

## SOLUTION OF PROBLEMS INVOLVING THE SUSTAINABLE DEVELOPMENT MANAGEMENT

### RIEŠENIE PROBLÉMOV TÝKAJÚCICH SA RIADENIA UDRŽATEĽNÉHO ROZVOJA

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#### Abstract

*The paper shows that environment is the basic public asset of human system, and therefore it must be specially protected. According to our present knowledge the sustainability is necessary for all human system and there is necessary to invoke the sustainable development principles that thrive on the both, the human system, i.e. the humans, and the environment. The sustainable development is understood as the development that does not erode ecological, social or politic systems on which it is dependent but it explicitly approves ecological limitation under the economic activity frame and it has full comprehension for support of human needs. In the paper there are summarized conditions for sustainable development, tools, methods and techniques for solution of problems of environment and tasks of executive governance in the environmental segment.*

#### Key words

*Environment. Human System. Sustainability. Sustainability Management. Methods and Tools.*

#### Introduction

The work summarizes results of systematic study of environment in recent 30 years. It goes from cognition of followed object on the present level and it summarizes conditions and limits for sustainable development, tools, methods and techniques for solution of environment problems and tasks of executive governance in the environmental segment.

The environment alone is the system of systems that is from the viewpoint of human existence and development the part of the superior system of systems by them it is the human system [1]. From the given fact it is evident that it is impossible to elevate environment existence and return to original state under the interests connected with human existence and development, but simultaneously it is impossible irresponsibly to damage the environment because it creates the medium that is necessary for itself human existence. Therefore, they must be introduced into the practice the compromises that respect needs of humans and environment, that are based on knowledge and experiences and their impacts and benefits are monitored by the way that allows to carry out in time the corrective measures if they seem to be necessary.

The sustainability (sustainable development) on the basis of recent cognition is not only related to the environment but to the whole human system and its basic assets (i.e. public assets) on which the human lives are dependent. Basis human system assets are: human lives, health and security; environment; property and public welfare; infrastructures and technologies, in particular those that belong among the critical ones [2]. The sustainability assessment in a general sense is the formalised process for identification, prediction and assessment of potential impacts of arbitrary inputs including the variants for society sustainable development (e.g. legal rules, ordinances, regulations, political intent, plan, program, and project). From the viewpoint of present cognition of human system and its assets the mentioned assessment might be performed always at good governance of territory [2].

#### Conditions for sustainable development

From the system viewpoint the sustainable system has attributes as productivity, resilience, adaptability and vulnerability, and therefore, sometimes it is not easy to find suitable reference state / conditions:

- The reference point of sustainability is demanded future state (scenarios techniques and foresight).
- The reference points are on the one hand inputs and on the other hands outputs of system processes (ecological trace, product life times etc.).

It means that we can assume the context given in Figure 1.

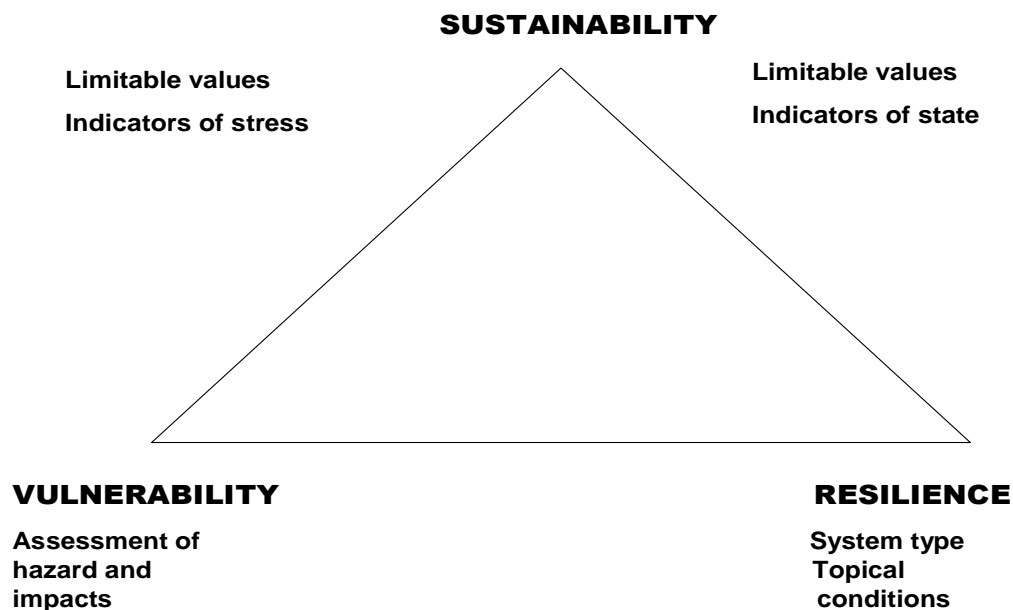


Fig.1. Relation among sustainability, vulnerability and resilience.

