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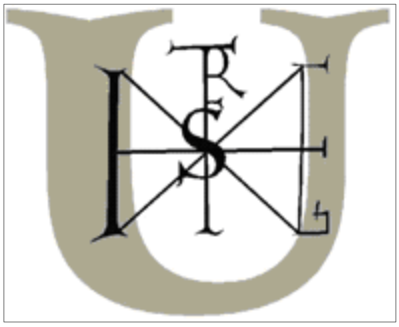

Environmental effects and economic alternatives for the reduction of the particulate matter content

PhD thesis

Created by

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Gödöllő

2012.

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Approval of the Head of School Approval of the Supervisor

1 Introduction

The main object of the research was the problem of air pollution in Hungary. This problem has been generally examined; however, the particulate emission in Hungary, Budapest has been emphasized and introduced in the view of local problems, given the fact that Hungary is highly capital-centric. The research work and the PhD thesis is twofold, firstly to show that in Hungary and especially in large cities, the particulate content of the air pollution (Particulate Matter - PM_{10}) exceeds the health limit, as prescribed by the European Union, several times a year, which results diseases caused by air pollution.

My aim is to show, that with rational urban development and with the application of environmental investments, the air pollution can be reduced to the extent that the city can evolve into a healthy, liveable European cultural metropolis in the 21st century.

In the 21st century, the major cities set a high value on developments. The development of European cities influenced by environmental changes, climate changes, global warming, limited set of fossil fuels, the problems of the global market and the related financial situations, moreover the declining health conditions among the population, and the changes related to international migrations.

There are ongoing activities for Global recognition and treatment of significant changes at the European Union (EU) organizations to develop such situations. After the recognition of changes, the results and experiences are displayed in various forums, news publications, committee materials, discussion documents, which are later incorporated into the EU directives.

In the EU, climate change plays a key role. Regarding to the report published in October 2010 by the Commission, the EU-15 in the 2008-2012

commitment period did well, because the greenhouse gas (GHG) emissions from the previous year decreased by 14.2%. The Kyoto targets have greatly contributed to the decreased production due to economic crisis.

The EU strategy for sustainable development includes economic, social, environmental and financial aspects of all EU policies and governance at all levels including the exploitation of the benefits of globalization (trade for sustainable development), the fight against poverty and social promotion of development (by 2015 reducing extremely poor – that means who live on less than 1 Euro per day - number of people in the world), the environment and sustainable natural resource management.

By 2015 the strategy aims to reverse the environmental resources in a net loss trend, has an interim targets for developed water, land and soil, energy and biodiversity, as well as a top priority for the role of civil society to strengthen the global economy, social and environmental governance legitimacy, efficiency, and financing the sustainable development.

We have to be prepared for global climate change, possible implications and their adverse effects, as extreme weather and environmental phenomena and processes (floods, inland waters, droughts, hurricanes, heat waves, early and late frosts, hail, slippery roadways, and flood-like thunderstorms, etc.) certainly can occur in the future by causing significant environmental and economical damage, as well as health and social problems, which should be prevented and / or mitigated. The adverse weather and environmental events can also be expressed in money that are significant and showing an increasing tendency.

A key feature of globalization that the in almost all areas of the world (social, economic and environmental) have a connection link. Today, human civilization, economic activity covers the whole planet. In international trade, financial activities of transnational global function, as a result of these

activities will impact on global product (e.g.: financial crises, environmental pollution). Economic and cultural global civilization spread is similar to the expansion of empires, with the important difference that now the system will cover the entire planet. So now there can be no criticism from the outside, but from inside the system.

The global "market economy" is based on neo-liberal economic policy - the "free" competition is one of its cornerstones – measuring its performance by the GDP (Gross Domestic Product: GDP) carries the constant constraint growth in itself. Regarding to the current economic paradigm a company or an economy can function properly if it continually increases (economic stagnation is already a decline as for the economists). It is also true that global GDP is the only measure accepted for the economic growth.

The terrestrial ecosystem carrying capacity, however limited, cannot bear the endless growth which realizes in the “over usage” of resources and the ever-increasing environmental loads, pollution. The effect of international trade, forcing the restructuring policies, the television, the Internet and other media, there are the same or similar economic and cultural patterns are spread all over the world. The result is a kind of monoculture: similar consumer lifestyles in society can be observed throughout the world, local traditions, modes of production lines disappear. Slowly all the same place will look like in the rest of the world. We will meet the same restaurants, hotels, clothes, shopping centres, crowded streets of the same car brands around the world. Despite the similar way of life and culture, it would be exaggeration to speak of a "globalized culture".

But we can talk about the ideologies and experiments of globalization, which took place in the world of culture and politics embodied a conservative revolution. Regarding to the advocates of globalization, the new system benefits everyone, ending the separation of center and periphery,

international inequality will gradually disappear. Globalization is a new phenomenon indeed, and this is a symptom of a number of off-farms. The rise in global chains made some people talk about "Mc Donaldization", "Coca Colization". Hollywood dominates the world's total TV channels 70 to 80% - the rock music, popular culture, and the effects of computerization and mobile phone globalization are discussed in hundreds of books.

