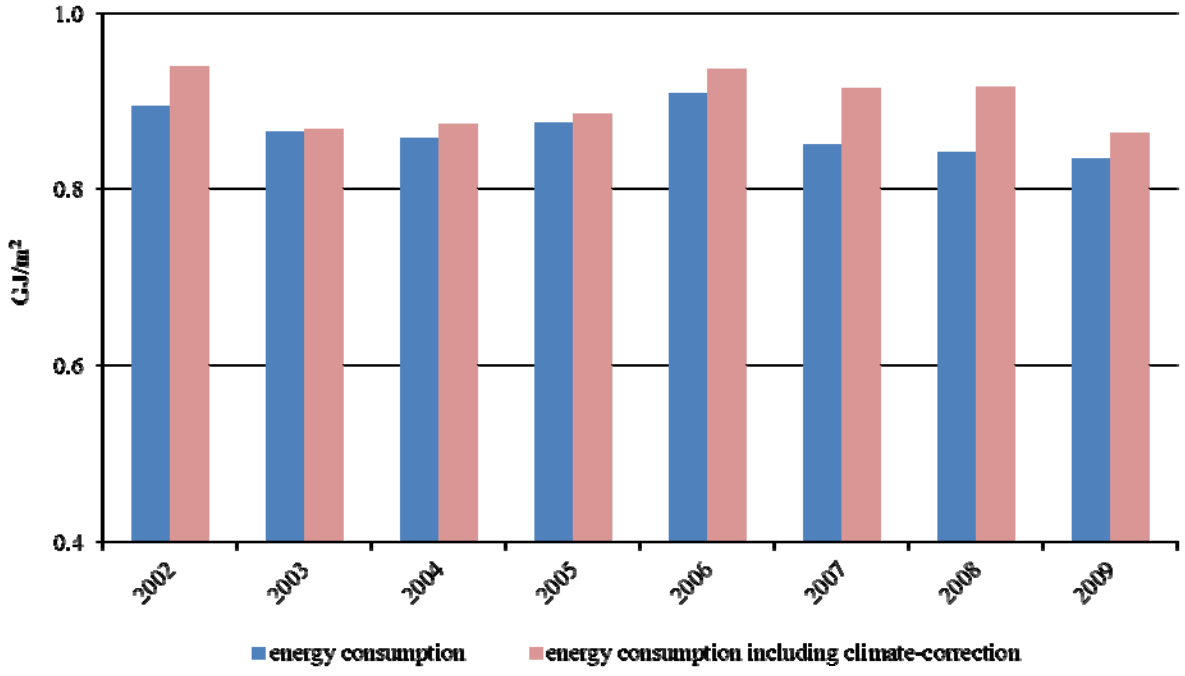
Table 5.3. Degree-days values in 2002-2009

	2002	2003	2004	2005	2006	2007	2008	2009
Sd – annual.....	3337	3594	3510	3547	3454	3222	3164	3439

Source: Eurostat and Joint Research Center

Considering the fact that the average dwelling area is growing systematically, the progress regarding energy efficiency is subject to change. When converted per 1 m^2 of the dwelling area, energy consumption in 2002-2009 dropped by 6.5%, from 0.894 GJ/m^2 to 0.836 GJ/m^2, and after climate-correction – by 8.1%.

Fig. 5.5. Energy consumption in households per 1 m^2 of the dwelling area



5.2.2. Energy efficiency of residential buildings

Building age and insulation are the two features of residential buildings that have a significant impact on the energy consumption in households.

The largest number of dwellings (around 36%) were constructed in Poland in 1961-1980, i.e. during an intensive period for housing construction, mainly multi-family. This was connected with a significant growth of population in the said period, and with the post-war reconstruction of the country. Over 20% of all dwellings existing in 2009 were constructed before 1946, and slightly less in the period of 1981-1995. Relatively less dwellings were built in 1946-1960 and after 1995.

The distribution of dwellings located in insulated and non-insulated buildings is almost even (Table 3). Insulation is only an approximate characteristics of thermal properties of a building. The insulation quality can be varied, though newly-constructed houses, using modern technologies and good-quality materials, are usually characterised with better thermal properties than old insulated houses. The massive building insulation campaign, taking place in Poland since 1995, aimed mostly at multi-family buildings constructed in 1961-1980, has brought very favourable effects, as it contributes to a significant improvement in the thermal properties of insulated buildings and in the efficient use of heat in the country.

The quantity impact of the two features mentioned, i.e. building age and insulation, on the energy consumption volume per 1 m^2 of the dwelling area was assessed as part of analysing the data obtained in the survey.

In order to assess the building age impact on the energy consumption volume, calculations were performed for two groups of households. The first group comprised households inhabited in buildings constructed until 1980, and the second one consisted of households inhabited in buildings constructed after 1980. The buildings surveyed were divided into six age groups (see *the Questionnaire*), and the calculations revealed that a significant energy efficiency difference occurred between the sub-population of buildings constructed until 1980 and the sub-population of buildings constructed after 1980. Higher energy efficiency of younger buildings can be attributed to more severe construction standards determining the permissible heat losses through walls, windows and other construction elements.

In order to examine the insulation impact on the energy consumption volume, calculations were also performed for two groups of households. The first group comprised households inhabited in insulated buildings while the second one consisted of households occupying non-insulated buildings.

The results of the calculations concerning the consumption of major energy commodities, i.e. district heat, hard coal and natural gas, in the groups of older and younger buildings, and in the groups of insulated and non-insulated ones, are presented in the tables below.

Table 5.4. Consumption of selected energy commodities for thermal purposes per 1 m^2 of the dwelling area in older and younger buildings

Energy commodities	Unit of measure	Consumption in buildings		Relative difference in the consumption volume
		constructed after1980	constructed until 1980	
District heat	GJ	0.53	0.87	39%
Natural gas	m^3	12.0	15.8	24%
	GJ	0.43	0.56	
Hard coal	kg	28.9	34.6	16%
	GJ	0.75	0.90	

Table 5.5. Consumption of selected energy commodities for thermal purposes per 1 m^2 of the dwelling area in insulated and non-insulated buildings

Energy commodities	Unit of measure	Consumption in buildings		Relative difference in the consumption volume
		insulated	non-insulated	
District heat	GJ	0.60	1.04	42%
Natural gas	m^3	12.6	17.1	26%
	GJ	0.45	0.61	
Hard coal	kg	30.2	34.8	13%
	GJ	0.79	0.90	

Summary

Households in Poland had a significant 20% share in the total national consumption of energy.[12] Poland belonged to the group of EU countries in which the share of households was relatively high (20% and more of the total national consumption occurred in 7 countries, with the average of 17%). In average terms, households used approximately 21 GJ of energy per 1 inhabitant, which places Poland below the average European level of 25 GJ/Ma. It should also be mentioned that less energy per inhabitant is mainly consumed by households in the southern European countries.

Solid fuels are central to the energy consumption structure of Polish households, including mainly **hard coal** (which is an exception on the EU scale) and **fuel wood**. These two energy commodities were the most frequently used for heating purposes. Solid fuels were used for space heating by nearly every second household surveyed. Less households used these fuels also for water heating, and much less for cooking.

District heat was a significant energy commodity. It was used in around 40% of all dwellings, mainly in cities where it was the predominating commodity. Around 1/4 of households, i.e. 60% of all district heating consumers, used this energy commodity to heat up water.

Natural gas was used in 55% of households, but every second consumer used it only for cooking, and only 17% for space heating. Such a consumption structure was the outcome of a long-lasting practice of installing gas networks in multi-family buildings only for cooking purposes. In those areas of the country which have no access to natural gas, the stationary use of **LPG** was common, though it was almost entirely used for cooking.

Over 40% of households used **fuel wood**. It was the only renewable energy commodity used by households on a massive scale. It was usually burnt in the same boilers and stoves as hard coal, either together with coal or interchangeably. Apart from fuel wood, households also used other types of biomass, though they were far less common than wood. **Solar collectors** were used by one out of 300 households, and **heat pumps** by as few as one out of 3000.

Electricity was commonly used by households, most of which used it for lighting as well as electrical appliances and electronic devices. The use of electricity for heating purposes was insignificant, due to high prices and the availability of cheaper substitutes. Electricity was used for space heating and cooking, usually on a secondary basis, whereas its use for water heating was common mainly in those areas which did not have access to the heating or gas network.

A vast majority of households had the most important **electric devices**, such as combined fridge-freezers, automatic washing machines, vacuum cleaners and TV sets. As regards **lamps**, incandescent bulbs dominated in quantity terms, as their withdrawal from the market did not start until 2009.

[12] Excluding motor fuels

Most households were well-equipped with energy-consuming devices, both those which satisfied the principal heating needs and those which improved the living comfort of inhabitants. Nevertheless, in Poland, similar to other European countries, there are some households which are less equipped. The survey revealed that 5% of dwellings did not have access to hot running water, 15% of dwellings were considered by respondents as insufficiently warm in the winter, and 10% were equipped in solid fuel stoves or cookers, which were the only heating devices.

Throughout the period of 2002-2009, the application of more modern and energy-efficient technologies developed. In dwellings equipped with own **central heating boilers** (including solid fuel or natural gas ones), **double-function boilers** were the most frequent, and they were also used for water heating. Single-function boilers were less popular, though still more common than fireplaces. In some old buildings, solid fuel stoves or cookers were the only heating devices.

Some minor, though favourable, changes occurred in the structure of **the average annual consumption of various energy commodities in households.** As a result of a wider provision of electric devices in households, a growth in the average electricity consumption was observed. Nevertheless, in terms of electricity consumption in households in relation to the number of inhabitants, Poland was rated last but one among the EU countries. In consequence of a wider popularisation of gas heating of dwellings, a growth in consumption also concerned this heating fuel which, against the background of a high share of solid fuels in the consumption structure of households, should be viewed as a positive phenomenon. For other energy commodities, the average consumption in households decreased, though the decrease fell within the range of 5-10%. Due to multi-annual activities comprising, among others, thermo-modernisation, stricter construction standards and an improved efficiency of heating devices, the share of energy used for space and water heating in the consumption structure decreased.

Despite a growth in the average annual consumption of electricity per household, the household energy consumption per 1 m^2 of the dwelling area dropped (by 9.1%, from 33 to 30 kWh/m^2). A similar drop of energy consumption was reached for heat (by 6.5%, from 0.77 to 0.72 GJ/m^2).

Passenger cars were used by 58% of households, with an average of 1.2 car in each car-using household. Cars with gasoline engines accounted for nearly 3/4 of all passenger cars used by households (20% of which were vehicles adapted to LPG), and the remaining slightly over ¼ were cars with Diesel engines.

Given the aforementioned structure, passenger cars owned by households accounted for nearly 75% of gasoline, over 50% of LPG and 20% of Diesel oil, consumed in the country. This corresponded to a total of nearly 40% of the total consumption of transport fuels.