Because the followed attributes are mutually tied up so in the relation to existence of system there is on the peak the sustainability. The decision-making on system adaptive capacity is then given by relation that is given in the decision matrix in table 1 [3].

The sustainability that is also connected with sustainable existence is often erroneously understood as the goal on which all strive. In reality the sustainability is not achievable final state / conditions because it is more the basic characteristics of dynamically developed system. It means that the **sustainability is permanent adoption to changing conditions**. It is reality that this adaptive property is own above all to the ecosystems. It is only question of education to introduce the adaptive procedures to the public administration decision-making on human, i.e. socio-ecologic-technical system [3]. For the realisation in practice it holds several pieces of knowledge:

Table1. System adaptive capacity

Impacts	Adaptive capacity	
	Low	High
High	Vulnerability	Chance of development
Low	Rest risks	Sustainability

- The criticality is directed to failures and hazards, the sustainability deals with the existence. Therefore, more and more there are important approaches and procedures that deal with the sustainable infrastructure, namely both, the grey one and the green one. The procedure for searching the sustainable elements is the following:
  - list of activities,
  - key impacts induced by human activities,
  - identification of receptors,
  - identification of ways of impacts spread,
  - identification of secondary and further order impacts on main and other receptors.
 This approach is possible to use only for grey (i.e. by human created) infrastructure, whereas the green infrastructure cannot be investigated by the way that their clear-cut parts are separately analysed since landscape with ecosystems create complex super system, i.e. system of systems [1].
- The landscape sustainability is also connected with its sensitivity; the assessment is done by scoring, i.e. decision matrix in table 2.
- The human needs, however, depends in broad rate on functions of ecosystems, and therefore, it is necessary to understand the ecosystem functions, because:
  - the ecosystem functions varies and with this reality there is variable their influence on human health,

- responses of ecosystems to human activity (intended or non-intended) are not always immediate, they can cumulate, affect vicariously or retrospectively and through the retrogressive links to create emergency up to critical situations.
- Therefore, it is necessary to alert that the procedure in which we define firstly the grey / engineering infrastructure for human settlements and after this the proposal is transformed into the landscape is incorrect because it completely ignores possible cumulative, long term and delayed impacts on environment sources and ecosystems services. Therefore, it is necessary to search for solution that is suitable for local conditions; i.e. it is site specific.
- The orientation to the interface of grey and green infrastructures relies on technologies that might solve present and future problems. New technologies, however, carry into green infrastructure uncertainty and vagueness because the technology impacts on environment are hardly forecast. Therefore, it is necessary to use and to process the methodology foresight not only on technological level but also on society level, i.e. societal foresight that is aimed to trends of behaviour of grey infrastructure (i.e. theory of normal accident, high reliable organisation, industrial ecology) and green infrastructure (adaptive environmental management, industrial ecology etc.) [3].

*Table2. Decision matrix on landscape sustainability*

Land- scape type	Sensitivity of land- scape features	Sensitivity of partial elements of landscape	Sensitivity of aesthetic viewpoints of landscape	Visual sensitivity of landscape	Total sensitivity of landscape	Value of landscape	Accept- able landscape Capacity
<b>Type 1</b>	High	Medium	Medium	High			
<b>Type 2</b>	Low	Medium	Low	Low			
<b>etc.</b>							

### Tools, methods and techniques for solution of problems of environment

The human does not come on the beginning of his / her conscious activity in the biosphere with intent to subvert the nature. He/she wanted to transform it for his/her needs. The problems started in time when he/she tried to separate from the nature and between him/her and the nature he/she placed technology / engineering. Initially, it did not too display, the biosphere had and till now it has its reserves and it contrived to equilibrate with a range of activities. However, the human activity progressively took on the intensity and in some directions the biosphere has been globally affected [4, 5].

The present global nature of worldwide problems is given by reality that it goes on questions that are mutually connected and their solution is connected with solution of other ones. Apart from environment contamination there are considered as global problems the questions of peace and war, overcoming the differences between developed and developing countries, ensuring the food for future population, energy accessibility, lack of water, soil, sources, and the questions of care on health, culture and education. THEREFORE, it is necessary to introduce STRATEGIC, SYSTEM AND PROACTIVE MANAGEMENT [6, 7], which is based on realistic, systemic and proactive view on environment and its problems. The given view is necessary from the following reasons:

- Humans have been getting to a certain life standard that they do not repudiate; this standard is conditioned by interventions to nature.
- The environment is the system that is adaptable. During their development the humans have been accumulated much knowledge and experiences, and therefore, it is possible to believe that there are ways by which it is possible to limit interventions to a system so that the system development might be ensured in direction that should support the mankind development.
- The environment today for many humans creates a stylish stalking horse by which they also cover actions that have nothing common with the environment (e.g. the reality that the soil is left unexploited does not prosper to environment).

