

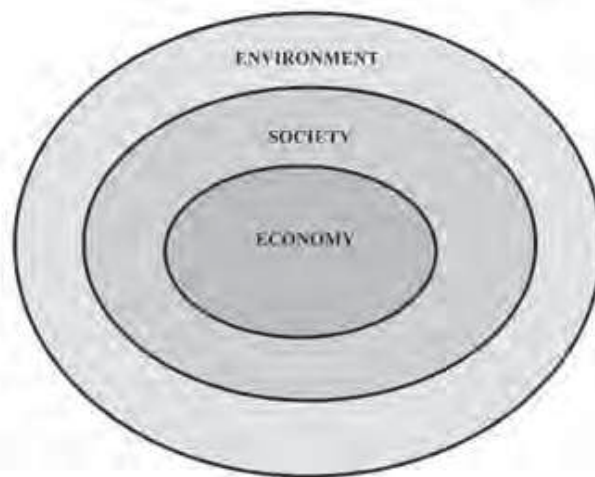
Some Additions to Sustainable Development in the Visegrad Countries, Especially in Hungary

Tibor László Csegődi

1. Introduction

Environmental and energy efficiency problems are important problems of the present day. This process continues since the end of 1980s. Economic growth is accompanied by an increased emission of greenhouse gases and an increase in energy demand. Lapka, Vávra and Sokolíčková (2012) note that the New Environmental Paradigm admitted that people live in particular ecosystems and that the environment has an impact on them. Economic, environmental and social problems cannot be addressed without an equivalent dialogue of the three essential sub-systems of sustainable development (which means an end of the neo-liberal dominance of economy and neglect of other factors). Lapka and colleagues (2012) say that in fact, the three pillars of sustainable development (environment, society and economy) should not be presented as three overlapping sets as they usually are (unsurprisingly with the economy in first place), but more as a real bull's eye concept, which reflects the position of economy, society, and environment in the world. Incidentally, I note that according to the bull's eye concept, the economic subsystem of the society and even the whole society is based on the environmental system (see Fig. 1). The final limits of the society's and economic growth are the environment's possibilities.

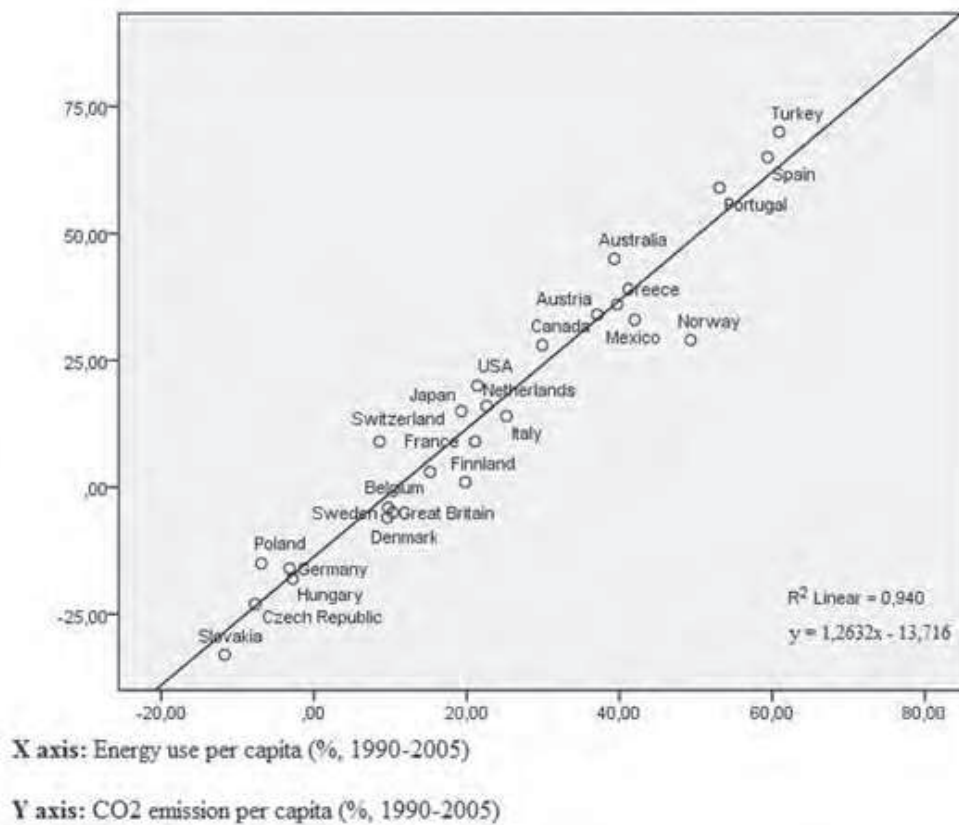
Fig. 1. The bull's eye concept of sustainable development



Source: Author.

A previous statistical analysis – using environmental indicators of most of the Organization for Economic Co-operation and Development (OECD) countries – demonstrated that there are statistically significant relationships between some variables, such as agricultural production (and total energy use) and greenhouse gas emissions, as well as the gross domestic product and energy use (see Fig. 2).

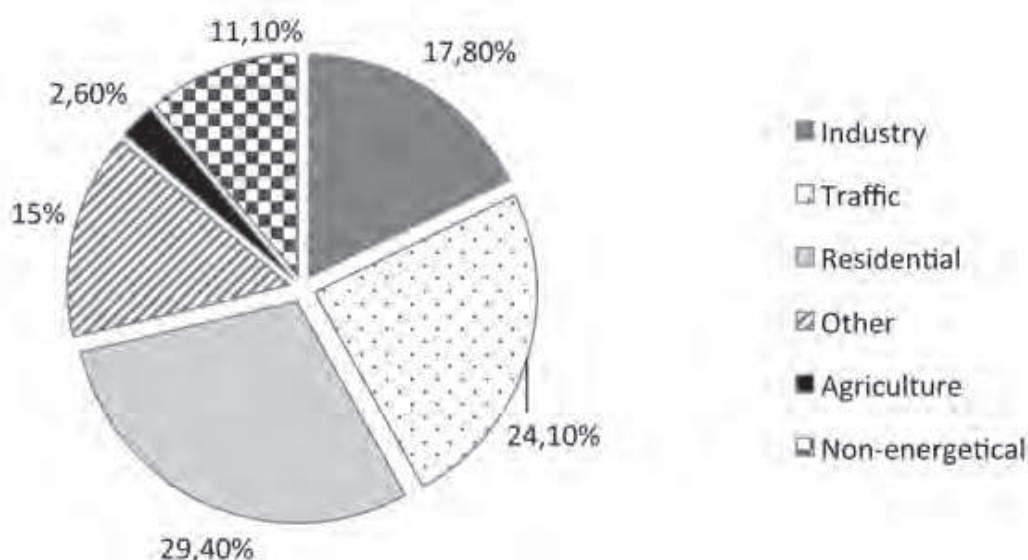
Fig. 2. The statistical connection between energy use and CO₂ emission in OECD countries



Source: Author, based on OECD (2008) data.

The strongest relationship identified was between energy consumption and CO₂ emissions. Apart from a depletion of fossil fuel sources, Hungary is highly dependent on them and nowadays these energy sources are quite expensive as well. According to the Hungarian Central Statistical Office's publication *Regional Differences in Economic Development in Hungary in 2010* (2010), energy consumption significantly decreased in Hungary from 2008 to 2009, but increased again in 2010. That year the relative energy intensity of the economy decreased by 0.7 %, while GDP increased by 1.7 %. Domestic electricity production continued to grow in 2010 by 4.1 %, more than in the previous year. Almost half of the aforementioned energy was produced from fossil fuels – mainly coal and gas – and 42 % of this energy was produced by nuclear power. In Hungary, 29.4 % of final energy is consumed by the residential sector, and 15 % is consumed by the (local) governmental sector inter alia (see Fig. 3).

Fig. 3. Final use of energy by sectors



Source: Fábíán (2011).

Researchers like László Antal (2007) and András Lányi (2012) said local communities will have an essential role in the prevention of climate change, much greater than what the central authorities would have. That is why it is justifiable to let them take a major part in the fight against climate change. So rural areas and local governments are able to spread environmentally conscious and energy efficient development methods, because the citizen's energy efficiency (and climate) awareness can be strengthened by local public institutions, mostly municipalities. Hard steps should be taken against climate change and energy waste. It can be difficult to communicate these measures to the people because of its unpopularity. It is important to make

these decisions by authorities which are close to the people; moreover, if we want to encourage sustainability in a local community we need to make it appealing. Furthermore, local and regional strategies have to be evolved in order to shape public opinion in the right direction, build people's environmental responsibility, and create a strong environmental focus (Kovács, 2001). We consider landscape to be the relevant space where all changes have their manifestation at the end (Lapka, 2012). Lapka and colleagues (2012) state that local perception and understanding of global environmental problems is often insufficient because it tends to disregard possible impacts of global issues on "our" town, city, or landscape. Even if science is able to provide us with crucial information about the threats, culture (here intended in the broad sense of human adaptation, thus as a manifestation of human activity) hardly ever integrates this information in a proper way. Both technology and economy are parts of a very complex cultural system, consisting of interlinking norms, values, ideas, and other manifestations of human enterprise. Lapka and colleagues (2012) note that this means that environmental problems do not only depend on the level of technology, but they are rather anchored in the whole cultural complex that is not able to either recognize or solve them.