TABLES

Table 1. Number of households

Voivodship	Number of households selected for the survey	Number of households actually surveyed	Number of households in the country as at 31.12.2009	Households actually surveyed
				in %
Poland in total.....	**4698**	**4565**	**13302400**	**0.0343**
Dolnośląskie	366	352	1053500	0.0334
Kujawsko-pomorskie ..	246	240	692700	0.0346
Lubelskie	270	270	722500	0.0374
Lubuskie	120	119	347300	0.0343
Łódzkie	342	330	968000	0.0341
Małopolskie	396	381	1077600	0.0354
Mazowieckie	690	656	2000700	0.0328
Opolskie	120	114	340000	0.0335
Podkarpackie	240	240	619800	0.0387
Podlaskie	150	150	414000	0.0362
Pomorskie	258	242	765700	0.0316
Śląskie	564	552	1709800	0.0323
Świętokrzyskie	162	162	422100	0.0384
Warmińsko-mazurskie	174	166	478700	0.0347
Wielkopolskie.....	396	391	1090600	0.0359
Zachodniopomorskie...	204	200	599400	0.0334

Table 2. Characteristics of dwellings – quantitative features

A. Measures for selected dwelling features

Dwelling feature	Unit of measure	Arithmetic average	First decile	First quartile	Median	Third quartile	Ninth decile
Total floor area of dwelling	m^2	74.9	38.0	48.0	63.0	100.0	140.0
Heated area	m^2	73.1	37.0	48.0	61.0	96.0	135.0
Share of heated area in total area	%	97.5	97.1	100.0	100.0	100.0	100.0
Height of dwelling	m	2.6	2.4	2.5	2.5	2.6	2.8
Total cubic volume of dwelling	m^3	193.6	95.0	122.4	162.0	250.0	355.2
Heated cubic volume	m^3	188.8	94.5	120.0	159.0	245.0	350.0
Share of heated cubic volume in total cubic volume	%	97.5	97.1	100.0	100.0	100.0	100.0
Number of floors in multi-family buildings[1)]	x	4.1	1.0	2.0	4.0	4.0	10.0
Number of inhabitants	x	2.9	1.0	2.0	3.0	4.0	5.0
Coefficient of thermal conductivity of windows	$W/m^2 \times K$	1.1	1.0	1.1	1.1	1.1	1.1

[1)] Data on the number of floors were taken from form BR-01a and refer to multi-family buildings only.

B. Dwelling structure by floor area, cubic volume, and the number of inhabitants

Specification	Unit of measure	Dwellings					
Intervals of floor area of dwellings	m^2	up to 40	41-50	51-60	61-75	76-100	over 100
Shares of dwellings by floor area	%	15.72	20.36	15.94	13.25	17.79	16.94
Intervals of cubic volume of dwellings	m^3	up to 100	101-150	151-200	201-250	251-300	over 300
Shares of dwellings by cubic volume	%	14.12	34.64	18.80	11.46	8.23	12.75
Number of inhabitants	x	1	2	3	4	5	over 5
Shares of dwellings by the number of inhabitants	%	23.66	23.01	20.22	18.16	8.52	6.43

Table 3. Characteristics of dwellings – qualitative features

A. Dwellings by building type

Specification	Multi-family building	Single-family building terraced	Single-family building detached	Other building type
	in %			
Shares of dwellings...	56.18	5.95	37.54	0.33

B. Dwellings by construction period

Specification	Before 1946	1946-1960	1961-1980	1981-1995	1996-2006	After 2006
	in %					
Shares of dwellings ..	21.42	15.05	35.73	19.22	7.85	0.72

C. Dwellings by insulation presence

Specification	Insulated building	Non-insulated building	Partly-insulated building	No information
	in %			
Shares of dwellings	46.00	45.23	8.30	0.47

D. Dwellings by window type

Specification	Integrated window	Two-framed window
	in %	
Shares of dwellings	77.95	22.05

E. Dwellings by number of glass layers

Specification	Single-glazed	Double-glazed	Triple-glazed
	in %		
Shares of dwellings	7.04	90.96	2.00

F. Dwellings by the value of the coefficient of thermal conductivity of windows [1)]

Specification	Coefficient of thermal conductivity in $W/m^2 \times K$						No information
	up to 0.8	0.9	1	1.1	1.2	over 1.2	
	in %						
Shares of dwellings..	0.02	2.81	3.13	50.22	0.25	3.15	40.42

[1)] Aggregated information on the coefficients of thermal conductivity of windows is not precise, there are significant gaps in source data in respect of this item.

G. Dwellings by thermal comfort (own assessment of respondents)

Specification	Sufficiently warm in the winter	Insufficiently warm in the winter
	in %	
Shares of dwellings ..	83.69	16.31

H. Dwellings by running water presence

Specification	Cold water [1)]			Hot water		
	from network	from own source	lack	from district heating installation	locally heated	lack
	in %					
Shares of dwellings	92.87	8.95	0.86	25.12	69.62	5.25

[1)] 2.67% of dwellings had cold water from both network and own source

Table 4. Agricultural activity of households

A. Households by the fact of conducting agricultural activity [1)]

Specification	Productive agricultural activity	Garden cultivation	Lack of agricultural activity and garden cultivation
	in %		
Shares of households	11.96	38.19	50.76

[1)] 0.92% of households conducted agricultural activity and cultivated their gardens simultaneously

B. Size of farm area in households conducting agricultural activity

Specification	Arithmetic average	First decile	First quartile	Median	Third quartile	Ninth decile
	in ha					
Size of farm area	8.87	0.70	1.65	4.53	10.00	18.90

Table 5. Households using various energy commodities, with the specification of the purposes of use

Energy commodities	Energy commodities usage			
	for any thermal purpose	for space heating	for water heating	for cooking
	in %			
Electricity	71.18	6.93	24.59	61.05
of which from own production	-	-	-	-
of which produced from renewable sources	-	-	-	-
District heat	40.16	40.16	x	x
Hot water from district heating installation	24.19	x	24.19	x
High-methane natural gas	51.80	9.23	27.11	49.87
Nitrified natural gas	2.83	0.81	1.62	2.75
LPG for household purposes	38.44	0.37	2.39	38.36
Heating oil	0.55	0.53	0.49	x
Hard coal	42.81	42.74	26.87	8.00
Lignite	1.21	1.21	0.71	0.17
Coke	0.79	0.79	0.35	x
Fuel wood	42.74	42.49	23.75	9.00
Other types of biomass	6.32	6.21	2.72	0.82
Solar energy	0.31	0.04	0.31	x
Heat pump	0.03	0.03	0.00	x

Table 6. Use of space heating equipment and water heating equipment in households

Devices	Households using a device	Average number of pieces of a device in a household using this device	Average age of device
	in %		in years
Electric stoves or heaters – non-portable	2.47	2.59	9.7
Electric stoves or heaters – portable	4.90	1.27	7.9
Underfloor electric heating	0.42	x	7.5
Electric water heater	24.56	1.02	8.1
Natural gas fired central heating boiler	3.64	1.03	10.6
Natural gas fired water heater	22.30	1.01	9.2
Natural gas fired double-function boiler (space + water)	6.35	1.00	7.8
LPG fired central heating boiler	0.10	1.00	8.8
LPG fired water heater	0.21	1.00	12.2
LPG fired double-function boiler (space + water)	0.30	1.00	7.4
Heating oil fired central heating boiler	0.07	1.00	11.6
Heating oil fired double-function boiler (space + water)	0.49	1.00	7.3
Solid fuel fired central heating boiler	15.13	1.00	10.4
Solid fuel fired water heater	8.84	1.00	12.1
Solid fuel fired double-function boiler (space + water)	20.69	1.01	9.3
Solid fuel fired stoves in rooms	11.44	1.46	23.7
Solid fuel fireplace with open fire	0.95	1.15	11.7
Solid fuel fireplace with closed insert	2.16	1.02	6.1
Solid fuel fireplace with water jacket	0.38	1.00	5.2
Solid fuel fired cooking stove	10.85	1.02	24.0
Solar collectors	0.31	1.87	3.3
Heat pumps	0.03	1.00	1.0

Table 7. Characteristics of the age of space heating equipment and water heating equipment

Devices	Arithmetic average	First decile	First quartile	Median	Third quartile	Ninth decile
	in years					
Electric stoves or heaters – non-portable	9.7	2.0	4.0	6.0	12.0	20.0
Electric stoves or heaters – portable	7.9	2.0	3.0	6.0	10.0	17.0
Underfloor electric heating	7.5	2.0	3.0	4.5	10.8	15.0
Electric water heater	8.1	2.0	4.0	7.0	10.0	15.0
Natural gas fired central heating boiler	10.6	3.0	5.0	10.0	15.0	20.0
Natural gas fired water heater	9.2	3.0	5.0	8.0	11.0	16.0
Natural gas fired double-function boiler (space + water)	7.8	2.0	5.0	7.0	10.0	15.0
LPG fired central heating boiler	8.8	4.0	8.5	10.0	10.0	10.0
LPG fired water heater	12.2	4.0	8.3	10.0	14.3	20.0
LPG fired double-function boiler (space + water)	7.4	2.0	3.8	5.5	10.0	12.0
Heating oil fired central heating boiler	11.6	8.0	9.5	10.0	11.3	15.0
Heating oil fired double-function boiler (space + water)	7.3	4.0	5.0	8.0	10.0	10.0
Solid fuel fired central heating boiler	10.4	2.0	4.5	9.0	15.0	20.0
Solid fuel fired water heater	12.1	2.0	5.0	10.0	15.0	20.0
Solid fuel fired double-function boiler (space + water)	9.3	2.0	4.0	8.0	12.0	19.0
Solid fuel fired stoves in rooms	23.7	4.0	10.0	20.0	32.0	45.0
Solid fuel fireplace with open fire	11.7	2.0	5.0	7.5	15.0	21.0
Solid fuel fireplace with closed insert	6.1	2.0	3.0	5.0	8.0	10.0
Solid fuel fireplace with water jacket	5.2	1.0	2.0	4.0	6.3	9.0
Solid fuel fired cooking stove	24.0	6.0	15.0	20.0	30.0	40.0
Solar collectors	3.3	1.0	2.8	3.0	4.3	5.0
Heat pumps [1)]	1.0	x	x	1.0	x	x

[1)] Decile and quartile values are not given as the number of devices in the surveyed sample was too small.

Table 8. Households equipped with central heating boilers and water heaters using various energy commodities

Energy commodities	Single-function boilers (space heating)	Double-function boilers (space heating + water heating)	Water heaters
	in %		
Natural gas	3.64	6.35	22.30
LPG	0.10	0.30	0.21
Heating oil	0.07	0.49	x
Solid fuels	15.13	20.69	8.84
Electricity	x	x	24.56

Table 9. Use of cooking equipment in households

Devices	Households using a device	Average number of pieces of a device in a household using this device	Average age of device
	in %		in years
Electric-only cooker with oven	7.44	1.00	8.1
Separate electric oven	6.18	1.01	6.8
Electric-only cooker without oven	2.69	1.02	6.9
Combined gas-electric cooker	47.98	1.01	7.1
Gas-only cooker	43.26	1.01	12.0
Solid fuel fired cooking stove	11.42	1.01	24.0
Microwave oven	50.66	x	x

Table 10. Characteristics of the age of cooking equipment

Devices	Arithmetic average	First decile	First quartile	Median	Third quartile	Ninth decile
	in years					
Electric-only cooker with oven	8.1	3.0	4.0	7.0	10.0	15.0
Separate electric oven	6.8	1.0	3.0	5.0	10.0	15.0
Electric-only cooker without oven	6.9	1.0	3.0	5.0	10.0	12.0
Combined gas-electric cooker	7.1	2.0	3.0	6.0	10.0	13.0
Gas-only cooker	12.0	3.0	6.0	10.0	15.0	20.0
Solid fuel fired cooking stove	24.0	7.0	15.0	20.0	30.0	40.0

Table 11. Use of mechanical ventilation and air-conditioning equipment in households

Devices	Households using a device	Average number of pieces of a device in a household using this device	Average age of device
	in %		in years
Central air-conditioning	0.03	1.00	5.4
Air-conditioners installed in rooms	0.24	1.84	2.1
Air-conditioners installed outside of the building	0.08	1.69	3.4
Fan heaters	0.08	1.24	8.1
Evaporative coolers	0.08	1.00	15.6
Mechanical ventilators	2.06	1.32	7.3
Recuperators	0.04	1.00	5.1

Table 12. Characteristics of the age of mechanical ventilation and air-conditioning equipment

Devices	Arithmetic average	First decile	First quartile	Median	Third quartile	Ninth decile
	in years					
Central air-conditioning	5.4	1.0	3.3	5.5	10.0	10.0
Air-conditioners installed in rooms	2.1	1.0	2.0	2.0	2.0	2.0
Air-conditioners installed outside of the building	3.4	1.0	1.0	4.0	4.0	5.0
Fan heaters	8.1	5.0	5.0	11.0	11.0	15.0
Evaporative coolers	15.6	4.0	4.8	10.0	15.0	20.0
Mechanical ventilators	7.3	2.0	3.0	5.0	8.5	15.0
Recuperators	5.1	3.0	3.5	4.0	6.0	8.0

Table 13. Use of lighting equipment in households

Types of lamps	Households using this type of lamps	Average number of pieces of this type of lamps in a household using this type	Average total power of this type of lamps in a household using this type
	in %		in W
All lamps inside dwelling [1)]	**99.83**	**14.25**	**546**
Incandescent bulbs	86.20	8.98	501
Compact fluorescent lamps	62.01	6.82	97
Other lamps (incl. halogen, diode, fluorescent tubes)	32.40	7.13	189
All lamps inside and outside dwelling [1)]	**99.83**	**14.92**	**585**
Lamps located outside the building	38.36	1.73	116

[1)] 0.17% of the surveyed households did not report any information on lamps.