For decision-making the states of their organisational parts there has been used from intelligible reasons the model of environment that is restricted to human medium because the aim of human strive is to ensure the human society development, i.e. by recent words said the such development trajectory of whole environment system that onward enables humankind development.

On the basis of present knowledge [6, 7] each quality management, i.e. also environment management must respect the need to carry out the decision-making with the aim:

- to prevent emergency situations and to localize emergency situations (the accidents can origin in the frame of both, the individual components and the more components or even in the frame of whole environment system),
- to ensure the healthful development of human society,
- to realise ecological programmes in the socio-economic sphere.
- At environment management it is necessary to follow [4-7]:

- impacts of anthropogenic activities into the environment that is possible to divide to:
  - pollution of environment component (may be either by the material character, manifested by concentrations of agents or by physical origin manifested by noise, heat, electromagnetic oscillation etc.,
  - biologic diversity, i.e. reduction of number of species, change of species composition etc.,
  - deterioration of health state of human population,
- pressure of antropogenic sphere on environment that is divided to:
  - emissions of agents (or better wastes of human activities) into natural medium,
  - consumption of renewable sources.

### Administration management and its tasks on environment sector

The basic function of state since its origin it has been to ensure the protection and development of a given human society which is impossible without ensuring the safe space in that the human society has been living. According to principles of advanced management of human society the *TASKS HAVE ALL PARTICIPATED IN* [6, 7]. The management of state include in the most general concept the managing, government, control and office hearing the public affairs. It represents the conscious activity that is directed to determination and control of course of topical processes for achievement of appointed goals. It puts in harmony individual activities and it fulfils general functions of the whole. i.e. the state / territory / object / organisation etc. The governance is the form of activity of authorities, particularly executive ones that consists in organizing and practical implementation of tasks given by managing team / state management / territory / object / organisation in harmony with laws and the other legal rules.

The basic tools of state for management, i.e. also for production and protection of environment according to [6, 7] there are:

- management (strategic, tactical, operational) based on qualified data, knowledge, professional assessments, qualified decision-making methods, land-use planning, correct sitting, designing, building, operation, maintenance, reparation and renovation of buildings, technologies and infrastructures,
- citizen's education, schooling and training,
- specific education of technical and management workers,
- technical, health, ecological, cyber and other standards, norms and rules including the best practice procedures, i.e. tools for control / regulation of processes that may or might lead to disaster occurrence or to its impact increase,
- inspections and audits,
- executive security forces for qualified response to emergency and critical situations,
- systems for critical situations defeating,
- security (land-use and spatial), emergency, continuity, crisis and contingency planning,
- specific system for defeating the critical situations - safety, emergency, continuity and crisis management.

The analysis of development of environment and of development of political, social and economic situation worldwide shows that it is necessary to prepare for solving the cases and actions that by their intensity induce the critical situations that can lead to relevant crises of type denoted as humanitarian catastrophe accompanied by catastrophe in environment domain.

Therefore, from the viewpoint of human security, human system development, conservation of quality environment, existence, stability and development of state there must be safety concept and with it connected concepts of development codified and implemented by safety management into practice [2]. In basic (usual) level of management the target are security and sustainable development, and on this level connect emergency and crisis management.

The goal of human society management is at each situation to ensure the protection of: human lives, health and security; property, welfare; environment; infrastructures and technologies, which are inevitable for human survival, i.e. the mobilisation and co-ordination of utilization of national sources (energy, labour force, production capability, food and agriculture, resources, telecommunications etc.), the co-ordination of such activities as they are notification system, rescue system and medical services that reduce impacts of natural or other disasters and ensures the continuity of activity of public administration, the adherence of legislation and also generate the conditions for start of development [4-8].

The land and regional development manifest by construction of industrial regions that approach to residential zones and vice versa. By this the possibility of harm origin increases and society (community) has not been willing to accept all risks. This is reason for origination of risk management discipline and consecutively risk engineering that include risk assessment, risk reduction and harm explanation. In short meaning the risk engineering is connected with technical systems (only in advanced forms there is considered the human factor influence on complex process safety) and in the broader one it is possible to generalize it to renewal of landscape with utilization of engineering approaches. Therefore, the risk engineering holds so important role and its target is on the one hand the optimum protection of humans, property and environment and on the other hand the optimum renewal of damaged landscape with utilization of engineering procedures and findings [9]. Both concepts require structured system approach and qualified utilization of planning the scenarios for decision-making support.