In Hungary, energetic self-preservation is also a problem for households and local governments even though energy waste and poverty are both typical for them. In the past few years many Hungarian local governments were in a difficult financial situation. It is true mostly for counties, and larger towns, but some smaller ones too. Still only few Hungarian local governments employ energy and climate experts, who should be in contact with authorities, non-governmental organizations, and residents, coordinate the work on energy efficiency and climate change, monitor climate protection tender opportunities, prepare tender documents, and finally, participate in the implementation of the projects.

The Hungarian society is a changing one, primarily politically, and economically. But the aim of this essay is to show the local society's (and small communities) changing opinion about protecting the environment, and saving energy. This process has some catalysts, like legal and economic necessities, but I am going to write about the changing level of environmental awareness and energy poverty in Hungarian local governments and households. In order to make the above concepts traceable, I examine related (statistical and questionnaire-based) data from the end of the 1980s and the beginning of the 2010s.

My research questions are:

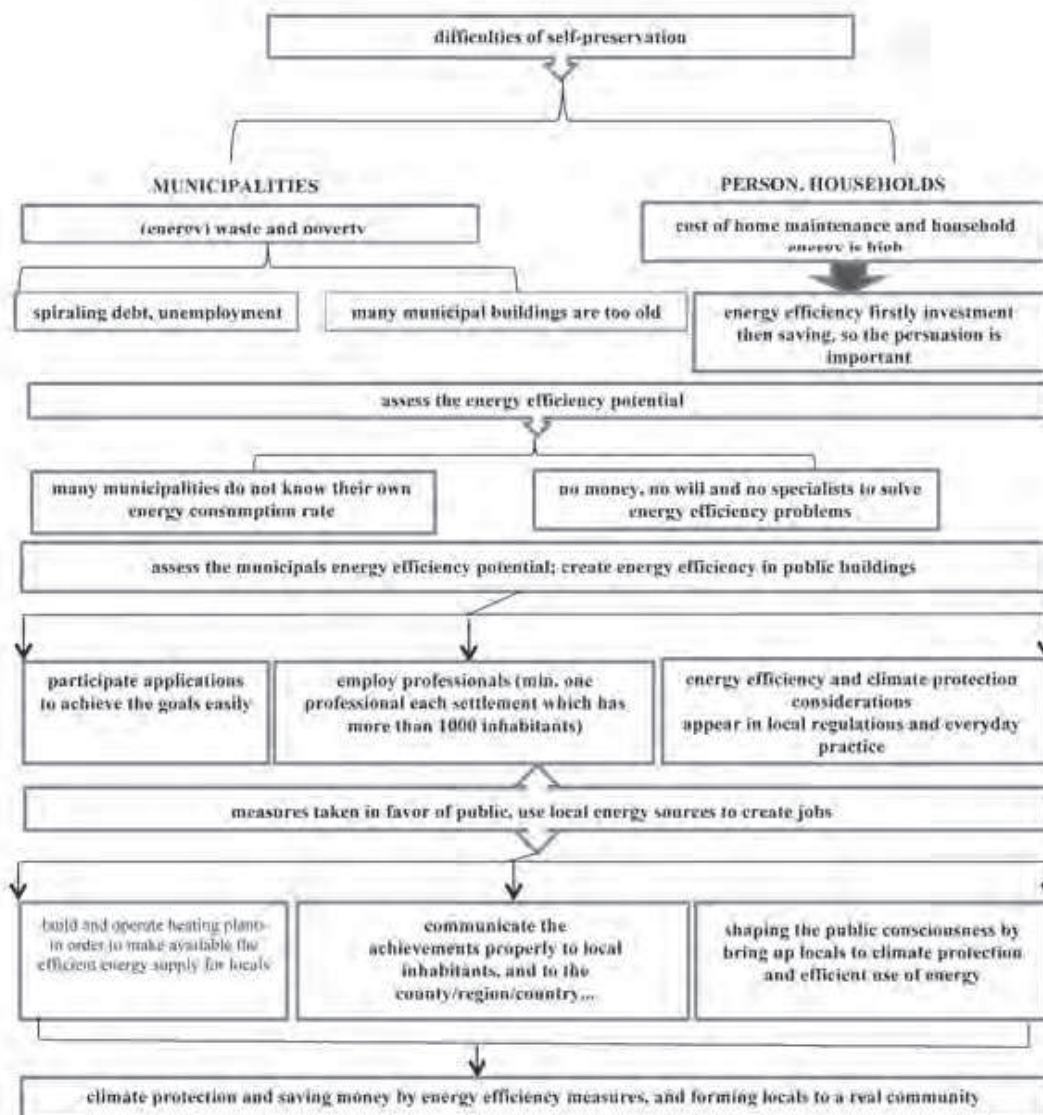
- Why do local authorities have an important role in the energy awareness “education” of local residents?
- What are the characteristics of Hungarian local government’s/inhabitant’s energy management/consumption?
- What are the visible causes and consequences in both cases?
- Whether a person – living in a settlement where the municipality takes measures for environmental protection and energy savings – will be motivated enough to take steps to reduce his/her household energy costs?
- What are the characteristics of the local people’s energy awareness in 2013 compared to 1989?
- In this context what are the essential steps a local government should take to use less energy and raise local resident’s energy-awareness?

My scientific presupposition about the relationship between the local people and municipalities, including the environmental, social and economic aspects, is illustrated in Figure 4.

2. Materials and methods

In order to be able to answer the questions above I carried out literature-based and statistical research, moreover, a survey, too. I would like to show the complexity of this theme so my literature-based research covers an analysis of relevant statistical indexes (HDI, or energy dependence value), sociological aspects (energy poverty in Hungary, self-preservation problems of Hungarian inhabitants), some legal aspects (in connection with EU law), and finally financial aspects (financial problems of Hungarian local governments in recent years). In this paper I analyze two statistical databases I got from two surveys, one was generated in 1989, the other in 2013. The latter was my own work. The sort of data obtained determined the data analyzing methods I was able to use, for details see below. I used some kind of descriptive statistics, cross-tab analysis, and the CHAID-method too. I use the following variable as the dependent variable: “Would you pay 50 % more for electricity, if you could close air polluting thermal power plants and build cleaner ones?” I use the following variables as independent ones: “How much are you interested in environmental issues?”; “Do you have a job currently?”; “Are you retired, or a housewife, or are you on maternity leave?” I expect that those people who had a job and interested in environmental issues would likely pay 50 % more for electricity if you could close air pollutant thermal power plant and build cleaner ones.

Fig. 4. The overview of this chapter



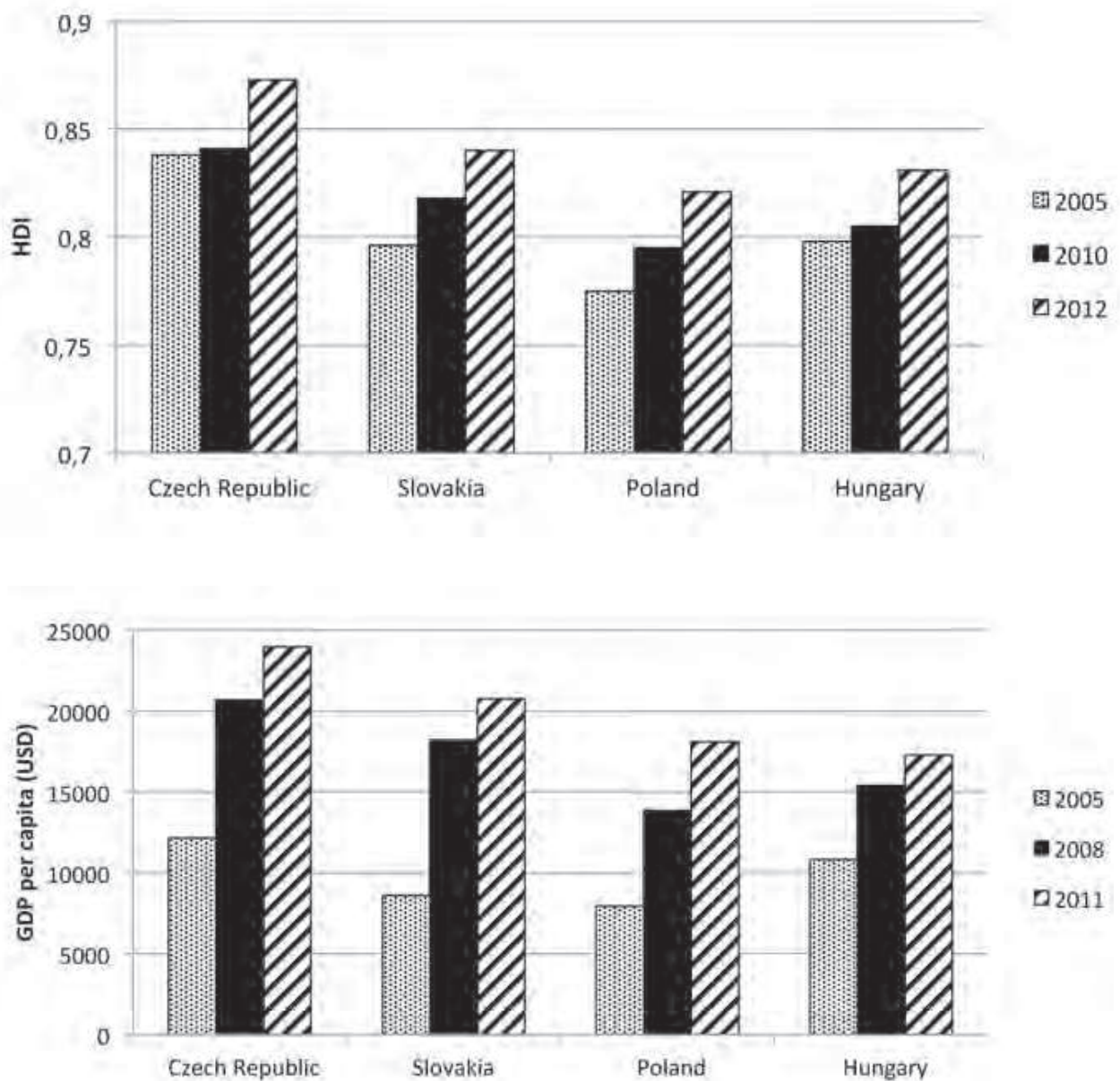
Source: Author.

