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THE IMPACT OF PRICES RATES ON ENERGY CONSUMPTION – EXAMPLE AND REQUEST SLAVONIA AND BARANJA

UTJECAJ CIJENE ENERGENATA NA POTROŠNJU NA PRIMJERU SLAVONIJE I BARANJE

ABSTRACT

The Republic of Croatia in the past decade, have led to a significant increase in energy prices, and with them consequently to the rising cost of living. With increase in price, it can be assumed, that there have been more savings effects, households pay more account to the energy savings, and more positive import-export trade balance, especially as European than Croatian, face the situation of the lack of indigenous energy resources.
This paper analyses and shows the trend of general energy consumption and prices of energy sources in Slavonia and Baranja by households during last decade. The particular attention is put on nature gas as the most relevant energy consumption source.
This paper aims to show the trend of changes in price and energy consumption during last decade. Moreover, the paper will analyze the impact of consumers' behavior and their impact on energy efficiency through pricing policy, by taking into consideration that during last decade the Republic of Croatia gave more emphasis on social than market aspect on determination of prices.
Also work will show the share of energy costs within the total income of the population through the ten-year period and with the focus on social dimension of the price policy.

Keywords*: energy, natural gas, energy prices, energy consumption, energy efficiency, Slavonia and Baranja*

[53] The author's attitudes in the text does not refer to the opinions and conclusions of the Ministry of Science, Education and Sport, but are part of the personal views of the author

SAŽETAK

U Republici Hrvatskoj u posljednjih desetak godina došlo je su do značajnog porasta cijena energenata, a sa njima posljedično i do rasta troškova života. Porastom cijena, za pretpostaviti je, vidljiviji su i rezultati štednje te se vodi više računa o energetskoj uštedi, a samim time i pozitivnijom uvozno izvoznoj trgovinskoj bilanci, tim više što i Europa, a tako i Hrvatska, nemaju dovoljno vlastitih energetskih resursa.

Ovaj rad se fokusira, prikazuje i istražuje kretanje ukupne potrošnje, potrošnje po kućanstvu, te cijene energenata u Slavoniji i Baranji u posljednjih deset godina, sa težištem na prirodni plin, kao najrelevantniji pokazatelj, a posebice odnos cijene i potrošnje prirodnog plina po domaćinstvu.

Cilj rada je prikazati trend promjene cijene i potrošnje energije kroz desetogodišnje razdoblje i analizom utvrditi ponašanje potrošača i njihov utjecaj na energetsku učinkovitost kroz politiku određivanja cijena, tim više što je u proteklom desetogodišnjem razdoblju Republika Hrvatska više vodila računa o socijalnom aspektu određivanja cijena, nego o tržišnom.

Isto tako rad će prikazati udio troškova energenata na ukupne prihode stanovništva kroz desetogodišnje razdoblje i razmotriti situaciju sa socijalnog aspekta.

Ključne riječi: *energija, prirodni plin, cijena energenata, potrošnja energenata, energetska učinkovitost, Slavonija i Baranja*

1. Introduction

Europe is dependent on energy imports and member country's average import of primary energy is more than 50%. That is the reason European Union has set the goals based on the fact that until the year 2020., it will accomplish the ratios 20/20/20+10 (COM, 2008), which means achieving the producing 20% of energy from renewable sources, 20% of reducing CO_2 emission, 20% of reducing energy consumption and 10% of energy produced from biofuel.

Simultaneously in Croatia, 40% of the energy is spent on economic and housing facilities, 30% on transport and 30% in industry. Observing construction facilities, more than 50% of the energy is spent on heating.

Population, but entrepreneurs as well, do not have a need for saving, if the results of saving are not visible, so it could be concluded there are no savings by the low prices of energy, and the consequences are even worse if trading companies that provide energy supplies make losses. The best example is heating sector, which supplies more the 160,000 households in Republic of Croatia, which has lost 1.5 billion kuna (HERA, 2013) in the last 5 years. Slightly better situation is with the gas and electricity that survived, but did not manage to develop into the modern companies.

In the last ten years the prices of energy have been decided generally at the political level, primarily by the local government units and the Croatian Government. Prices are being delivered, depending on the political will and affection of voters, and even today is the same situation in many communal activities. Before the election it is generally sensitive issue and changes in energy prices are almost impossible, regardless of market conditions, and after the elections change in price is a common practice, and again which the worst, withought special calculation is.

