

## PHENOMENA DAMAGING THE HUMAN SYSTEM AND THE CHARACTERISTICS OF THEIR IMPACTS

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### ABSTRACT

THE PAPER DEALS WITH PHENOMENA THAT IMPAIRED HUMAN SYSTEM. IN HARMONY WITH PROFESSIONAL LITERATURE THEY ARE DENOTED BY TERM "DISASTER". IT SHOWS THE ROLE OF VULNERABILITY THAT PLAYS BIG ROLE BETWEEN DISASTER SIZE AND SIZE OF LOSSES AND HARMS ON PROTECTED ASSETS. IT SHOWS THAT ENSURING THE COMPLEX HUMAN PROTECTION MEANS

THE ESTABLISHMENT OF PROACTIVE, SYSTEM AND AIMED HUMAN SYSTEM SAFETY MANAGEMENT WITH CONSIDERING THE HUMAN SYSTEM AS SYSTEM OF SYSTEMS THE PARTIAL SYSTEMS OF WHICH ARE OF A DIFFERENT NATURE, AND THEREFORE AT ITS MANAGEMENT IT GOES ON SOLUTION OF CONFLICTS FOR ENSURING THEIR CO-EXISTENCE.

### Key words

*human system, disaster, impacts, vulnerability, systems co-existence, safety management*

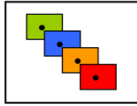
### INTRODUCTION

Throughout all its existence the human society had to face natural disasters, which were threatening its existence; in the Czech Republic this is mostly about floods. The growing concentration of population causes growing vulnerability of buildings and technologies. In our land, as early as 200 years ago, i.e. from the beginning of the industrial revolution, effort was made to reduce the impacts of disasters on the lives and health of inhabitants and their property. In the last decades the effort was widened also to the environment and later on, on technologies and infrastructures. Step by step the stabilized and departmentally orientated system is created minimizing the impacts on the lives, health and property of citizens and on the environment.

The entirely understandable aim of people is the ensuring of a quality life and sustainable development of the system, in which they are living and that we summarily define as "human system". It is evident that this general wish will be fulfilled only when the human system is safe in all the aspects which are fundamental and important. The basic tool for the creation of human system is therefore the ensuring of the integral security i.e. security that pay attention to all the important aspects of the system. For this, it is necessary to define targets and measures leading to their achievement, the measures execute proactively i.e. to use the tool of the safety management of the area understood as the human system, to which the human society assets also belong.

If we take into account that the human system develops we must admit that the conditions, in which we are living change also. On one side, the civilization comforts/conveniences facilitate the life of people and on the other side they allow to destroy it viciously. Unfortunately, the technical force of humans is so big nowadays that it can lead to human annihilation if human kind will not behave and correct/set straight its activities reasonably. It products both the unintended disasters being for example the pollution of the environmental components, induced earthquakes and the intended ones (terrorism, criminality, wars). The abusing of technology in history have always had severe impacts on the society and that not only physical but also psychical, we shall remember Hiroshima 1945, 11<sup>th</sup> September 2001 New York, 11<sup>th</sup> March 2004 Madrid or 3<sup>rd</sup> September Beslan.

Nowadays, for the ensuring of the early defence and protection we use the tool of the area safety management and its integral parts the crisis and emergency management. Their basic parts compose of the analysis and risk assessment from possible disasters on the observed area and activities coming under the crisis and emergency management. Because the most effective preventive measures are demanding about the accessibility of necessary technologies, economical means and qualified personnel, the world developed countries use the safety management tool in a higher quality and that allows them to ensure a higher level of the security in comparison with the less developed countries.



For the ensuring of the acceptable level of safety the program of a preventive protection is implemented into practice against impacts that arise or can arise at possible emergency or crisis situations (its target is to prevent the impacts possible to prevent or at least to reduce them). By this, the reduction of the impact on the lowest level possible is achieved and good conditions are created for the restoration/reparation of damages that emerge or can emerge during the crisis situation.

