ANALYSIS OF SOIL DEGRADATION CAUSES

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Abstract: *Soil degradation belongs to the prominent problems on global and regional level and has relative close relationship to other environmental and societal problems such as floods/drought occurrence, food and water sufficiency & quality with direct impact on population health development.*

Immediate causes of soil degradation in agricultural sector (and partly also in forestry sector) belong the non-respecting the principles of good management practice as well as considering soil as a tool of production that serves to user to reach economic benefits. Human economy activities influence soil quality and territorial stability as in urban and industrial sectors (usually compaction and pollution) so in agriculture and forestry sector (acidification and pollution). Soil in private sector is usually considered as property that serves exclusively to owner purposes.

The above mentioned mirrors the societal values, attitudes, beliefs, inclinations, motivations, priorities, desires, behaviour that lie behind the results of society and environment development. Favouring economic view against environmental, private and group interest against cross societal ones, short term benefits against long-term ones, promotion of excessive consumption as well as permanent need to increase the economic growth of individuals or purpose-built groups - that all are masked driving forces of soil and environment degradation that is necessary to take into account at provision of sustainable soil/land use.

Key words: *soil degradation, soil use, soil protection*

INTRODUCTION

Soil degradation belongs to the significant problems on global as well as on regional level and has close relationship to other environmental and societal problems such as floods/drought occurrence, food and water sufficiency & quality with direct impact on population health evolution (e.g. Bujnovský et al., 2004; EEA, 2005; Van Camp et al., 2004).

Identification of the state of soil degradation and monitoring of soil parameters evolution represents the source of necessary information that serves as the information support for the legislation development and the realisation of necessary soil protection measures. Although this area of activities is still under the progressive development, the analysis of driving forces that directly or indirectly initiate/promote the soil degradation is perceived as very actual (e.g. EEA 2005; Van Camp et al., 2004).

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MATERIAL AND METHODS

The paper is focused on examination of soil degradation in Slovak conditions. Concept of *DPSIR analysis* (European Commission, 1999) serves as pragmatic frame or starting point for evaluation of soil degradation problem and related soil quality. In accordance to Loveland and Thompson (2002), drivers of environmental changes are socio-economic factors while physical, environmental and natural factors are considered rather as pressures.

In paper is presented basic/accustomed and more complex view on reasons that directly or indirectly cause the soil degradation. In line with Lambin (2005) the second approach is based on *in depth analysis* of factors that cause environmental degradation or may impede the adoption of more sustainable management practices including also individual behaviour with respect to natural resource use and management. In broader context the environment deterioration mentioned below embraces also the soil degradation.

RESULTS AND DISSCUSSION

Basic analysis of soil degradation causes

The type and degree of soil degradation is affected by concrete soil use. In generally, the intensity of soil degradation decreases in order: industrial area > urban area > agricultural sector > forestry sector. Immediate reasons of the soil degradation are often remarkable and attract the attention of soil scientists and policy makers. First of all it is necessary to mention the insufficient respecting the principles of good agricultural/forest practice and relevant legislation (erosion, compaction, loss of SOM, and partially acidification as well pollution in agriculture; erosion and landslides in forestry). Giving long-term precedence to the importance of soil production function over remaining ecological ones represents significant cause of soil degradation. Till now, soil has been considered as the basic production tool that serves to farmer to gain the economic benefit. It is necessary to stress that principally soil preservation is not consistent with permanently increasing of benefit from its production use.

Economic activities affect soil quality not only in industrial and urban areas (compaction, pollution), but also the soil in agricultural and forest sector (acidification, pollution). Building of infrastructure, industrial enterprises and parks for provision of permanent economic growth was/is often realised on account of permanent soil sealing of agricultural soil. Although this process in the future is not possible to stop the intensity of sealing and quality of sealed soil can be partly regulated.

Non-negligible is also the misunderstanding of the essence of ownership relations to the soil. Soil in private sector is usually considered as property that serves *exclusively* for owner purposes. It is necessary to mention that property rights to the soil are often connected with its economic use (production function, resource of raw materials, space for economic human activities including housing construction – soil sealing). The types of ownership alone can not satisfactorily solve the problem of soil/land degradation. Property rights, even the private, should encompass also duties or responsibility especially in the case of natural resources because consequences of deterioration of ecological soil functions by owner or user have impact on other people. As Cairns (2002) introduces, there is a conflict between environmental protection and property rights. Human "rights" can not be met if the ecological life-support system is endangered by doing so. Property owns

are still misused or not understood, because instead of repairing environmental damage that occurred many years ago the human society is engaged in endless legal battles to see if present property owners can be held accountable. It is necessary to stress that human can not more consider the soil/land as commodity exclusively belonging him - in fact he is only steward that should to maintain the soil in the same quality for next generations.

