

## **ECONOMICAL ASPECTS OF ENVIRONMENTAL SAFETY**

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### **Abstract**

*After transition to market economy, information about environmental condition has been accessible and the findings of such “inventory control” are being published. There is a space for slowing-down the growth of economic damages on environment and for disposal of old environmental loads, the solution to which requires around 3.3 – 4.3 billion Euro in conditions of the Slovak Republic. This space is formed in difficult socio-economic conditions, mainly regarding the shortage of investment for solving these problems, but also due to the insufficient legislation and its slow approximation to the European Union requirements, as well as the insufficient environmental appreciation and low awareness of “satiation of our own future”.*

### **Key words**

*environment, economic*

### **Introduction**

Economic activities of the recent decades have brought about a side-effect that involves the abuse of particular elements of environment and other related negative consequences on natural environment. Crucial impact on the condition and quality of environment is due to the economic process of reproduction that is in reverse affected by the quality of environment (production and consumption). During industrialization, some industries increased their production regardless the environment, while causing negative consequences in the form of economic effects.

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Though most of the Slovak soils are clean – not contaminated, there are some areas in the Slovak Republic (SR) indicated as problem ones. Various earlier and current economic activities carried out in these areas have been contaminating soils mostly by industrial, power and other air pollutants and other effects. This fact causes ecological, economic and safety problems called “environmental loads”. Similar areas with acreage approximately of 4470 km<sup>2</sup> (12 % of the Slovak Republic area) are inhabited by almost 40 % of the Slovak inhabitants. They represent bigger urban territorial units with concentrated economic activities. Allocation of endangered areas led to determination of 9, later 10, and at present 8 endangered areas.

### **Sources and methods**

Environment (human and natural) in the Slovak Republic was hurt mainly by intensive development of heavy industry and power industry, as well as improper structure and location of particular types of productions. In our contribution, we analyse human economic activities and their impact on environment. We will discuss so called environmental load, the removal of which takes around 3.3 – 4.3 billion Euro.

In our analysis, we used accessible current sources related to the implementation of the analysed issue on the national as well as international levels. We used home internet information sources, and sources of the European Commission as well as the National allocation plan (programme) for the years 2005-2007. We used the methods of synthesis, analysis and guided interview; we used subscribed analysis of mathematical-statistical methods. We brought our own ideas of the solution to the given problem. We used the results of our own research within VEGA and APVV grants.

### **Results and discussion**

Environmental policy, which is a part of economic policy, is focused on production and consumption decisions of business sphere and consumers, with the aim to achieve changes in behaviour of subjects that damage the environment. The instruments of environmental policy introducing desirable behaviour of the subjects responsible for environmental deterioration are considered the main economic incentives for solving these environmental problems.

#### **EXTERNALITIES – MARKET FAILURES**

Externalities, or external effects, affect production of a certain product, or work in consumer favour or disadvantage, whereby producer and neither consumer can control them. This causes costs or benefits of a subject, which are not included in decision-making. In relation to *externalities*, market and its price structure as well as their defection are evaluated. Externalities are the relations between economic subjects, which are not solved by market prices. It means that they are not market internal loads, but for the market, they are external – therefore we call them *externalities*. *Positive externalities* positively affect subject’s economic activity at the market (they are a product of economic activities of one subject and they bring benefit to another subject, which did not endeavour to this benefit and it does not need to meet the costs related to this benefit), contrariwise, *negative externalities* have adverse – detrimental impacts especially on environment (economic activities of one subject bring costs de incremento to another one). This “hurt” subject does not earn benefit, but it makes higher

costs and shows a loss. That is one of the reasons why we talk about two essentially different approaches to externalities and their solution. National economic policy is one of the solutions via using *taxes and subsidies*. This solution is based on fact, that market does not consider externalities. Another solution is negotiations between companies, by using the theory of transaction costs. Further on, we will analyse the impact of industry and power air pollutants (presenting negative externalities) in relation to agricultural products. They become evident as constraints resulting from impaired quality of soil, what leads to impaired quality and quantity of grown production. They also become evident in the decrease of animal production efficiency parameters and, last but not least, in posse of food web contamination.