The spread of globalization started in parallel with the enormous production and accumulation, with the consequence of increasing environmental pollution. Today, creating a liveable environment becomes more urgent task to stop the steadily increasing global pollution. It appears reasonable to global unity and the consciousness of environmental protection.

For the research national and international literature was carried out, by which I formulated hypotheses and methodological procedures. The domestic and international literature, as well as the compilation of databases acquired through experience, I took the following hypotheses:

H1: The particulate matter (PM_{10}) pollution in Hungary is one of the largest environmental problems, but since the Accession of Hungary to the European Union improvement has occurred in this area compared to the EU average.

H2: With the increases of renewable energy resource ratios a significant decrease had been observable in the volume level of air pollution regarding to the total energy consumption.

H3: Air pollution, as environmental pollution, shows a close correlation with the increasing number of respiratory diseases.

2 Methodology

In this chapter I present my research in the primary underlying data, methods and methodologies by which the hypotheses prove true or false conclusions.

I have compiled a database that helps, and choosing the appropriate methodology to prove my hypothesis. The base data are from domestic institutions as the following:

Central Statistical Office (CSO): Hungarian household consumption expenditures from 1995 to 2009 and Internet publications. Household energy use in 2008, by industry data, the quantity of waste generated in 2009, stADAT tables as shown by the quantity of hazardous waste between 1991 to 2009, Waste Management Database, Environmental Situation in 2008, Environmental assessment of the situation in 2012, Amount of carbon dioxide emissions in Hungary from 1985 to 2009.

- Agricultural Research Institute (AKI): Biomass publication in 2011,
- Ministry of Rural Development (VM) internal-use materials
- Ministry of Environment, Waste Information Management System Summary of survey of the nation between 2004 and 2009
- Charts published by the Independent Ecological Foundation
- Air Action Group website published data
- Water Resources Research Society and Eurostat published by nitrogen oxides emissions data in 2009, carbon emissions, particulate matter emissions in 2009,
- National Meteorological Service (HMS) gauge stations data from 2003 to 2009
- National air quality network (OLM) data in 2011

- National Public Health and Medical Information Service in 2009
- Governmental in-house material
- Databases of self-government of Budapest, Budapest City Integrated Urban Development Strategy 2008, Municipal Regulation Smog Alert
- National Spatial Development Concept
- Ministry of National Development, the National Action Plan for 2008
- WHO research, studies
- EU-funded French National Public Health Institute (InVS), coordinated by the Research Aphekom 2011
- Self-made tables, graphs based on data released by CSO
- Correlation and regression calculations using data from EU countries, the average was carried out regarding to Hungary as there was insufficient data.

Major research methods, complex tables, graphical representations of various editing tools, advanced mathematical and statistical methods were applied, including linear and nonlinear correlation and regression analysis methods.

Investigating the correlation between the factors, SPSS correlation matrix software package was used. The regression models were performed to run the Enter method, which is to put into the model simultaneously monitoring all the variables.

At the multivariate regression models, it is important to filter the strong linear interactions (multicollinearity) with explanatory variables. The measurement of the variation of inflated multicollinearity factor (VIF) and tolerance index was used.

The analysis of variance method (Ward's method) investigated the possibility of assigning each country group. With the help of results obtained by using a

dendogram, I limited such groups of countries with the most important indicators (proportion of renewable energy sources, the vulnerability of the urban population levels of particulate matter) are roughly equal. With this option, this is open for future correlations, to formulate useful lessons.

The correlation and regression calculations individual factors were studied and used to explore relationships between the factors and the following tests which were analyzed:

- Particulate matter concentrations
- Respiratory disease rates
- Renewable energy sources and the proportion of asthmatic disease.

3 Results

3.1 Air pollution has become a major environmental problem

Secondary research results proved that air pollution has become a major environmental problem. I made the following statement.

The air pollution can distinguish two main types, both natural and, secondly, human (anthropogenic) pollution. The natural pollution comes from forest fires, volcanoes, oceans, the cosmos and human influence free emissions, as long as the human, or anthropogenic pollution comes from the activities of people's ongoing connection with daily pollution into the atmosphere. The natural emissions in the atmosphere is more or less acclimated, because these processes has for centuries been present, but human pollution such as industrial pollution, car usage, waste incineration is the problem that the atmosphere is hard to adapt.

The air pollution can include additional components like aerosols that are the smallest particles; their size is smaller than 2.5 micrometers. Floating in the air is the most dangerous for human health, since the same emission source, such as gases, and even chemical may occur in the atmosphere. This process can be observed in winter, when wood is used for heating in many cities, the air that occurs is a brown blur as causing pollution, everyday is known as soot in the air. This process can be observed on the plants and on the surface of snow this causing discoloration.

The other type, size of air pollution 10 micrometers in diameter dust, which is the wear and tear of roads, soil from erosion and from industrial activities.

The incidence of pollutants depends on the size of each load of industrial areas, heating the atmosphere and the geographical and climatic factors.

The urban climate influenced by a number of human and natural talents. The air pollution depends on the position of the city's topography, the amount of population, industrial level of development, the amount of heat emitted by the population and population density and the amount of green space. If the city’s asphalt, brick, or concrete is predominantly, it causes higher temperature, such as in rural and urban areas. Therefore they are influencing the climate change.