3. Literature review

3.1. The connection between HDI and energy dependence values in V4 countries

According to these charts we see that both levels of Gross Domestic Product and Human Development Index had a rising tendency between 2005 and 2011 in our region. The economic crisis – especially in Hungary and in Slovenia – spoils the picture (see Fig. 5 and 6).

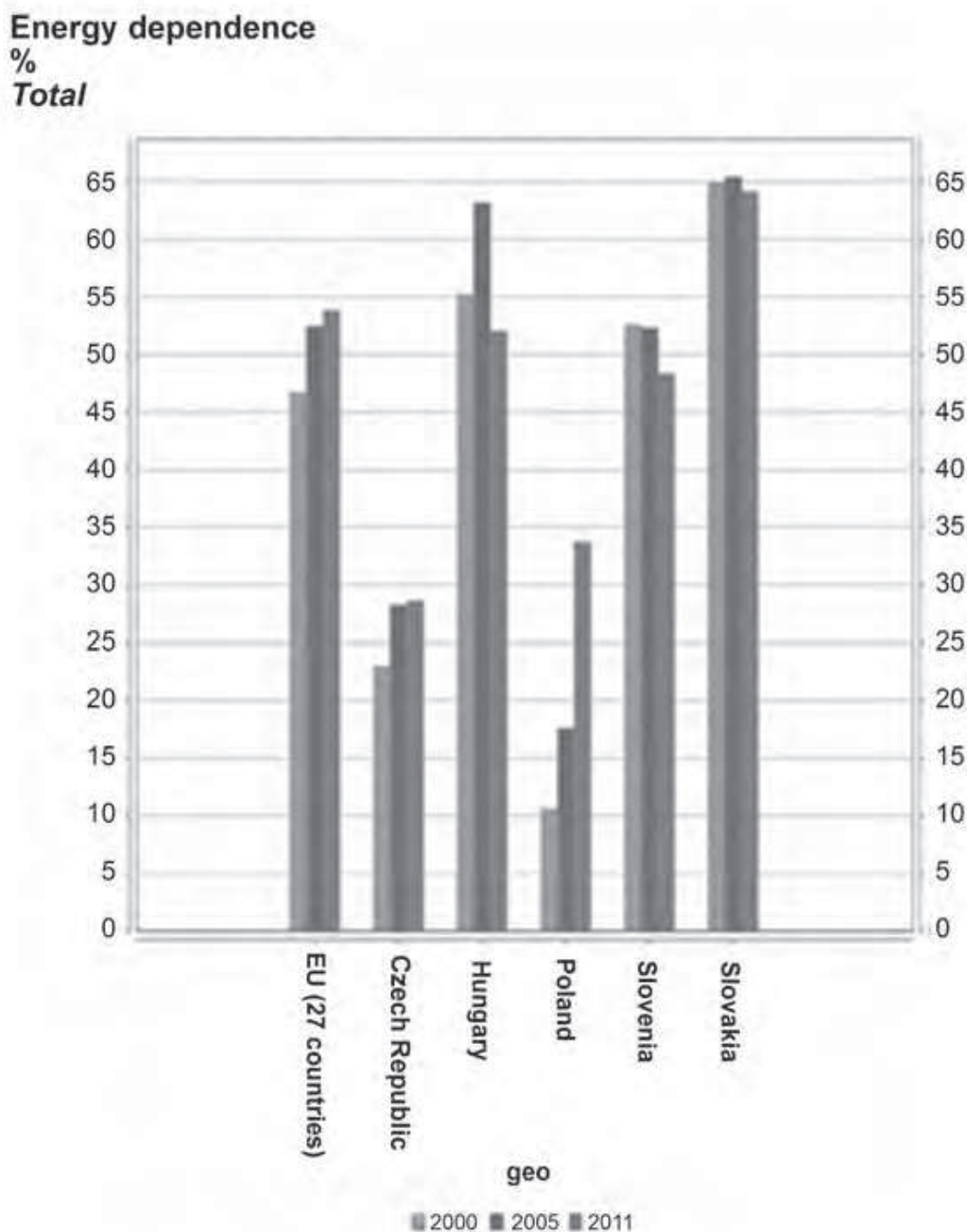
Fig. 5 and 6. Comparison of HDI and GDP per capita values



Source: United Nations Development Programme [UNDP] (2013).

The energy dependency index has decreased in Hungary and in Slovenia in recent years (see Figure 7), due to the economic crisis probably. But it would be better if the reason for this tendency were an energy efficient (and environmental friendly) reform of our everyday life.

Fig. 7. Energy dependence values in central european countries between 2000 and 2011



Source: Eurostat (2013).

According to Human Development Report 2011 and 2013, countries with higher incomes generally have higher carbon dioxide emissions per capita. These results also show the nonlinear nature of the relationship between carbon dioxide emissions per capita and HDI components: little or no relationship at low HDI, but as the HDI rises a “tipping point” is reached, beyond which appears a strong positive correlation between carbon dioxide emissions and income (UNDP, 2011).

3.2. Towards a “pro-environmental” society

“Pro-environmental” society values mean changes in terms of intrinsic values toward respect to the environment, towards the consciousness of dependence of human culture to nature, and towards environmental ethics. The term pro-environmental society is better than “environmentally friendly society”, which is more connected with the results, the technology and processes (Lapka, 2012). Environmental awareness is an environmental value of individuals and the society which is created by the knowledge and moral beliefs about the environment. Environmental awareness is the best, science-based way of thinking and a behavior based on it, which purposefully combines long-term environmental interests. Its purpose is creating the harmony between mankind and the environment. The environmental attitude is intuitive, but on the other hand it is dependent on learned behavioral patterns, scientific knowledge or ideologically supported ideas (Kovács, 2007). The changing “inscape” – our internal understanding of the world and the relationships between man and nature – is the first driving force in the process of building the pro-environmental society. Of course any conceptualization of a pro-environmental society will be based on the adoption of critical ecological paradigms and programs. But beyond environmental goals, it would seem that basic criteria should include such societal and human values as justice and equity (Lapka, 2012). Changes in the physical and biological spheres of the environment are inseparable from power relations in society, from its institutional forms (politics, public administration), the level of economic development, and cultural traditions (Buday-Sántha, 2009). People’s environmental awareness covers only environmental pollution, but most of them do not care about the limits of existing resources. Even so, we should take seriously the restrained use of our existing energy and raw material resources, and the environmental damage of which consequences have not been perceptible but the tendency is very threatening (Vass, 2008).