Magnesite factories can serve as an example of negative externalities. They mine magnesite ores and, at the same time, they produce emissions by processing these magnesite ores. Those emission strike upon soil (as pollutants), and their excessive accumulation leads to high increase of soil reaction (pH 9). Soil so heavy over-alkalised becomes unsuitable for agricultural crops. At the same time, landscape stability has been disrupted as a result of structure disturbance and strong erosion. We observed analogical situation in the areas of iron ores processing, where converting plants produce some element chain into atmosphere, that was first useful for plants and soil (positive externality), but later their contents increased above the level of toxicity due to the continuous input into the soil.

These are examples of negative externalities in production activity of manufacturing or power plants. In addition to its regular production, a company seems to be also a producer of externalities which are not included in the price of the goods that company produces. [6]

## ENVIRONMENTAL MANAGEMENT OF THE COMPANIES

Economic and ecological problems in the Slovak Republic, as well as in other countries, could be consistently solved by using EMS or EMAS system according to the ISO 14 000. As evidence, we can mention tens of organizations with certified systems, that accepted this “challenge”, but also those ones, that are in the process of preparation for certification. We observed this voluntary trend in the change of attitudes of biggest companies - the polluters of environment in our country. Within the frame of their environmental policy, those companies “pull” their supplier and business partners. Competitiveness and products success in world markets depends on increasing requests for quality, that is in relation to sustainable development understood as optimisation of raw consumption, decrease of energy intensity (in production as well as in consumption), minimization of emissions and processing scrap production, as well as production of negative effects on environment within product life cycle at al. (LCA). The result of environmentally appropriate production would be “environmentally appropriate product life cycle” what apart from the “environmentally appropriate product” would definitely mean also abatement of environmental ecological load. This process applies to our biggest polluters of environment, existence and activity (past or ongoing) of which has led to the determination of problems – ecologically disrupted areas. The management of the companies operating in problem areas should look for such solutions that would eliminate at least partly this unwanted effect. Government have to contribute to these areas by active environmental policy and financial compensation of aggrieved subjects by using direct and indirect instruments of environmental policy. Managements of companies should look for optimum of quality at macro and micro levels [7].

Management of agricultural companies is constraint to apply measures that will, at least partly, eliminate unwanted effect in advance (good soil – good plants – health of people). Amount of damage on 1 hectare of agricultural land depends on the degree of soil damage as well as on concentration of harmful pollutants in the air. According to our calculation, the amount of damage ranges from 9.6 to 83 Euro on 1 hectare of agricultural land, depending on the degree of damage.

Environmental as well as top managements have to find solution to harmony between economic activities and quality of environ components. It will be also necessary to monitor responsibility of every polluter to pay for his share of pollution [1].

### EMISSION RIGHTS AND PERMISSION TRADING

It is necessary to consider the problem of so-called “greenhouse effect”, wherewith global warming is connected. There is a need for solving the exploitation of exhaustible and non-renewable resources. At present, this concerns mainly the group of fossil fuels, such a coal, oil and natural gas. Nearly 90 % of industrially produced power in the world comes from fossil fuels. By their combustion, we acquire necessary power, which also produces emission of greenhouse gases – especially of carbon dioxide - CO<sub>2</sub>, that causes climate change. The United Nations Framework Convention on Climate Change of 1992 (UN FCCC), and the International Convention so-called Kyoto Protocol are dealing with this problem. Emission of greenhouse gases are mainly due to these factors: trend in HDP, number of the population, trend in energy intensity to HDP unit, and carbon-fuel quantities in power industry. Reduction of greenhouse gases emission and their improvement in future lead up to low carbon techniques. This lead to the formation of the market with greenhouse gases emissions. Its measurable indicators are “*quantified emission limitation, emission rights, unit price for tonne of CO<sub>2</sub> equivalent*”.

Market system with quantified emission limitation connects the mechanism of financial market with environmental objectives. It determines the “upper limit” of total greenhouse gases emissions quantity, and the companies therefore have to reduce quantity of emissions emitted to air. This upper limit will be flared up to the assigned amount of emission units. In this system, company is allowed to exceed the assigned amount of greenhouse gases emission provided that it will buy missing quotas on the emission market. On the contrary, company that will aim to reduce emission can sell redundant quotas at the end of the period or keep them. Those companies, which will not be able to reduce emission up to the assigned amount, will have to be prepared to pay for the needed emissions rights, while those companies, which will be able to control their emissions, should trade the with surpluses.

