ENVIRONMENTAL LOADS AND LAND STABILITY

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Abstract: *Environmental loads are one of the main all-society problems these days. Problems resulting from a decline in the environmental quality have given rise to increased efforts for elimination of the negative consequences and improvement of damages caused in the past. The mining of ore, their processing, generation of electrical energy from less quality coal caused abnormal charge of land, where was realized. At the present, in Slovakia there are registered eight areas with the excessively damaged quality of the environmental components. Four from them are located in the east part of Slovakia. In each of them is necessary to appoint a specific approach, how the issue of an environmental status should be solved.*

Key words*: environment, quality, heavy metals, acidification, polluted regions*

PREFACE

Old environmental loads are all-society problem, which must be solved immediately. Under this term we understand generally old dumping places of waste, old mining pollutants, waste piles, decanting plants and others old mining objects, places polluted by army activities and others sources of pollution, for example: companies areas, agricultural yards, dung-yards, etc., which can be important source of pollution for ground and surface water, hornblende environment and atmosphere and soils. Through these elements can be endangered human and animal health.

In other words: under old environmental load we understand such anthropogenic intervention into environment that has arisen in the past and persists up to the present day, whereby source of pollution can be removed or is still active.

Serious problem are old mining objects, there are more than 17 thousand of them in Slovakia, and they include waste dumps (6 418), adits (4 913), ping tors (4 556) and decanting plants (10).

Another negative effect was and still is derogating of soils, plants and biota at all by air pollutants from industry, energetics, traffic and other sources of pollutants.

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Acidification, alkalization, metallization of soils – those are exclamation marks of past when economic activity was thoughtless to the environment. And so we are mapping and evaluating remained old environmental loads.

Slovakia as a part of Czechoslovakia belonged, in previous social system, to so-called advanced industrialized countries. Special emphasis was put on growth of heavy industry. As much as 65% of state armament production was realized in Slovakia, what has requested significant demands on natural resources and energy. Ores mining, their processing, generation of electric power out of bad quality coal, it all caused overloading of environment, in which they were realized. Country was endangered, destabilized. On the other site it showed economic prosperity, that means ecology was not conformable with economy.

Second aspect of this issue incurred differences between regions in environment components quality, what we can see till these days.

Works of Bielik et al. (1998), Čurlík a Šefčík (1999), Hronec et al. (2006), Hronec, Tóth a Holobradý, Kobza et al. (2000), Vilček (1998, 2004a, 2004b) a Andrejovský (2002) discuss these issues.

SOURCE AND METHODOLOGY

Regions in Slovakia have different status of environmental load following the natural conditions, anthropogenic activities, whereupon risk factors in regions are applied also at different degree. According to enactment no. 17/1992 Statute, s. 17, article 17 about environment: „Land should not be loaded by human activity over the level of bearable load. Acceptable level of environmental deterioration is defined by limit values that are set by special directives. These values are defined in accordance with accessible knowledge condition without endangering human health as well as others living organisms and environmental components. "In this sense we are solving research projects directed into the analysis of environmental components and its using agriculture restructuring and sustainable development securing in problem area of Severný Gemer, and into the identification of environmental components changes in others problems area of East Slovakia with the view to acquire new knowledges for execution of environmental components revitalization program. We also analyse the quality of environmental components within Slovak Republic in relation to settlement.

In our work we act upon methodology set for analyzing the environmental components, especially air and soil and in terms of present laws and regulations.

RESULTS AND DISCUSSION

Following the complex evaluation of air condition, quality of ground and surface waters, hornblende environs, biota, waste disposal in relation to health and environmental protection, as well as others risk factors, areas in fifth degree of environment quality were specified in Slovakia, as areas with the most disturbed environment. They represent centre of each loaded area and in Slovak Republic their acreage is 2109 km^2 (4,3 % of state acreage), and population of 1 262 000 people (23 %) is living in these areas. Area in fourth degree of air quality is part of loaded areas with acreage 2 759 km^2 (5,7 %), where live 752 000 citizens and presenting (14 %). It means, that in loaded areas of Slovak Republic on overall area of 4 868 km^2 what presents 10 % of overall acreage of soils in

Slovak Republic live 2 014 000 citizens, what presents more than 35 % citizens in Slovak Republic. From this number in loaded areas in Slovakia 2578 km² live 671 000 citizens in Presov and Kosice county. It presents 16,42 % of overall acreage of these counties, in which live around 650 000 citizens (42,8 %). Analysis of each loaded areas in Slovak Republic shows table bellow.