3.3. Energy poverty

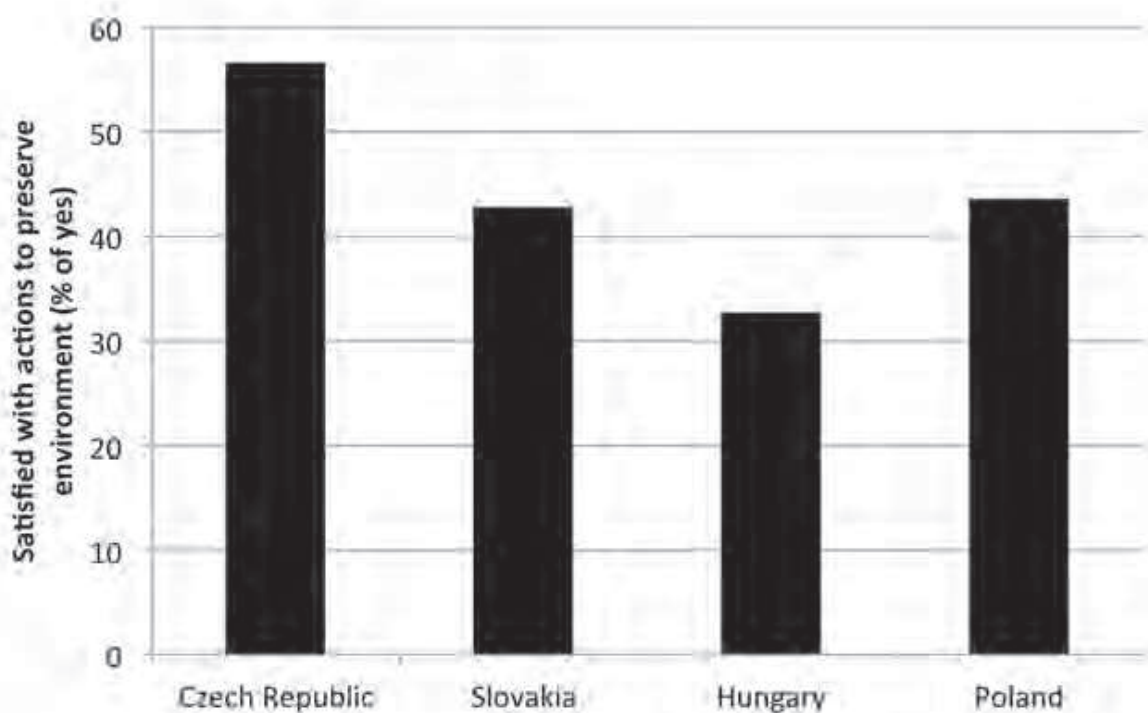
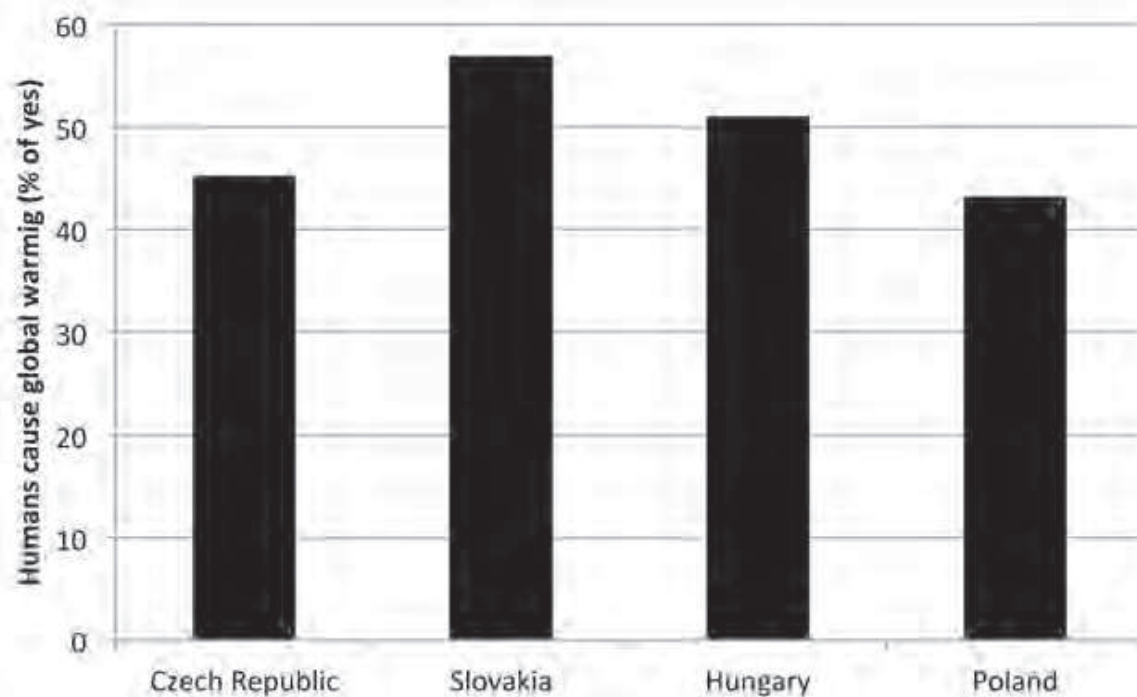
Energy efficiency as a problem has not only an environmental and social aspect (in a broader sense) in Hungary but another special aspect, too. This is energy poverty, which as a social problem arose in 1970s and 1980s. In Hungary at least one million people are affected by this phenomenon. The state should support (financially) energy efficiency, should promote measures to reduce energy consumption. According to a report from 2009, 50–125 million people were affected by this problem Europe-wide (Szabó-Tóth, 2013). The study found that one out of seven households was concerned in energy poverty. Eighty percent of Hungarian households are affected by energy poverty because they usually spend more than 10 % of their income on energy costs. According to the opinion of the researchers who were involved in the Nega-

Joule 2020 research project of the Energiaklub Climate Policy Institute (Ada Ámon, Zsuzsanna Király, András Perger), those households were involved in energy poverty which usually spend more than 10 % of their income on energy costs (Fellegi & Fülöp, 2012). The research also shows that the problem mainly affects elderly people living alone in smaller towns in the countryside. In the first report of the project “Energy Poverty in Hungary” Tirado-Herrero and Ürge-Vorsatz (2010) stated that the main reasons for the high level of energy poverty in Hungary are high energy prices, a relatively low level of GDP per capita, a high level of energy consumption of houses, and finally, the inadequate temperature regimes of low-income families’ houses. Between 2005–2007 16.7 % of the Hungarian population accumulated utility arrears – it means more than one and a half million people. In 2007 Hungary had the highest rate among the EU population. Examining this question per household types for the same period I can find the highest ratio in households with dependent children: 21 % in 2005, 24 % in 2007 as Tirado-Herrero and Ürge-Vorsatz stated (2010). Only 13.7 % of these families said that they were not able to heat their apartment properly. Four percent of households with 65 year or older family members have utility arrears, but 20 % of them said that they are not able to heat their apartment comfortably. For the question “In the past year has it ever happened that your household could not pay the bills or there was not enough money for food?” 34 % of responders answered yes. It is twice as much as EU average. So the number of people who have utility arrears could be 2.3 million. The unemployed person and those who live in the Northern Hungarian Region are in the most difficult situation: every second one of them has some kind of debt. According to the Eurostat database (data between 2008 and 2010) 10–12 % more people had existential problems in Hungary in 2010 than in 2008. Fifty-eight percent is the proportion who responded yes to this question (Szabó-Tóth, 2012). Moreover in 2010, an average Hungarian household spent 6.4 % more money on home maintenance and household energy (and 6 % less money on food and soft drinks) than in 2000. Maybe the reader is able to see that important residential environmental attitudes have to be changed if we would like to solve this problem. I think so many residential attitudes have been changed in Hungary since 1989, but the main attitudes in connection with energetic problems have not yet. This is a real and current problem not only to Hungarian families but to local governments, too.

3.4. Different environmental attitudes between 1990 and 2012 in Hungary

Before 1990 the society's environmental awareness and values were greatly influenced by the following factors: people's qualification, the size of their municipality, their age, parents' qualification, interest for ecological problems, and their position in the society. Other determining factors are living conditions, the level of quality of life, and a variety of economic and other constraints, and finally the lack of historical and cultural socialization in the context of the above mentioned environmental problems. Further studies are reported by Kovács (2007). The Hungarian Gallup Institute conducted an assessment in 1994 called "Greener Hungary" – Environmental attitudes. According to this assessment it was stated that environmental problems are considered more important than social problems in Hungary. In 1996 TARKI recognized the significant lack of knowledge about the factors that impair the environment. Exceptions were those which were frequently cited by the media, like acid rain, the greenhouse effect, the ozone hole, smog, and radioactivity (Vass, 2008). Kovács (2007) described the results of a countrywide, representative poll by the Hungarian Gallup Institute which was done among the 18 and older population in connection with the following topics: environmental protection, energy consumption, and the fiscal policy related to them. It is stated that the vast majority of the population is willing to make (not too significant) sacrifices for the environment, but many others are waiting for others' help for a solution. Only a small group of respondents think that each person has just as much responsibility as the local governments, environmental organizations and the government in solving environmental problems. According to the respondents the state should tax much more rigorously environment-intensive activities, and the biggest environmental polluters who "do not pay for the damage they have caused". The majority believes that excessive material and energy consumption should face increased taxation in order to reduce people's personal income taxes and contributions. Even 70 % of the respondents rejected paying more taxes even if the state spends the surplus to reduce environmental degradation. According to modern United Nations Development Programme (UNDP, 2011) surveys (for some results see Fig. 8 and 9) every second Hungarian said that global warming is an anthropogenic process. In our region it is the second highest value (after Slovakia). Furthermore Hungarian people are the least satisfied with actions to preserve the environment. The Czechs are the most satisfied.

Fig. 8 and 9. Some results of UNDP survey in charts (2006–2010 answers)



Source: UNDP (2011) and author.