Table 14. Characteristics of the power of lighting equipment

Types of lamps	Arithmetic average	First decile	First quartile	Median	Third quartile	Ninth decile
total power of lamps in W						
All lamps inside dwelling	**546**	**180**	**295**	**460**	**720**	**1060**
Incandescent bulbs	501	125	240	420	660	1000
Compact fluorescent lamps	97	18	36	70	125	210
Other lamps (incl. halogen, diode, fluorescent tubes)	189	27	60	120	240	440
All lamps inside and outside dwelling	**585**	**180**	**304**	**494**	**770**	**1160**
Lamps located outside the building	116	40	60	100	120	200
total power of lamps per unit of the dwelling floor area in W/m^2						
All lamps inside dwelling	**7.21**	**2.55**	**4.37**	**6.94**	**10.56**	**14.71**
Incandescent bulbs	6.62	2.00	3.72	6.25	9.88	13.89
Compact fluorescent lamps	1.20	0.28	0.50	1.00	1.79	2.98
Other lamps (incl. halogen, diode, fluorescent tubes)	2.28	0.38	0.75	1.67	3.51	6.40

Table 15. Use of electrical appliances and electronic devices in households

Devices	Households using a device	Average number of pieces of a device in a household using this device	Average age of device
	in %		in years
Refrigerator (1-door)	26.30	1.01	11.8
Combined fridge-freezer (2-door)	74.08	1.03	7.0
Freezer	20.77	1.03	10.0
Automatic washing machine without dryer	86.60	1.01	6.8
Combined washer-dryer	1.79	1.00	7.3
Clothes dryer	0.52	1.00	14.6
Non-automatic washing machine	14.50	1.01	16.1
Dishwasher	13.79	1.00	4.0
Vacuum cleaner [1)]	94.95	1.02	X
TV set	96.78	1.37	7.8
CRT [1)]	79.67	1.25	X
other than CRT [1)]	33.09	1.12	X
Home cinema set [1)]	17.97	1.01	X
Multi-component audio set [1)]	41.46	1.05	X
Radio or radio/tape-recorder without CD player [1)]	66.16	1.06	X
Radio or radio/tape-recorder with CD player [1)]	23.50	1.05	X
DVD player or video tape player [1)]	64.78	1.48	X
Stationary computer (desktop)	49.61	1.06	4.9
Mobile computer (laptop)	26.02	1.13	2.5
Printer	39.15	1.03	3.6

[1)] Data from BR-04 questionnaire.

Table 16. Characteristics of the age of electrical appliances and electronic devices

Devices	Arithmetic average	First decile	First quartile	Median	Third quartile	Ninth decile
	in years					
Refrigerator (1-door)	11.8	3.0	5.0	10.0	15.0	22.0
Combined fridge-freezer (2-door)	7.0	2.0	3.0	6.0	10.0	13.0
Freezer	10.0	3.0	5.0	10.0	15.0	20.0
Automatic washing machine without dryer	6.8	2.0	3.0	6.0	10.0	13.0
Combined washer-dryer	7.3	2.0	3.3	6.0	10.0	13.0
Clothes dryer	14.6	1.0	3.8	10.0	26.5	32.0
Non-automatic washing machine	16.1	5.0	10.0	15.0	20.0	30.0
Dishwasher	4.0	1.0	2.0	3.0	5.0	10.0
TV set	7.8	1.5	3.0	5.0	10.0	15.0
Stationary computer (desktop)	4.9	2.0	3.0	4.0	6.0	9.0
Mobile computer (laptop)	2.5	1.0	1.0	2.0	3.0	4.0
Printer	3.6	1.0	2.0	3.0	5.0	7.0

Table 17. Equipment in different classes of energy efficiency

Devices	Energy efficiency class							No information
	A	B	C	D	E	F	G	
	in %							
Central air-conditioning	100.00	-	-	-	-	-	-	-
Air-conditioners installed in rooms	39.04	-	-	-	-	-	-	60.96
Air-conditioners installed outside of the building	10.58	-	-	-	-	-	-	89.42
Electric-only cooker with oven	55.69	7.61	2.02	0.21	0.63	-	0.19	33.66
Separate electric oven	41.85	2.45	1.36	0.27	1.21	0.53	-	52.33
Combined gas-electric cooker	52.11	7.97	1.50	0.73	0.82	0.12	0.14	36.60
Incandescent bulbs	2.15	0.80	0.37	0.20	58.10	13.61	-	24.78
Compact fluorescent lamps	76.44	2.75	0.70	0.14	0.84	0.45	-	18.68
Other lamps (incl. halogen, diode, fluorescent tubes)	40.11	2.70	2.46	0.89	1.69	0.64	0.34	51.18
Lamps located outside the building	8.07	1.17	1.07	0.44	41.58	3.02	0.29	44.37
Refrigerator (1-door)	31.74	7.35	2.47	1.76	1.61	0.09	0.25	54.71
Combined fridge-freezer (2-door)	63.82	7.63	1.10	0.49	0.51	0.04	0.15	26.26
Freezer	36.98	7.27	1.59	0.92	0.88	0.07	0.36	51.94
Automatic washing machine without dryer	61.89	5.68	1.16	0.41	0.60	0.07	0.18	30.01
Combined washer-dryer	58.81	12.31	2.25	-	-	-	-	26.63
Clothes dryer	36.04	8.00	-	-	3.09	-	-	52.87
Dishwasher	79.26	3.54	0.75	-	0.71	0.13	-	15.61

Table 18. Presence of measurement and regulation equipment

A. Devices in households

Devices	Households		
	equipped with a device	not equipped with a device but consuming a energy commodity	not equipped with a device and not consuming a energy commodity
	in %		
Electricity meter	98.30	1.70	0.00
Gas meter	48.34	6.30	45.37
Heat meter	3.46	36.70	59.84
Heat cost allocators on radiators	16.12	24.04	59.84
Thermostatic valves on radiators	37.13	X	X
Thermostat centrally regulating the temperature in dwelling	5.76	X	X
Thermostats regulating the temperature in individual rooms	2.19	X	X
Cold water meter(s)	85.47	13.67	0.86 [1)]
Hot water meter(s)	21.98	2.21	75.81

[1)] The lack of cold running water in the dwelling.

B. Dwellings using district heat by the methods of payments calculation

Specification	Measurement of the actual consumption (heat meter)	Approximate measurement (heat cost allocators)	Other method of calculation (in general the dwelling area)
	in %		
Dwellings using district heat	8.62	40.15	51.23

Table 19. Households from which an information was acquired on consumption quantities and values of energy commodities

Energy commodities	Households			
	using a commodity	from which information on the commodity consumption quantity was obtained	from which information on the commodity consumption value was obtained	from which both information were obtained: on quantity and value
	in %			
Electricity	100.00	55.36	87.18	55.26
of which from own production	X	X	X	X
of which produced from renewable sources	X	X	X	X
District heat	40.16	1.80	27.42	1.80
Hot water from district heating installation	24.19	10.56	17.89	10.52
High-methane natural gas	51.80	21.83	42.67	21.73
Nitrified natural gas	2.83	1.79	2.54	1.79
LPG for household purposes	38.44	34.40	35.80	34.35
Heating oil	0.55	0.40	0.47	0.40
Hard coal	42.81	38.78	38.91	38.52
Lignite	1.21	0.83	1.03	0.79
Coke	0.79	0.56	0.59	0.56
Fuel wood [1]	42.74	34.56	35.36	34.02
Other types of biomass (measured in m^3) [1]	6.32 [2]	1.33	1.61	1.21
Other types of biomass (measured in kg) [1]	X	0.43	0.44	0.40

[1] Values equal to 0 are treated as correct because some households obtained wood and other types of biomass free of charge.

[2] The number provided relates also to other type of biomass measured in kg.

Table 20. Characteristics of quantities of consumed energy commodities

Energy commodities	Unit of measure	Arithmetic average	First decile	First quartile	Median	Third quartile	Ninth decile
Electricity	kWh	2303	956	1368	2039	2886	4080
of which from own production	kWh	X	X	X	X	X	X
of which produced from renewable sources	kWh	X	X	X	X	X	X
District heat	GJ	37	13	18	35	51	60
Hot water from district heating installation	m^3	43	14	24	36	53	72
High-methane natural gas	m^3	542	85	156	307	667	1458
Nitrified natural gas	m^3	495	91	144	269	605	1359
LPG for household purposes	kg	107	44	66	110	132	143
Heating oil	l	1710	300	660	1607	2500	3000
Hard coal	kg	3039	1000	2000	3000	4000	5500
Lignite	kg	3073	1000	1500	2000	3750	5000
Coke	kg	1734	300	1000	2000	2400	3000
Fuel wood	m^3	7	2	3	5	10	15
Other types of biomass (measured in m^3)	m^3	7	1	2	4	10	15
Other types of biomass (measured in kg)	kg	1235	20	20	200	500	2000

Table 21. Characteristics of values of consumed energy commodities

Energy commodities	Arithmetic average	First decile	First quartile	Median	Third quartile	Ninth decile
	in zl					
Electricity	1245	520	755	1105	1560	2160
of which from own production	X	X	X	X	X	X
of which produced from renewable sources	X	X	X	X	X	X
District heat	1434	676	989	1391	1796	2280
Hot water from district heating installation	663	224	340	558	825	1200
High-methane natural gas	1000	209	312	596	1185	2500
Nitrified natural gas	872	216	301	483	1030	2140
LPG for household purposes	414	186	258	405	504	574
Heating oil	4378	690	1975	4500	5795	7200
Hard coal	1894	650	1125	1800	2600	3400
Lignite	742	192	350	520	900	1200
Coke	1530	250	800	1550	1950	3000
Fuel wood [1)]	554	0	200	400	750	1300
Other types of biomass (measured in m^3) [1)]	251	0	0	130	360	800
Other types of biomass (measured in kg) [1)]	156	0	0	0	190	350

[1)] Values equal to 0 are treated as correct because some households obtained wood and other types of biomass free of charge.