Mechanism of IET (International Emissions Trading) allows the industrialized countries with emissions under the assigned amount of Kyoto Protocol sell their units within the frame of annex I to another country, which is not able to carry out its commitment by itself. Trading is the scantiest of mechanisms of flexibility listed in Kyoto Protocol. Principles, rules and regulations for trading are defined by particular conferences of COP. Some countries have already made progress in this area – Slovak Republic has presented financial structure to support the companies that reduced their greenhouse gases emissions, whereby profits on AAU (Assigned Amount Units) selling are allocated to these companies. We will probably see those structures in several countries of the Central and Eastern Europe.

Mechanism of CDM (Clean Development Mechanism) allows governments or private subjects in industrialized countries to accomplish their objectives in reducing the emissions. Industrialized countries obtain units for these projects in a form of CER (Certified Emission Reductions) units. The purpose of CDM is to support sustainable development and, at the same time, to contribute to the accomplishment of the United Nations Framework Convention on Climate Change objectives. Inconsistent with this is the objective of JI, by Kyoto Protocol, to support only the countries listed in Annex I in pursuance of their commitments in reducing emissions.

Each quota or credit represents metric tonne of CO<sub>2</sub> equivalent, which is calculated following the effect of 6 gases listed in Kyoto Protocol. The European Unit Allowances (EUA) is one of them. The Assigned Amount Units (AAU) is the quotas formed within the conditions of - /CMP.1 Annex (account procedures of assigned units). Emission Reduction Units (ERU – emission credits) represents a metric tonne of CO<sub>2</sub> equivalent. They embody the transferred credits that were obtained from the Joint Implementation (JI) project, which has been accomplished in one of the countries listed in Annex B of Kyoto Protocol.

Mechanism of Kyoto Protocol known as JI allows governments and companies in industrialized countries to buy ERU (Emissions Reduction Units - represents metric tonne of CO<sub>2</sub> equivalent, there are several types of quotes and credits that are defined in international conventions) from the projects that have been carried out in underdeveloped countries that reduce greenhouse gases emissions. Joint Implementation is a reasonable instrument, because it is possible to reduce financing costs and capital by means of it. That is how the following project can be implemented: *Changes in greenhouse gases emission technologies – Reduction of methane emissions in coal-mines – Stock gas collection – Promotion of renewable power resource – Transformation of power stations fuel basis and cogeneration units building – Measures for rising of energy intensity at industry and municipal sphere – Fuel change of central heating system and measurer for efficiency increase.*

Since 1 January 2005, approximately 15 000 plants have entered the emissions trading scheme of EU (EU ETS). The objective of this scheme, which is an important element in EU strategy for attaining the objectives of Kyoto protocol, is to reduce emissions of carbon dioxide in member states by regulation of CO<sub>2</sub> emissions from big sources in each of the member states. Technical possibilities associated with CO<sub>2</sub> collection and storage, are in the centre of attention for the first time. Nevertheless, it is hard to achieve 5 % reduction of greenhouse gases emission in the years 2008 - 2012 when compared with the year 1990. Overall emissions in industrial countries in 2003 were by about 5.9 % (1.08 billion tonnes of CO<sub>2</sub>) lower than in 1990, because reports included the countries of former eastern block where production has tumbled, whereupon they temporary got under the assigned amount of Kyoto Protocol. Estimated growth of emissions in industrial countries in 2010 regarding the negative present trend is almost 11 % (instead of minus 5 %).

Price for opportunity to pollute air with CO<sub>2</sub> emissions keeps growing. While last year emissions trading price was 5 €, the price has increased since the beginning of the year also due to the rise in the price of energies. Price of one tonne of carbon dioxide emissions attain approximately 26.55 € for EUA in March this year (spot price – 31 March 2006). Large companies can prosper from this new system, if they have good planning. Quotes, that

company will save, can be used in the future as extraordinary reserves (etc. the Slovak power plants).