By keeping the price low, companies are forced to work with outdated technology which is generally not competitive, and consumption is irrationally high. Therefore, the development is limited, and the development of innovation disabled. Except underdeveloped technology, trading companies are also over dimensioned by the capacity of labor, where naturally an important role plays the fact there are still significant shares of social ownership of the state and local government.

In order to protect the most vulnerable social strata of society, EU created the directives in the field of energy, introduced the concepts such as status of vulnerable customer and energy poverty. In some EU countries, the status of vulnerable customers or energy-poor households is defined for

those households which energy consumption is equal or exceeds 10% of total revenue (OFGEM, 2012).
In the 70's of last century there were the oil crisis and a significant increase in energy prices, so many countries have been forced to turn to alternatives, which means to renewable energy sources. It resulted with incurring of the entire industry and a large number of employees. So today, Denmark has the most developed wind turbine industry, in which are additionally 20.000 people employed. Germany has a strong solar industry in which are 45.000 people employed, in other words, in entirely sector of renewable energy there are over 200.000 employees, and that could be stimulated by taking the compensation for renewable energy from the citizens, so it additionally increased the price of energy that had been already imported.(Šimleša, D,. 2010):.

2. Regulation of heat energy consumption by the price and reduction of the principle of collective consumption

In the case of low energy prices there is not enough taking care of consumption, and following the law of supply and demand curves, higher price reduces consumption. Consumption is higher per unit area in the case of collective consumption of what we could see in the heat sector and in joint boiler consumption sector where consumption per unit area is over 250 kWh/m^2 per year.
A few years ago at the consumer level in the common boiler room (mostly trading companies) the price was generally calculated per square meter of housing or economic object, regardless of insulation and energy that are used.
Subsequently, based on the general conditions for supply of heat, a decision about the obligation of installing calorimeter on each heat substation (which covers one or more objects) is made. Therefore there are noticeable differences in consumption depending on the degree of isolation of individual buildings. Although there is still the problem of pricing inside a single object because the accounting unit is designated per square meter of space, regardless of the exploited energy and as a result – consumption has not significantly changed.
When a particular building, which was not the obligation, started to equip heat consumption allocator and measure individual consumption, there was a significant drop in consumption, which ranged from about 150 kWh/m^2 per year. Therefore the psychological effect of self-management is the cheapest form of optimization of consumption and possible saving. On the other hand, as energy price directly affects and takes a significant place in the household budget, there is naturally, increasingly taking care of optimization of energy consumption, savings and investments that would result in the most relevant solution.
Depending on the distributive areas various technology systems are implemented. Accordingly, the final consumer price varies depending on the distribution.

Table 1 Example of the comparison of heat energy by the place of distribution (2011)

City	**Distributor**	**Number of apartments**	**Price kn/kWh**	**Consumption kWh**	**Size m^2**	**Average size of the apartment m^2**	**Average annual consumption kWh/m^2**
Zagreb	HEP Toplinarstvo	31	0,12	334.000	1629	53	205
Slavonski Brod	Brod-plin	35	0,23	137.200	1106	32	124
Vukovar	Tehnostan	30	0,23	198.406	1870	62	106

Source: HEP Toplinarstvo, Brod-Plin, Tehnostan, 2011

In this example it is obvious to see that in 2011 in the city of Zagreb where the price of energy was twice lower and consumption was higher more than 50% (compared to Vukovar and Slavonski Brod). Sizes of buildings are approximately equal and they are located in continental part of Croatia, so the weather and other conditions such as configuration of the building did not significantly affect the difference in consumption.
Isolation of an object can play an important role in consumption, but as this is about older buildings (over 30 years or more), they are on the same level, because the new buildings are mostly realized with the heat consumption allocators.
Consumption in Vukovar is a little bit lower than in Slavonski Brod, although the prices are the same. This difference can be attributed to a larger average size of the apartment, which naturally affects the size of the account and the potential cost savings, because the rooms are not necessarily heated, but only the rooms that are used for dwelling.

Table 2 Example of comparison of prices and heat energy consumption (2011)

City	**Distributor**	**The average energy consumption per dwelling. kWh**	**Consumption kn**	**Consumption for 50 kWh m2**	**Consumption for 50m2 kn**
Zagreb	HEP Toplinarstvo	10.865	1.303,8	10.250	1.230
Slavonski Brod	Brod-plin	3.968	912,64	6.200	1.426
Vukovar	Tehnostan	6.572	1.511,56	5.300	1.219

Source: HEP Toplinarstvo, Brod-Plin, Tehnostan, 2011

From Table 2 is evident that for the same size of apartment and twice lower price, the consumption is roughly doubled.