Tab. 1: *Loaded areas in Slovakia and their contaminants*

LOADED AREA	ACREAGE KM²	NUMBER OF CITIZENS	CONTAMINANTS	LOCATION OF LOADED AREAS WITHIN COUNTIES %
Bratislavská	488	432 000	SO_2, NOx, CS_2, F, Pb, Cd, As	Bratislavský – 93% Trnavský – 7%
Dolnopovažská	1261	247 000	SO_2, NOx, Ni , Cr, dust, flue ash	Nitriansky – 66% Trnavský – 34%
Ponitrianska	450	272 000	SO_2, NOx, Pb, Cu flue ash with content of As, Cd,	Nitriansky – 51% Trenčiansky – 49%
Pohronská	203	186 000	F, SO_2, NOx, flue ashes	Banskobystrický – 100%
Jelšavsko – lubenícka	137	21 000	Mg, dust, SO_2, NOx, Mn, As, Cd, Hg, flue ash	Banskobystrický – 100%
Rudniansko - gelnická	357	52 000	Hg, Cu, Pb, As, Zn, Cd, SO_2, NOx,	Košický – 95% Prešovský – 5%
Košicko - prešovská	1044	425 000	SO_2, NOx, Mg, Fe, Mn, Cr	Košický – 81% Prešovký – 19%
Zemplínska	1040	173 000	SO_2, NOx, F, NH_3, organic pollutants	Košický – 83% Prešovský – 17%

Source: SEA

According to updated environmental regionalization completed in 2004, result of which is evaluative map (SEA) of environment quality in five degrees (from high quality environment, to heavy disturbed environment), loaded areas in the eastern part of Slovakia were pecified in size and population under the names Jelšavsko – lubenícka, Rudniansko – gelnická, Košicko – prešovská a Zemplínska.

In the air different processes are in progress that lead to chemical changes e.g. by photolysis, oxidation, sorption on aerosols in the air and compounds with toxic effect, as well as their precursors, can arise. An example of this is tropospheric ozone, which accrues from photochemical reactions of hydrocarbon and dioxide nitrogen, and is considered to be the most serious stressful factor for the ecosystems and vegetation. While in years 1970 – 1990 the rise of ozone concentration was heightening in average of 1 $\mu g.m^{-3}$ per year, after year 1990 the rise of ozone, in our country as well as in Central Europe, has slowed down or stopped what match with trend in progress of O_3.

In term of ecosystem and vegetation protection, regulation of Ministry of environment of the Slovak Republic no. 705/2002 sets limit values for SO_2 a NO_x. Target values and long-term objectives are also set for ozone. According to Appendix 3 of cited regulation special localities for SO_2 a NO_x measuring should be placed more than 20 km from agglomeration or more than 5 km from other built-up areas, industrial objects or highways.

Particular member state of EU can place measuring locality in smaller distance or so that it may represent the air quality considering geographic conditions. As we can see it is about measuring regional air pollution, and thus acting of harmful pollutants in regional measure. In regional measure those harmful pollutants are implemented, which abidance time in atmosphere takes several hours to several days and so they can be translocated far from emission sources. Such a harmful pollutant is especially SO_2, NO_x hydrocarbons and heavy metals.

At the present time there are 5 regional stations for monitoring of air pollution and rain waters chemical composition (in 1999 monitoring was stopped in stations in Milhostov and Mochovce) in Slovak Republic. Out of this in eastern part of Slovakia are 2 stations: in Stará Lesná (since 1992 part of EMEP) and in station in Starina (since 1994 part of EMEP). Their aim is to monitor and evaluate level of regional air pollution, thus continuous effect on natural environment, different ecosystems and vegetation including measuring of ozone, which is measured in eastern part of Slovakia also in mountain stations Štrbské Pleso, Kojšovská hoľa a Lomnický štít.

Air pollution cannot be separated from pedosphere and hydrosphere pollution, as integral parts of environment. Catharsis of air takes place at the expense of soil and water, what has negative impact on soil abilities to insure health products for direct consummation, food industry as well as health forage crops that affect the quality of animal products. Polluted air combined with unqualified agricultural intensification as well as influence of pollutants and others anthropic and natural resources in certain concentration has harmful effect on soil, they invoke changes in physical, chemical and biological soil attributes, they have negative influence on soil productive potential, on nutritional, technological and sensorial value of agricultural products. Increased values of hazardous substances in soil in loaded areas of Eastern Slovakia result also from natural endogenous geochemical anomalies.

Chemical degradation of soil is caused by soil contamination with heavy metals and organic contaminants, by acidification, alkalization and salanization.

In term of danger heavy metals entry into the food web we think of soil contamination by non-degradable heavy metals such as Hg, Cu, As, Pb, Zn and Cd in Rudniansko-gelnická loaded area as well as in the surrounding of Nižná Slaná as the priority within the frame of solving our project. These soils can be found especially in area of Rudňany, Jaklovce, Gelnica, Slovinky, Olšo, Poráč. In area of Spišsko - gemerské rudohorie the largest association of heavy metals is situated, whereby the distinctive correlation between contents of some heavy metals has been found out (Čurlík - Šefčík, 1999, Kobza et al. 2000). Mineralized areas are enriched by numerous heavy metals. Diffusion contamination of soil by heavy metals is shown by uneven distribution of elements, whereby local concentration markedly exceeds limit values of risk factors in agricultural land that are set by legislative.

Area contaminations (diffusive) over the limit values of As and Hg, can be found in the surrounding of Nižná Slaná and Slaná river-basin. Over the limit values of Hg, As, Pb, Cd, Cu, Zn can be found at Stredný Spiš, than in Zemplínska loaded area – there are 2 samples over the limit B for Ni and Cr, northerly form Humenné and in south part of Zemplín there is 1 sample of As over the limit B (Tisa river-basin), 1 sampleo of Cu over the limit in Medzibodrožie and in Košicko – prešovská loaded area Cu, As and Hg are over the limit in Hornád river-basin.