Therefore, in the interest of the sustainable development of human kind also the historically formed systems of human lives and health protection adapt to a newly arisen situation. The task of states' governments is to ensure the development of their country, the assurance/certainty and safety of citizens. The ensuring of development means the ensuring of the healthy population, safety of people, healthy environment and reliably functioning technical, cybernetic, organizational and service (organizational) infrastructure, which will provide the fulfilment of the peoples' needs (in the EU the term "public welfare" is often used).

For the development of technical, cyber and organizational (service) infrastructure the energy, water, resource base, links and flows in the system of the human society, knowledge and experiences are indispensable. The task of governments is to execute such interventions, with which these demands will be fulfilled in the long term, because from the experiences and theory of management follows that short-term solutions are possible only for temporary periods but generally they cannot ensure the sustainable development.

Problems of society management are so various that it is no longer enough to handle the problems/critical situations (i.e. to have the emergency and crisis management on a high level) but it is necessary to prevent them (viz. e.g. semi-finished/well-developed systems of the safety management of technological buildings) and to be able to start the further development along with the pointed restoration, i.e. to execute competently the safety management understood as an anthropogenic management in the wider sense that also includes the intelligent management of technological units based on artificial intelligence. Some systems of safety management (e.g. [1-3]) have a target according to which the aim of restoration after emergency or critical situation is not to reach the state before a disaster but a state, in which the security level is higher.

The work comes out of the systematic approach of the reality and uses integral terms/conceptions [4], the list of which is cited in works [5, 6]. Its target is to provide intellectual basis and the tools' description allowing public administration to properly manage the area security and development. That is why it copes with the identification of possible disasters which the public administration of the Czech Republic must take into account during the safety management and ensuring of the area development. It also states the characteristics of disasters' impacts of which the many of them are also the subjects of the emergency and crisis planning.

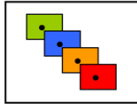
#### **SUMMARY OF THE RESEARCH OUTCOMES, WHICH CREATE DATA USED IN THE FURTHER PROCESSING**

Age-old target of humans and all the human society is to live in a safe space with a perspective of a development. With the development of knowledge human gradually changes tools used for achieving of a given target. *The present situation in the developed countries is that there is built, for the risk management, the philosophy of norms and standards in the various departments of activity in such way that the risk increasing leads to the disasters, accidents, collisions etc. prevention.* The currently promoted type of management i.e. safety management have a higher objective and that is constant security increasing with the help of the measures and activities implementation leading to the safety increasing i.e. they ensure the reduction of significant risks and at the same time the prevention or reduction of the impacts of cruel (serious) disasters with a very little probability, i.e. they contain the principle of preliminary caution, by which they increase the potential of a sustainable development [5, 6].

The present philosophy of human protection and development developed throughout the times. The development moved on pointedly and systematically mainly in the USA, Holland and Switzerland [6]. For example in the USA: 50's – the civil defence was being build, which was understood as a protection against the nuclear attack; 60's – the protection against natural disasters was set up (after the big earthquake in Alaska and the big floods ); 70's – there was systematically put into practice the creation of the flood control plans; 1977 – the research on reducing the impacts of earthquake was launched; 1789 – the FEMA (Federal Emergency Management Agency) was constituted that should process the protection against the disasters and crisis natural, technological and from the field of a civil protection (including war); 1985 – the framing of the response plans for disasters on all the levels of the state administration was initiated; 1992 – the reorganization of FEMA (after the hurricane Hugo and the earthquake Loma Prieta) passed –prevention and measures for reducing the impacts of disasters have been purposely put into practice.

In other countries it was similar. It is therefore the fact that the today's conception that takes into account also others disasters than nuclear war appears in the developed countries only after year 1970 [6].

Both the development of knowledge and application of measures were in the field of expertise similar in our country and that mainly in the section of area planning. But compared to the world, in the 70's, the organizational structure independent on the army was not created that would be connected with the expert system of research and of civil organizations. If we take into account the measure against the fire, the first state or city-organized protection systems in the central Europe are in the area of the CR in the 14<sup>th</sup> century and during the floods from the devastating flood on Vltava in 1724. This is logical because the cumulated human settlements were and are more vulnerable than the sparsely inhabited areas of other continents.