On the international climate summit forums the participating countries formally recognized the need to reduce pollution. Unfortunately, the expansion is still in the foreground, so it is very difficult to downward pressure on high polluting countries in emissions compliance.

In our country from the 1990s, the power generation declined, as observed in the present day, so a catch up was needed for Hungary. A rise occurred after accession with the EU. Overall, the year 2009 to 2000 was the lowest in the country's energy consumption. Our energy export is not significant, mainly due to the economic crisis.

The Ward's method (variance method) executing a hierarchical cluster analysis examined the hypothesis formulated in my assumption that its output regarding to my dendrogram (Figure 1) differentiates four groups of countries (Table 1). The first group of 10 countries are included, including the EU-15 Member States (Belgium, France, Luxembourg, the Netherlands, Ireland), Bulgaria and the Visegrád Four (the Czech Republic, Hungary, Poland and Slovakia) are found. In this group of countries the proportion of renewable energy sources are relatively low (7.57% is the group average) and a high proportion of fossil energy sources (group average is 92.43%) is characterized by (CSO, 2012).

The other "air-populous" country group comprises nine countries. Among these are the EU-15 Member States (Austria, Denmark, Portugal, and Finland) and EU-12 countries (Estonia, Latvia, Lithuania, Romania, and Slovenia). For this group of countries the renewable energy sources are in higher proportion (24.2% in group average), which is the typical (CSO, 2012).

The third group of countries (Germany, Spain, Italy, England), the air pollution associated with high rates of diseases (respiratory diseases, 36.825%, 22.125% of chronic respiratory diseases). Here, however, noted that this type of disease demonstrated a not necessarily indicate a statistically high rate of adverse ecological situation, may be due to a higher quality health care (diagnosed more than in other countries).

The last group of countries covers two northern European countries, Sweden and Norway Lower. The characteristic of air pollution in these countries are lower (the average concentration of particulate matter: 17.0 $\mu g/m^3$) and a relatively high proportion of renewable energy sources (56.1% in group average) and a low proportion of non-fossil energy sources (43.9% in group average) can be found (Table 1).

Table 1 Ward method

Source: Own Compliation, CSO (KSH) database, 2012

				The proportion of renewable resources	The proportion of non-fossil energy sources within total energy consumption	The endangerment of the urban people regarding to particulate matter content	Sum of respiratory diseases	COPD Chronical obstructive Respiratory Diseases	Asthma	Country
Ward Method	1	1		4,60	95,40	29,00	7,30	4,60	,20	Belgium
		2		11,60	88,40	53,00	2,70	1,70	,10	Bulgary
		3		8,50	91,50	26,00	2,70	2,10	,10	Czech Republic
		4		5,00	95,00	14,00	1,90	1,20	,10	Ireland
		5		12,30	87,70	26,00	20,20	8,30	1,00	France
		6		2,70	97,30	23,00	,20	,10	,00	Luxembourg
		7		7,70	92,30	30,00	5,30	4,40	,20	Hungary
		8		4,10	95,90	26,00	8,00	6,40	,10	The Netherlands
		9		8,90	91,10	35,00	10,80	8,30	,70	Poland
		10		10,30	89,70	25,00	1,10	,70	,10	Slovakia
		Total	Mean	7,5700	92,4300	28,7000	6,0200	3,7800	,2600	
	2	1		19,90	80,10	17,00	3,50	3,00	,10	Danmark
		2		22,80	77,20	13,00	,30	,20	,00	Estonia
		3		34,30	65,70	20,00	,40	,30	,10	Lattvia
		4		17,00	83,00	23,00	,90	,80	,10	Lithuania
		5		29,70	70,30	24,00	2,90	2,40	,10	Austria
		6		24,50	75,50	25,00	6,50	2,70	,10	Portugal
		7		22,40	77,60	30,00	6,90	5,40	,30	Romania
		8		16,90	83,10	29,00	,60	,40	,00	Slovenia
		9		30,30	69,70	13,00	1,50	1,00	,10	Finnland
		Total	Mean	24,2000	75,8000	21,5556	2,6111	1,8000	,1000	
	3	1		9,80	90,20	22,00	34,90	24,10	1,70	Germany
		2		13,30	86,70	26,00	34,10	13,80	,80	Spain
		3		8,90	91,10	33,00	30,80	21,50	,60	Italyg
		4		2,90	97,10	19,00	47,50	29,10	1,30	United Kingdom
		Total	Mean	8,7250	91,2750	25,0000	36,8250	22,1250	1,1000	
	4	1		47,30	52,70	15,00	3,50	2,60	,10	Sweden
		2		64,90	35,10	19,00	2,50	2,00	,10	Norway
		Total	Mean	56,1000	43,9000	17,0000	3,0000	2,3000	,1000	
	Total	Mean		17,6240	82,3760	24,6000	9,4800	5,8840	,3240	