Table 22. Characteristics of prices of consumed energy commodities

Energy commodities	Unit of measure	Arithmetic average	First decile	First quartile	Median	Third quartile	Ninth decile
Electricity	zl/kWh	0.53	0.48	0.50	0.52	0.56	0.60
of which from own production	zl/kWh	X	X	X	X	X	X
of which produced from renewable sources	zl/kWh	X	X	X	X	X	X
District heat	zl/GJ	39	24	29	40	44	53
Hot water from district heating installation	zl/m^3	15	10	12	14	18	20
High-methane natural gas	zl/m^3	2.37	1.56	1.95	2.26	2.70	3.13
Nitrified natural gas	zl/m^3	1.94	1.23	1.60	1.89	2.26	2.77
LPG for household purposes	zl/kg	3.82	3.45	3.64	3.82	4.09	4.36
Heating oil	zl/l	2.61	2.40	2.50	2.60	2.75	2.80
Hard coal	zl/kg	0.64	0.51	0.58	0.65	0.70	0.75
Lignite	zl/kg	0.22	0.19	0.20	0.20	0.25	0.30
Coke	zl/kg	0.82	0.50	0.75	0.82	1.00	1.00
Fuel wood [1)]	zl/m^3	81	0	60	90	120	150
Other types of biomass (measured in m^3) [1)]	zl/m^3	29	0	0	20	50	90
Other types of biomass (measured in kg) [1)]	zl/kg	0.14	0.00	0.00	0.00	0.26	0.44

[1)] Values equal to 0 are treated as correct because some households obtained wood and other types of biomass free of charge.

Table 23. Average quantities, values and prices of consumed energy commodities

Energy commodities	Unit of measure of quantity	Average		
		quantity	value	price
		in unit of measure of quantity	in zl	in zl/unit of measure of quantity
Electricity	kWh	2303	1245	0.53
of which from own production	kWh	X	X	X
of which produced from renewable sources	kWh	X	X	X
District heat	GJ	37	1434	39
Hot water from district heating installation	m^3	43	663	15
High-methane natural gas	m^3	542	1000	2.37
Nitrified natural gas	m^3	495	872	1.94
LPG for household purposes	kg	107	414	3.82
Heating oil	l	1710	4378	2.61
Hard coal	kg	3039	1894	0.64
Lignite	kg	3073	742	0.22
Coke	kg	1734	1530	0.82
Fuel wood	m^3	7	554	81
Other types of biomass (measured in m^3)	m^3	7	251	29
Other types of biomass (measured in kg)	kg	1235	156	0.14

Table 24. Households in the pre-defined intervals of annual consumption of energy commodities

Specification	Unit of measure	Households						
Electricity								
Consumption intervals	kWh	up to 1000	1001-1500	1501-2000	2001-3000	3001-5000	over 5000	no information
Shares of households.....	%	7.19	10.38	10.43	15.58	9.35	2.43	44.64
Heat								
Consumption intervals	GJ	up to 20	21-30	31-40	41-60	61-100	over 100	no information
Shares of households.....	%	1.50	0.62	0.49	1.47	0.21	0.18	95.52
Hot water								
Consumption intervals	m^3	up to 20	21-30	31-40	41-60	61-100	over 100	no information
Shares of households.....	%	9.61	8.67	7.34	10.40	5.48	2.16	56.34
High-methane natural gas								
Consumption intervals	m^3	up to 100	101-200	201-300	301-600	601-1200	over 1200	no information
Shares of households.....	%	5.81	9.58	6.46	9.19	6.12	4.98	57.86
Nitrified natural gas								
Consumption intervals	m^3	up to 133	134-266	267-400	401-800	801-1600	over 1600	no information
Shares of households.....	%	16.41	15.82	8.16	11.46	7.65	3.63	36.87
LPG								
Consumption intervals	kg	up to 50	51-75	76-100	101-150	151-200	over 200	no information
Shares of households.....	%	10.88	20.92	12.75	37.03	5.11	2.80	10.52
Hard coal								
Consumption intervals	kg	up to 1000	1001-1500	1501-2000	2001-3000	3001-5000	over 5000	no information
Shares of households.....	%	15.54	6.17	15.99	20.13	23.76	9.00	9.42

Table 25. Characteristics of quantities of energy commodities consumed per unit of floor area and per unit of cubic volume of dwellings

Energy commodity Households group	Unit of measure	Arithmetic average	First decile	First quartile	Median	Third quartile	Ninth decile
consumption per floor area unit of the dwelling							
Electricity							
All households	kWh/m^2	29.82	14.43	20.06	29.21	42.00	57.50
	GJ/m^2	0.11	0.05	0.07	0.11	0.15	0.21
Households not using electricity for space heating	kWh/m^2	29.23	14.40	19.89	28.97	41.07	55.01
	GJ/m^2	0.11	0.05	0.07	0.10	0.15	0.20
Households not using electricity for space heating and water heating	kWh/m^2	28.18	13.95	19.60	28.27	39.58	53.09
	GJ/m^2	0.10	0.05	0.07	0.10	0.14	0.19
Households using only electricity for space heating	kWh/m^2	72.03	31.25	43.80	61.35	111.39	134.26
	GJ/m^2	0.26	0.11	0.16	0.22	0.40	0.48
District heat							
All households using district heat for space heating	GJ/m^2	0.72	0.27	0.41	0.72	1.00	1.14
Households using district heat for space heating but not using hot water from district heating installation	GJ/m^2	1.02	0.52	0.82	1.00	1.05	1.11
High-methane natural gas							
Households using gas for space heating	m^3/m^2	14.03	5.40	8.89	13.66	20.50	29.90
	GJ/m^2	0.51	0.19	0.32	0.49	0.74	1.08
Households using gas only for water heating and cooking	m^3/m^2	5.81	2.26	3.42	5.25	8.13	12.88
	GJ/m^2	0.21	0.08	0.12	0.19	0.29	0.46
Households using gas only for cooking	m^3/m^2	2.97	1.13	1.62	2.50	3.93	5.93
	GJ/m^2	0.11	0.04	0.06	0.09	0.14	0.21
LPG							
Households using LPG for space heating	kg/m^2	6.25	0.25	1.22	3.30	6.65	14.36
	GJ/m^2	0.29	0.01	0.06	0.15	0.31	0.67
Households using LPG only for cooking	kg/m^2	1.19	0.55	0.83	1.26	1.78	2.48
	GJ/m^2	0.06	0.03	0.04	0.06	0.08	0.12
Heating oil							
Households using heating oil for space heating	l/m^2	16.46	4.00	7.66	16.23	21.36	36.00
	GJ/m^2	0.59	0.14	0.28	0.58	0.77	1.30
Hard coal							
Households using hard coal for space heating	kg/m^2	32.78	13.51	20.83	33.33	48.58	62.50
	GJ/m^2	0.85	0.35	0.54	0.87	1.26	1.63

Table 25. Characteristics of quantities of energy commodities consumed per unit of floor area and per unit of cubic volume of dwellings (cont.)

Energy commodity Households group	Unit of measure	Arithmetic average	First decile	First quartile	Median	Third quartile	Ninth decile
consumption per cubic volume unit of the dwelling							
Electricity							
All households	kWh/m^3	13.22	5.60	7.80	11.42	16.41	22.60
	GJ/m^3	0.05	0.02	0.03	0.04	0.06	0.08
Households not using electricity for space heating	kWh/m^3	12.92	5.61	7.79	11.30	16.25	21.78
	GJ/m^3	0.05	0.02	0.03	0.04	0.06	0.08
Households not using electricity for space heating and water heating	kWh/m^3	12.50	5.43	7.69	11.00	15.75	20.83
	GJ/m^3	0.05	0.02	0.03	0.04	0.06	0.07
Households using only electricity for space heating	kWh/m^3	29.52	10.88	15.72	24.10	39.22	55.06
	GJ/m^3	0.11	0.04	0.06	0.09	0.14	0.20
District heat							
All households using district heat for space heating	GJ/m^3	0.30	0.10	0.16	0.29	0.37	0.45
Households using district heat for space heating but not using hot water from district heating installation	GJ/m^3	0.40	0.24	0.30	0.42	0.42	0.45
High-methane natural gas							
Households using gas for space heating	m^3/m^3	5.95	2.08	3.36	5.14	7.59	11.54
	GJ/m^3	0.21	0.07	0.12	0.18	0.27	0.42
Households using gas only for water heating and cooking	m^3/m^3	2.61	0.88	1.34	2.09	3.17	5.09
	GJ/m^3	0.09	0.03	0.05	0.08	0.11	0.18
Households using gas only for cooking	m^3/m^3	1.29	0.42	0.63	1.01	1.54	2.31
	GJ/m^3	0.05	0.02	0.02	0.04	0.06	0.08
LPG							
Households using LPG for space heating	kg/m^3	2.26	0.08	0.43	1.25	2.54	5.74
	GJ/m^3	0.11	0.00	0.02	0.06	0.12	0.27
Households using LPG only for cooking	kg/m^3	0.57	0.21	0.33	0.49	0.70	0.98
	GJ/m^3	0.03	0.01	0.02	0.02	0.03	0.05
Heating oil							
Households using heating oil for space heating	l/m^3	6.67	1.00	2.84	5.72	7.67	13.09
	GJ/m^3	0.24	0.04	0.10	0.21	0.28	0.47
Hard coal							
Households using hard coal for space heating	kg/m^3	14.13	5.24	8.33	12.82	18.52	24.69
	GJ/m^3	0.37	0.14	0.22	0.33	0.48	0.64

Table 26. Characteristics of values of energy commodities consumed per unit of floor area and per unit of cubic volume of dwellings

Energy commodity Households group	Arithmetic average	First decile	First quartile	Median	Third quartile	Ninth decile
			consumption per floor area unit of the dwelling in zl/m^2			
Electricity						
All households	16.27	7.85	11.14	16.00	22.80	31.25
Households not using electricity for space heating	15.89	7.81	11.08	15.75	22.39	30.16
Households not using electricity for space heating and water heating	15.46	7.69	10.83	15.25	21.55	28.89
Households using only electricity for space heating	41.86	16.33	26.77	39.65	60.81	83.08
District heat						
All households using district heat for space heating	28.50	14.98	21.07	28.65	34.92	42.59
Households using district heat for space heating but not using hot water from district heating installation	31.94	17.72	24.88	31.20	37.93	45.69
High-methane natural gas						
Households using gas for space heating	26.83	11.04	18.33	26.70	38.89	50.77
Households using gas only for water heating and cooking	12.87	5.66	8.35	12.50	19.31	26.67
Households using gas only for cooking	6.58	2.78	4.07	5.84	8.37	12.73
LPG						
Households using LPG for space heating	23.05	0.91	5.64	26.25	35.71	52.12
Households using LPG only for cooking	4.57	2.13	3.18	4.80	6.84	9.51
Heating oil						
Households using heating oil for space heating	42.74	10.40	18.75	40.91	59.23	99.00
Hard coal						
Households using hard coal for space heating	20.46	8.57	13.89	20.67	30.00	39.43

Table 26. Characteristics of values of energy commodities consumed per unit of floor area and per unit of cubic volume of dwellings (cont.)