From the end of 70's the emergency management has elaborated, in the developed world, theoretical basis, which follows four interconnected phases: prevention, readiness, response and restoration [6]. At the end of 80's to these phases the lesson from the emergency situation and its handling is being connected. After the emergency management the crisis management follows-up used for the coping with the crisis situation with the help of the above-standard resources, forces and means. But more and more, in the field of management, the focusing on prevention is enforced because the rightly executed technical preventive measures can eliminate 60-80% of serious disasters' impacts, managerial/organizational 40-60% etc. [6].

According to current knowledge and experiences it is necessary to apply these measures at every plan for the manipulation and utilisation of area or the human society managing, every restoration after emergency or crisis situation and all the changes at the manipulation and utilization of area because those are exactly the time periods, in which it is the easiest possible to make a sudden change to a higher security. No longer valid construction law (i.e. the law n. 50/1976 Sb.) and other connected legislative show that in the technical field the former Czechoslovakia did not stand behind the developed world.

However, it was different in the citizens' training; the training was constantly directed in the sense of a protection in case of a nuclear war and that in spite of the international treaties guaranteed also by the former Soviet Union. In the beginning of 90's, the training of the people in this field entirely collapsed and until now only simple descriptive manuals about what to do before, while and after selected disasters were processed and that in the Czech Republic usually have undesirable impacts on assets.

What is entirely missing is the citizens' system of measures what to do before, while and after disaster, which would followed up from the local specifications and there is the lack of the activity plans of the each participating organization, public administration and citizens. Only the executive units united in the Integrated rescue system (IZS) have sophisticated orders.

After experiences from the handling of the emergency situations of a big range, in the beginning of the 90's, the FEMA enforced a philosophy according to which the emergency planning, response and restoration are subjects of all the resorts and FEMA represents only the coordination function. The Emergency Support Functions were defined that have to be ensured for the handling of the response and for *the start of the further area development after the emergency situation*. Their number is usually between 12 and 22 and their ensuring is the part of the response plan of both the whole USA and the individual states of the federation. Some of them were, as the time went, defined as a critical infrastructure [6]. The development in a similar direction that was a result of expert knowledge ran also in other countries even though under the different management of definition. That means that in the states in the territory of the Central Europe (i.e. also in the former Czechoslovakia) there were, under the guidance of a state, ensured energetic resources, water resources, bridges, roads, communication systems, instituted storehouses for goods etc.

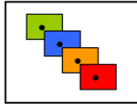
With the development of technologies and knowledge the approaches changed, and naturally, are changing along with material equipment, ways or concepts of these systems. On one side, the introduction of the IT (informational technologies) made the managing of these systems more simple but on the other side it brought new vulnerabilities on which the EU research was focused in the 7<sup>th</sup> outlined program [7].

Besides the activities stated above and included in the emergency and crisis management other activities developed next to each other, that is:

- protection of the environment grounded on the assessment of impacts on the environment (EIA in the USA - 1970) and constantly trying to achieve a sustainable development of the environment and enforcing the principle of a preliminary caution covered by the governmental agency EPA (Environmental Protection Agency). The similar development took place in the European Union and later on in the CR (viz. the law about EIA from 1992 and other succeeding legislative),
- ensuring of technological development grounded on the assessment of technology covered by the USA Congress agency known as OTA (Office for Technology Assessment – 1972-1996). Similar development took place in the EU (relevant directive is from 1986).

Interconnecting of the up-stated activities occurs from the end of 80's of the last century (viz. the activities of the UN and other national and international organizations [6]). Into practice, the concept of integral/complex security is being introduced the basis of which were took over from the field of nuclear technologies and which have gradually evolved and broke through after the collision in Three Mile Islands in the USA [6]. After this collision the safety management concept in the nuclear field was developed and put into practice under the expert supervision of NEA/OECD (Nuclear Energy Agency for the nuclear energy of OECD) and the organisational management of IAEA (International Atomic Energy Agency) working under the UN and it is still being improved. In 1986 after the nuclear catastrophe in Chernobyl, the international consultative governmental committee (INSAG) defined integral safety and stressed that the security is not possible to ensure only by the totality of technical security measures but it is necessary to consider, as one of the important factors, the influence of the human factor as well.