3.5. Energetic self-preservation difficulties in Hungarian municipalities

Paradoxically, increased investment activity related to EU applications had a negative impact on the financial position of local governments (Domokos, 2012). The EU financial support system would work more appropriately if resources were available to support operations and constructions. It was announced in October 2012 that the state would assume the full debt of settlements which have less than 5,000 inhabitants and partly assume the debt of larger settlements. The financial balance of local municipalities deteriorated between 2007 and 2010. Municipality bank debts increased by 77.7 % (Hunyor, 2012). The main reason for local governments' debt was a lack of their own resources to cover the down-payment needs of the EU investments. Local governments used property, which failed to cover the loans. The forms of indebtedness consisted of operating credits, investment credits from banks, and bonds. The biggest increase could be observed in the field of bond issues (Vas, 2011). The non-operating budgets of every Hungarian municipality had deficits in every year between 2007 and 2010. There are commitments the repayments of which are not assured because of increased investments. Another risk factor concerns the future management, operations and sustainability of facilities established by previous developments (National Audit Office [NAO], 2012). Another problem is that in many cases the operation did not result in additional revenues or a significant savings in expenditures. In the past few years, the investments' main goal did not involve improving equipment used in obligatory municipal tasks nor the efficiency of tools (Domokos, 2012). The operating incomes of local governments declined steadily from 2008 (from 2007 to 2010 operating incomes decreased by 55.8 %) (NAO, 2012). Material expenses spent on public institution operations were very important items of municipal budgets. Their energy (utility) costs increased. The growth rate of energy was higher than any other material expenses growth rate (Kovacsics, 2003). Communal consumers represented an increasing proportion in the national energy balance. The municipalities' material expenses, which are controlled by the State Audit, increased by 136.8 % between 2007 and 2010. During the decision-making process, priority was not given to repayment requirements but to compulsory tasks, the improvement of equipment efficiency, and the preservation of existing assets. Moreover, because most Hungarian municipal buildings are old, their maintenance is also expensive. Hungarian local governments spent 345 million € (totally) on energy expenditures (Fábián, 2011). The local governments' main reason for energy investments was maintenance (Kovacsics, 2003). Energy efficiency improvements have many benefits. However, the approach of local governments and residents needs to change. This pertains not only to climate protection and morality but expenditures too.

3.6. The most important catalysts, some legal and economic necessities

Beyond the financial necessity there are other important factors which could press Hungarian local governments to “think green”, and take measures to create energy efficiency. The base of the substantive political priorities defined by the Multi-Annual Financial Framework 2014–2020 are the priorities from the Europe 2020 document (European Commission, 2010) which will have an important role in this decade. According to the framework, 37 % of the available financial resources will be spent on sustainable development and natural resources in the next years, and after 2014 the environmental and climate policy priorities will prevail in all major EU funding instruments. It is necessary to increase the proportion of expenditures on climate policy by a minimum of 20 % together with contributions from other policy areas. The Commission’s announcement – the so-called Europe 2020 report which was finalized by 2010 – suggested that the European Union should set realistic targets in the fields of energy, education, and R&D; and furthermore, fight against poverty, and climate change. The national goals could be deduced from these targets. We would find the causes of the energy consumption rate reduction in poverty rather than in serious changes of consumer’s behavior. Consumers and enterprises are exposed to harmful and costly price changes; this threatens economic security and contributes to climate change. According to the well-known Hungarian NGO, ENERGIAKLUB Climate Policy Institute’s investigations (Fülöp, 2013) the energy consumption of Hungarian state office buildings can be reduced by 50 %. According to the same study the energy consumption of Hungarian state educational buildings (various kinds of elementary schools and high schools) can be reduced by 62.9 %.

4. Results and discussion

4.1. Statistical analysis of environmental awareness data from 1989

Unlike the international practice, in Hungary a few polls deal with the environmental (and energy efficiency) awareness of the population. Also, only a few polls deal with the relationship between the population and environment programs. One of the first, nation-wide, representative, professional polls was held in 1989, using approximately 800 questionnaires.¹ I used some parts (16 observation variables – see Tab. 1) of all of the original questionnaires, and then prepared a SPSS database for statistical analysis. **It is important to state, that my results are not the same as the original researchers results were because I used only their questionnaires and modern statistical analysis software (SPSS 20).** The observation variables are in Tab. 1. During digitalization I did not modify the mode of giving

¹ For earlier, not SPSS-based results see Hársfalvi, Kulcsár and Misovicz (1989).

codes to answers the original authors used. Most of the codes they used previously were not dichotomic ones (0 no, 1 yes), rather like this 0 – no answer, 1 – yes, 2 – no, 9 – do not know. The exact number of observation units is 782. It is necessary to present all the observation variables because all but one of them (as independent variables) will be included in a CHAID analysis below.

Tab. 1. The observation variables

Settl. type	The simplified administrative classification of the settlement (added subsequently to the matrix by me, using the questionnaires)
County	The county where the particular settlement is located (added subsequently to the matrix by me, using the questionnaire)
Q1	Are there any environmental issues in your town cause problems to inhabitants?
Q3	Can you do something to solve these environmental problems?
Q4	What can you do?
Q10	According to your experiences, is your town/city a cleaner or a polluted one?
Q11	According to your experiences, is Hungary a cleaner or a polluted country?
Q13	Can you mention such environmental problem which is relevant for the country?
Q15	Can you do something to solve those environmental problems?
Q25	How much are you interested in environmental issues?
Q3435	Do you have a job currently?
	Are you retired, or a housewife, or are you on maternity leave?
Q52	What do you think about constructing another nuclear power plant in Hungary?
Q74	Are you a member of an environmental NGO?
Q75	Have you ever participated in an environmental movement?
Q79_9	Would you take part in a protestation against anything which threatens the environment, if you are endangered?
Q79_12	Would you pay 50 % more for electricity, if you could close air polluting thermal power plants and build cleaner ones?

Source: Hársfalvi, Kulcsár and Misovicz (1989) and own work.

Using such non-metrical codes I mentioned previously delimit the statistical analyze methods I could use. Transforming the codes to dichotomic ones is not the appropriate method because I will lose data if I do not take into account “answers” like 0 – no answer, or 9 – do not know, or sometimes 8 – not my job. Moreover some questions are connected with others, like Q1–Q3–Q4. The data matrix does not allow me to use very simple statistical analysis methods, like most of basic, descriptive statistics, and dimension reduction methods (factor analysis), too. Without using factor analysis there is no reason for doing cluster analysis.

Because of the above mentioned facts I could only use cross-tab analysis and CHAID decision tree analysis, because this latter one does not demand any regulations in connection with the measuring scale and distribution of variables (Hámori, 2001).

The relevant cross-tabs analysis results are the following:

- **Settlement type versus “How much are you interested in environmental issues?”**

Tab. 2. Cross tabulation analysis

		Q25				Total
		not interested in	interested in a bit	interested in (medium)	interested in very much	
Settl. type	rural	23	29	137	74	263
	urban	7	22	129	133	291
	Budapest	17	28	94	79	218
Total	47	79	360	286	772	

Source: Author.

Tab. 3. Chi-Square tests

	Value	d. f.	Asymp. sig. (2-sided)
Pearson Chi-Square	28.376 ^a	6	0.000
Likelihood Ratio	30.027	6	0.000
Linear-by-Linear Association	1.816	1	0.178
N of Valid Cases	772		

Note: ^a 0 cells (0.0 %) have expected count less than 5. The minimum expected count is 13.27.
Source: Author.

I was able to use 98.7 % of the answers to the mentioned questions. According to Tab. 2 I can state that most of the people who are interested in environmental issues came from urban areas (towns) and from Budapest. Rural inhabitants showed only “medium” interest in environmental issues. According to Tab. 3 the result of the Chi-Square test ($p < 0.01$) is highly significant, so the associative relationship is statistically justified.

- **“Do you have a job currently?” versus “How much are you interested in environmental issues?”**

Tab. 4. Cross tabulation analysis

		Q25				Total
		not interested in	interested in a bit	interested in (medium)	interested in very much	
Q3435	have a job	11	38	234	177	460
	be on maternity leave	1	1	16	5	23
	housewife or dependant	2	6	27	12	47
	retired	33	34	81	89	237
Total		47	79	358	283	767

Source: Author.

Tab. 5. Chi-Square tests

	Value	d. f.	Asymp. sig. (2-sided)
Pearson Chi-Square	57.901 ^a	9	0.000
Likelihood Ratio	55.570	9	0.000
Linear-by-Linear Association	21.004	1	0.000
N of Valid Cases	767		

Note: ^a 4 cells (25.0 %) have expected count less than 5. The minimum expected count is 1.41.

Source: Author.

I was able to use 98.1 % of the answers to the mentioned questions. According to Tab. 4 most of the people who had a job showed a “medium, or very much interested” in environmental issues. People who were retired showed a considerable interest to environmental issues. According to Tab. 5 the result of the Chi-Square test ($p < 0.01$) is highly significant, so the associative relationship is statistically justified.

- **“Do you have a job currently?” versus “Would you pay 50% more for electricity, if you could close air polluting thermal power plants and build cleaner ones?”**

Tab. 6. Cross tabulation analysis

		Q79_12			Total
		I would	I would not	do not know	
Q3435	have a job	179	264	15	458
	be on maternity leave	7	13	3	23
	housewife or dependant	7	37	5	49
	retired	61	163	13	237
Total		254	477	36	767

Source: Author.

Tab. 7. Chi-Square tests

	Value	d. f.	Asymp. sig. (2-sided)
Pearson Chi-Square	27.676 ^a	6	0.000
Likelihood Ratio	27.354	6	0.000
Linear-by-Linear Association	6.887	1	0.009
N of Valid Cases	767		

Note: ^a 2 cells (16.7 %) have expected count less than 5. The minimum expected count is 1.08.
Source: Author.