It is possible to state that the importance of the soil for the human society is still not adequately appreciated (e.g. deKimpe, Warkentin, 1998; Yaalon and Arnold, 2000). Although the results of soil science research are usually used for the development of soil protection legislation and relevant educational/methodology publications, much of the expert and scientific knowledge does not have satisfactory application in practical life. Even though regular environmentally focused training of farmers or forest users brings some progress, the remaining broad population remains uninformed about the problems with soil degradation. Progress still has to be made in the area of periodical environmental education of soil users as well as in the area of increasing environmental awareness of the broader population. In line with this, the proposal for an EU Directive for soil protection (European Commission, 2006) stresses the problem of awareness and the need to address it. Moreover, the acceleration of natural disasters and human tragedies (poverty, epidemics, local war conflicts, criminality increase, etc.) masks and shifts the problems of soil degradation and its societal effects into the background of human attention.

In harmony with Gordon et al. (2001), efficient use and protection of natural resources, including soil, assumes three basic factors: *i)* adequate information, *ii)* motivation for sustainable use of soil/environmental resources, and *iii)* required capacity to adopt the necessary measures in daily life. While the creation of knowledge and information is in the process of permanent development, the motivation to adopt sustainable use of the soil and other environment resources is weak. Often scarce capacities are used insufficiently when individual, rather than cross-cutting, solutions are preferred (e.g. Bujnovský et al., 2004). There is tendency to perceive soil protection as a 'competitive issue' or a less significant problem within environmental protection.

Traditionally, policy regulations in hand with the market are considered as major tools for solving current environmental problems (e.g. Nicolaisen et al., 1991; OECD, 2005). In fact, market has limited capacity to solve these problems that can not be solved only by internalisation of external costs, as they have deeper social roots.

More complex view on causes of soil degradation

Despite the broad lack of peoples` willingness to search and solve primary roots of soil degradation (other environment components inclusive) and long-term tendency to ascribe results of human activities to the general global changes, insufficiency of finances or lack of other capacities it is necessary to mention that whatever causes of soil/land degradation are closely related with human thinking and his activities that follows from many literary sources (e.g.. Cairns, 2002, 2003; Engel, Engel, 1992; Gore, 1992; Meadows et al., 1993).

According to Meyer and Turner II (1994), the consumption is considered as a key variable of driving trends and patterns in the human impact on atmospheric deposition, land use, biogeochemical cycles - and so the soil and its quality. Permanent growth of material and energy consumption connected with incomes increase is one of the basic features of a

consuming society and reflects unconcern of individuals about the state of the environment and its improvement. In fact basic economic and social model of human society is based on ownership and controlling of sources, materials, products and services.

There exist more societal forces and phenomena, which directly or indirectly affect state and evolution of the environment, and so they become politically significant. Besides economic, political, social and cultural factors, market, advertising, demographic factors and technical developments, it is necessary to mention human convictions, beliefs, values, attitudes and behaviours at the level of individuals, household, communities and whole public (EEA, 2005; Goodwin et al., 1997; Meadows et al., 1993; Stern, 2000). It is important to point out that the individual groups of driving factors have a different hierarchical position and the common denominator of all these drivers is the satisfaction of human needs.

Kamenetzky (1992) refers to importance to analyse real problems that are masked behind individual needs and wishes. For example excessive use of natural resources only seemingly supplies life conditions of human because in long-term time horizon these conditions get worse. Satisfying of social (e.g. respect, tribute, solidarity, acceptation) and ethical needs (love, truth, fairness, excellence, aesthetics, meaningfulness) usually do not require great amount of market products and services, sometimes none. In fact, more from material needs (e.g. safeness, sureness) is not possible fully satisfy by external products and services.