Energy commodity Households group	Arithmetic average	First decile	First quartile	Median	Third quartile	Ninth decile
			consumption per cubic volume unit of the dwelling in zl/m^3			
Electricity						
All households	6.31	3.05	4.32	6.20	8.96	12.34
Households not using electricity for space heating	6.18	3.04	4.29	6.15	8.81	11.92
Households not using electricity for space heating and water heating	6.03	3.00	4.19	6.00	8.56	11.45
Households using only electricity for space heating	14.83	6.14	9.41	14.68	21.47	26.80
District heat						
All households using district heat for space heating	11.20	5.93	8.32	11.28	13.89	17.04
Households using district heat for space heating but not using hot water from district heating installation	12.42	7.16	9.49	12.32	14.55	17.74
High-methane natural gas						
Households using gas for space heating	10.14	4.17	6.84	10.16	14.78	19.48
Households using gas only for water heating and cooking	4.98	2.17	3.23	4.85	7.57	10.12
Households using gas only for cooking	2.56	1.08	1.59	2.28	3.33	4.89
LPG						
Households using LPG for space heating	8.49	0.36	1.76	9.38	14.01	20.72
Households using LPG only for cooking	1.79	0.82	1.24	1.87	2.70	3.72
Heating oil						
Households using heating oil for space heating	16.29	3.94	7.28	15.15	21.55	36.00
Hard coal						
Households using hard coal for space heating	7.95	3.25	5.36	8.00	11.52	15.38

Table 27. Characteristics of quantities of energy commodities consumed per 1 inhabitant

Energy commodity Households group	Unit of measure	Arithmetic average	First decile	First quartile	Median	Third quartile	Ninth decile
Electricity							
All households	kWh/person	801.01	390.00	541.45	772.58	1123.69	1640.00
	GJ/person	2.88	1.40	1.95	2.78	4.05	5.90
Households not using electricity for space heating	kWh/person	784.81	387.33	540.00	762.80	1100.00	1600.00
	GJ/person	2.83	1.39	1.94	2.75	3.96	5.76
Households not using electricity for space heating and water heating ...	kWh/person	726.14	375.50	515.75	715.50	1013.75	1442.00
	GJ/person	2.61	1.35	1.86	2.58	3.65	5.19
Households using only electricity for space heating..... ...	kWh/person	1744.20	625.00	1153.25	1872.75	3000.00	3447.00
	GJ/person	6.28	2.25	4.15	6.74	10.80	12.41
District heat							
All households using district heat for space heating..... ...	GJ/person	14.54	4.75	8.83	15.00	22.00	29.00
Households using district heat for space heating but not using hot water from district heating installation	GJ/person	21.65	13.67	16.00	21.00	33.00	45.00
High-methane natural gas							
Households using gas for space heating	m^3/person	525.70	171.00	283.32	475.00	937.06	1332.50
	GJ/person	18.93	6.16	10.20	17.10	33.73	47.97
Households using gas for water heating and cooking..... ...	m^3/person	145.09	67.50	95.00	129.50	184.00	304.50
	GJ/person	5.22	2.43	3.42	4.66	6.62	10.96
Households using gas only for cooking	m^3/person	72.43	24.29	35.83	63.00	107.50	200.00
	GJ/person	2.61	0.87	1.29	2.27	3.87	7.20
LPG							
Households using LPG for space heating	kg/person	354.34	6.60	40.50	139.38	854.13	975.00
	GJ/person	16.65	0.31	1.90	6.55	40.14	45.83
Households using LPG only for cooking	kg/person	31.48	16.50	22.00	33.00	44.00	66.00
	GJ/person	1.48	0.78	1.03	1.55	2.07	3.10
Heating oil							
Households using heating oil for space heating	l/person	593.46	100.00	359.03	680.00	788.73	1000.00
	GJ/person	21.36	3.60	12.93	24.48	28.39	36.00
Hard coal							
Households using hard coal for space heating	kg/person	942.52	333.33	500.00	1000.00	1500.00	2333.33
	GJ/person	24.51	8.67	13.00	26.00	39.00	60.67

Table 28. Characteristics of values of energy commodities consumed per 1 inhabitant

Energy commodity Households group	Arithmetic average	First decile	First quartile	Median	Third quartile	Ninth decile
	in zl/person					
Electricity						
All households	435	216	300	420	600	882
Households not using electricity for space heating	423	216	299	414	600	842
Households not using electricity for space heating and water heating	399	206	284	390	555	781
Households using only electricity for space heating	1024	405	692	997	1482	2008
District heat						
All households using district heat for space heating	595	277	396	617	915	1376
Households using district heat for space heating but not using hot water from district heating installation	633	290	420	672	992	1445
High-methane natural gas						
Households using gas for space heating	1032	348	587	991	1591	2523
Households using gas only for water heating and cooking	317	155	225	300	435	609
Households using gas only for cooking	157	66	88	140	228	368
LPG						
Households using LPG for space heating	1342	95	188	1667	2606	3838
Households using LPG only for cooking	120	63	87	126	180	252
Heating oil						
Households using heating oil for space heating	1536	417	975	1625	2175	3500
Hard coal						
Households using hard coal for space heating	588	210	345	600	938	1420

Table 29. Households using wood and other biomass by types of fuels and sources of origin

Fuels	Total	Fully purchased	Fully free-of-charge	Partly purchased, partly free-of-charge
	in %			
Fuel wood from national forests	15.38	13.72	0.36	1.29
Fuel wood from private forests	11.09	3.74	5.85	1.50
Fuel wood from in-field and near-house trees	6.70	1.18	5.08	0.43
Fuel wood purchased from trading intermediaries	13.69	13.69	X	X
Formed wood (briquettes, pellets)	1.01	0.57	0.35	0.09
Wood waste from industrial plants (e.g. sawdust)	2.37	1.48	0.65	0.23
Wood waste from processed wood (e.g. old furniture, packages)	3.25	0.55	2.54	0.15
Plants from energy plantations	0.05	0.02	0.03	0.00
Straw	0.05	0.00	0.05	0.00
Other waste fuels of agricultural or forest origin	0.29	0.03	0.26	0.00

Table 30. Solar collectors in households

A. Households by the use of solar collectors

Specification	Using	Not using
	in %	
Shares of households.....	0.31	99.69

B. Households using solar collectors by types of collectors

Specification	Glazed flat plate	Evacuated tube	Unglazed flat plate	Air	No information
	in %				
Shares of households.....	45.25	30.95	4.70	0.00	19.11

C. Characteristics of the surface area of solar collectors

Specification	Arithmetic average	First decile	First quartile	Median	Third quartile	Ninth decile
	in m^2					
Surface area of solar collectors.....	5.7	4.0	4.0	5.0	6.0	10.0

Table 31. Heat pumps in households

Specification	Using heat pumps	Not using heat pumps
	in %	
Shares of households.....	0.03	99.97

Table 32. Use of passenger cars in households and technical characteristics of cars

A. Passenger cars in households

Cars	Households using cars	The average number of cars			
		in a household using cars	per one household	per person in a household using cars	per person in a household
	in %	in pcs			
Passenger cars	**57.80**	**1.20**	**0.69**	**0.35**	**0.24**
of which:					
gasoline powered without LPG installation	33.87	0.64	0.37	0.19	0.13
gasoline powered with LPG installation.....	13.36	0.25	0.14	0.07	0.05
Diesel oil powered	16.35	0.31	0.18	0.09	0.06
natural gas powered	0.00	0.00	0.00	0.00	0.00

B. Technical characteristics of cars

Cars	Average annual distance driven	Average age of a car	Average capacity of engine
	in km	in years	in cm^3
Passenger cars	**13076**	**11.0**	**1567**
of which:			
gasoline powered without LPG installation	11811	10.7	1402
gasoline powered with LPG installation.....	13897	12.8	1604
Diesel oil powered	14971	10.0	1870
natural gas powered	-	-	-

Table 33. Passenger cars in households – number of cars and consumption of fuels

A. Households by the use of passenger cars and the number of cars

Specification	Households using			Not using cars
	3 cars	2 cars	1 car	
	in %			
Shares of households	1.16	9.08	47.56	42.20

B. Passenger cars by type of fuel used

Specification	Gasoline	Gasoline + LPG	Diesel oil	Natural gas
	in %			
Shares of cars	53.26	20.49	26.25	0.00

C. Characteristics of fuel consumption by passenger cars

Fuel	Arithmetic average	First decile	First quartile	Median	Third quartile	Ninth decile
	in l/100 km					
Fuels	**7.62**	**6.00**	**6.00**	**7.00**	**8.00**	**10.00**
Gasoline [1)]	7.31	6.00	6.00	7.00	8.00	9.00
LPG	9.80	7.00	8.00	10.00	11.00	12.00
Diesel oil	6.73	5.00	6.00	6.00	7.00	8.00

[1)] The data do not include cars with LPG installation.

D. Difference between the consumption of LPG and gasoline by passenger cars with an LPG installation

Specification	Arithmetic average	First decile	First quartile	Median	Third quartile	Ninth decile
	in l/100 km					
Difference between the consumption of LPG and gasoline	1.72	0.00	1.00	2.00	3.00	4.00

Table 34. Passenger cars in households – annual distances, age of cars and engine capacities

A. Characteristics of the annual distance driven

Cars	Arithmetic average	First decile	First quartile	Median	Third quartile	Ninth decile
	in km					
Passenger cars	**13076**	**3000**	**6000**	**10000**	**15000**	**25000**
of which:						
gasoline powered without LPG installation	11811	3000	5000	10000	15000	20000
gasoline powered with LPG installation	13897	4000	7000	11000	18000	30000
Diesel oil powered	14971	4000	8000	12000	20000	30000

B. Characteristics of the age of cars

Cars	Arithmetic average	First decile	First quartile	Median	Third quartile	Ninth decile
	in years					
Passenger cars	**11.0**	**5.0**	**8.0**	**11.0**	**15.0**	**18.0**
of which:						
gasoline powered without LPG installation	10.7	4.0	8.0	11.0	14.0	17.0
gasoline powered with LPG installation	12.8	7.0	10.0	13.0	16.0	18.0
Diesel oil powered	10.0	4.0	6.0	10.0	13.0	17.0

C. Characteristics of the engine capacities of cars

Cars	Arithmetic average	First decile	First quartile	Median	Third quartile	Ninth decile
	in cm^3					
Passenger cars	**1567**	**1004**	**1300**	**1600**	**1800**	**2000**
of which:						
gasoline powered without LPG installation	1402	900	1200	1400	1600	1800
gasoline powered with LPG installation	1604	1200	1400	1600	1800	2000
Diesel oil powered	1870	1500	1700	1900	2000	2200

Table 35. Average annual consumption of motor fuels and expenditures of households for motor fuels

Fuels	Average unit fuel consumption	Average annual distance driven	Average annual fuel consumption by 1 car	Average price of fuel in 2009 [1)]	Average annual expenditures on fuel for 1 car	Average annual expenditures on fuel for a household using a car/cars
	in l/100 km	in km	in l	in zl/l	in zl	
Total motor fuels	**7.62**	**13076**	**996**	**3.35**	**3336**	**4003**
Gasoline	7.31	11811	864	4.15	3584	x
LPG	9.80	13897	1362	1.84	2507	x
Diesel oil	6.73	14971	1008	3.64	3669	x

[1)] Source: Energy Prices and Taxes; for gasoline the weighted average including types 95 and 98.

Table 36. Estimation of total energy consumption in households

Energy commodities	Number of households using energy commodity	Households using energy commodity	Unit of measure of the quantity of consumption in a household	Average annual consumption in a household			Unit of measure of the quantity of national consumption	National consumption in households		
				quantity		value		quantity		value
		in %		in unit of measure	in GJ	in zl		in unit of measure	in TJ	in mln zl
Total energy commodities [1)]					**93**	**3630**			**1243362**	**48284**
Electricity	13302400	100.00	kWh	2303	8	1245	GWh	30634	110283	16561
District heat	5342452	40.16	GJ	37	37	1434	TJ	195791	195791	7661
Hot water from district heating installation	3218212	24.19	m^3	43	7	663	mln m^3	138	23195	2132
High-methane natural gas	6890701	51.80	m^3	542	19	1000	mln m^3	3737	133398	6888
Nitrified natural gas	377043	2.83	m^3	495	13	872	mln m^3	187	4853	329
LPG for household purposes	5113548	38.44	kg	107	5	414	thous. t	549	25974	2115
Heating oil	72698	0.55	l	1710	61	4378	thous. t	104	4464	318
Hard coal	5695214	42.81	kg	3039	79	1894	thous. t	17306	449947	10787
Lignite	160476	1.21	kg	3073	31	742	thous. t	493	4932	119
Coke	105698	0.79	kg	1734	49	1530	thous. t	183	5132	162
Fuel wood	5685384	42.74	m^3	7	48	554	thous. m^3	39001	273006	3151
Other types of biomass	635875	4.78	m^3	7	51	251	thous. m^3	4649	32540	160
Other types of biomass	205162	1.54	kg	1235	15	156	thous. t	253	3041	32
Total motor fuels	**7688554**				**38**	**4053**			**295357**	**31161**
Gasoline	4505522	33.87	l	940	31	3900	thous. t	3167	141848	17571
LPG	1776585	13.36	l	1446	37	2661	thous. t	1387	65616	4727
Diesel oil	2174564	16.35	l	1120	40	4076	thous. t	2028	87893	8864

[1)] Excluding hot water from district heating installation.

