

## **A DECISION SUPPORT STUDY ON REMEDIAL MEASURES TO THE PROBLEMS IN SUSTAINABLE DEVELOPMENT OF MANAGEMENT**

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### **ABSTRACT:**

*Environment is part of a human system, and it must be protected. Based on the present scenario sustainability is necessary for all human systems. It is necessary to invoke the sustainable development principles in all human systems. "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable development is understood as a development that does not erode ecological, social or political systems on which it depends, but it explicitly approves ecological limitation under the economic activity frame and it has full comprehension for support of human needs. Sustainable management takes the concepts from sustainability and synthesizes them with the concepts of management. Sustainability has three branches: the environment, the needs of present and future generations, and the economy. The paper summarises the conditions for sustainable development, tools, methods and techniques to resolve the environmental problems and the tasks of executive governance in the environmental scenario.*

**Keywords:** [Environment. Human System. Sustainability. Sustainability Management. Methods and Tools]

### **I. INTRODUCTION:**

The paper reveals the results of the study of environment in the recent years. It starts from the study of subject on the present level and briefs the conditions and limits of sustainable development, as well as the tools, methods and techniques that are used to solve the environment problems and tasks of executive governance in the environmental scenario. In science and engineering, a system is the part of the universe that is being studied, while the environment is the remainder of the universe that lies outside the boundaries of the system. It is also known as the surroundings, and in thermodynamics, as the reservoir. Sustainable development represents a commitment to advancing human well-being, with the added constraint that this development needs to take place within the ecological limits of the biosphere. Significant interest in the concept of sustainable development exists amongst scientists,

planners, policy makers and the public, and considerable effort and expenditure is made or envisaged at local, national and international levels to promote a more sustainable society.

As regards to the human existence and development, Environment is a part of the superior system of systems in the human system. It is necessary to introduce that respect to human needs and environment into the practice. The impact and benefits are monitored in the way that allows carrying out the corrective measures. Based on recent cognition, sustainability (sustainable development), is not only related to the environment, but also to the entire human system and its basic assets (i.e. public assets) on which the human lives are dependent. Basic human system assets are human lives, health and security, environment, property and public welfare, infrastructures and technologies, in particular those that belong to the critical ones.

The sustainability assessment in general sense is the formalised process for identification, prediction and assessment of potential impact 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 assessment might be performed always at good governance of territory. Economic Development without environmental considerations can cause serious environmental damage, in turn impairing the quality of life of present and future generations. Such environmental degradation imposes a cost on the society and needs to be explicitly factored into economic planning, with necessary remedial measures incorporated.

"Developed countries and relevant international organizations should cooperate, in particular with developing countries, to expand their capacity to receive, store and retrieve, contribute, disseminate,

use and provide appropriate public access to relevant environmental and developmental information..."

## II. Supporting principles of Environmental Sustainability:

The primary purpose for this effort to develop a definition of environmental sustainability was to help environmental professionals and others operationally a portion of the concept sustainable development as set forth in Our Common Future.

### a) Societal Needs:

- Produce nothing that will require future generations to maintain vigilance.
- Design and deliver products and services that contribute to a more sustainable economy.
- Support local employment.
- Support fair trade (Williams).
- Review the environmental attributes of raw materials and make environmental sustainability a key requirement in the selection of ingredients for new products and services ("Global Sustainability Principles").

### b) Preservation of Biodiversity:

- Select raw materials that maintain biodiversity of natural resources.
- Use environmentally responsible and sustainable energy sources and invest in improving energy efficiency ("Global Sustainability Principles").

### c) Regenerative Capacity.

- Keep harvest rates of renewable resource inputs within regenerative capacities of the natural system that generates them.
- Keep depletion rates of non-renewable resource inputs below the rate at which renewable substitutes are developed.

### d) Reuse and Recycle:

- Design for re-usability and recyclability.
- Design (or redesign, as appropriate) manufacturing and business processes as closed-loop systems, reducing emissions and waste to zero (Robinson).

### e) Constraints of Non-renewable Resources and Waste Generation:

- The scale (population x consumption per capita x technology) of the human economic subsystem should be limited to a level that, if not optimal, is at least within the carrying capacity and therefore sustainable.

- Keep waste emissions within the assimilative capacity of receiving ecosystems without unacceptable degradation of its future waste absorptive capacity or other important ecological services.

- Develop transportation criteria that prioritize low-impact transportation modes.

- Approach all product development and product management decisions with full consideration of the environmental impacts of the product throughout its life cycle.