Causes or factors that finally are projected into immediate reasons of soil degradation and other environmental issues can be generalised into several levels (fig. 1):

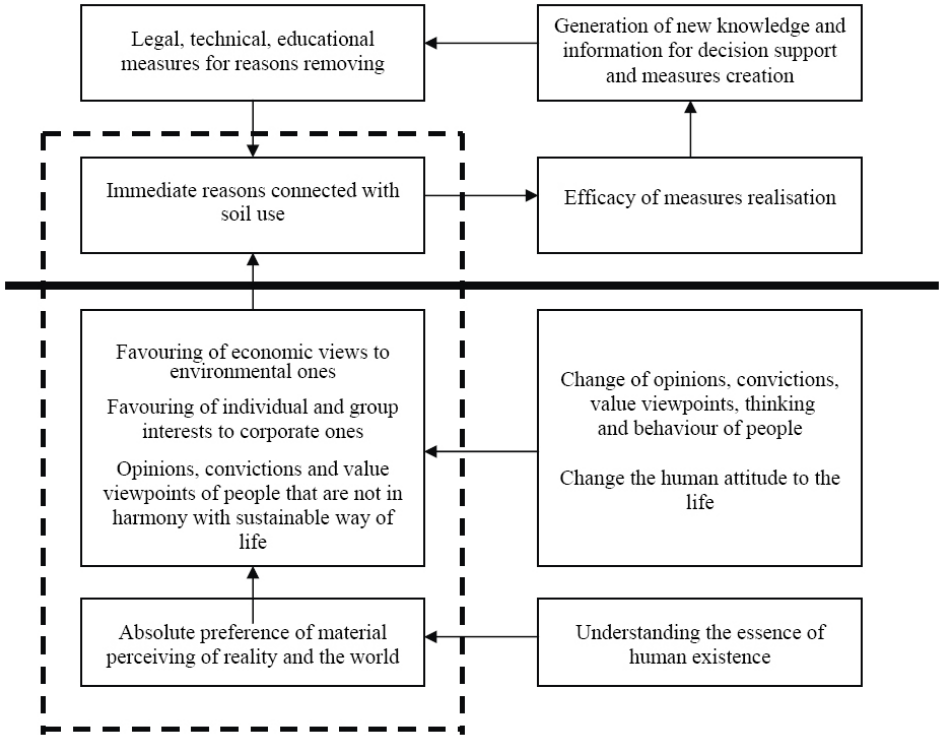
- favouring economic views to environmental ones (sealing of quality soils, negative externalities are not fully incorporated into production costs), preference short term benefits against long-term ones, promotion of excessive consumption as well as permanent need to increase the economic growth of individuals or purpose-built groups
- favouring private and group interests to cross societal ones
- absolute preference of material perceiving of reality and the world when technical progress foreruns the moral, ethical and spiritual evolution of the society.

Till now great part of population is not ready to accept the need of deep analysis of problems related to environment and society because still persists and lives in own ideas, opinions and convictions they identify with. One of ideas, that for long-term liquidates Earth environment is the conviction on insufficiency of issues to cover life demands of all people and following „necessity“ to compete or battle for these issues. From next beliefs, inappropriate from view of sustaining or improvement the existing life quality, belong the next ones:

- the people are separated from each other
- some people are better or valuable than others
- only the most strong can alive
- more material and financial sources is guaranty of better, more safe and more happy life
- people can not satisfy own needs themselves and depends on external help
- it is not possible change basic beliefs and convictions

- it is human nature to behave as he does (negative behaviour, double standard of behaviour)
- there is necessary to maintain and respect age-long traditions that create the identity of the society (alternative ways of life are unrealistic or hardly imaginable)
- it is necessary to maintain and respect long-term traditions that create the societal identity (endless amount of needs and problems is usual part of living standard of people but alternative ways of life seems unrealistic or heavily imaginable)
- the future is to be discounted (it mirrors the preference of short term benefits from natural resource use before the long term ones), etc.