Table 37. Energy consumption in households and the share of households in the total national energy consumption in Poland and in the EU countries

Country	Gross inland energy consumption	Energy consumption in households		Households in national energy consumption
	in TJ	in TJ	in GJ/ 1 inhabitant	in %
UE-27	**71317026**	**12323447**	**25**	**17**
UE-15	60353454	10303387	32	17
Austria	1359878	262314	31	19
Belgium	2432924	347484	32	14
Bulgaria	735629	88601	12	12
Czech Republic	1772730	251933	24	14
Cyprus	117415	12982	16	11
Denmark	825196	185617	34	22
Estonia	221609	40454	30	18
Finland	1437715	221801	42	15
France	10883884	1795743	28	16
Greece	1285120	202971	18	16
Spain	5457280	665043	15	12
Ireland	624553	130174	29	21
Lithuania	357012	65564	20	18
Luxembourg	182860	21582	44	12
Latvia	181235	64252	28	35
Malta	37704	2834	7	8
Netherlands	3416860	426647	26	12
Germany	13667994	2753969	34	20
Poland	**3990841**	**786112**	**21**	**20**
Portugal	1043720	134145	13	13
Romania	1486573	335580	16	23
Slovakia	703688	89909	17	13
Slovenia	297615	50671	25	17
Sweden	1914647	290956	31	15
Hungary	1061523	231168	23	22
United Kingdom	8704007	1664298	27	19
Italy	7116815	1200643	20	17

Source: Eurostat

Table 38. Energy consumption in households by commodities in Poland and in the EU countries and the share of countries in the EU-27 energy consumption

Country	Population		Total energy		Electricity		District heat		Natural gas		LPG		Heating oil		Hard coal	
	in thous.	in %	in TJ	in %	in TJ	in %	in TJ	in %	in TJ	in %	in TJ	in %	in TJ	in %	in TJ	in %
UE-27	**499686.6**	**100**	**12323447**	**100**	**2957382**	**100**	**846362**	**100**	**4838319**	**100**	**284791**	**100**	**1341608**	**100**	**320796**	**100**
UE-15	323220.3	65	10303387	84	2628900	89	460059	54	4324597	89	240294	84	1318096	98	74472	23
Austria	8355.3	2	262314	2	63803	2	26827	3	51072	1	1794	1	48749	4	56	0
Belgium	10753.1	2	347484	3	72756	2	524	0	138698	3	2944	1	109056	8	10000	3
Bulgaria	7606.6	2	88601	1	37087	1	15115	2	2127	0	1012	0	85	0	3924	1
Cyprus	796.9	0	12982	0	6199	0	-	-	-	-	-	-	3536	0	-	-
Czech Republic	10467.5	2	251933	2	52873	2	46657	6	86217	2	263	0	-	-	1882	1
Denmark	5511.5	1	185617	2	36346	1	65606	8	26436	1	690	0	17294	1	-	-
Estonia	1340.4	0	40454	0	6782	0	13842	2	2121	0	137	0	212	0	-	-
Finland	5326.3	1	221801	2	79369	3	64767	8	1796	0	508	0	20624	2	-	-
France	64350.2	13	1795743	15	546239	18	-	-	594290	12	52900	19	271405	20	12480	4
Greece	11260.4	2	202971	2	65272	2	2050	0	10715	0	1702	1	90056	7	52	0
Spain	45828.2	9	665043	5	271238	9	-	-	153475	3	57730	20	75743	6	8045	3
Ireland	4450.0	1	130174	1	29178	1	-	-	26102	1	2254	1	8350	1	10035	3
Lithuania	3349.9	1	65564	1	9810	0	21656	3	6075	0	1532	1	129	0	1608	1
Luxembourg	493.5	0	21582	0	3254	0	-	-	8224	0	92	0	9304	1	-	-
Latvia	2261.3	0	64252	1	7200	0	16242	2	4304	0	911	0	850	0	813	0
Malta	413.6	0	2834	0	2052	0	-	-	-	-	782	0	-	-	-	-
Netherlands	16485.8	3	426647	3	86962	3	11125	1	312415	6	994	0	1025	0	205	0
Germany	82002.4	16	2753969	22	501120	17	176441	21	1206000	25	24719	9	560459	42	16621	5
Poland	**38135.9**	**8**	**786112**	**6**	**99122**	**3**	**177500**	**21**	**134857**	**3**	**20240**	**7**	**7881**	**1**	**233649**	**73**
Portugal	10627.3	2	134145	1	51084	2	209	0	11060	0	21804	8	383	0	-	-
Romania	21498.6	4	335580	3	39676	1	49496	6	89883	2	12854	5	-	-	-	-
Slovakia	5412.3	1	89909	1	15941	1	19192	2	50488	1	736	0	-	-	294	0
Slovenia	2032.4	0	50671	0	11293	0	4022	0	4441	0	1566	1	10820	1	-	-
Sweden	9256.3	2	290956	2	147406	5	108172	13	2767	0	-	-	3195	0	-	-
Hungary	10031.0	2	231168	2	40446	1	22581	3	133209	3	4465	2	-	-	4154	1
United Kingdom	61595.1	12	1664298	14	426748	14	2174	0	1077297	22	14295	5	5581	0	16820	5
Italy	60045.1	12	1200643	10	248126	8	2164	0	704249	15	57868	20	96872	7	160	0

Table 38. Energy consumption in households by commodities in Poland and in the EU countries and the share of countries in the EU-27 energy consumption (cont.)

Country	Lignite		Coke		Fuel wood		Other types of biomass[1)]		Solar energy		Geothermal energy		Other liquid fuels		Other solid fuels		Renewable energy[2)]	
	in TJ	in %	in TJ	in %	in TJ	in %	in TJ	in %	in TJ	in %	in TJ	in %	in TJ	in %	in TJ	in %	in TJ	in %
EU-27	**24082**	**100**	**10403**	**100**	**1388141**	**100**	**12544**	**100**	**43626**	**100**	**20937**	**100**	**180667**	**100**	**51862**	**100**	**1465248**	**100**
EU-15	632	3	3164	30	953178	69	12304	98	40997	94	19753	94	179066	99	46017	89	1026232	70
Austria	37	0	1140	11	62972	5	224	2	3399	8	-	-	1412	1	828	2	66595	5
Belgium	-	-	257	2	9224	1	237	2	396	1	-	-	3096	2	296	1	9857	1
Bulgaria	885	4	-	-	27345	2	-	-	-	-	-	-	-	-	1021	2	27345	2
Cyprus	-	-	-	-	174	0	180	1	2061	5	15	0	817	0	-	-	2430	0
Czech Republic	15245	63	1140	11	43489	3	-	-	206	0	-	-	-	-	3960	8	43695	3
Denmark	-	-	-	-	37219	3	41	0	415	1	-	-	1146	1	20	0	37675	3
Estonia	-	-	-	-	17219	1	-	-	-	-	-	-	1	0	140	0	17219	1
Finland	-	-	-	-	52900	4	1060	8	35	0	-	-	272	0	469	1	53995	4
France	-	-	-	-	292448	21	-	-	1617	4	2207	11	20576	11	1582	3	296272	20
Greece	100	0	-	-	22611	2	2108	17	7480	17	524	3	301	0	-	-	32723	2
Spain	-	-	-	-	86785	6	-	-	5224	12	318	2	5576	3	-	-	92327	6
Ireland	496	2	-	-	1176	0	-	-	179	0	-	-	40681	23	11723	23	1355	0
Lithuania	-	-	-	-	24457	2	-	-	-	-	-	-	-	-	298	1	24457	2
Luxembourg	-	-	-	-	633	0	-	-	29	0	-	-	25	0	20	0	662	0
Latvia	-	-	-	-	33607	2	60	0	-	-	-	-	266	0	-	-	33667	2
Malta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
Netherlands	-	-	-	-	12232	1	270	2	818	2	-	-	601	0	-	-	13320	1
Germany	-	-	1482	14	208880	15	-	-	16474	38	16704	80	1874	1	23195	45	242058	17
Poland	**3905**	**16**	**5928**	**57**	**102500**	**7**	**-**	**-**	**-**	**-**	**460**	**2**	**-**	**-**	**-**	**-**	**102960**	**7**
Portugal	-	-	-	-	48600	4	-	-	961	2	-	-	44	0	-	-	49561	3
Romania	580	2	-	-	142124	10	-	-	-	-	450	2	516	0	-	-	142574	10
Slovakia	1448	6	171	2	1619	0	-	-	-	-	-	-	-	-	20	0	1619	0
Slovenia	-	-	-	-	18091	1	-	-	179	0	259	1	-	-	-	-	18529	1
Sweden	-	-	-	-	25873	2	2757	22	414	1	-	-	-	-	-	-	29044	2
Hungary	1386	6	-	-	24338	2	-	-	183	0	-	-	-	-	406	1	24521	2
United Kingdom	-	-	285	3	13194	1	297	2	-	-	-	-	99555	55	7882	15	13491	1
Italy	-	-	-	-	78431	6	5310	42	3556	8	-	-	3907	2	-	-	87297	6

[1)] This group of energy commodities includes charcoal. [2)] Renewable energy includes fuel wood, other types of biomass, solar energy and geothermal energy. Source: Eurostat

Table 39. Commodity structure of energy consumption in households per 1 inhabitant in Poland and in the EU countries

Country	Total energy	Electricity		District heat		Natural gas		LPG		Heating oil		Hard coal		Lignite	
	in GJ	in GJ	in %	in GJ	in %	in GJ	in %	in GJ	in %	in GJ	in %	in GJ	in %	in GJ	in %
EU-27	**24.7**	**5.9**	**24**	**1.7**	**7**	**9.7**	**39**	**0.6**	**2**	**2.7**	**11**	**0.6**	**3**	**0.0**	**0**
EU-15	31.9	8.1	26	1.4	4	13.4	42	0.7	2	4.1	13	0.2	1	0.0	0
Austria	31.4	7.6	24	3.2	10	6.1	19	0.2	1	5.8	19	0.0	0	0.0	0
Belgium	32.3	6.8	21	0.0	0	12.9	40	0.3	1	10.1	31	0.9	3	-	-
Bulgaria	11.6	4.9	42	2.0	17	0.3	2	0.1	1	0.0	0	0.5	4	0.1	1
Cyprus	16.3	7.8	48	-	-	-	-	-	-	4.4	27	-	-	-	-
Czech Republic	24.1	5.1	21	4.5	19	8.2	34	0.0	0	-	-	0.2	1	1.5	6
Denmark	33.7	6.6	20	11.9	35	4.8	14	0.1	0	3.1	9	-	-	-	-
Estonia	30.2	5.1	17	10.3	34	1.6	5	0.1	0	0.2	1	-	-	-	-
Finland	41.6	14.9	36	12.2	29	0.3	1	0.1	0	3.9	9	-	-	-	-
France	27.9	8.5	30	-	-	9.2	33	0.8	3	4.2	15	0.2	1	-	-
Greece	18.0	5.8	32	0.2	1	1.0	5	0.2	1	8.0	44	0.0	0	0.0	0
Spain	14.5	5.9	41	-	-	3.3	23	1.3	9	1.7	11	0.2	1	-	-
Ireland	29.3	6.6	22	-	-	5.9	20	0.5	2	1.9	6	2.3	8	0.1	0
Lithuania	19.6	2.9	15	6.5	33	1.8	9	0.5	2	0.0	0	0.5	2	-	-
Luxembourg	43.7	6.6	15	-	-	16.7	38	0.2	0	18.9	43	-	-	-	-
Latvia	28.4	3.2	11	7.2	25	1.9	7	0.4	1	0.4	1	0.4	1	-	-
Malta	6.9	5.0	72	-	-	-	-	1.9	28	-	-	-	-	-	-
Netherlands	25.9	5.3	20	0.7	3	19.0	73	0.1	0	0.1	0	0.0	0	-	-
Germany	33.6	6.1	18	2.2	6	14.7	44	0.3	1	6.8	20	0.2	1	-	-
Poland	**20.6**	**2.6**	**13**	**4.7**	**23**	**3.5**	**17**	**0.5**	**3**	**0.2**	**1**	**6.1**	**30**	**0.1**	**0**
Portugal	12.6	4.8	38	0.0	0	1.0	8	2.1	16	0.0	0	0.0	0	-	-
Romania	15.6	1.8	12	2.3	15	4.2	27	0.6	4	-	-	0.0	0	0.0	0
Slovakia	16.6	2.9	18	3.5	21	9.3	56	0.1	1	-	-	0.1	0	0.3	2
Slovenia	24.9	5.6	22	2.0	8	2.2	9	0.8	3	5.3	21	-	-	-	-
Sweden	31.4	15.9	51	11.7	37	0.3	1	-	-	0.3	1	-	-	-	-
Hungary	23.0	4.0	17	2.3	10	13.3	58	0.4	2	-	-	0.4	2	0.1	1
United Kingdom	27.0	6.9	26	0.0	0	17.5	65	0.2	1	0.1	0	0.3	1	-	-
Italy	20.0	4.1	21	0.0	0	11.7	59	1.0	5	1.6	8	0.0	0	-	-

Table 39. Commodity structure of energy consumption in households per 1 inhabitant in Poland and in the EU countries (cont.)