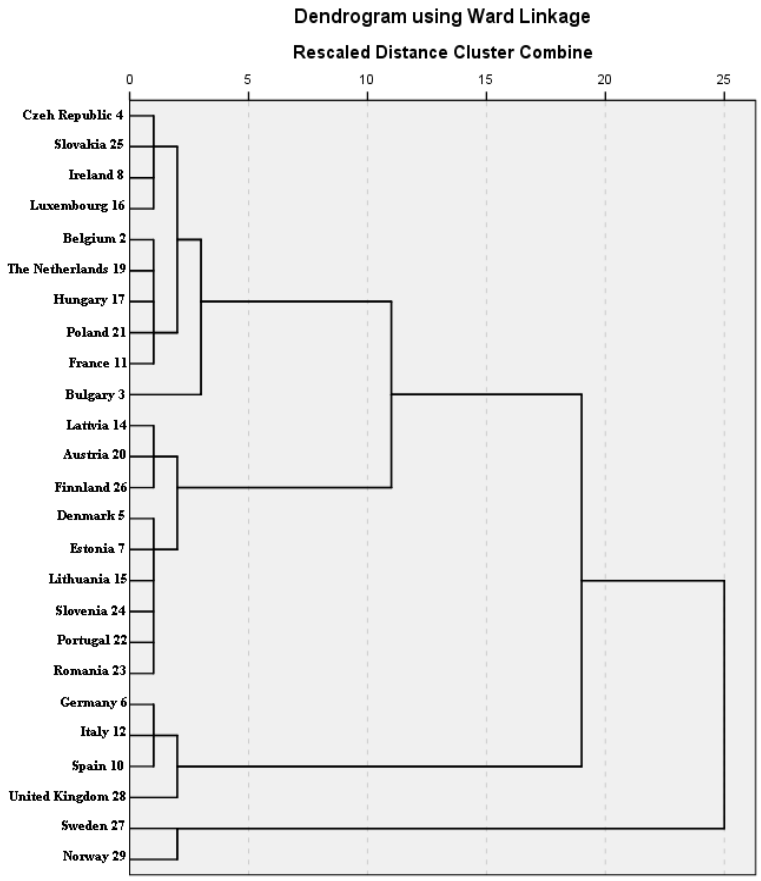

Figure 1 Dendogram

Source: Own Compliation, CSO (KSH) database, 2012

After the systematization of the results of secondary research, and after the own calculations, I see the H1 hypothesis has been justified.

3.2 The connection of renewable energy sources and air pollution ratios

The H2 hypothesis, correlation and regression calculations were performed to demonstrate the database of EU member states.

The increase in the proportion of non-fossil energy sources has been studied, that can affect the concentration of dust in the evolution of the urban population.

The following function has been flitted:

$Y_1 = a + b \times x\ 1$

where: x_1 = non-fossil (renewable) resources in the total use of resources in%

Y_1 = concentration of particulate matter content ($\mu g/m^3$) for the urban population

The regression results are presented in Table 2. The data indicate that among the factors is weak, moderate correlation can be found, suggesting that the dust concentration is still less felt in the increasing proportion of non-fossil energy sources. The data shows that high-flow estimates can be made with a great concentration.

Table 2 Non- fossil energy sources within the total urban population ratio and the risk of dust between the regression results

Regresszion Model

Model	R	R-square	Adjusted R-square	Std. Failure of the estimate
1	,353[a]	,125	,087	8,08476

a. Independent Variable:The proportion of non-fossil energy sources within total energy

ANOVA[b]

Model		The sum of square differences	Degree of Freedom	Variance	F	The significance level of F-probe
1	Regression Model	214,644	1	214,644	3,284	,083[a]
	Error	1503,356	23	65,363		
	Total	1718,000	24			

a. . Independent Variable:The proportion of non-fossil energy sources within total energy

b. Dependent Varable: The endangerment of the urban people regarding to particulate matter content

Coefficients[a]

Model		Unstandardised Coefficienst		Standardised Coefficients	t	The significance level of F-probe
		B	Standard error	Beta		
1	Regression (Constant)	8,002	9,301		,860	,399
	The proportion of non-fossil energy sources within total energy consumption	,201	,111	,353	1,812	,083

a. Dependent Varable: The endangerment of the urban people regarding to particulate matter content

Source: Own Compliation, CSO (KSH) database, 2012

Regarding to my primary research hypothesis the H2 is only partially can be justified, because the growth of renewable energy sources cannot be justified through reduced dust emissions. The correlation coefficient r = 0.353, i.e., there is a weak relationship between the two factors.

3.3 The relationship between pollution and respiratory diseases

To prove the H3 hypothesis the following connection between factors also been analyzed in the secondary research:

- The increase in the share of renewable resources to reduce the amount of airborne dust concentration in the respiratory diseases which eventually contributes significantly in its formation

I fitted the following function:

X = concentration of particulate matter PM_{10}/m^3

Y = rate of respiratory diseases °%

Unlike the expected impact, if the non-fossil rate increases by 1%, growing 0.2 μg/m3 the dust concentrate (Figure 2, Figure 3), therefore the impurity concentration is not reduced, which requires further investigation and research work.