3. Analysis of gas consumption

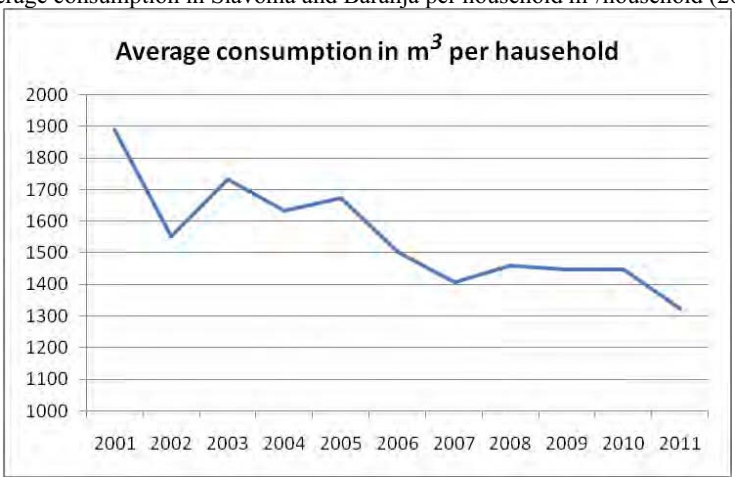
In this section is presented review and comparison consumer prices and consumer consumption for households in distribution areas of Slavonia and Baranja

Table 3 Total and average gas consumption per household in Slavonia and Baranja in recent 10 years (2001-2010)

Year	**Number of households**	**Total consumption**	**Average consumption**	**changes in average consumption**
		mil. m^3	**m^3/household**	**%**
2001	66.934	126.500	1890	
2002	70.118	108.862	1553	-17,85%
2003	76.010	131.802	1734	11,69%
2004	81.505	133.221	1635	-5,74%
2005	88.378	148.050	1675	2,49%
2006	94.471	142.131	1504	-10,19%
2007	98.320	138.327	1407	-6,49%
2008	102.650	149.734	1459	3,68%
2009	106.137	153.664	1448	-0,75%
2010	108.921	157.600	1447	-0,06%

Source: HSUP, 2013

Figure 1 Average consumption in Slavonia and Baranja per household m^3/household (2001-2011)



Source: HSUP, 2013

From displayed table it is possible to see almost continuous decrease from 2001. onwards. Certainly, one of the key corrective elements is the change of energy price in the same period.

Table 4 Number of households in Slavonia and Baranja sorted by distributors (2001-2010)

Number of households					
Year	**HEP Plin, Osijek[1]**	**Brod-plin, Slavonski Brod**	**Plin projekt, Nova Gradiška[2]**	**Plinara istočne Slavonije, Vinkovci**	**Prvo plinarsko društvo, Vukovar**
2001	46.610	6.143	1.148	13.033	n.p.
2002	48.033	6.938	954	14.193	n.p.
2003	51.422	7.695	1.069	15.824	n.p.
2004	53.046	7.414	2.251	14.793	4.001
2005	55.492	8.285	2.574	15.406	6.621
2006	57.116	9.207	3.121	16.123	8.904
2007	59.305	9.925	3.424	16.134	9.532
2008	61.542	10.839	3.803	16.530	9.936
2009	63.499	11.609	4.014	16.899	10.116
2010	64.982	12.021	4.146	17.620	10.152

Source: HSUP, 2013

Table 5 Gas consumption in Slavonija and Baranja per each distributor (2001-2010)