I was able to use 98.1 % of the answers to the mentioned questions. According to Tab. 6 most Hungarians would not like to pay 50 % more for electricity if they could close air polluting thermal power plants and build cleaner ones. Although these are old data, the tendency could be the same nowadays.

According to a countrywide, representative poll of Hungarian Gallup Institute almost ten years ago even 70 % of the respondents rejected paying more taxes even if the state would spend the surplus to reduce environmental degradation. See below for details. Rather, people who had a job or retired ones would not like to pay 50 % more for electricity if they could close air polluting thermal power plants and build cleaner ones. According to Tab. 7 the result of the Chi-Square test ($p < 0.01$) is highly significant, so the associative relationship is statistically justified.

- **“Would you pay 50 % more for electricity, if you could close air polluting thermal power plants and build cleaner ones?” versus “What do you think about constructing another nuclear power plant in Hungary?”**

Tab. 8. Cross tabulation analysis

		Q52			Total
		agree	disagree	do not know	
Q79_12	I would	97	142	15	254
	I would not	168	271	37	476
	do not know	6	22	7	35
Total		271	435	59	765

Source: Author.

Tab. 9. Chi-Square tests

	Value	d. f.	Asymp. sig. (2-sided)
Pearson Chi-Square	12.044 ^a	4	0.017
Likelihood Ratio	10.791	4	0.029
Linear-by-Linear Association	10.745	1	0.001
N of Valid Cases	765		

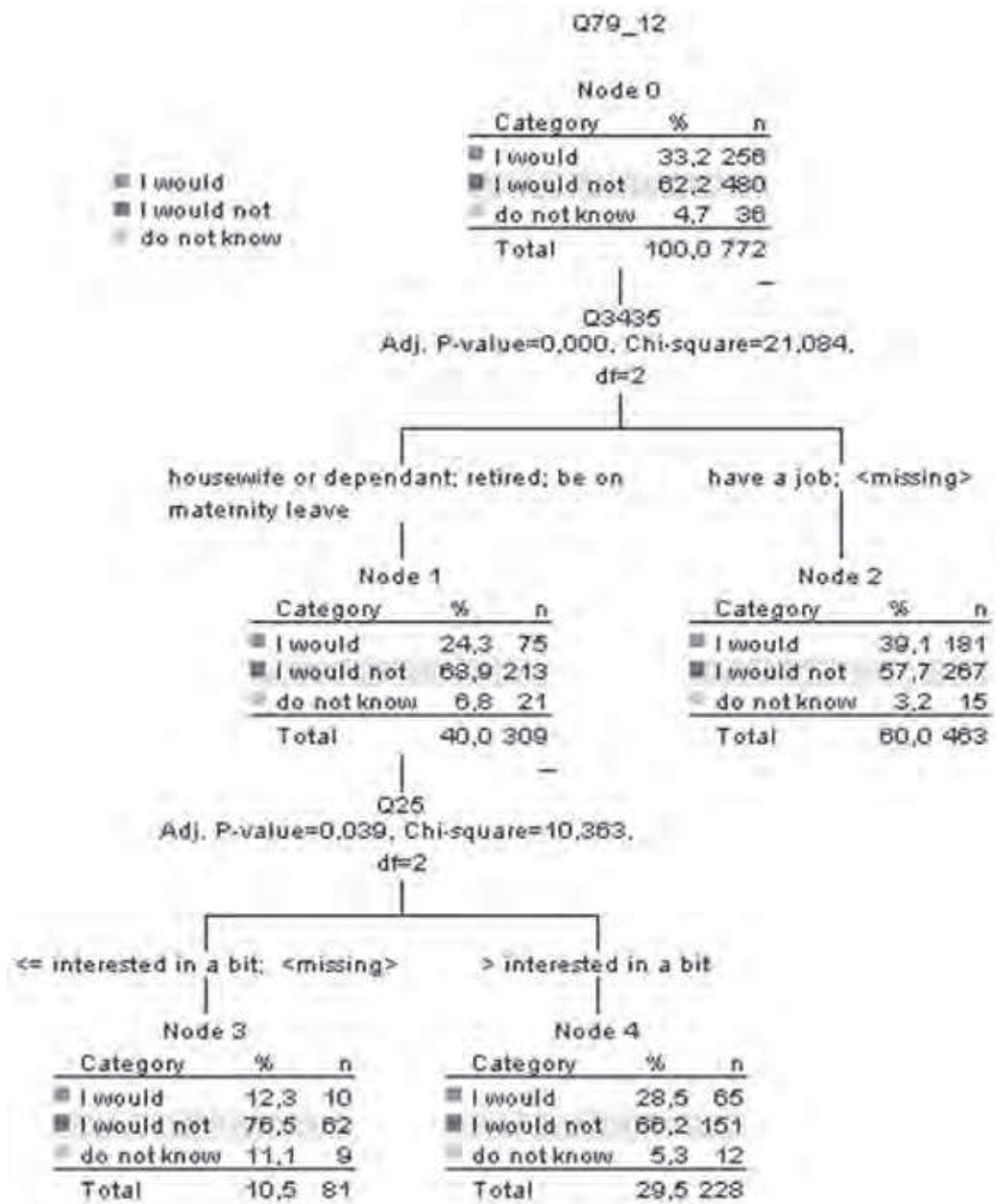
Note: ^a 1 cells (11.1 %) have expected count less than 5. The minimum expected count is 2.70.
Source: Author.

I was able to use 97.8 % of the answers to the mentioned questions. According to Tab. 8 I can state that most Hungarians disagreed with constructing another nuclear power plant in Hungary. It is very interesting that a significant

part of inhabitants who disagreed with constructing another nuclear power plant would not like to pay 50 % more for electricity if they could close air polluting thermal power plants and build cleaner ones. According to Tab. 9 the result of the Chi-Square test can be significant, so the associative relationship is statistically justified.

- **CHAID decision tree method**

Fig. 10. The CHAID decision tree model



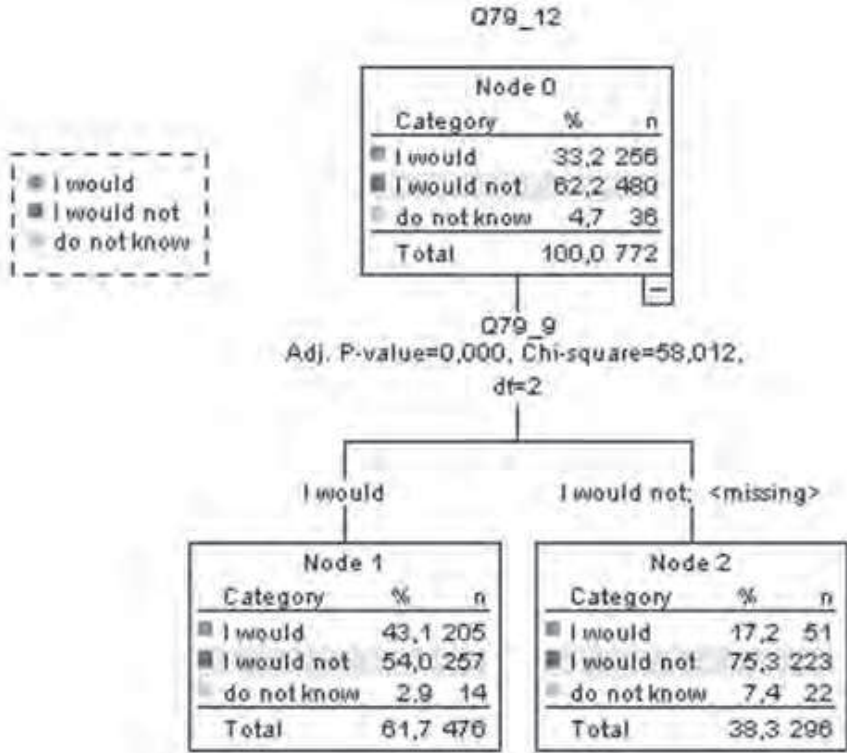
Source: Author.

It had a high probability that a randomly selected individual would not like to pay 50 % more for electricity if he or she could close air polluting thermal power plants and build cleaner ones. It is true despite the fact that the

Hungarians are mostly interested in environmental issues. A non-negligible percentage of those who would not like to pay 50 % more for electricity are interested in environmental issues, had a job, or were retired. So the dependent variable is mostly dependent on whether the responder had a job or not, and less dependent on whether the responder was interested in environmental issues or not (see Fig. 10).

The previous analysis using the CHAID decision tree method was maybe a bit pre-set. I chose not only the dependent variable, but the independent variables, too. I am convinced that my previous analysis and its result was statistically relevant, nevertheless I think that performing another analysis can be justified. Now I choose the same dependent variable (Q79_12), but now I allow SPSS to choose those independent variables which are relevant statistically. Firstly, I can state the same as previously, it had a high probability that a randomly selected individual would not like to pay 50 % more for electricity if he/she could close air polluting thermal power plants and build cleaner ones. SPSS chose (see Figure 11) the following independent variable: “Would you take part in a protest against anything which threatens the environment if you were endangered?”. Those people who would like to pay 50 % more for electricity would really like to do something for the environment (not only in words but also in deeds). So the dependent variable is dependent on whether the responder would like to take part in a protest in favor of the environment if he/she is endangered.

Fig. 11. The CHAID decision tree model



Source: Author.