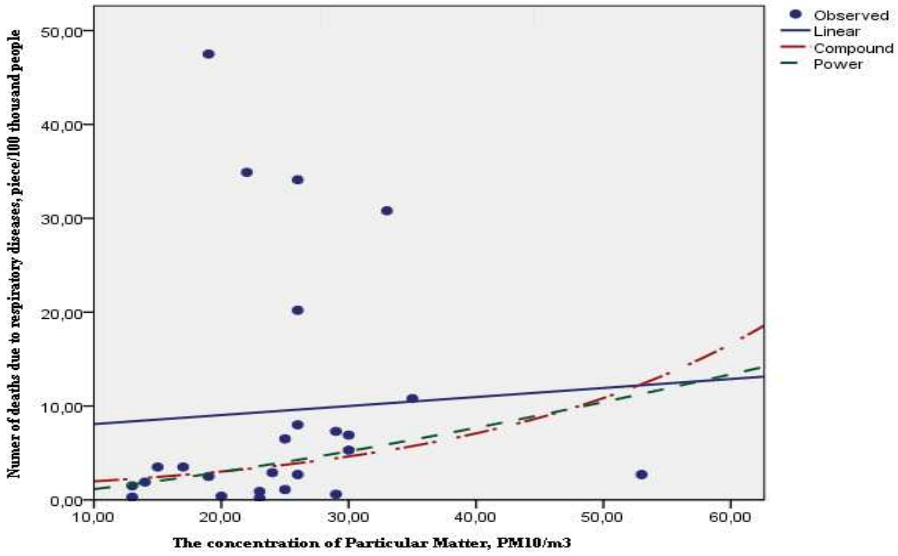

Figure 2 Ratio of respiratory diseases

Source: Own Compliation, CSO (KSH) database, 2012

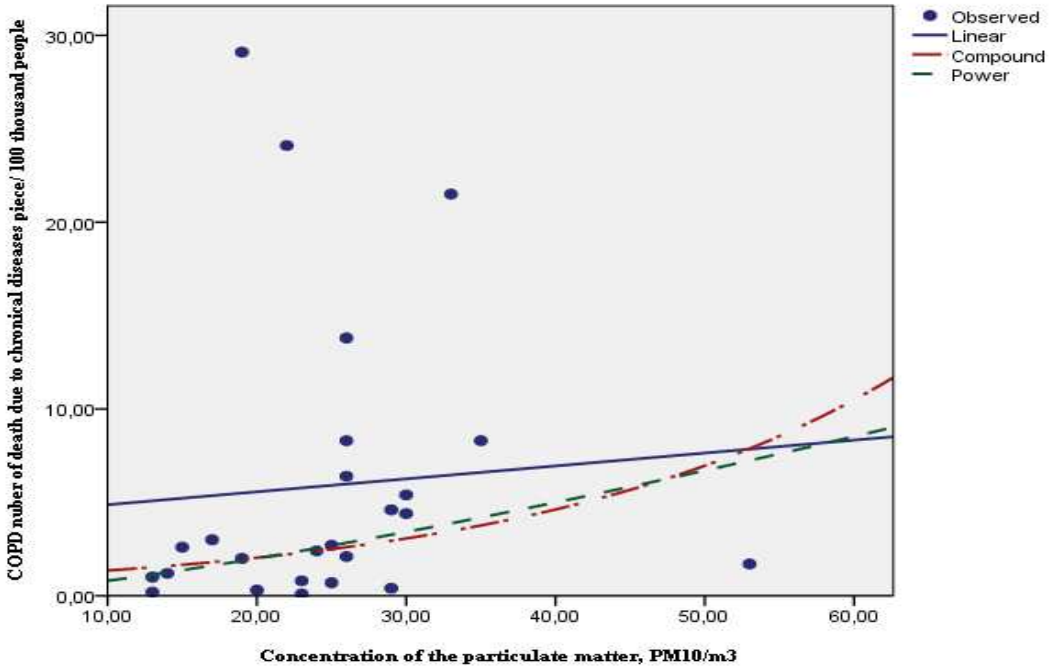

Figure 3 COPD chronic obstructive ratios of respiratory diseases

Source: Own Compliation, CSO (KSH) database, 2012

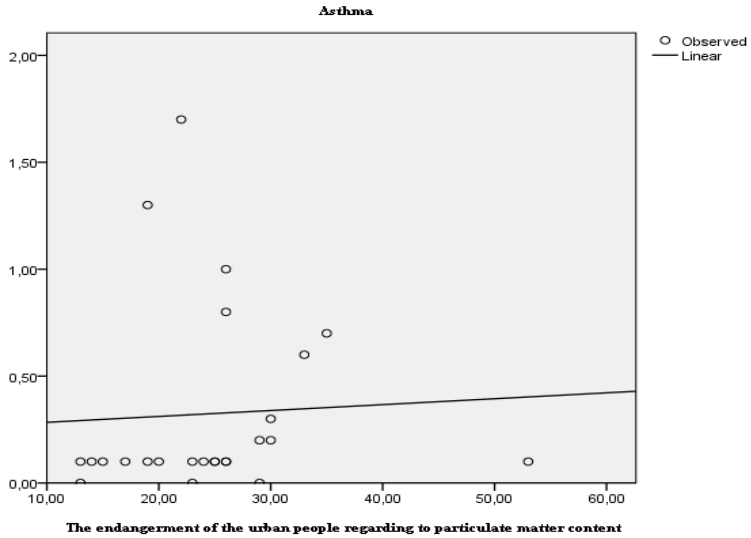

Figure 4 Asthma

Source: Own Compliation, CSO (KSH) database, 2012

Regression calculations were carried out as well as air pollution and respiratory diseases among these is statistically proven correlations. The calculations were based on the data gained from EU member states and was fitted to the following function:

$Yi = a + bxi$

To investigate the dust concentrations and statistically proven effect on the rate of respiratory diseases in the linear and nonlinear function were carried out.The exponential and linear relationships between the factors of the exponential function are approximated. The factors expressing the relationship between correlation coefficients, index value indicates a weak relationship (r (i) = 0). Contrary to expectations, it shows that European countries understood the level of dust concentration and the ratio of respiratory diseases can be detected virtually no verifiable connection.

Almost no change in the proportion of non-fossil energy sources has occurred. The non-fossil energy sources within a modern use of renewable energy sources should be increased.

According to my calculations, my hypothesis H3 is only partially justified, since the increase in the share of renewable energy sources cannot be justified statistically the relationship between the decreases in the number of respiratory diseases. With the increases of energy rate there were no statistically verifiable reduction in air pollution and air pollution and respiratory diseases among the number there is no statistical correlation which can be justified. The air pollution-related diseases have increased, but statistical numbers cannot be proved unequivocally that the use of renewable energy sources has increased the number of diseases and air pollution load reduction in the level of quantification. However, the problem exists, and special research projects should be started and deeper scientific analysis needed.

4 A new and novel scientific results

My results according to my hypothesis are summarized below:

In the recent years, the particulate matter pollution in Europe and in Hungary is a major environmental problem. In 2003, the Hungarian contamination was significantly higher than the European average (EU 31.2 $\mu g/m^3$, Hungary 40.1 2 $\mu g/m^3$). Due to the regulations in Hungary, their position has improved, and the air pollution level has nearly reached the EU average (EU 26.8 2 $\mu g/m^3$, Hungary 27.1 2 $\mu g/m^3$)

The Ward's method (variance method) executing its output from a hierarchical cluster analysis dendrogram based on four groups of countries. The first group of 10 countries was among the 15 EU Member States (Belgium, France, Luxembourg, the Netherlands, and Ireland) and EU-12 Member States (Czech Republic, Hungary, Poland and Slovakia). In this group of countries the proportion of renewable energy sources is relatively low (7.53% of the group average) and high proportion of fossil energy sources (92.47% in group means) are characterized.

The other "air-populous" country group of nine countries is involved. Among them, we found are some of the EU-15 Member States (Austria, Denmark, Portugal, and Finland) and EU-12 Member States (Estonia, Latvia, Lithuania, Romania, and Slovenia). For this group of countries a higher proportion of renewable energy sources (24.2% in group means) are characterized by the total energy consumption.

The third group of countries (Germany, Spain, Italy, England), the air pollution associated with high rates of diseases (respiratory diseases, 36.825%, 22.125% of chronic respiratory diseases). Here, however, noted that this type of disease demonstrated a not necessarily indicate a statistically high rate of adverse ecological situation, may be due to a higher quality health care (diagnosed more than in other countries).

Data average for the country group:

With the help of advanced mathematical and statistical methods I could show that the ratio of renewable energy increases, contrary to my assumption, that it does not reduce the pollution load level. The data indicate that among the factors is weak, moderate correlation can be found, suggesting that the dust concentration is still less felt in the increasing proportion of non-fossil energy sources. The data shows that high-flow estimates can be made with a great concentration. The correlation coefficient r = 0.353, i.e., there is a weak relationship between the two factors. Unlike the expected impact, if the non-fossil rate increases by 1%, the dust concentrate growing with 0.2 $\mu g/m^3$, therefore the impurity concentration is not reduced, this requires further investigation and research work.

I analyzed the relationship between the concentration of particulate matter and various respiratory diseases (asthma, respiratory diseases). Secondary research results proved that the small increase in the particulate content of the air is also caused coughing, wheezing triggered, and if the pollution enters the lungs, it can trigger a variety of inflammatory processes, which can lead to serious respiratory illnesses. The dust amount is slightly too negative, it is easily absorbed in the lungs; and air pollution from long-term health effects can be observed by the public health.

The dust concentration, respiratory diseases impact, linear exponential and power functions were investigated by primary research methods. The exponential and linear relationships between the factors of the exponential function are approximated. The factors expressing the relationship between correlation coefficients, index value indicates a weak relationship (r (i) = 0). Contrary to expectations, it shows that European countries understood the level of dust concentration and the ratio of respiratory diseases can be detected virtually no verifiable connection.

5 Conclusions and recommendations

5.1 Conclusions

One of today's most important task of the atmosphere to be continuously reduce the amount of harmful emissions, so the amount of airborne dust concentrations occur also less likely to cause lasting damage to organisms. There is a need for renewable resources and production of bio-energy. Budapest will inevitably need to improve air quality as the city's first smog alarm shown. Prevention is the key to action programs and the more stringent air quality protection. Intersectorial Action for PM10 Reduction Program and Action Plan based on the primary task of the urban background and local levels can be measured, due to human activities which get the sources of PM10 emissions from transport.