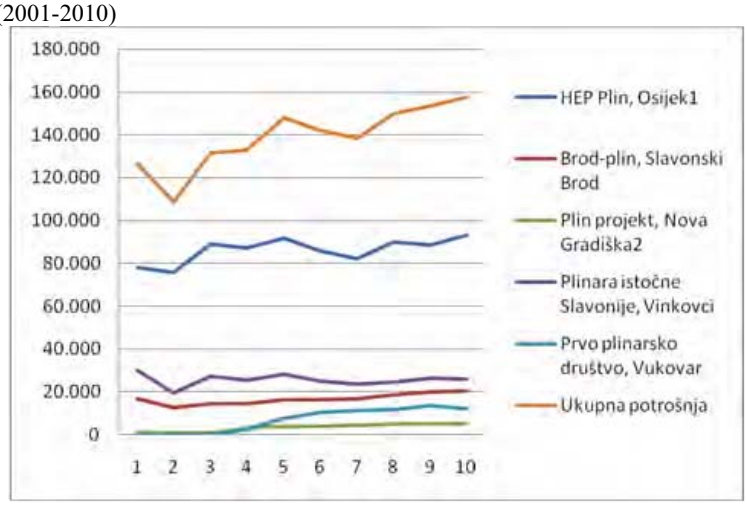
Consumption (mil. m^3)							
Year	**HEP Plin, Osijek[1]**	**Brod-plin, Slavonski Brod**	**Plin projekt, Nova Gradiška[2]**	**Plinara istočne Slavonije, Vinkovci**	**Prvo plinarsko društvo, Vukovar**	**Total consumption**	**The change (%)**
2001	78.160	17.072	1.040	30.228	n.p.	126.500	
2002	75.953	12.745	655	19.509	n.p.	108.862	-13,9%
2003	89.057	14.783	556	27.406	n.p.	131.802	21,1%

Consumption (mil. m^3)							
Year	**HEP Plin, Osijek[1]**	**Brod-plin, Slavonski Brod**	**Plin projekt, Nova Gradiška[2]**	**Plinara istočne Slavonije, Vinkovci**	**Prvo plinarsko društvo, Vukovar**	**Total consumption**	**The change (%)**
2004	87.169	14.680	2.973	25.619	2.780	133.221	1,1%
2005	91.698	16.488	4.059	28.135	7.670	148.050	11,1%
2006	86.118	16.238	4.205	25.287	10.283	142.131	-4,0%
2007	82.180	16.793	4.443	23.902	11.009	138.327	-2,7%
2008	89.868	18.982	4.914	24.407	11.563	149.734	8,2%
2009	88.412	20.140	5.266	26.430	13.416	153.664	2,6%
2010	93.169	20.650	5.553	26.118	12.110	157.600	2,6%

Source: HSUP, 2013

Table 5 and figure 2 show clearly increasing of total gas consumption from 24.6% (2001-2010), which can be attributed to significant increase in number of households in the given period in the amount of 62.7%.They also show that the energy operator "*HEP Plin Osijek"* holds the leading position in the share of overall gas consumption and practically dictates dynamics of changing of overall consumption, although some gas distributors as *"Plinara istočne Slavonije Vinkovci"* in the referenced observed period accomplished gas consumption declined to 13.6%.

Figure 2 Graphical representation of the overall consumption and gas consumption per each distributor (2001-2010)



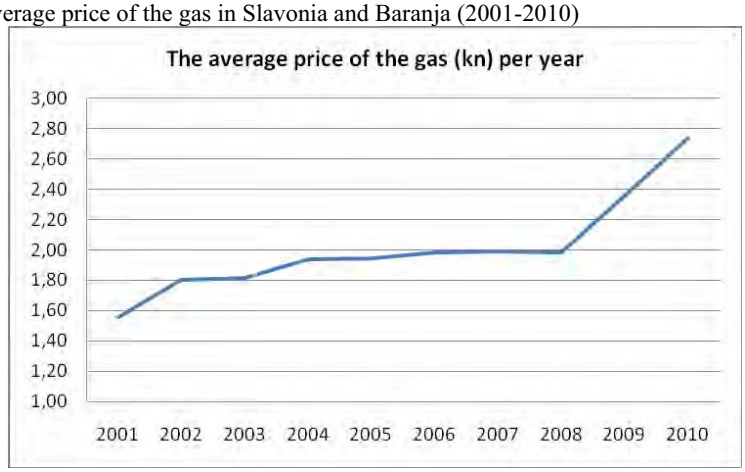
Source: HSUP, 2013

Table 6 Gas prices of some energy companies and the average price m^3 per household (2001-2010)

Prices (kn/m^3)							
Year	**HEP Plin, Osijek[1]**	**Brod-plin, Slavonski Brod**	**Plin projekt, Nova Gradiška[2]**	**Gas Factory of Eastern Slavonia, Vinkovci**	**First Gas Society, Vukovar**	**Average price**	**The change (%)**
2001	1,57	1,47	1,86	1,56	n.p.	**1,56**	
2002	1,77	1,92	1,98	1,83	n.p.	**1,80**	15,6%
2003	1,79	1,92	2,40	1,83	n.p.	**1,82**	0,9%
2004	1,90	2,01	2,50	1,97	2,00	**1,94**	6,9%
2005	1,90	2,01	2,50	1,97	2,00	**1,95**	0,3%
2006	1,90	2,04	2,50	2,10	2,10	**1,98**	1,9%
2007	1,90	2,04	2,50	2,10	2,10	**1,99**	0,1%
2008	1,90	2,04	2,50	2,10	2,10	**1,99**	-0,1%
2009	2,31	2,39	2,61	2,42	2,42	**2,36**	18,8%
2010	2,66	2,85	3,09	2,79	2,91	**2,74**	16,2%