Fig. 1: *Levels of soil degradation causes and measures*

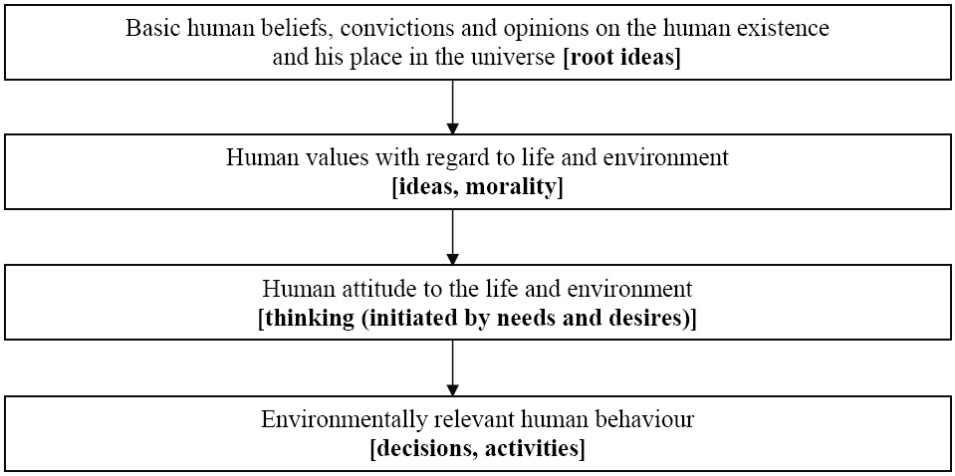


Reverting the process of environmental issues degradation, soil inclusive, assumes improvement or change the formulas of human behaviour, the change of existing way of life and new ways of thinking and acting (Engel, Engel, 1992; Gore, 1992; Meyer, Turner, 1994).

It is necessary to mention that driving force of changes on the Earth (political, economic, societal and environmental ones) is human thinking that permanently creates and changes the reality. Topicality of thinking and human behaviour, as illustrated above, is confirmed by many authors (e.g. Howard, 2000; Stern, 2000). According to these, for most people

more than a simple change in ecological awareness is required. Rather a more fundamental reassessment of basic beliefs and thinking algorithms is needed, because environmentally relevant behaviour is at the end of long causal chain involving a spectrum of personal and relevant factors. As follows from the next simplified scheme (fig. 2), human beliefs and convictions influence behaviour.

Fig. 2: *Hierarchy of causal factors of environmentally oriented human behaviour*



CONCLUSION

In spite of the abundance of information and arguments there is still very difficult to convince majority of citizens as well as most of responsible leaders about the all-societal importance of soils, its degradation and necessity of remedial measurements. **It is important to realise that people should change their lifestyles not because of soil degradation itself or because of the risk of environment destruction but for the sake of their quality of life.**

People have always possibility of free choice (whether conscious or unconscious) through which they change the reality for better or for worse. At the same time we bear the responsibility for decisions we make. Ignoring this fact does not make us immune against laws of nature.

Instead of changing beliefs and opinions which lead to current (often unfavourable) state, people by using political and economical tools keep altering the life conditions including the environment. **What must to happen in order to induce positive changes in the society including improvement of the state of our environment?**

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ANALÝZA PRÍČIN DEGRADÁCIE PÔDY

Zhrnutie

Degradácia pôdy patrí k významným problémom tak na globálnej aj environmentálnej úrovni a úzko súvisí s ďalšími environmentálnymi a spoločenskými problémami akými sú výskyt záplav a sucha, dostatok a kvalita potravín a vody s priamym dopadom na vývoj zdravotného stavu populácie.

Bezprostrednými príčinami degradácie pôdy v poľnohospodárstve (a čiastočne aj v lesnom hospodárstve) je nedostatočné uplatňovanie zásad správnej poľnohospodárskej resp. lesohospodárskej praxe a považovanie pôdy za výrobný prostriedok, ktorý slúži užívateľovi pre dosahovanie hospodárskeho zisku. Hospodárske aktivity človeka ovplyvňujú kvalitu pôdy nielen v priemyselných a urbánnych oblastiach (predovšetkým zhutňovanie a znečisťovanie pôdy), ale aj pôdu v poľnohospodárskom a lesnom sektore (najmä acidifikácia a znečisťovanie pôdy). Pôda v súkromnom vlastníctve je spravidla považovaná za prostriedok ktorý slúži *výlučne* záujmom vlastníka.

Vyššie uvedené odzrkadľuje spoločenské hodnoty, postoje, presvedčenia, viery, dispozície, motivácie, priority, želania, správanie, ktoré sú v pozadí výsledkov vývoja spoločnosti a životného prostredia. Uprednostňovanie ekonomických hľadísk pred environmentálnymi, individuálnych a skupinových záujmov pred celospoločenskými, krátkodobých ziskov pred dlhodobými, podporovanie nadmernej spotreby ako aj trvalá potreba ekonomického rastu jednotlivcov a účelových skupín - to všetko predstavuje skryté hybné sily degradácie pôdy, ktoré treba zohľadňovať pri zabezpečovaní udržateľného využívania pôdy.

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