Concept of integral security is enforced under the projects of UN, which is IDNDR (International Decade for Natural Disaster Reduction) in the years 1990-2000 and ISDR (International Strategy for Disaster Reduction) beginning the year 2000. It is further enforced under OECD, the EU (Seveso) and other national and international organizations. In the European Union between the years 2004 and 2006 the concept was developed in the preparatory program labelled as PASR and it is



purposely applied in the 7<sup>th</sup> outlined program for the years 2007 to 2013 [7]. However, in broad public, it did not become important before the terrorists attacks on the USA and other countries.

The up-stated facts show that the protection against the disasters and attacks became gradually integrated. At first, the terms hazard and risk were used at its characteristic and by the encompassment of disasters influenced by the human factor the term risk and threat were differed.

The new departments of human activities were created as: the risk analysis, risk engineering (correctly as the engineering based on the risk management) [5, 6] and risk assessment. To the practice, the expert tools were introduced: hazard assessment, risk assessment, risk management, safety management. The stated expert theoretical tools, with which we assess the expected size of disasters, expected size and extend of impacts, were later on applied on area. By that, the impact of the area features was discovered i.e. the role of vulnerability and later on also the impact of the amount of people in the affected area on the size of disasters' impacts. All that, step by step, influenced the ways of area safety management, area administration system and building of the systems protecting humans from possible disasters, demands on executive units, needs of training etc.

Safe human system, for which the politicians often use the term "Safe space" [6, 7] is defined as a system, in which there is the security on the acceptable level and in which the public welfare and safety of people is taken into account.

*Safety in this sense is an integral term connecting all the attributes of all the individual safeties, which have already been defined before (e.g. external safety, internal safety, nuclear safety, medical safety, chemical safety etc). It is the complex of measures and activities for the ensuring of the safety and sustainable development of the human system i.e. for the safety and development of protected assets.*

It is important to realize that it is not possible to develop and protect everything that exists but it is necessary to determine basic priorities and on them to focus care and attention in detail and at the same time to observe wider context in order to avoid the occurrence of non-returnable actions and phenomena that would have severely interrupted or even degraded the human system.

Such understood safety it is possible to reach only on the basis of knowledge, quality monitoring of the human system state and qualified measures within the managing process. Tool, which is used for implementing of this method into practice, is called safety management and is followed in this work.

Safe space established by the European committee after the terrorist attack on 11.03.2004 in Madrid is an analogy to a safe human system [2], i.e. the system, in which there is an acceptable safety i.e. the acceptable level of security and the sustainable development, is guaranteed. According to the current knowledge about ensuring of the security and sustainable development of the human system, the assets (protected assets) of the safety management are: the lives and health of people; property and public welfare (prosperity); ENVIRONMENT; technology and infrastructures, most importantly the critical ones. Process model of the human system management is shown in the figure 1.

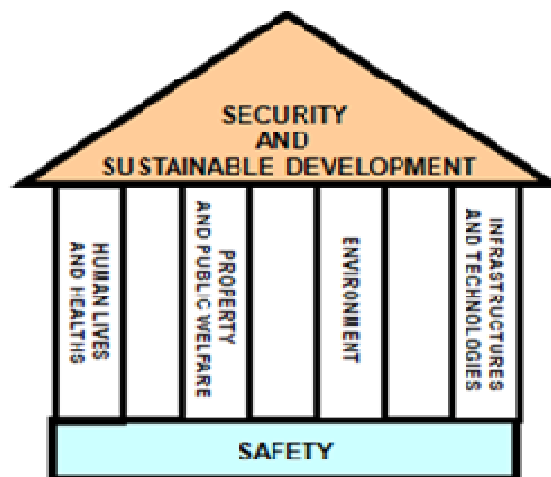


Fig. 1 – Process model of human system.

From the systematic approach we consider as the human system assets also the links and flows among the assets. However, which of them are the important ones, we cannot say yet, because the links and flows among the basic human system assets are nowadays only in the state of a systematic research [8-10]. The research was required by the fact that at the extreme disasters' occurrence the critical situations are formed in buildings, area, state etc., which are awakened by secondary and tertiary impacts of disasters often causing more loss, damages and harms than primary impacts (more detailed in the situation in the figure 2).