Currently, the traffic emission is increasing. Although the car stock, and within it a number of diesel cars – following the economic changes in varying intensity - is steadily growing, it remains about 70% of the share of trucks and buses in the particulate emissions from road vehicles. The number of vehicles being driven in 2035 from the present 820 million will rise to 1.7 billion. Currently 96% of motor vehicles operate with fossil fuel. Transport energy demand is expected definition is fraught with many uncertainties that affect the use of biofuels. These factors include the oil price development, the development of automotive technologies, energy efficiency improvements, and the old car park and the modernization of public transport.

In Hungary, the use of renewable energy is not only the obligation (the fourth of the European Parliament and the Council's 2009th dated April 23, the renewable sources of energy subsidies, 2001/77/EC and Directive 2003/30/EC amending and subsequently repealing Repeal of Directive 2009/28/EC on ("Policy", "RED Directive") in Article 4 of the national

reporting obligations for compliance), but the high road to economic development opportunities this is the so called breakout point.

For Hungary, the development of a green economy is necessary regarding to the use of fossil fuels and creating jobs by resulting economic boom, as well as creating a healthy environment.

Europe 2020 sets out five key aims as guidelines: employment, research and innovation, climate change and energy, education, fight against poverty. The objectives set out figures and border countries as to group together. The strategy highlighted in the "20/20/20" climate-energy performance target that the EU Member States agreed at EU level by 2020 at least 20% (favourable conditions, 30%) reduction of greenhouse gas (GHG) emissions, 20% increase in the share of renewable energy sources (renewable energy in 2009, a 10% share of the total energy consumption), and 20% increase in energy efficiency compared to 1990 levels. However, the transport of renewable energy sources should represent 10% share of the total use of energy. The European Union is the promotion of biofuels production and use of the foundations were laid down in Directive 2003/30/EC, by 2010, 5.75% of the shares set a target performance, however, only 4.71% reached.

Today the biggest problem within the renewable electricity production is the electrical energy storage. Controllability of the system is also a problem, including exposure to the weather conditions in a continuous and consistent availability. In the big cities and especially in Budapest, the largest air pollution from transport is a burden for the population, large particulates, nitrogen oxides and ozone-causing the main part of the pollution. By littering at the countryside, burning, heating causing also problems.

Not taking effective measures to mitigate the long-term air pollution, you can reach a high level of air pollution, which seriously threatens our health by causing large number of deaths. In this case, the official measure - smog alert

- should be limited to the most polluting activities such as transport, heating and industrial emissions. The electric-powered vehicles can play a role in the future, but it depends on the distribution of consumer habits and battery recharge capabilities. 80% of the consumers are involving car for their jobs who are not interested in electric or hybrid vehicle for. Battery technology needs improvement, because the electric-powered car is difficult to control the air-conditioning system.

The European Union's greenhouse gas emissions in the European Environment Agency reports that in 2002 an 82% carbon dioxide, 8-8% of methane and nitrous oxide and 2% of fluorine gas. The most important issue would be the deduction of carbon emissions. The International Energy Agency estimates that till 2030 the energy demand will increase by an average of 1.7% so that the world now will consume more than two-thirds of energy; the other hand, fossil fuels will remain dominant sources of energy and the increasing demand for it will make up to 90%.

5.2 Recommendations

In order to reduce the particulate matter content the following suggestions have been made:

- To reduce the PM_{10} content rail transport would be required for development,
- Diesel-fuelled buses and vehicles to modernize,
- In relation to residential areas road traffic calming needed
- In terms of environmental impact the spread of electric cars would be necessary in urban transport
- In the case of reducing dust from the roads:

- have to introduce a solid surface for vehicle wheels and excavated soil, sand or demolition waste during the transport of spilled cargo, have to make preventions, measures, restrictions, since these impurities later on pollute in a particulate matter form. The change of the Road Traffic Act offenses is necessary, and should create viable treatment in the building work stages.
- the dust contamination caused by the vehicles and the wind shall terminate effectively with the help of public services. The roads and public areas are needed to be cleaned continuously; this not only keeps the air cleaner, but also the environment, and enhances the aesthetic effect.

- The environmentally-friendly heating system giving preference to the public for competitive on a different type of heating
- Following the EU energy trends has become necessary, to reduce their operating costs (heating modernization), and thereby reduce greenhouse gas emissions.
- The structure of conscious city planning, design and building permit for the environmental aspects.
- The urban green areas, development of islands, which absorb the anthropogenic heat
- To develop / further develop the dissemination of home composting scheme. The garden waste burning ban for all PM10 emission is around 2.5%. This regulation does come into force; the suggestion of dust reduction therefore is indicated.
- Strong emphasis on the social environment necessary development of the sociocultural behaviour and education.