In this connection, radical change has to be made in the area of energy policy concept on the European as well as at international levels. New concept has to expressly support the power production of renewable resources, too. Lots of companies have stepped out in the way of biomass; in our country it is especially Lesy SR, š.p. who pursue this policy. Our Slovak producers, in comparison to e.g. Austrian ones, are highly disadvantaged in the support by the rate 1:5 for a unit (kWh). Even the biomass is half cheaper than gas; there is the way for 0.3 billion Euro. In the conditions of the Slovak Republic, it seems to be profitable only in the area of 30 km [8], [9], [12].

## Conclusion

Externalities as a said effect of production and consumption are related to price system, which does not respond to some effects. This is typical for environment, because there is no market for its elements, and there is nobody who owns them as well as nobody who would offer them. It is one of the reasons why society looks for new market instruments that are *emissions rights* and *emissions permissions*, through which negative trends in trading and international conventions would be reduced, but also financial situation of countries and companies that have invested into relevant measures would be improved. Establishment of a global carbon market that should be formed after 2012, when Kyoto Protocol will end up, by the scheme of emission trading in EU is under consideration. Economic instruments become a very powerful instrument which will lead to the improvement of air pollution condition. In company practice, this will lead to looking for the ways of their effect and activities improvement, to goodwill improvement and, of course, to a gained sufficient wherewithal for the companies that invest in air conservation. Not to invest – it is step back for the management, the way that leads to loss in production.

With old environmental loads, consistent inventory control of area should take place. It is very hard to apply for resources for something we do not know thoroughly. Otherwise, the erasure of ecological debt would be only a matter of good will of company's owners and ecological thinking of local government, what is not in-step with TUR.

## References:

- [1] ADAMIŠIN, P., NAŠČÁKOVÁ, J. Financing of old environmental burdens solution from public sources. In *Staré environmentálne záťaž a prístupy manažmentu k ich riešeniu*. Nitra: SPU, 2007.
- [2] GOZORA, V. *Crisis Management*. Nitra: SPU, 171 p. 2000. ISBN 80-7137-802-X,
- [3] HRONEC, O., ANDREJOVSKÝ, P., ADAMIŠIN, P. *Air and water protection*. Nitra: SPU, 170 p. 2005. ISBN 80-8069-536-9
- [4] HRONEC, O., ANDREJOVSKÝ, P. Damages and losses in jeopardized agricultural soil fund of Slovakia. In *Acta economica et informatica*. Nitra: SPU, 2002, ročník 5, č.2, p. 36-38. 2002. ISSN 1335-2571
- [5] HRONEC, O., TÓTH, J., TOMÁŠ, J. *Extraneous substances*. Košice: Pont, 200 s. 2002. ISBN 80-968824-0-6

- [6] LUMNITZER, E., ROMÁNOVÁ, M., MIHOK, J., ANDREJOVSKÝ, P., ADAMIŠIN, P. *Quantification of possible damages in regions*. Nitra: SPU, 193 p. 2006. ISBN 80-8069-663-2
- [7] MAJERNÍK, M., BOSÁK, M., KRASULA, R. Environmental aspects management in projecting and operation of manufacturing enterprises. In *Envirautom*, 2000, roč. 5, č. 2. p. 100-110.
- [8] MARČAN, P., SLOVÁK, K. Emission trade: problems from the beginning. In *Trend*, 2005, roč. 14, č. 40, p. 29.
- [9] MAXIM, V., KUDLÁČ, Ľ. Meaning of electronical publications in modern educational system. In *Zborník Transfer inovácií*, 2001, č. 3, p. 33-37. ISBN 80-7099-950-0
- [10] Ministry of environment SR: Environmental regionalization and endangered regions. In *Správa o stave životného prostredia na Slovensku 2007*. Bratislava a Banská Bystrica: MŽP SR a SAŽP, 2008, 244 p. ISBN 80-88833-40-X
- [11] PRESSBURG A. P. Where are the boundaries of Kyoto protocol? In *Trend*, 2005, roč. 14, č. 46, pp. 13-1.
- [12] ROMANČÍKOVÁ, E. *Financial – economical aspects of environment*. Bratislava: ECO Instrument, 2004. 270 p. ISBN 80-967771-1-4
- [13] ŠAUER, P., LIVINGSTON, M. *Economy of environment and ecological policy*. Litomyšl: Augusta, 1996. p. 204. ISBN 80-902168-0-3

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