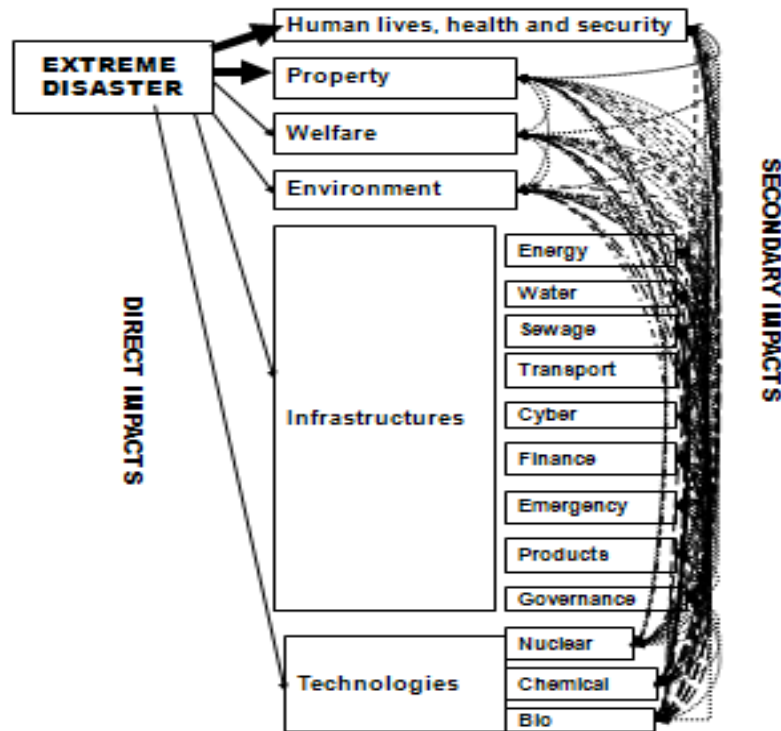
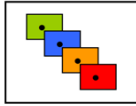


Fig. 2 – impacts of extreme disaster on human system.

**METHOD OF RESULTS PROCESSING**

At the research of phenomena damaging the human system, characteristics of their impacts and at searching mutual connections, which must be taken into account in the human system safety management because the situation, which is in the human system caused by this phenomena depends not only on the size of phenomena but also on the features of the human system, vulnerability of assets and on the human ability to rightly adopt measures and activities that are part of the safety management of the human system, figure 3.

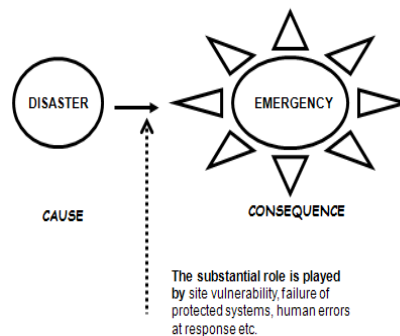
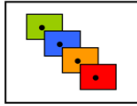


Fig. 3- Relation “cause-consequence”.

In the given context, the term “disaster” determines phenomena in the human system that brings loss, damage and harm to humans. Some disasters the man can avoid but the majority, to which belong natural disasters cannot be avoided. The disasters cause, or from a certain size cause loss, damage and harm on the protected assets, i.e. they are the cause of situations affecting humans, so that he has to solve them. From the reason of the big variety of disasters, the term “emergency situation” is used for the formed situations. Relation between disaster and emergency situation is the relation “cause-consequence”, figure 3. The quoted relation is not easy because the intensity (destructiveness, cruelty) of an emergency situation is predetermined not only by the size of a disaster but also by a local vulnerability, failure of already implemented protecting systems (e.g. of the system of area warning), mistakes of people during the response etc. From the up-stated reasons, different approaches as deterministic, stochastic and heuristic and derived methods, tools and techniques [11] are used. In cases when it is possible to transfer all the observed assets, which are not possible to



commensurate/compare by their character, to one quantity whose value is possible to formulate e.g. in some financial unit, it is possible to use methods, tools and techniques that are much easier. At solving the task connected with deciding and management, in which we e.g. determine priorities, the quoted easy approach isn't possible at all, because it is necessary to consider more incomparable/incommensurable assets and therefore, in these cases the multi-criteria approaches or the combination of methods must be used. [11].