6 Biography

Katalin Bános graduated in 1993, Jászberény at Lehel Vezér High School. She continued her college studies in Budapest, at the College of Foreign Trade, majoring in foreign trade and on finance specialization. Her industrial placement was at Inter-Europa Bank. After finishing her studies, she started to work at of Agriculture and Rural Development Department of Technology Development, Research and Education Department. She participated in work organization, the task of research and research was in relation with the EU Phare and co-operations and preparing tenders. Besides her work she was admitted to the Corvinus University of Budapest (part-time education) evening class, where she got her diploma in 2002 in economics. Beside the university, she was working at one of the Daimler-Chrysler Group's subsidiary, Temic Hungary Ltd., as the head of money and credit management. In relation to her commercial experiences she was working at Co-op Hungary Zrt to develop division management. Beside the international trading and logistics organization, Katalin organized trainings and professional lectures for manager at Coop supermarket chain stores In addition she played a key role in the company's development and implementing projects, including SAP Retail Corporate Governance system. On several occasions she had the opportunity to represent the company at national and international professional exhibition.

In 2007 the Municipality of Budapest Mayor's Office of EU Affairs was the office where she started to work on the development of the new office. In the 2007-2008 year Katalin was invited to be a member of the Central Regional Development Company Supervisory Board.

Since then, her work is part of several major metropolitan EU project, as well as preparations and implementations, and ongoing training of officers of the EU, and representation of the city at conferences, exhibitions abroad.

Katalin has an advanced level language exam in German, while she speaks Spanish and English in intermediate level.

In her series of publications there is: 1 English, 1 Hungarian, 3 foreign-language scientific journal publication, 1 Hungarian and 1 other foreign language specialist journal article, 3 foreign languages, 4 Hungarian scientific conference presentations, and performances in 2 other international conferences.

7 List of publications

Books in foreign languages

Katalin Bános, Andrea Somogyi: Environmental problems in the CEE Accession big cities after 2011. Publisher: University of St Stephen's: Economic and Social Sciences, ISBN: 978-963-269-145-9 design process

Scientific journals

National scientific journals:

Hungarian:

1. Katalin Bános: The European Union's climate protection requirements are met, "AIR-21" notebooks

Designing period

Foreign language:

2. Katalin Bános and Andrea Somogyi: Participation of the EU's capital Budapest, 2004-2010: Problems and perspectives, Regional Science Inquiry Journal, Vol III (2), 2011, pp. 199-205.

3. Stephen Smith, Imre Szalkai - Katalin Bános: the Most Important tasks in the management information systems, Hungarian Agricultural Engineering design in progress

4. Katalin Bános - Andrea Somogyi in Budapest: it MOTEUR de la région, INFO Magazine, No19, 2008. Budapest, pp. 8-9. ISSN 1786-4321

Other journals:

5. Katalin Bános - Andrea Somogyi: Mobility and Energy Efficiency in the heart of the action. Regional Review, Europe's Regions and Cities, Issue 14, October 2009th Brussels, 102 p.

6. Katalin Bános: The Budapest Zoo and Botanical Garden institutional modernization of energy supply, "The Village" in the process of design magazine

Scientific Conference

7. Katalin Bános: Some aspects of globalization XI. International Scientific Days, beads, 2008. March 27 to 28, Vol I pp.. 593-600., ISBN 978-963-87831-1-0

8. Katalin Bános: Budapest in the Period 2007-2013 planning 4th Aspects and Visions of Applied Economics and Informatics, Debrecen, 2009. March 26 to 27, Vol I pp. 1038 to 1044. ISBN 978-963-9732-83-4

9. Katalin Bános: Projects in Budapest within the Period 2007-2013 planning XII. International Scientific Days, beads, 2010. March 24 to 25, Vol I pp.. ISBN 978-963-9941-09-0

10. Katalin Bános Major Andrew Stephen Szalkai: Power plants, economy, energy use, XXXIV. Symposium on Research and Development, Faculty of Mechanical Engineering, Faculty of 03/02/2010.

11. Katalin Bános - Szalkai Stephen Power plants, utilization of thermal energy and economic analysis XII. International Scientific Days, beads, 2010. March 24 to 25, Vol I pp. ISBN 978-963-9941-09-0

12. Katalin Bános: PM10 load reduction alternatives to the economic capital city of Budapest, XIII. International Scientific Days, beads, 2012th March 29 to 31. Designing period

13. Katalin Bános: Institutional modernization of the Budapest Zoo in terms of energy - supply and emission reduction, XIII. International Scientific Days, beads, 2012th March 29 to 31. Designing period

Other conference

14. Katalin Bános, Andrea Somogyi: Energy policy of the City of Budapest dunaLog 3rd Annual Congress, 2009. September 30

15. Katalin Bános: RFID Technology in the waste management Synergy of Agriculture and Food Industry Technical development, II. International Agriculture and Food Industry Conference, Gödöllő, 2011.október 9-15.

Other printed or electronic publications in foreign languages

16. Katalin Bános, Gyula Somogyi Andrea Sipos: Damaging effects of air pollution, and practices for SMOG-Situations in European cities of Szeged Days, 2009 ISBN 978-963-88468-3-9,

17. Katalin Bános, Gyula Somogyi Andrea Sipos: The Budapest Development Pole Program within the Strategies of the Municipality of Szeged Days, 2009 ISBN 978-963-88468-3-9,