Source: HSUP, 2013

Figure 3 Average price of the gas in Slavonia and Baranja (2001-2010)

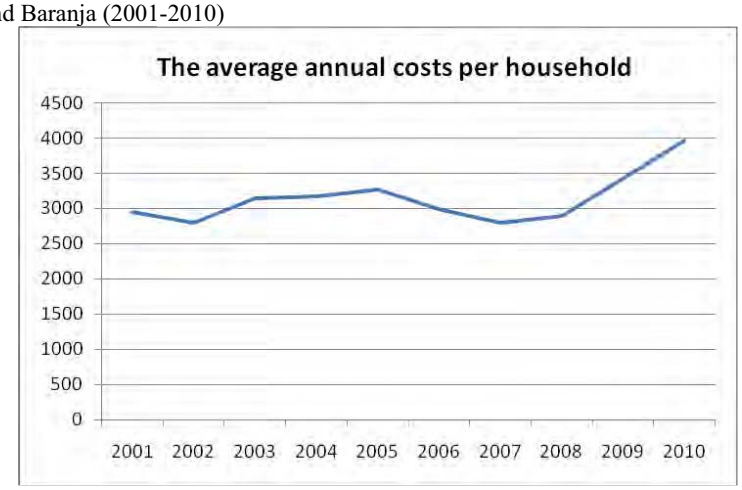


Source: HSUP, 2013

The presented data shows that consumption per household from 2001 until 2010 decreased from 1890 m^3/year to 1447 m^3/year, in other words by 24%. At the same time, the average price of the gas per $m^3$from 2001 until 2010 increased from 1.56 kn to 2.74 kn/m^3, in other words by 75.6%. It means that the increasing in gas prices of 75.6%, consumption is reduced by 24%.

In 2001 the average household totally spent 2948 kn, while in 2010 it was 3964 kn, in other words 1017 kn or 34,5% more. Although the average household consumption declined by 24%, it paid the 34.5% more.

Figure 4 The product of the average price and the average gas consumption per household in Slavonia and Baranja (2001-2010)



Source: HSUP, 2013

A significant trend of increasing of average annual cost per household is noticeable only since the end of 2008 onwards, which is of course a result of a sudden increase in fuel prices in recent years. But in order to get comparable sizes and valid sizes in the overall calculation, it is necessary to include the changes average salary of work force in the reference period, as it is shown in Table 7.

Table 7 The average net incomes of employees in Republic of Croatia - Slavonia and Baranja county (2001-2010)

Year	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
County	**County average net income (kn)**									
Požeško-slavonska	3.128	3.265	3.488	3.615	3.719	3.901	4.088	4.457	4.603	4.605
Brodsko-posavska	3.158	3.223	3.564	3.670	3.826	3.981	4.161	4.464	4.599	4.649
Osječko-baranjska	3.198	3.299	3.540	3.674	3.881	4.034	4.309	4.600	4.707	4.774
Vukovarsko-srijemska	3.245	3.403	3.633	3.755	3.892	4.006	4.203	4.501	4.563	4.630
AVERAGE	**3.182**	**3.298**	**3.556**	**3.679**	**3.830**	**3.981**	**4.190**	**4.506**	**4.618**	**4.665**

