



HUMAN SOCIETY AND TECHNICAL FACILITIES COEXISTENCE

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ABSTRACT

HUMAN SOCIETY NEEDS TECHNOLOGICAL FACILITIES FOR ITS QUALITY LIFE. BECAUSE SECURITY SITUATION IN THE WORLD, IN EACH TERRITORY AND IN EACH TECHNOLOGICAL FACILITIES CONTINUOUSLY CHANGES WITH TIME, SO IT NEEDS TO BE FORMED NEW SAFETY CULTURE BASED ON ADVANCED RISK MANAGEMENT THAT TAKES INTO ACCOUNT ACTUAL KNOWLEDGE AND EXPERIENCES WITH CROSS-SECTIONAL RISKS AMONG THE PUBLIC ASSETS. VERY IMPORTANT IT IS TO SOLVE THE CONFLICTS BETWEEN THE TERRITORY MANAGEMENT AND TECHNOLOGICAL FACILITIES MANAGEMENT BECAUSE THEIR DEVELOPMENT IS NOT SYNERGIC.

Key words: Human System. Technical Facility. Coexistence. Risk Management.

1. INTRODUCTION

Present goal of humans is to live at safe space. In agreement with EU [1], UN [2] and professional knowledge, summarized in [3], there is necessary for conservation and sustainable development of human society to create safe territory, safe community, safe state, safe Europe and safe world. Safe space is safe open dynamically variable system, named Human System according to [2].

From professional viewpoint Human System is system of systems (SoS), which is formed by several overlapping open systems, and therefore, its management is not easy [3]. In agreement with Maslow pyramid [4] its assets are: human lives, health and security; property and welfare; environment; and technological facilities having the object or net form [3].

Human system security and development is disturbed by disasters (internal or external phenomena that lead or can lead to damages, harms and losses of system assets). Disasters are results of processes, actions and phenomena that are under way in human society, environment, planet system, galaxy and other higher systems. It is fact that human system safety is very affected by human factor, mainly by human management acts that are sources of organizing accidents.

2. HUMAN SOCIETY NEEDS AND TOOLS

For safe world, we need to negotiate with risks of different origin and kind; i.e. with all disaster types. It is necessary to consider that human capability in combat with disasters is limited, namely to design



disaster (disaster size to which the humans systematically perform successful countermeasures). It means that higher disasters and especially extreme disasters threaten the human existence [3]. For human protection it is necessary: to realize better countermeasures against disasters; to reduce human assets vulnerability; and to strengthen the resilience of human cities.

Human society has been using the tools based on management concept that used the following terms [5]:

Security is a state of system at which the occurrence of harm or loss on system assets (protected interests) has an acceptable probability (it is almost sure that harm and loss do not origin). To this there is also belonged a certain sure stability of system in time and space, i.e. a sustainable development in time and space which means that the system is protected against to internal and external disasters.

Safety is a set of human measures and activities for ensuring the security and sustainable development of system and its assets. Its measure is effectiveness size of appropriate measures and activities at ensuring the system assets security and sustainable development.

Secure human system is represented by a territory including the human society that is protected against to internal and external disasters.

Safe human system is represented by a territory including the human society the assets of which (for public assets see Figure 1) are in security and they can sustainable develop. The system is protected against internal and external disasters and the system itself does not threaten its vicinity because the good symbiosis of each system with its vicinity is necessary for system existence. Similarly, **safe organisation** is the organisation the protected assets of which are in security and they can sustainable develop.

Human system safety management is the management of human system directed to human system safety the product of which is security and sustainable development of all public assets denoted in Figure 1.

Resilience is the combination of asset capability „withstanding” and “recovering” from disaster [6]. Present attention is concentrated to resilience of cities and states. It is improved by technical and organizational tools; i.e. by technology, organization and education, which work with the priority risks by way directed to human system safety. Tools for work with risks are: empirical, theoretical (analytical – deterministic, probabilistic approach); and expert (complex systems – multi criteria nature, DSS, ...). Present knowledge shows that tools need to be applied proactively, systematically and coherently, so the aim might be reached. It means that it is necessary to apply smart tools for work with priority risks [3].

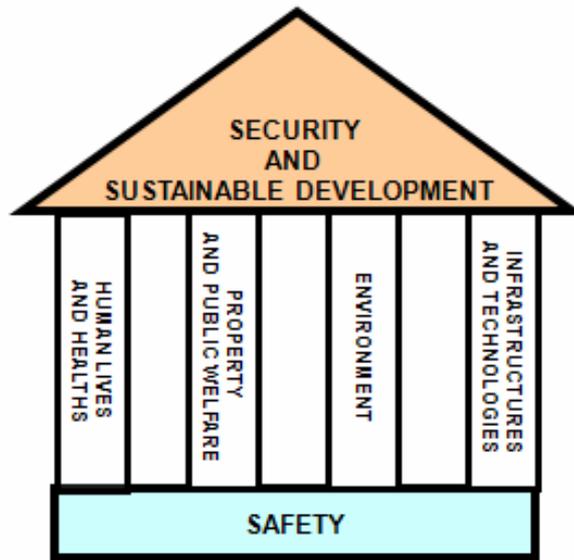


Fig. 1 - Human system safety management process model with presentation of public assets [5].