Country	Coke		Fuel wood		Other types of biomass[1)]		Solar energy		Geothermal energy		Other liquid fuels		Other solid fuels		Renewable energy[2)]	
	in GJ	in %	in GJ	in %	in GJ	in %	in GJ	in %	in GJ	in %	in GJ	in %	in GJ	in %	in GJ	in %
EU-27	**0.0**	**0**	**2.8**	**11**	**0.0**	**0**	**0.1**	**0**	**0.0**	**0**	**0.4**	**1**	**0.1**	**0**	**2.9**	**12**
EU-15	0.0	0	2.9	9	0.0	0	0.1	0	0.1	0	0.6	2	0.1	0	3.2	10
Austria	0.1	0	7.5	24	0.0	0	0.4	1	-	-	0.2	1	0.1	0	8.0	25
Belgium	0.0	0	0.9	3	0.0	0	0.0	0	-	-	0.3	1	0.0	0	0.9	3
Bulgaria	-	-	3.6	31	-	-	-	-	-	-	-	-	0.1	1	3.6	31
Cyprus	-	-	0.2	1	0.2	1	2.6	16	0.0	0	1.0	6	-	-	3.0	19
Czech Republic	0.1	0	4.2	17	-	-	0.0	0	-	-	-	-	0.4	2	4.2	17
Denmark	-	-	6.8	20	0.0	0	0.1	0	-	-	0.2	1	0.0	0	6.8	20
Estonia	-	-	12.8	43	-	-	-	-	-	-	0.0	0	0.1	0	12.8	43
Finland	-	-	9.9	24	0.2	0	0.0	0	-	-	0.1	0	0.1	0	10.1	24
France	-	-	4.5	16	-	-	0.0	0	0.0	0	0.3	1	0.0	0	4.6	16
Greece	-	-	2.0	11	0.2	1	0.7	4	0.0	0	0.0	0	-	-	2.9	16
Spain	-	-	1.9	13	-	-	0.1	1	0.0	0	0.1	1	-	-	2.0	14
Ireland	-	-	0.3	1	-	-	0.0	0	-	-	9.1	31	2.6	9	0.3	1
Lithuania	-	-	7.3	37	-	-	-	-	-	-	-	-	0.1	0	7.3	37
Luxembourg	-	-	1.3	3	-	-	0.1	0	-	-	0.1	0	0.0	0	1.3	3
Latvia	-	-	14.9	52	0.0	0	-	-	-	-	0.1	0	-	-	14.9	52
Malta	-	-	0.0	0	-	-	-	-	-	-	-	-	-	-	-	-
Netherlands	-	-	0.7	3	0.0	0	0.0	0	-	-	0.0	0	-	-	0.8	3
Germany	0.0	0	2.5	8	-	-	0.2	1	0.2	1	0.0	0	0.3	1	3.0	9
Poland	**0.2**	**1**	**2.7**	**13**	**-**	**-**	**-**	**-**	**0.0**	**0**	**-**	**-**	**-**	**-**	**2.7**	**13**
Portugal	-	-	4.6	36	-	-	0.1	1	-	-	0.0	0	-	-	4.7	37
Romania	-	-	6.6	42	-	-	-	-	0.0	0	0.0	0	-	-	6.6	42
Slovakia	0.0	0	0.3	2	-	-	-	-	-	-	-	-	0.0	0	0.3	2
Slovenia	-	-	8.9	36	-	-	0.1	0	0.1	1	-	-	-	-	9.1	37
Sweden	-	-	2.8	9	0.3	1	0.0	0	-	-	-	-	-	-	3.1	10
Hungary	-	-	2.4	11	-	-	0.0	0	-	-	-	-	0.0	0	2.4	11
United Kingdom	0.0	0	0.2	1	0.0	0	-	-	-	-	1.6	6	0.1	0	0.2	1
Italy	-	-	1.3	7	0.1	0	0.1	0	-	-	0.1	0	-	-	1.5	7

[1)] This group of energy commodities includes charcoal.
[2)] Renewable energy includes fuel wood, other types of biomass, solar energy and geothermal energy.
Source: Eurostat

ANNEX

Precision of survey results – absolute and relative errors of the estimations of quantities and values of the energy consumption

Energy commodities x- measure s- absolute standard error v- relative standard error		Arithmetic average	
		Quantity of consumed energy commodity	Value of consumed energy commodity
Electricity	x	2302.90	1244.98
	s	39.03	17.01
	v	1,69	1.37
District heat	x	36.65	1433.99
	s	4.29	30.34
	v	11.72	2.12
Hot water from district heating installation	x	43.03	662.55
	s	2.05	25.81
	v	4.76	3.90
High-methane natural gas	x	542.27	999.68
	s	29.48	40.38
	v	5.44	4.04
Nitrified natural gas	x	495.08	871.68
	s	86.04	104.26
	v	17.38	11.96
LPG for household purposes	x	107.39	413.66
	s	2.84	9.63
	v	2.64	2.33
Heating oil	x	1710.14	4378.26
	s	316.61	704.88
	v	18.51	16.10
Hard coal	x	3038.63	1894.09
	s	55.25	33.10
	v	1.82	1.75
Lignite	x	3073.36	742.09
	s	453.89	117.80
	v	14.77	15.87
Coke	x	1734.17	1529.76
	s	225.84	226.71
	v	13.02	14.82
Fuel wood	x	6.86	620.20
	s	0.18	18.44
	v	2.68	2.97
Other types of biomass (measured in m^3)	x	7.31	385.77
	s	1.24	46.35
	v	16.91	12.01

QUESTIONNAIRE E-GD

CENTRAL STATISTICAL OFFICE **al. Niepodległości 208, 00-925 Warszawa** ***www.stat.gov.pl***

QUESTIONNAIRE ON FUELS AND ENERGY CONSUMPTION IN HOUSEHOLDS

E-GD

in the year 2009

Part 1. IDENTIFICATION OF HOUSEHOLD

1. Symbol of region		2. Number of household		3. Number in sample	

Part 2. STRUCTURAL CHARACTERISTICS OF DWELLING

4. Total floor area of dwelling *(in square metres)*	
of which heated area	
5. Height of dwelling *(in centimetres)*	
6. Number of inhabitants in dwelling	

7. Is the building insulated?	• Yes	**1**
	• No	**2**
	• Partly	**3**
	• I don't know	**4**

8. Characteristics of windows

Type of windows	• Integrated	**1**
	• Two framed	**2**
Number of glazing		**1** **2** **3**
Coefficient of thermal conductivity		

Part 3. USE OF FUELS AND ENERGY COMMODITIES FOR THERMAL PURPOSES

9. Please specify, which fuels and energy commodities are used in your household for the purposes of space heating, water heating and cooking.

Please indicate at least one answer in each column. The appropriate symbols should be surrounded with the circles.

	Specification	Space heating	Water heating	Cooking
01	Electricity	**1**	**2**	**3**
01a	of which from own production	**1a**	**2a**	**3a**
01b	of which from own production, generated from renewable sources	**1b**	**2b**	**3b**
02	District heat	**1**		
03	Hot water from district heating installation		**2**	
04	High-methane natural gas	**1**	**2**	**3**
05	Nitrified natural gas	**1**	**2**	**3**
06	Liquefied petroleum gas (LPG)	**1**	**2**	**3**
07	Heating oil	**1**	**2**	
08	Hard coal	**1**	**2**	**3**
09	Lignite	**1**	**2**	**3**
10	Coke	**1**	**2**	
11	Fuel wood	**1**	**2**	**3**
12	Other types of biomass, specified in Part 8	**1**	**2**	**3**
13	Solar energy	**1**	**2**	
14	Heat pump	**1**	**2**	

Part 4. USE OF SPACE HEATING, WATER HEATING, AIR-CONDITIONING AND COOKING EQUIPMENT

Part 4 is divided into 3 sub-parts, in which an information should be specified about the following equipment:

– in sub-part 4.1 about the equipment used for space heating and water heating,

– in sub-part 4.2 about the equipment used for mechanical ventilation and air-conditioning,

– in sub-part 4.3 about the equipment used for cooking.

Only the devices actually used should be specified, and the eventual devices possessed but permanently not used should be omitted.

Sub-part 4.1. EQUIPMENT USED FOR SPACE HEATING AND WATER HEATING

10. Please specify numbers and ages of devices, which are used in your household for the purposes of space heating and water heating.

In case of using of more than one device of the same type, the average age should be written.

	Specification	Number of pieces	Age of device *(in years)*
01	Electric stoves or heaters – non-portable		
02	Electric stoves or heaters – portable		
03	Underfloor electric heating		
04	Electric water heater		
05	Natural gas fired central heating boiler		
06	Natural gas fired water heater		
07	Natural gas fired double-function boiler (space + water)		
08	LPG fired central heating boiler		
09	LPG fired water heater		
10	LPG fired double-function boiler (space + water)		
11	Heating oil fired central heating boiler		
12	Heating oil fired double-function boiler (space + water)		
13	Solid fuel fired central heating boiler		
14	Solid fuel fired water heater		
15	Solid fuel fired double-function boiler (space + water)		
16	Solid fuel fired stoves in rooms		
17	Solid fuel fireplace with open fire		
18	Solid fuel fireplace with closed insert		
19	Solid fuel fireplace with water jacket		
20	Solid fuel fired cooking stove		
21	Solar collectors		
22	Heat pump		

Sub-part 4.2. MECHANICAL VENTILATION AND AIR-CONDITIONING EQUIPMENT

11. Please specify numbes and ages of devices, which are used in your household for the purposes of mechanical ventilation and air-conditioning, and in case of air-condition devices also their classes of energy efficiency.

In case of using of more than one device of the same type, the average age should be written and the energy efficiency classes of all devices should be indicated.

	Specification	Number of pieces	Age of device *(in years)*	Energy efficiency class *Possible answers: A, B, C, D, E, F, G or X (class unknown)*
01	Central air-conditioning			
02	Air-conditioners installed in rooms			
03	Air-conditioners installed outside of building			
04	Fan heaters			
05	Evaporative coolers			
06	Mechanical ventilators			
07	Recuperators			

Sub-part 4.3. COOKING EQUIPMENT

12. Please specify numbers and ages of cooking devices, which are used in your household, and in case of electric ovens also their classes of energy efficiency.