4.2. About currently related research

One of the current research projects related to the mentioned topic took place at the Szent István University which is a part of a research consortium (which deals with pyrolysis as waste management technology). One of the areas of this research is about the acceptance of new waste management technologies (which creates and saves energy) within the community, or generally the environment and energy (saving) awareness of local communities. It was assumed that the presupposition can be better verified by examining smaller settlements, because there is a much more direct relationship between the inhabitants and the local government than in larger settlements. That is why four relatively small (3,000–8,000 inhabitants each) Hungarian settlements were chosen where surveys were carried out in Autumn 2013 and in Spring 2014 in order to define the level of the environment and energy (saving) awareness of inhabitants. We got back 677 completed questionnaires. The chosen settlements were Vértesszőlős, Tura, Sajóbáony, and Polgárdi (see Fig. 12 and Tab. 11). The reasons for selection: Vértesszőlős and Tura were chosen because they are open to environmental initiatives; Polgárdi because there is a pyrolysis pilot plant, and finally Sajóbáony (and its area) is burdened with serious environmental problems (a chemical industry park, two hazardous waste incinerators, etc.). These new questionnaires contain several questions from the previous survey of Hársfalvi, Kulcsár and Misovicz from 1989 in order to get comparable data. The selected settlements represent the specific problems of their wider area very well. Two of them are not the same as the Hungarian average, because their practices are not reflected by the Hungarian average, they really take seriously the need to establish energy efficiency. Vértesszőlős is one of the most energy conscious Hungarian settlements located in the Central Transdanubian Region, about 100 km from Budapest. The administrative area of the town is quite small, that is why establishing industrial parks or big agricultural areas is not possible. The small area is the reason why there is no chance to designate as much residential area as the municipality would like, therefore the prices of building sites are high. Since the 1970s many people have been moving from the neighboring big towns, mostly young affluent people. The Mayor's main goal is a livable and a sustainable ("pain-free" savings) nice town with transparent management. In 2010 the town spent about 43,000 € to pay electricity bills, and about 32,000 € to pay gas bills. The town got approximately 215,000 € from the Energy and Environment Operative Program (co-funded by the European Regional Development Fund) for full energy reconstruction of a cultural center in the village, the mayor's office, the school, and so on. Currently, 17 projects are running; every 2 out of 9 applications for EU funds are rejected every year. In Vértesszőlős not only the mayor but the notary monitors the energy bills every month. The municipal is in contact with Greenpeace; two tree planting events are held

every year by the municipality, NGOs, and the heads of municipal institutions. This year is the third one when the pruning waste is collected from residents by the municipality. In 2011 the Vértés Power Plant used this pruning waste, but from second half of 2012 the municipality has been using it in new local biomass furnaces. The most important energy-conscious step is to acquire EU resources to achieve a 50% reduction in energy consumption by September 2012, but the main goal for 2020 is to achieve energy independence. In contrast with Vértesszőlős we can mention Sajóábony, a small town located in the Northern Hungary Region, a relatively poor part of the country. The town faces different kinds of problems; for example it has had a polluting chemical industrial park for decades, the housing stock is relatively old, and the proportion of disadvantaged population groups is rather high. This settlement is a very interesting case study because it has two working hazardous waste incineration plants but the inhabitants refused (in a local referendum) to build a biomass-fired (pig manure) power plant there. Energetic self-preservation is a very big problem for the 50 % of the inhabitants according to the mayor. Even so, the local government tries to help to the households during renovations. The third location, Tura, is a settlement in the Central Hungarian Region close to Gödöllő and Budapest. This town tries to be energy conscious and that is why for example their nursery's building gets hot water and most of their electricity from solar cells, and the local government plans to produce tomatoes in greenhouses heated by geothermal energy. The public's acceptability of energy conscious projects is better than in Sajóábony thanks to the location of the settlement inter alia. Polgárdi, a town near to Lake Balaton in the Central Transdanubian Region was chosen because there is a working (pilot) pyrolysis waste management plant.

Fig. 12. The four settlements' location on a map



Source: Author.

4.3. Current research results

Out of the 677 completed questionnaires we got 172 from Vértesszőlős, 203 from Polgárdi, 209 from Tura, and 93 from Sajóbábony. In every town, there was an opportunity offered to complete the questionnaire via the internet. It was thought this could be a real opportunity for youngsters, and students. Unfortunately very few people chose this option.

In Vértesszőlős 53.5 % of the respondents finished their secondary studies and 37.8 % had a university or college degree. Almost seventy percent (68.6 %) of the respondents had a job, but only 6 % were students. The proportion of unemployed people was 1.7 %. Most of the respondents (72 %) lived in a rural, family housing milieu. Only two people lived in an apartment building.

In Polgárdi 60.1 % of the respondents finished their secondary studies and 20.2 % had university or college degree. Two thirds (67.5 %) of the respondents had a job and 26.1 % were retired. The proportion of unemployed person was 4.9 %. Most of the respondents (92 %) lived in a family housing milieu. Only 14 people lived in block of flats.

In Tura 59.3 % of the respondents finished their secondary studies and 19.6 % had university or college degree. Almost sixty percent (59.8 %) of the respondents had a job and 28.3 % were retired. The proportion of unemployed people was 3.8 %. All of the respondents lived in a family housing milieu.

In Sajóbábony 64.5 % of the respondents finished their secondary studies and 10.8 % had a university or college degree. Half (52.7 %) of the respondents had a job and 35.5 % were retired. The proportion of unemployed people was 6.5 %. Most of the respondents (69.9 %) lived in a family housing milieu. Twenty one people lived in an apartment building.

The relevant cross-tabs analysis results are the following

- **“What is the level of your highest qualification?” versus “Have you ever tried to reduce your household energy costs?”**

Tab. 10. Cross tabulation analysis

		Have you ever tried to reduce your household energy costs?		Total
		Yes, I have	No, I have not	
What is the level of your highest qualification?	less than 8 class	21	30	51
	8 class	19	51	70
	industrial school, vocational school	67	133	200
	high school	37	151	188
	post-secondary training, college	19	90	109
	university	8	37	45
Total		171	492	663

Source: Author.

Tab. 11. Chi-Square tests

	Value	d. f.	Asymp. sig. (2-sided)
Pearson Chi-Square	21.741 ^a	5	0.001
Likelihood Ratio	21.492	5	0.001
Linear-by-Linear Association	15.535	1	0.000
N of Valid Cases	663		

Note: ^a 0 cells (0.0 %) have expected count less than 5. The minimum expected count is 11.61.
Source: Author.

I was able to use 97.9 % of the answers to the mentioned questions. According to Tab. 10 I can state that the highest level of the qualification of the people who have ever tried to reduce their household energy costs was mostly high school, vocational or industrial school. Most of the responders have not tried to reduce their household energy costs yet. According to Tab. 11 the result of the Chi-Square test ($p < 0.01$) is highly significant, so the associative relationship is statistically justified.

- **“Are you concerned about the status of the environment?” versus „Energy saving is very important for me. I would pay for it irrespective of my financial status.”**

Tab. 12. Cross tabulation analysis

		Energy saving is very important for me. I would pay for it irrespective of my financial status		Total
		true	false	
Are you concerned about the status of the environment?	no	20	18	38
	little bit	59	51	110
	mostly	182	96	278
	very	119	30	149
Total		380	195	575

Source: Author.

Tab. 13. Chi-Square tests

	Value	d. f.	Asymp. sig. (2-sided)
Pearson Chi-Square	23.348 ^a	3	0.000
Likelihood Ratio	24.025	3	0.000
Linear-by-Linear Association	21.539	1	0.000
N of Valid Cases	575		

Note: ^a 0 cells (0.0 %) have expected count less than 5. The minimum expected count is 12.89.
Source: Author.

I was able to use 84.9 % of the answers to the mentioned questions. According to Tab. 12 most of the people who would like to pay for energy savings (irrespective of their financial status) are “mostly, or very” concerned about the status of the environment. According to Tab. 13 the result of the Chi-Square test ($p < 0.01$) is highly significant, so the associative relationship is statistically justified.

- **“Have you ever tried to reduce your household energy costs?” versus “If the municipality of your residence did more for environment protection and energy saving you would be more environment friendly and energy conscious than now?”**

Tab. 14. Cross tabulation analysis

		If the municipality of your residence do more for environment protection and energy saving you would be more environment friendly and energy conscious than now?		Total
		true	false	
Have you ever tried to reduce your household energy costs?	Yes, I have	135	34	169
	No, I have not	419	69	488
Total		554	103	657

Source: Author.

Tab. 15. Chi-Square tests

	Value	d. f.	Asymp. sig. (2-sided)	Exact sig. (2-sided)	Exact sig. (1-sided)
Pearson Chi-Square	3.395 ^a	1	0.065		
Continuity Correction ^b	2.957	1	0.085		
Likelihood Ratio	3.250	1	0.071		
Fisher's Exact Test				0.085	0.045
Linear-by-Linear Association	3.389	1	0.066		
N of Valid Cases	657				

Note: ^a 0 cells (0.0 %) have expected count less than 5. The minimum expected count is 26.49.

^b Computed only for a 2x2 table.

Source: Author.