## III. Conditions and concepts for sustainable development:

'sustainable' development suggests that two interpretations of that concept have emerged: a wider concept concerned with sustainable economic, ecological and social development and a more narrowly defined concept largely concerned with 'environmentally sustainable development', i.e. with optimal resource and environmental management over time.' The term 'natural resources' is used broadly. It includes renewable resources, such as water, terrestrial and aquatic biomass; non-renewable resources, such as land in general, minerals, metals and fossil fuels; and semi renewable resources, such as soil quality, the assimilative capacity of the environment and ecological life support systems "The concept of "sustainable development", as coined by the World Commission on Environment and Development and with it, the term "sustainability" itself, have been gaining increasing recognition in recent years all around the world. Wide-spread use, however, has been followed by growing ambiguity so that today both terms are employed within a very broad spectrum of meaning often, to the point of trivialization.

### a) Concepts of sustainability:

The Natural Step Foundation have developed requirement for proper resource management, the so-called four systems conditions. These are in brief summary

- Not accumulating substances mined from Earth

- Not accumulating substances made by society
- Not use natural renewable resources beyond their capacity to renew

- Use all resources in an efficient and equitable way

The four systems conditions are severely violated by our present industrial society: Carbon dioxide from fossils accumulates in the atmosphere; phosphorus from mines accumulates in the water system and various chemicals like PCB made by mankind is found in all kinds of life forms.

To achieve sustainability we need to out-phase fossils in the energy system and stop using chemicals

b) The broad objectives of our environmental policies and programmes are:

1. Conservation of flora, fauna, forests, and wildlife
2. Prevention and control of pollution;
3. Afforestation and regeneration of degraded areas;
4. Protection of the environment.

c) From the system point of view, the sustainable system has attributes as productivity, resilience, adaptability, vulnerability, and therefore, sometimes it is not easy to find a suitable reference state or conditions:

1. The reference point of sustainability is a demanded future state (scenarios, techniques and foresight).
2. The reference points on the one hand are inputs and on the other hand are outputs of system processes i.e. Ecological trace, product life times etc.,

We can thus assume the context given in Figure 1. Since these attributes are mutually tied up, in the relation to the existence of system, the sustainability is on the peak. The decision making on system adaptive capacity is defined by the relation given in the decision matrix in table 1.

Sustainability is often misinterpreted as the goal that we all strive for. In fact, sustainability is not an achievable final state, since it is rather the basic characteristics of a dynamically developed system.

Thus, sustainability is permanent adaptation to changing conditions. This adaptive property is natural to all ecosystems. It is only a question of education to introduce the adaptive procedures to the public administration decision-making on human, i.e. socio-ecologic-technical system.

The set of five Sustainability Principles proposed below is offered in order to advance and restore some rigor to the underlying ideas. Its development was informed by a number of existing frameworks and was inspired, in particular, by the work of R. Buckminster Fuller.

The principles are articulated in a general fashion but can receive a specific operational meaning in relation to particular sectors of the economy, development issues, business strategies, investment guidelines, or initiatives taken by individuals. They are expressed in relation to five fundamental domains:

1. The Material Domain: Constitutes the basis for regulating the flow of materials and energy that underlie existence.
2. The Economic Domain: Provides a guiding framework for husbanding and managing wealth.
3. The Domain of Life: Provides the basis for appropriate behaviour in the biosphere.
4. The Social Domain: Provides the basis for social interactions.
5. The Spiritual Domain: Identifies the necessary attitudinal orientation and provides the basis for a universal code of ethics.

The result is a set of five core principles, each with its own derived policy and operational implications. The set is fundamentally systemic in nature, meaning, that each principle affects all the others and is affected by each in return.

This systemic aspect is fundamental. It reflects the interdependent nature of reality itself. It has far reaching implications for policy and for any competent attempt at strategy for change. It implies that in seeking a transition to sustainability as a predominant planetary state, no piece-meal approach — emphasizing some aspects while neglecting others — is likely to yield effective, lasting results."

For the implementation in practice it holds several pieces of knowledge: It's a triangular distribution. Sustainability is apex, vulnerability and resilience are base of the triangle.