#### PHENOMENA DAMAGING THE HUMAN SYSTEM

As it was already stated above, phenomena damaging the human system are called disasters. The disasters are divided into several categories/groups/units depending on the type of processes that run inside and outside of the Earth as a planet and that cause them to happen and therefore they have different places of occurrence and different characteristic.

On the basis of current knowledge, their possible sizes depend on the regional processes and on the size of their impacts both on the regional processes and the local conditions. Their causes and characteristics are incomparable. From the view of protected assets they have one in common and that is their ability to destroy them i.e. to cause damage and harm on them. On the basis of current knowledge [6, 12, 13] the following phenomena represent disasters (note- this term is more general than a threat, which is used mainly in the military practice for determining an external cause of some harm made on assets), which cause loss, damage and harm to people and other assets of the human system that are the results of the following processes (figure 4).

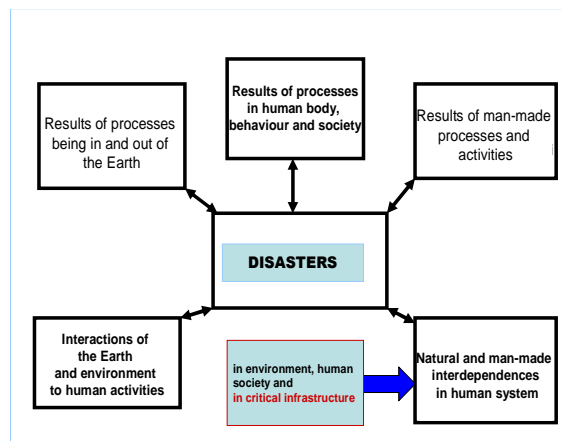


Fig. 4 – Disaster sources.

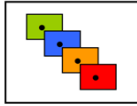
The list shows that the disasters, depending on the process, of which they are the product, have a very various physical, chemical, economical, biological, social or cybernetic etc. character/substance. The fact, only just stated, is a clincher from a view of a security because preventive measures must be concentrated on the character of a disaster so that they would be effective.

#### CHARACTERISTICS OF DISASTERS' IMPACTS

Disasters have certain characteristic features, which are the source of impacts causing loss, harm and damage on the important elements, links or flows of the human system and that from the viewpoint of a human. Therefore, depending on the nature of a disaster, among the disasters' impacts we rank e.g. vibrations; directed fast stream of air (from the soft breeze until the phenomenon described as a pressure wave), water or soil; damage of the compactness of soil and rocks; material transfers; liquid outbursts; anomalies in temperature etc. The quoted impacts affect a human either directly or vicariously through links and flows in the human system [6].

Impacts of disasters are interdepartmental and in the human system, they cause changes of various characters i.e.:

- Physical changes that embrace the occurrence of phenomena in areas having a mechanical, electric, optical, magnetic, electromagnetic, acoustic, thermal, seismic character or the character inducing phase transitions or radiation. The phenomena of thermal character are combustion, radiation and flow of heat. The phenomena of mechanical character are explosion, collision, fracture, cut, friction, skid, rip, distortion, fall, slump, implosion, pressure wave. The phenomena of electrical character are short circuit, induction, transferral resistance. The phenomena of magnetic character are the change of magnetisation, causing the magnetisation of a thing. The phenomena of optical character are optical refraction, false reflection, fata morgana, bedazzlement, light impulse. The phenomena of acoustic character are noise, roar/grumble, infra and ultrasound oscillation. On the basis of the phenomena inducing phase transitions or radiation, the aerosol mixtures, air-dust mixtures, fogs, smokes, active isotopes and mutations of living tissues occur.