I was able to use 97 % of the answers to the mentioned questions. According to Tab. 14 most of the responders have not tried to reduce their household energy costs, however they said if the municipality of their residence did more for environmental protection and energy savings they would be more environmentally friendly and energy conscious. According to Tab. 15 the result of the Chi-Square test is less significant, so the associative relationship is statistically barely justified.

- **“Are you concerned about the status of the environment?” versus „Have you ever tried to reduce your household energy costs?”**

Tab. 16. Cross tabulation analysis

		Have you ever tried to reduce your household energy costs?		Total
		Yes, I have	No, I have not	
Are you concerned about the status of the environment?	no	21	25	46
	little bit	43	85	128
	mostly	68	253	321
	very	38	125	163
Total		170	488	658

Source: Author.

Tab. 17. Chi-Square tests

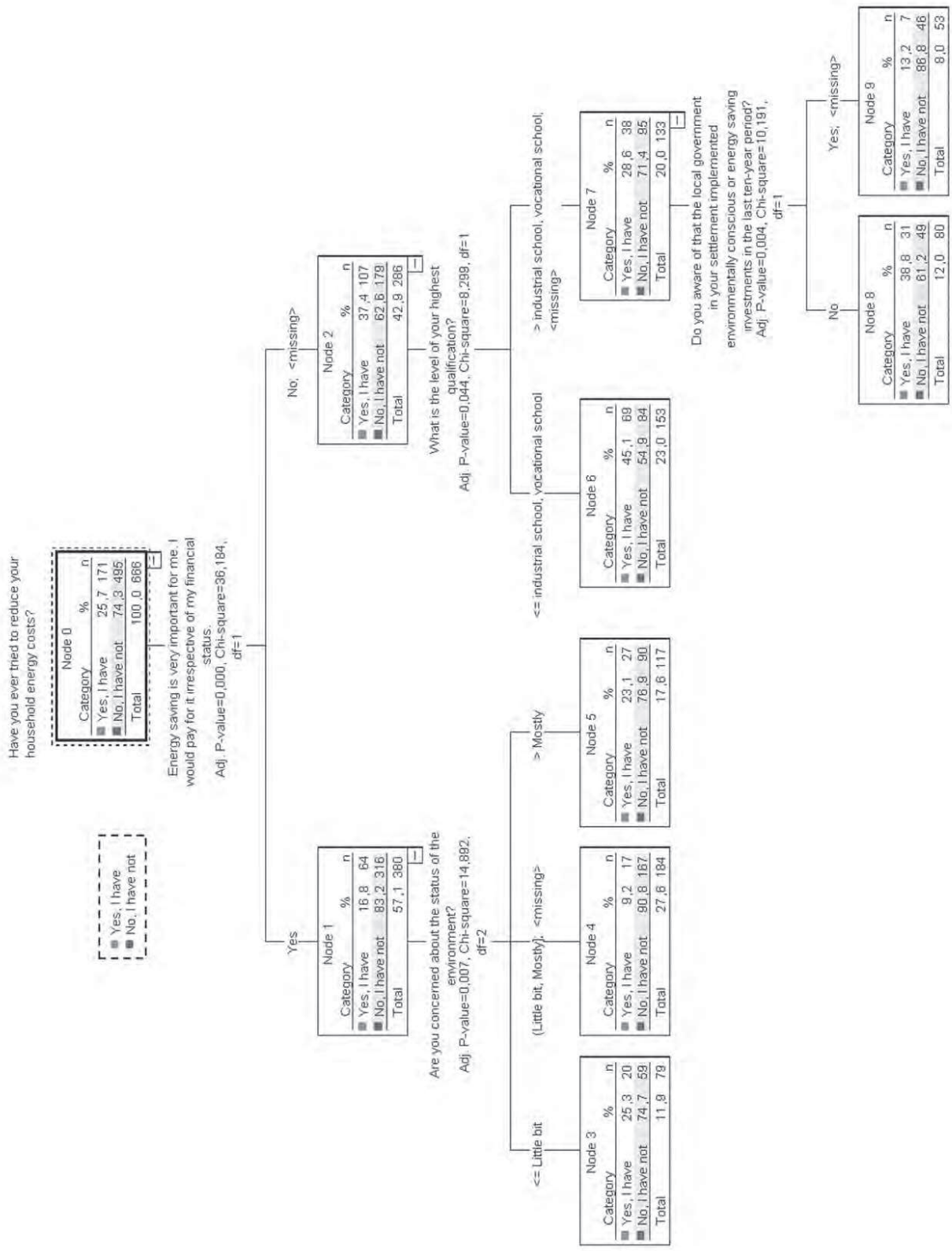
	Value	d. f.	Asymp. sig. (2-sided)
Pearson Chi-Square	17.615 ^a	3	0.001
Likelihood Ratio	16.503	3	0.001
Linear-by-Linear Association	11.547	1	0.001
N of Valid Cases	658		

Note: ^a 0 cells (0.0 %) have expected count less than 5. The minimum expected count is 11.88.
Source: Author.

I was able to use 97.8 % of the answers to the mentioned questions. According to Tab. 16 I can state that most of the responders have not ever tried to reduce their household energy costs, however they are concerned about the status of the environment. According to Tab. 17 the result of the Chi-Square test ($p < 0.01$) is highly significant, so the associative relationship is statistically justified.

- CHAID decision tree method

Fig. 13. The CHAID decision tree model



Source: Author.

I choose only one dependent variable (“Have you ever tried to reduce your household energy costs?”) and several independent ones (“What is the level of your highest qualification?”; “Energy savings is very important for me. I would pay for it irrespective of my financial status.”; “If the municipality of your residence did more for environmental protection and energy savings, you would be more environmentally friendly and energy conscious than now?”; “Are you aware that the local government in your settlement implemented environmentally conscious or energy saving investments in the last ten-year period?”; “Are you concerned about the status of the environment?”). The main message of this CHAID-figure (Fig. 13) is that most people have not ever tried to reduce their household energy, however energy savings is important to them so much so that they would pay for it irrespective their financial status. These people are “mostly or a little bit” concerned about the status of the environment.

Unfortunately, most of the respondents are energy conscious (and environmentally friendly) but only on a conceptual level. Reducing household energy costs can be very costly. People need to raise funds (for example from EU applications) and they need good examples that they can see very close to them. If a local government takes measures to increase energy efficiency these measures will have a spill-over effect. Public buildings will be more energy efficient, local governments will pay less for energy bills, and residents will see good examples so their attitudes will change.

4.4. Proposals for local governments

Among municipal energy management measures, firstly, preventive or mitigation measures should be developed, because ensuring energy efficiency and using more renewable energy will enable the reduction of greenhouse gas emission and prevent or slow down climate change. It is essential for local governments to be able to meet energy efficiency requirements in their everyday management as well as creating energy efficient operations in public buildings. That is why it is necessary to introduce energy efficiency requirements to the relevant legal provisions for local governments. In addition, it is important that each municipality with more than 1,000 inhabitants employs at least one climate rapporteur or energy professional. To achieve these goals the local governments’ participation in applications should be made easier. Various steps should be taken in order to change people’s environmental or energy approach. Residents need to become aware that they belong to a community. If steps are taken to create energy efficiency local governments/communities, it will be possible to use their local energy resources and create jobs.

5. Summary

As a final thought, I would like to stress the importance of energy efficiency in our life, especially in Central and Eastern Europe. In Fig. 2 I show the statistical connection between energy use and CO₂ emission in OECD countries. If we use more and more energy – to ensure economic development – our CO₂ emission will increase in line with the well-known environmental Kuznets curves. Another factor in connection with the importance of energy efficiency is energy security, and the difficulties of energetic self-preservation in families and in local governments (and in the state). For Hungarian families energy poverty has been a serious problem for decades. The overhead reduction program of the government is not a real solution because the real solution involves high costs for families. That is why local governments have a key role in the situation. It is assumed that if the local governments take measures to increase energy efficiency these measures will have a spill-over effect. Public buildings will be more energy efficient, local governments will pay less for energy bills, and residents will see good examples so their attitudes will change.

In this chapter I show that Hungarian local governments do not spend the EU (and development) funds in an appropriate way. The motivations for spending the EU funds are rather aesthetic and not sustainable ones, although according to the Multi-annual Financial Framework 2014–2020, 37 % of the available financial resources will be spent on sustainable development and natural resources in the next few years, and after 2014 the environmental and climate policy priorities will prevail in all major EU funding instruments.

Furthermore – after analyzing 25-year old (countrywide) and new questionnaires from 4 chosen settlements – 25 years ago most of the people who were interested in environmental issues came from urban areas and from Budapest, they had a job. But most of them would not like to pay 50 % more for electricity if they could close air polluting thermal power plants and build cleaner ones. This is true for the current situation, too. In 2013 (in relation to the mentioned four settlements), the highest level of qualification of the people who have ever tried to reduce their household energy costs was mostly high school, vocational or industrial school. Most of the responders have not tried to reduce their household energy costs yet. However they said if the municipality of their residence did more for environmental protection and energy savings they would be more environmentally friendly and energy conscious. Most of the people are energy conscious (and environment friendly) but only in a conceptual level.

I think – and I hope – the results of the statistical analysis show what I would like to say the key role of local governments in the termination of energy poverty in Hungary is.

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