In case of using of more than one device of the same type, the average age should be written and the energy efficiency classes of all devices should be indicated.

	Specification	Number of pieces	Age of device *(in years)*	Energy efficiency class *Possible answers: A, B, C, D, E, F, G or X (class unknown)*
01	Electric-only cooker with oven			
02	Separate electric oven			
03	Electric-only cooker without oven			
04	Combined gas-electric cooker			
05	Gas-only cooker			
06	Solid fuel fired cooking stove			

Part 5. LIGHTING AND ELECTRICAL APPLIANCES

Part 5 is divided into 2 sub-parts, in which an information should be specified about the following equipment:

– in sub-part 5.1 about the lighting equipment,

– in sub-part 5.2 about the most important electrical appliances and electronic devices.

Only the devices actually used should be specified, and the eventual devices possessed but permanently not used should be omitted.

Sub-part 5.1. LAMPS

13. Please specify numbers, total power ratings and classes of energy efficiency of lamps, which are used in your household.

In rows 01, 02 and 03 report the lamps located inside dwelling, and in row 04 the lamps located outside the building (only in cases of single-family buildings).

	Specification	Number of pieces	Total power rating *(in watts)*	Energy efficiency class *Possible answers: A, B, C, D, E, F, G or X (class unknown)*
01	Incandescent bulbs			
02	Compact fluorescent lamps			
03	Other lamps (incl. halogen, diode, fluorescent tubes)			
04	Lamps located outside the building			

Sub-part 5.2. ELECTRICAL APPLIANCES AND ELECTRONIC DEVICES

14. Please specify numbers and ages of electrical appliances and electronic devices, which are used in your household, and in case of refrigeration, clothes washing and dish washing appliances also their classes of energy efficiency.

In case of using of more than one device of the same type, the average age should be written and the energy efficiency classes of all devices should be indicated.

	Specification	Number of pieces	Age of device *(in years)*	Energy efficiency class *Possible answers: A, B, C, D, E, F, G or X (class unknown)*
01	Refrigerator (1-door)			
02	Combined fridge-freezer (2-door)			
03	Freezer			
04	Automatic washing machine without dryer			
05	Combined washer-dryer			
06	Clothes dryer			
07	Non-automatic washing machine			
08	Dishwasher			
09	TV set			
10	Stationary computer (desktop)			
11	Mobile computer (laptop)			
12	Printer			

Part 6. MEASUREMENT AND REGULATION EQUIPMENT

15. Please specify the instruments present in your dwelling. The appropriate symbols should be surrounded with the circles.

01	Electricity meter	**1**
02	Gas meter	**2**
03	Heat meter	**3**
04	Heat cost allocators on the radiators	**4**
05	Thermostatic valves on the radiators	**5**
06	Thermostat centrally regulating the temperature in dwelling	**6**
07	Thermostats regulating the temperature in individual rooms	**7**
08	Cold water meter(s)	**8**
09	Hot water meter(s)	**9**

Part 7. QUANTITIES AND VALUES OF FUELS AND ENERGY COMMODITIES CONSUMED IN 2009

16. Please specify quantities of energy commodities, consumed in your household in the year 2009, as well as monetary values of these commodities.

	Specification	Unit of measure	Quantity of consumed energy *(unit of measure shown nearby)*	Monetary value of consumed energy *(zl)*
01	Electricity	kWh		
01a	of which from own production	kWh		
01b	of which from own production, generated from renewable sources	kWh		
02	District heat	GJ		
03	Hot water from district heating installation	m^3		
04	High-methane natural gas	m^3		
05	Nitrified natural gas	m^3		
06	Liquefied petroleum gas (LPG)	kg		
07	Heating oil	liter		
08	Hard coal	kg		
09	Lignite	kg		
10	Coke	kg		
11	Fuel wood	m^3		
12a	Other types of biomass (measured in m^3)	m^3		
12b	Other types of biomass (measured in kg)	kg		

Part 8. ADDITIONAL INFORMATION ON BIOMASS FUELS

Report only in cases when the household uses fuel wood or other types of biomass.

17. Please surround with the circles the appropriate symbols, which define types of used fuels and sources of their origin.

	Specification	Fully purchased	Fully free-of-charge	Partly purchased, partly free-of-charge
01	Fuel wood from national forests	**1**	**2**	**3**
02	Fuel wood from private forests	**1**	**2**	**3**
03	Fuel wood from in-field and near-house trees	**1**	**2**	**3**
04	Fuel wood purchased from trading intermediary	**1**		
05	Formed wood (briquettes, pellets)	**1**	**2**	**3**
06	Wood waste from industrial plants (e.g. sawdust)	**1**	**2**	**3**
07	Wood waste from processed wood (e.g. old furniture, packagings)	**1**	**2**	**3**
08	Plants from the energy plantations	**1**	**2**	**3**
09	Straw	**1**	**2**	**3**
10	Other waste fuels of agricultural or forest origin	**1**	**2**	**3**

Part 9. ADDITIONAL INFORMATION ON SOLAR COLLECTORS

Report only in cases when the household has solar collector.

18a. Collector type code *(1 – glazed flat plate, 2 – evacuated tube, 3 – unglazed flat plate, 4 – air)*		
18b. Period when solar collectors are active *(number of months within a year)*		
18c. Optical efficiency of collectors *(in %)*		
19a. Total surface area of collectors *(in square metres)*		
19b. Floor area of dwelling heated with solar energy *(in square metres) (report only in cases when solar energy is used for space heating)*		
19c. Quantity of water heated annually by solar collectors *(in cubic metres)*		
19d. Is the solar system of water heating combined with the other system of water heating?	*If **yes**, then report with what system, e.g. oil fired boiler*	
	*If **no**, then report how many taps are served by the solar system*	

Part 10. ADDITIONAL INFORMATION ON HEAT PUMPS

Report only in cases when the household has heat pump.

20. Floor area heated with heat pump *(in square metres) (report only in cases when the other heat sources are used in household)*	
21a. Heat source code *(1 – air, 2 – ground to 30 m, 3 – ground over 30 m, 4 – ground water to 30 m, 5 – ground water over 30 m, 6 – surface water, 7 – other)*	
21b. Heat pump type code *(first component means the source of heat) (1 – air-air, 2 – air-water, 3 – water-water, 4 – brine water-water, 5 – water-air, 6 – other)*	
21c. Installed capacity of heat pump *(in kW)*	
21d. Coefficient of performance – COP *(according to the manufacturer information)*	
21e. Quantity of energy *(in kWh)* a) electric (N) used to drive the installation, in which the heat pump operates	
b) thermal (Qg) acquired from the installation, in which the heat pump operates	
21f. Period when heat pump is active *(number of months within a year)*	

Part 11. PASSENGER CARS

22. Please report the information on the passenger cars used by household for the private purposes.

Do not report any information on other types of motor vehicles (trucks, motorcycles).

01. Does the household use a passenger car?	• Yes	**1**
	• No	**2**

	Car No. 1	
02	Fuel type code *(1 – gasoline, 2 – gasoline + LPG, 3 – Diesel oil)*	
03	Average consumption of gasoline or Diesel oil *(in litres per 100 km)*	
04	Average consumption of LPG *(in litres per 100 km)*	
05	Total distance driven in the year 2009 *(in 1000 km)*	
06	Age of car *(in years)*	
07	Engine capacity *(in cm^3)*	
	Car No. 2	
08	Fuel type code *(1 – gasoline, 2 – gasoline + LPG, 3 – Diesel oil)*	
09	Average consumption of gasoline or Diesel oil *(in litres per 100 km)*	
10	Average consumption of LPG *(in litres per 100 km)*	
11	Total distance driven in the year 2009 *(in 1000 km)*	
12	Age of car *(in years)*	
13	Engine capacity *(in cm^3)*	
	Car No. 3	
14	Fuel type code *(1 – gasoline, 2 – gasoline + LPG, 3 – Diesel oil)*	
15	Average consumption of gasoline or Diesel oil *(in litres per 100 km)*	
16	Average consumption of LPG *(in litres per 100 km)*	
17	Total distance driven in the year 2009 *(in 1000 km)*	
18	Age of car *(in years)*	
19	Engine capacity *(in cm^3)*	

Was the interview performed in full?	• Yes • No	**1** **2**

Time of interview duration *(in minutes)*	

Reason for non-response	
• Dwelling not inhabited, dwelling liquidated, non-existing address, dwelling changed into the non-residential object	**1**
• No access to dwelling	**2**
• Nobody present at home	**3**
• Household moved to the other place	**4**
• Temporary absence	**5**
• Refusal to participate	**6**
• Incapability to participate because of illness or elderly age	**7**
• Inhabitants do not speak Polish language	**8**
• Other reason	**9**

Reason for refusal to participate	
• Negative approach to all statistical surveys	**1**
• Questions connected with money	**2**
• Interview too difficult	**3**
• Lack of time	**4**
• Other reason	**5**

Interviewer remarks (important facts not reflected in the table part of the questionnaire):

Number of interviewer | | - | | - | | | | |

Prepared by _____ *(name of interviewer)* _____ *(date)*

Inspected by _____ *(name of inspector)* _____ *(date)*

BIBLIOGRAPHY

1. Fuels and energy consumption in households, in urban and rural areas, in 1993. Central Statistical Office, Warsaw 1995.
2. Fuels and energy consumption in households and individual farms. Survey results. Energy Market Agency, Warsaw 2003.
3. Model Assisted Survey Sampling, Carl-Erik Sarndal, Bengt Swensson, Jan Wretman. Springer – Verlag 1992.
4. Household budget surveys in 2009. Statistical information and elaborations. Central Statistical Office, Warsaw 2010.
5. Energy statistics 2009, 2010. Central Statistical Office, Warsaw 2010.
6. Statistics of Polish Power Industry, Energy Market Agency, Warsaw 2010.
7. Energy Prices and Taxes, quarterly publication. International Energy Agency, Paris 2010.
8. The European Price Bulletin of Energy Commodities, Energy Market Agency, publications concerning 2009, Warsaw 2009 and 2010.
9. Recommended Scope of a Data Collection Exercise in the Household Sector, attached to the minutes of the Working Group's meeting on energy consumption in households. Luxembourg, 8.12.2008.
10. The Act on Energy Efficiency of 15 April 2011.
11. Eurostat databases, *http://epp.eurostat.ec.europa.eu*
12. J. Jakubowski "The replication subsamples method and generalisation"; Publication series entitles *"Based on the work of the Statistical and Economic Surveys Centre"* vol. 266. 1999, Warsaw.

SYMBOLS

(-)	-	magnitude zero
(.)	-	data not available or not reliable
(0)	-	magnitude not zero, but less than 0,5 of a unit
(x)	-	not applicable
„Of which”	-	indicates that not all elements of the sum are given

MAJOR ABBREVIATIONS

kilo (k)	=	10^3 = thousand
mega (M)	=	10^6 = million
giga (G)	=	10^9 = billion
tera (T)	=	10^{12} = trillion
peta (P)	=	10^{15} = quadrillion
W	=	watt
kWh	=	kilowatthour
GWh	=	gigawatthour (million of kilowatthours)
TWh	=	terawatthour (billion of kilowatthours)
MJ	=	megajoule = thousand of kJ
GJ	=	gigajoule = million of kJ
TJ	=	terajoule = billion of kJ
PJ	=	petajoule = trillion of kJ
cm^3	=	cubic centimetre
m	=	metre
m^2	=	square metre
m^3	=	cubic metre
kg	=	kilogram
t	=	metric tonne
km	=	kilometre (thousand meters)
l	=	litre
pcs	=	piece
ha	=	hectare
%	=	percent
ppts	=	percentage point
thous.	=	thousand
mln	=	million
Ma	=	inhabitant
zl	=	zloty

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