- Chemical changes that embrace the occurrence of phenomena in areas having a character connected with the effect of qualities such as pH, solutions' concentration, oxidation or reduction behaviour, and reaction mechanisms on the human organism and area. On the basis of the above mentioned phenomena, the burning of various sort, pressure wave, creation of chemical clouds, corrosion of metal constructions, oxidation of organic matter, ageing of materials, changes in structure of solid substances, acid rains occur.
- Biological changes that embrace the occurrence of phenomena in areas having a character connected with the effect of changes in a living organisms in areas immediately or with a time delay (e.g. mutations, immediate or sudden illnesses). On the basis of the above mentioned phenomena, the changes in living organisms of various kinds (appearance, size, change of structure, mutation, loss of abilities e.g. reproductive, stress, loss of resistance, reduction in diversity etc.) occur.
- Structural changes that embrace the occurrence of phenomena in areas and the human society causing the changes in the human system. On their basis, the climate changes, changes in the weather, occurrence of induced earthquakes, ozone holes, planet warming, and polarization of the human society until the emerging of mutually intolerant groups occur.
- Psychological changes that embrace the occurrence of phenomena on people in area having the character of disturbing of psychical balance, increased stress, frustration or psychical illnesses. On the basis of the above mentioned changes, the phenomena as bullying, psychical shorts, the feelings of alienation, violence, animosity, intolerance, xenophobia, criminality, murders, terrorism, migration etc. occur.
- Sociological changes that embrace the occurrence of phenomena at in area having the social, economic or political character. On the basis of them/this phenomena, the unemployment, indebtedness, tax evasions and fiddles, cartel agreements; personal bondage, restricting of freedom of expression, religion intolerances, destabilisation of the system of state administration; forced conquest of an area, occupation, wars occur.

Other information is in works [6, 12, and 13]

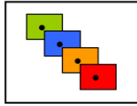
The occurrence of disasters, their size, size and specification of their impacts depends on the characteristics of the area, its inhabitation, industry and infrastructure. What is important are the characteristics and parameters of the area, ways of using of the area and its inhabitation because the only just quoted items noticeably determine the vulnerability of the area towards some concrete disaster i.e. also towards the source of domino effects. The screening of disasters in a determined area means that we find out from the disasters' scenarios, framed for the general, projected and above-the-projected sizes of disasters, the impact of the each actual disaster in the observed area and from them we determine expected loss, harm and damage on protected assets according to the method described in work [12]. Scenarios of disasters are determined by processing the empiric data, modelling with the help of analytic or heuristic approaches [12].

#### **CURRENT PROBLEMS**

Because an area is the human system having inhomogeneous basic assets: lives and health of people; property; public welfare; the environment; infrastructures and technologies, the connection of which is a source of cross-section risks; and in the mean time it develops together with its surroundings so its management led by humans, or more clearly the human management of human affairs and behaviour, must be executed in a way so that humans do not contribute to the disintegration or doom of the human system, which is vitally important for them. From the viewpoint of a current knowledge and experiences, the management must be proactive, strategic, complex (respecting all the protected assets) and effective [6]. On the basis of knowledge and experiences, it has 3 interconnected levels: the management targeted on creating of security and sustainable development; emergency management; and crisis management [6], which are such adapted, so that it would be possible to quickly avert every disruption in the area that is not desirable from the view of security and sustainable development of human.

From the methodical point of view, the integral security management of the area represents the coordination of various inhomogeneous processes that are in progress simultaneously in different areas and some of their results are inter-conditioned/ conditioning each other, i.e. processes are in some way dependent on each other i.e. handling of relevant tasks is determined by directing them to a given target. From the view of the given target, it is necessary that every participant would understand every problem in the existing context and seek its effective solution in given conditions and in the mean time proceed rationally and with regard to expenses and resources available in given areas.

That means that all the up-stated aspects must be factored in the scenario of safety management. The fulfilment is possible only when there is a quality tool for scenario compilation in disposition for safety management which is flexible enough; transparent; exact in a sense that it ensures the same results after a repetition; and right in a sense that there are both uncertainties and vagueness evaluated. For the creation of the tool for the compilation of the safety management scenario, the current knowledge and experiences from disasters' management and from the theory of variable systems [6] are used. However, there are many problems in practice that are unstructured and at many elements, links and flows of assessed system, there are not only uncertainties but also vagueness. For achieving of the ability to solve the problems mentioned,



only the methodology of the application of a case study while deciding in the systematic concept and expert methods are the possible actions.