For valuation of soil contamination it is necessary to take into consideration contents of humus, clay elements and soil reaction. In Zemplínska loaded area will be necessary to valuate hazards of crop contamination by PCB, in the surrounding of Strážske with higher levels in soil in relation to content of humus and soil reaction. In this location it will be also necessary to evaluate and map deported wastes of PCB, old ecological loads, bottom sediments of Laborec, Zemplínska Šírava as well as way of PCB degrading (degrading potential of organic contaminants in soil and water solubility).

Despite of sooner formulated corrective steps, after chemical degradation of soil it will be needed to re-evaluate soils inclination or resistance to acidification in relation to base rocks, systems buffer as well as alkaline soils in the surrounding of magnesite plants and saline soils at VSN in relation to clime warming, evaporation raising and accumulation of salt in soil.

In term of sustainable development of agricultural soil utilization it is needed (statute no. 220/2004 Z.z.): „to utilize and protect soil properties and functions in such way and in such range so its biological diversity, productivity, renewal ability and ability to perform all functions will be well-preserved". Therefore it is necessary, within the project, in the loaded areas to synthesize actual knowledges about soil properties especially in light of their development, especially results from 1st and 2nd cycle of monitoring by SSCRI and other research places, agrochemical properties of soils such as agrochemical reaction, nutrient content, humus quantity and quality, content of carbonates by HPJ that are characteristic for particular localities.

Next it is needed to pay attention to physical properties of soils, deterioration of which, caused especially by incorrect cultivation, is the problem of the most productive soils of eastern part of Slovakia following the intensive utilization. Out of physical degradation, in the eastern part of Slovakia, water erosion is the biggest problem; on the flat to middle gradient slopes of flysch and volcanic highlands it is accelerated liquidation of anti-erosion effective degrees, balks and by incorrect crop rotation. In areas of Easter Slovakia – Ondavská vrchovina and flysch uplands in Ulič –sensitive to erosion, selected erosive slopes (slope gradient 8 – 14º) are situated, erosion on which has the distinctive impact on soil properties, especially on the soils with lower content of humus and clay elements in surface level. Intensive erosion – accumulative processes are in progress here. Therefore is necessary pay attention to anti-erosion protection, especially to increasing of infiltration soil capacity and prevention its surface outflow (especially on extremely eroded very steep lands).

CONCLUSION

Industrial production focused on inconsiderate usage of natural resources, energy demanding technologies and preference of economy without without reference to consequences in natural environment caused to abuse of ecological stability in some regions of our state. Full-area fact is acidification. Around exhalation resources, where amounts of heavy metals were accumulated with all consequences. Some thousands acres of Slovak soil are heavy alkalized (surroundings of magnesia factories, cement factories and limestone quarries), whereby the ecosystems are very devastated. This shows that ecological land security is disturbed and so without life. Erosion is also associated to this fact, which takes the smallest soil elements from fields. Even though these facts

are very good known in present, they are not researched very well. Also in loaded areas all necessary arrangements to preservation of sustainability are missing and also their application in praxis.

In consequence of several changes in land the activity in agricultural land is limited. As a part of ecological land stability will be necessary to prefer permanent grassy vegetations for biodiversity preservation of nature.

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DOPADY ENVIRONMENTÁLNYCH ZÁŤAŽÍ NA STABILITU KRAJINY

Zhrnutie

Staré environmentálne záťaže sú celospoločenským problémom, ktorý sa musí neodkladne riešiť. Pod pojmom staré environmentálne záťaže rozumieme staré skládky odpadov, staré banské diela, haldy, odkaliská a iné objekty bývalej banskej činnosti, územia znečistené militantnými organizáciami a inými činnosťami, napr. zdroje znečistenia pochádzajúce z priemyselných simplexov, produktovodov, agrárnych simplexov atď. Tieto lokality môžu byť významným zdrojom znečistenia podzemnej a povrchovej vody, horninového prostredia a ovzdušia a pôd a tým aj rastlinnú výrobu a zvyšné rastlinné asociácie v krajine. Cez environmentálne záťaže môže byť ohrozené zdravie človeka, hospodárskych zvierat a fauny vôbec.

Slovensko ako súčasť Československa patrilo v bývalom spoločenskom systéme k tzv. priemyselne vyspelým krajinám. Zvláštny dôraz bol kladený na rozvoj ťažkého priemyslu. Na Slovensku sa realizovalo až 65% zbrojárskej výroby štátu, čo si vyžadovalo vysoké nároky na prírodné zdroje a energiu. Ťažba rúd, ich spracovanie, výroba elektrickej energie z málo. kvalitného uhlia spôsobili nadmerné environmentálne záťaže priestorov, kde sa realizovali. Krajina bola ohrozená, destabilizovaná a vznikli veľké rozdiely medzi regiónmi v kvalite zložiek životného prostredia, čo sa prejavuje doposiaľ.

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