Source: DZS, 2013

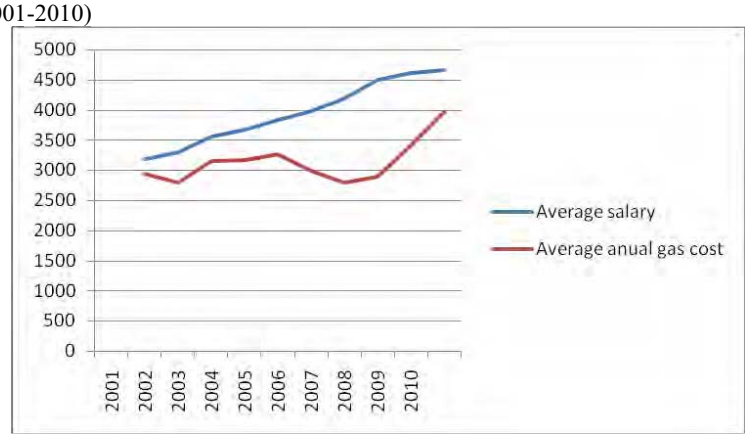
The average net salary in 2001 amounted 3182 kn, while it was 4665 kn in 2010, therefore net salary grew from 2001 until 2010 by 1483 kn, in other words 46.6 %. As the average annual salary in 2001 was 38187 kn, it turns out that the employees (if they cover the costs per household by themselves) should allocate 7.7% of their salary for gas, while in 2010 the average annual salary was 55974 kn and the employees are supposed to allocate 7.08% from their salary. Comparing these indicators it turns out that the consumers had no reason to save, unless it had happened on their account. If not sparing, the consumer would have to set aside an additional 1306 kn or 2.33% of annual salary.

Table 8 The average net monthly and annual income, average costs per household and the share of costs of gas of total revenues in Slavonia and Baranja (2001-2011)

Year	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
The average salary (kn)	3.182	3.298	3.556	3.679	3.830	3.981	4.190	4.506	4.618	4.665
The average annual salary (kn)	38.187	39.570	42.675	44.142	45.954	47.766	50.283	54.066	55.416	55.974
Average annual costs (kn)	2.942	2.794	3.148	3.173	3.262	2.985	2.795	2.896	3.416	3.966
The share of annual salary	**7,70%**	**7,06%**	**7,38%**	**7,19%**	**7,10%**	**6,25%**	**5,56%**	**5,36%**	**6,16%**	**7,08%**

Source: DZS, 2013; HSUP, 2013

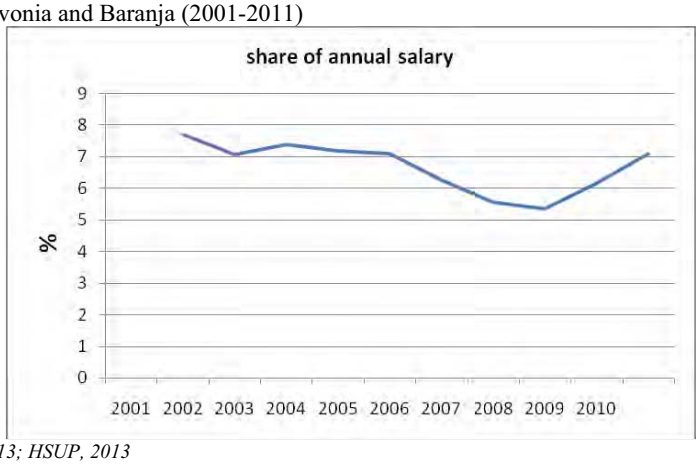
Figure 5 Comparison of trends in average annual salary and average costs of gas in Slavonia and Baranja (2001-2010)



Source: DZS, 2013; HSUP, 2013

It is interesting to notice that trends show even decrease of the share of overall gas costs in a few years from 2007-2009., which is most likely induced by the impending global economic crisis.

Figure 6 The share of household gas energy source costs in the average annual salary of employed persons in Slavonia and Baranja (2001-2011)



Source: DZS, 2013; HSUP, 2013

Some countries in EU have defined the poverty line, so the subsidized low price of the energy has only the citizens who consume the energy more than 10% (with ought the energy for transport) of the total annual income. Gas, as the cheapest source of energy in our case takes already over 7%, and if we add more water and electricity, we can say that the average household in which only works one family member (with no additional benefits from other members), would belong to energy poor households under such criteria.

4.Conclusion

In the above analysis, we compared current price and consumption in the heating industry considering to the current consistent price of gas, multi-year price of gas and the impact on consumption in Slavonia and Baranja, so it is shown how the price of the energy affects on the consumption. It is also possible to see wrong decision about keeping energy prices low, because from one side we are giving a bed message that the saving is not important, so the significantly more energy sources, that are anyway imported, are consumed. Resources that cannot be recovered should be rationally used. Some European countries such as Denmark have introduced additional levies on energy taxes, and from them encouraged the development of renewable energy sources and energy efficiency.
This work should stimulate the new thinking about the price of energy and how to manage energy policy. Additional analysis can be made by comparing the costs of heating in continental Croatia and Dalmatia, where it would be possible to conclude that the consumption of heating may be assumed at least twice as small and would make about 3% of the average net salary.

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