Expert methods simulate the thought techniques/procedures of specialists. They are grounded on the scenario of process where the solver is guided to the progressive solution of partial problems by deciding in a certain logical sequence of considerations and activities connected with the creation and assessment of different variants of a given problem. The method of the application of a case study at deciding is, on the basis of the current literature analysis, cited in work [14], nowadays, it is considered as a reliable method when it is made conscientiously. It is the ideal method for acquiring the results by the whole and deep investigation and for that purpose, specific rules are created determining how to do a case study and how to strengthen the reliability and correctness (validity) of the results of executed investigations [14].

Both the quoted methods are grounded on the variants of scenarios of area safety management.

At the compilation of the variants of scenarios of area safety management [6] we must come out of:

- characteristic of the area i.e. scenario of the area where there are placed actual assets in a given quality and a given number,
- variant scenarios of actual disasters affecting or that can affect a given area where there are placed actual assets,
- the fact that a human system is the system of systems [6] and at the management of its safety it is about the coexistence of several systems, at least the environmental, technical and social, figure 5.

On the basis of current knowledge, the disasters, as a result of their nature, do not have the same affect on assets and therefore the actual vulnerabilities towards the individual possible disasters are different [12]. The fact mentioned means the application of multi-criteria approaches at deciding and management. Furthermore, it is necessary to solve the problem of identification, analysis, assessment and cross-section risk management [5].

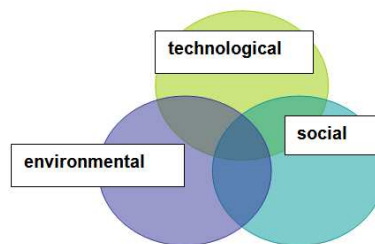


Fig. 6 – Coexistence of main systems.

## CONCLUSION

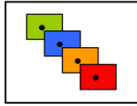
Modern safety management of the human system uses processional approach based on knowledge management i.e. it does not concentrate on results but on causes. Processional management is based on the conception and methodology elaboration and it has three basic levels of management which is necessary to harmonize. Strategic level determines the basic direction of development, from which it outcomes, which processes is necessary to repair or create, which organizational changes will it be essential to execute, where to get the know-how, financial sources etc. tactical level deals with processional management and helps to organize the actions necessary for the realization of the long-term intentions. The answers for questions are sought how to set the processes, in which state to keep them and how these processes must cooperate together. Operational management decides about a concrete placement of resources in the process (human, technological, financial) and also about the performance of individual actions according to the set processes (how to execute the actual situation). The aim is to ensure the transfer of knowledge and abilities among the workers. *The organization gains the significant effect and competitive advantage only by harmonizing all the three levels of management.* It is about reaching the state where the processes are defined and managed on the basis of strategy and the operational management will not serve only for putting out/dealing with/saving the exceptional occasions/accidents.

Processes will be therefore improved on the basis of knowledge transferred from the operative. New knowledge coming out from the processional management will then quickly return to the strategy and cause other fundamental changes in the development of an organization.

Processional management is based on the principle of integrating the activities into compact processes. So it is also necessary to unify the partial operations. Processes are managed by the processional teams. Every process team guides processes on its level and give tasks to subordinate teams that leads to the task fulfilment. Withal all the processional teams must be motivated to the acquiring of optimal results and all the levels must seek, while trying to reach the partial results, the fulfilment of a final result.

At processional management there exist next to each two other systems of management, and that is functional and processional, what makes the management more complicated. The modern management of public affairs grounded on the project and processional management uses general process (Problem Solving Process) [6], which is a part of the best-practice (i.e. of the best experiences) and it is used widespread. The process overcomes the problematic of projects and





project management by its generality and it consists of ten points: the identification of a problem; definition of a problem; analysis of a current state; seeking causes; definition of the final state; proposition of a solution; choosing a solution; validation of a solution; realization; and evaluation. Processes for safety support, which is necessary to follow in the human system are observed in detail in works [15, 16].

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