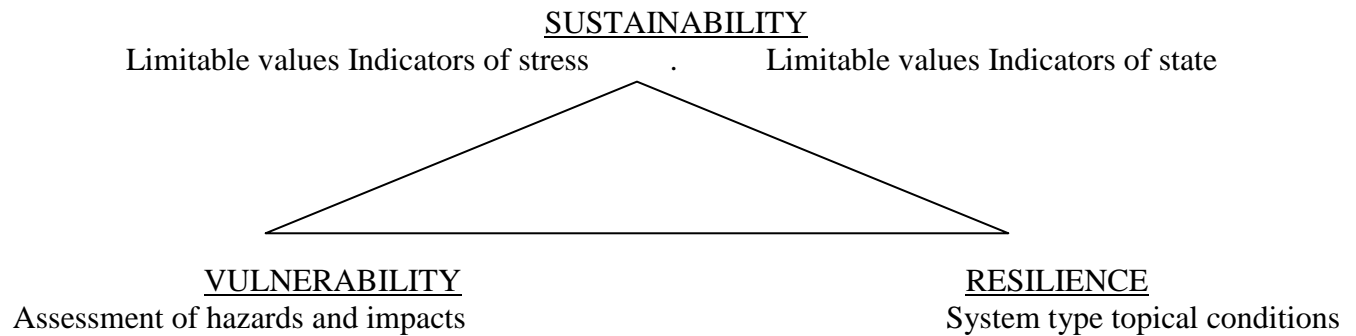


Fig. 1 Relation among sustainability, vulnerability and resilience

System adaptive Capacity: Table 1:

<u>Impacts</u>	<u>Adaptive capacity</u>	
	low	High
High	Vulnerability	Chance of development
Low	High Rest risks	Sustainability

1. Criticality is directed to failures and hazards, while sustainability deals with the existence. Therefore, more and more important are the 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 the secondary and further order impacts on main and other receptors.

This approach can be used only for grey (i.e. by human created) infrastructure, whereas the green infrastructure cannot be investigated in the way that its parts are separately analysed, since landscape and ecosystems create a complex super system, i.e. system of systems.

2. The landscape sustainability is also connected with its sensitivity; the assessment is done by scoring, i.e. decision matrix in Table 2.



3. The human needs, however, depend mostly on functions of ecosystems, and therefore, it is necessary to understand the ecosystem functions, because:

A) The ecosystem functions vary and thus influence the human health, B) 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, the procedure in which we define firstly the grey/engineering infrastructure for human settlements and, after that, the proposal is transformed into the landscape is incorrect as it completely ignores possible cumulative, long term and delayed impacts on environment sources and ecosystems services. Therefore, it is

necessary to search for the solution suitable for local conditions; i.e. it is site specifications.

4. The orientation to the interface of grey and green infrastructures relays on technologies that might solve present and future problems. New technologies, however, bring in uncertainty and vagueness into green infrastructure, because the technology impacts on environment are hard to forecast. Therefore, it is necessary to use and process the methodology of foresight not only on technological level, but also on societal level, i.e. societal foresight aimed at the trends of behaviour of grey infrastructure (i.e. theory of normal accident, highly reliable organisation, industrial ecology) and green infrastructure (adaptive environmental management, industrial ecology etc.).

**Decision Matrix on Landscape Sustainability: Table 2**

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	Acceptable landscape Capacity
Type 1	High	Medium	Medium	High			
Type 2	Low	Medium	Low	Low			
etc.							

IV. Tools, methods and techniques for solutions to environmental problems:

The humans did not come in the environment with intent to subvert the nature. The problems started at the time when humans tried to separate themselves from the nature, and they placed technology / engineering between themselves and the nature. Initially, it was not evident, the biosphere has kept its reserves and it contrived to equilibrate with a range of activities. However, the human activity has been progressively taking on the intensity and in some directions the biosphere has been globally affected. The present worldwide problems are of a global character. Apart from the environment contamination, other major global problems involve the questions of peace and war, the

differences between developed and developing countries, providing the food for future population, energy demand, lack of water, soil, sources, as well as the questions of health care, culture and education.

Therefore it is necessary to introduce strategic system and proactive management based on a realistic, systematic and proactive view of human system 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 an adaptable system. During their development, the humans have accumulated much knowledge and experience, and



therefore, they are supposed to know the ways to limit the interventions to a system, so that to ensure the system development in the direction supporting the mankind's development.

- For many humans, the environment today represents a stylish stalking horse which makes them take up the actions that have nothing in common with real environment (e.g. the reality that the soil is left unexploited does not prosper to environment).

For decision-making, a model of environment that is restricted to human medium has been used, 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.

Based on the present knowledge, each quality management, including environmental management, must carry out the decision-making process with respect to the following goals:

- to prevent emergency situations and to localize emergency situations (the accidents can origin in the frame of both, individual components or even in the frame of the whole environment system),
- to ensure the healthy development of human society,
- to implement ecological programmes in the socio-economic sphere. The management must monitor.

Impacts of anthropogenic activities into the environment that can be divided into:

- pollution of environment component (may be either of the material character, manifested by concentrations of agents or of 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 anthropogenic sphere on environment that is divided to:
- emissions of agents (or better wastes of human activities) into natural medium,
- consumption of renewable sources.