The measures for benefit in environment protection have been performed in frame of:

- land-use planning connected with technology assessment [2],
- construction of security and protection systems,
- different recommendations, e.g. smog regulation.

The territory management understand as strategic and proactive territory safety management differs from normal environment management in the following items:

- It is directed to the long-term sustainability.
- The aim is the system integrity (including the so called ecological integrity) because ecosystem services/utilities (i.e. utilities that environment offers to humans) promotes live supporting functions.
- It considers the human as an element of system and it integrates human activity with environment protection.
- It sentient reacts to human needs in the system contexts.

## Conclusion

From the viewpoint of society needs there is necessary to ensure on the one hand the further development of economy and on the other hand to reduce the environment contamination and to ensure the environment protection. It particularly consists in the following:

- The detection of objective environment conditions and of direction of their development in future, resp. in the nearest period.
- The determination of priority questions for protection and production of environment and their solutions in frame of programmes and tasks (it is necessary the concept solution).
- The elaboration of proposal of regulative, protective and corrective measures for reduction or remove of negative influences of human activities on environment and human.
- The elaboration of methods of prevention against to excessive contamination of environment in the next period.
- The determination of development trend and prognoses of reflection of development in science and technology in environment domain/sector.

The artistic creation is the high degree of proficiency. The complex problems of relation of human to nature lean on certain philosophical foundations in each historical era. The present period is possible to characterize as the era in which the humans incessantly start turning the higher merry-go-round of substances and energies for satisfaction of their needs, with reality that the bulk of these substances grows much faster than the human needs. On one side it displays deficiencies of resources and energy (resource stocks have been stretched) and on the other side it wastes with resources and with energy.

There is necessary to consider that in effort on sustainability it does not go on founding the conciliation or utopian harmony with nature how it found in several philosophical works of 60s years of last century or on understanding the nature as hard-hearted element in which it has been under way heartless and nonsensical fight against to all presenting. But it goes on realistic view that is represented by understanding the nature and human from the viewpoint of optimum development of the whole biosphere. The ecological behaviour is impossible to reduce on riotous discussions around the nuclear power plants, water structures or industrial complexes. We must plan and build big structures. At the same time we must consider the impacts of these constructions on environment and human health. It is true that ecological behaviour the human manifests by apparent details, e.g. need of neatness and tidiness, respect to societal worth, scruples against to demolition and abuse etc. It manifests in whole approaches, e.g. quite recently it asserts that the products with shorter lifetime are better because they need not be repaired; today from the need to reduce wastes and to save resources and energy we return to the old-time concept, i.e. to products with long-term lifetime.

## References

- [1] PROCHÁZKOVÁ D. Principles of Sustainable Development. Manuscript, 200p. In print
- [2] PROCHÁZKOVÁ D. Strategic Safety Management of Territory and Organisation. ISBN 978-80-01-04844-3. ČVUT, Praha 2011.
- [3] PROCHÁZKOVÁ D. 5 Research Reports to Ministry of Agriculture project 1R56002 „Auxiliary Multi-Criteria System for Decision-making Supporting the Sustainable development of Land and Human Seats“. MZe, Praha 2005-2007, 1023p.
- [4] PROCHÁZKOVÁ D. (ed.): Environmental Monitoring and Adjacent Problems. ČEÚ and MŽP ČR, Praha 1993, 356p.
- [5] PROCHÁZKOVÁ D. Environmental Monitoring the Czech Republic. I. Conception. Studie pro MŽP ČR. ČEÚ, Praha 1993, 465p.
- [6] PROCHÁZKOVÁ D. Safety, Crisis Management and Sustainable Development. ISBN 978-80-86723-97-6. UJAK, Praha 2010, 243p.



- [7] PROCHÁZKOVÁ D. Strategy of Management of Safety and Sustainable Development of Territory. ISBN 978-80-7251-243-0, PA ČR, Praha 2007, 203p.
- [8] PROCHÁZKOVÁ D. Security Planning (Land-use, Emergency and Crisis Planning). ISBN 978-80-86708-80-5. VŠERS o.p.s., České Budějovice 2009, 200p.
- [9] PROCHÁZKOVÁ D. Risk Analysis and Risk Management. ISBN 978-80-01-04841-2. ČVUT, Praha 2011, in print, 400p.

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