#### V. Administration management and its tasks on environment sector:

Since its origin, the basic function of state 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. The management of state includes generally the concepts of government, control and office hearing of the public affairs.

It represents the conscious activity that is directed to the determination and control of course of topical processes for achievement of appointed goals. It puts individual activities in harmony 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 task environment includes sectors with which the organization interacts directly and that have a direct impact on the organization's ability to achieve its goals. The task environment typically includes the industry, raw materials, and market sectors, and perhaps the human resources and international sectors.



The following examples illustrate how each of these sectors can affect organizations:

- In the industry sector, cola rivals Coke and Pepsi are intensifying their competition in local markets. For example, in New York City, one of the few markets where Pepsi Cola outsells Coca-Cola Classic, each Coca-Cola marketing rep visits up to 120 small stores a week to push snazzier displays, better placement, and more promotions.
- An interesting example in the raw materials sector concerns the beverage can industry. Steelmakers owned the beverage can market until the mid-1960s, when Reynolds Aluminium Company launched a huge aluminium recycling program to gain a cheaper source of raw materials and make aluminium cans price-competitive with steel.
- In the market sector, changes in toy-buying patterns, with parents wanting more educational toys and electronics, have stalled growth rates for companies such as Mattel and Hasbro.
- The human resources sector has become of significant concern to almost every business because of the tightest labour market in thirty years. Well-educated, computer-literate young workers, sometimes called gold-collar workers, can often demand high salaries and generous benefits because companies have great difficulty finding qualified workers.

V-I The basic tools for sustainability management are:

- a) 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,
- b) Citizen's education, schooling and training,

- c) Specific education of technical and management workers,
- d) 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 the increase of its impact,
- e) Inspections and audits,
- f) Executive security forces for qualified response to emergency and critical situations,
- g) Systems for critical situations defeating,
- h) security (land-use and spatial), emergency, continuity, crisis and contingency planning,
- i) Specific system for defeating the critical situations - safety, emergency, continuity and crisis management.

The analysis of the development of environment and the development of political, social and economic situation worldwide shows that it is necessary to solve the cases and actions that by their intensity induce the critical situations leading to relevant crises of the type denoted as a humanitarian catastrophe or social crisis.

Therefore, from the viewpoint of human security, human system development, conservation of quality environment, existence, stability and development of state must comprise a safety concept connected with the concepts of development codified and implemented by safety management. Of the basic (usual) level of management, the target is security and sustainable development, thus connecting emergency and crisis management.

The goal of human society management is 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.

The land and regional development is manifested by the construction of industrial regions coming closer and closer to the residential zones. Possibility of harm thus increases, and society (community) is not willing to accept all risks.

This is the reason for the necessity of risk management and consecutively risk engineering that includes risk assessment, risk reduction and harms explanation. In short, the risk engineering is connected with technical systems (only in advanced forms, the human factor influence on complex process safety is considered) and in the broader sense, it is possible to generalize it to renewal of landscape with utilization of engineering approaches. Therefore, the risk engineering plays such an important role. Its target, on the one hand, is 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. Both concepts require structured a system approach and qualified utilization of planning the scenarios for decision-making support.

The territory management understood 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. It includes quality environment management.

#### VI.0 Conclusions:

As a condition of balance, resilience, and interconnectedness that allows human society to satisfy its needs while neither exceed the capacity neither of its supporting ecosystems to continue to regenerate the services necessary to meet those needs nor by our actions diminishing biological diversity.

Deeper reflection on the concept of sustainability and the five core principles which together prescribe it reveals that the spiritual dimension, the spiritual principle, is fundamental to the quality and coherence of the whole. It is rarely incorporated, however, in the conventional calculus of practical affairs.

It is necessary to ensure the development of economy on the one hand and, to reduce the environment contamination on other hand duly ensuring the environmental protection. The complex problems of the human/nature relation are based on certain philosophical foundations in each historical era. The present period starts turning the higher substances and energies in order to satisfy their needs, with reality. The bulk of these substances are growing 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. Sustainability considers the nature and human from the viewpoint of optimum development of the whole biosphere. The ecological behaviour should





not be reduced to the riotous discussions around the nuclear power plants and 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 the environment and human health.

By 2050 the world's population will reach nine billion. It is therefore necessary for the

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developed and developing countries to act together to meet the challenge of sustainable development. If we do not meet this challenge, we will need the equivalent of two planets to sustain us. Sustainability for us is not a choice to be made but is a precondition for development.

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