Special interest at human security formation is concentrated to technological facilities that on one side improve human life quality and on the other they have potential seriously to threaten humans. Present human effort [3] is concentrated to build:

Dependable (reliable) technological facility denoting the technological facility that performs required functions in given place, given time and given quality during the whole life cycle.

Secure technological facility denoting the dependable technological facility that is protected against to internal and external disasters of all kinds.

Safe technological facility denoting the secure technological facility that does not endanger itself and its vicinity under all conditions.

The main quantities following in this field [3,5] are:

Risk denoting the probable size of losses, damages and harms on protected assets in real system that is calculated for unit of space and unit of time.

Safety denoting the human measures and activities for protection of humans and other public assets (on the system level).

Criticality denoting the limit (boundary) from which the risk impacts are significant up to eliminative for followed system, which means that appurtenant risk needs to be always mastered.

Present knowledge [3] shows that: safety and risk are not complementary quantities because risk reduction means safety increase, but it is not always valid inversely; complementary quantity to safety is criticality because risk level predetermines the criticality.

Main problem in safe system formation (at human system and technological facility system) is connected with the system nature of all items in our world. Our knowledge is not sufficient for pulling off unacceptable interdependences on levels: physical; cyber; organisational; and territorial [3]. Very important it is also the human behaviour, i.e. the safety culture and in technological facilities the process safety.



3. RISK MANAGEMENT ROLE

Strategy of management for ensuring the security and sustainable development of managed subject consists in negotiation with risks [5,7]. In its frame according to present possibilities of human society we apply several ways of deal with risk:

- part of risk is reduced, i.e. by preventive measures the risk realisation is averted,
- part of risk is mitigated, i.e. by preventive measures, activities and by preparedness (warning systems and another measures of emergency and crisis management) there are reduced or averted non-acceptable impacts,
- part of risk is re-insured,
- part of risk for which there are prepared resources for response and renovation,
- part of risk for which there is prepared contingency plan, i.e. it is used for part of risk that is non-controllable or too expensive or low frequent.

To this it is joined the distribution of risk defeating among all stakeholders [5]. The distribution in good governance is performed according to rule that all stakeholders have responsibility for risk defeat and that the defeat of real risk is assigned to a subject the preparedness of whom is the best.

In practice there are usually used two risk management models: classical risk management; and safety management, i.e. risk governance for security and sustainable development [3, 5].

Risk management is realised by the human process which is shown in Figure 2. In figure, the criterions are the conditions that determined when the risk is acceptable, conditionally acceptable or unacceptable. Aims denote the required states that we want to reach by management. The numbers 1,2,3,4 denote the feedbacks that are used if the monitoring shows that followed requirements on safety are not fulfilled.

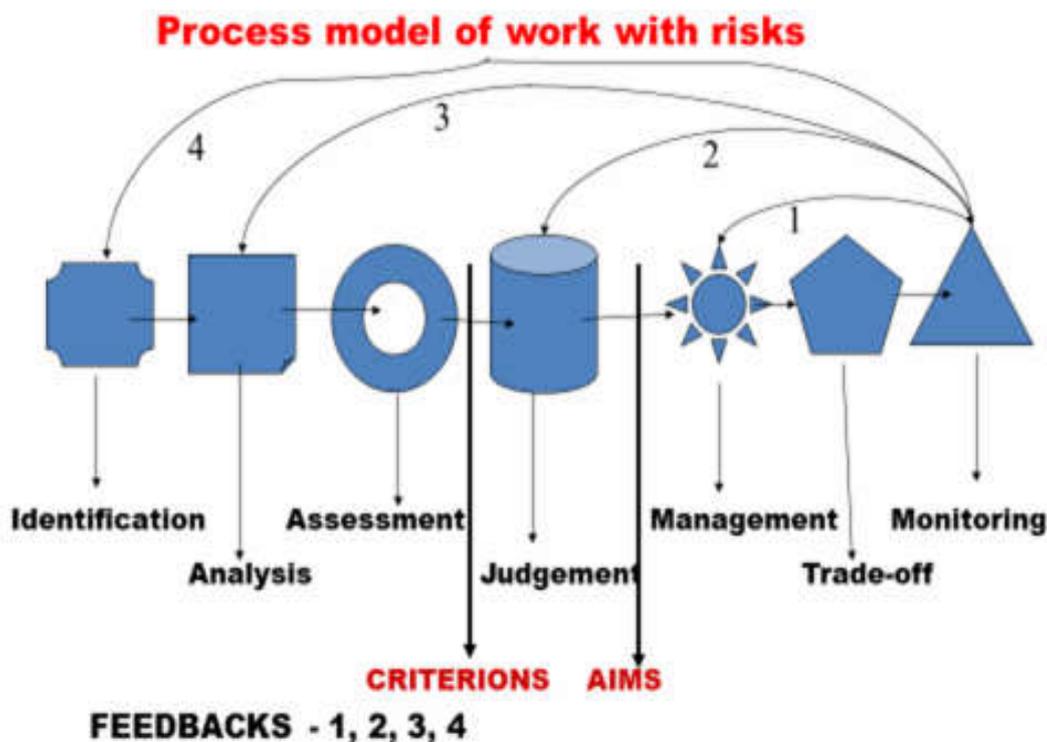


Fig. 2 - Process model of work with risks [5].



4. SAFETY CULTURE AND PROCESS SAFETY ROLES

The culture denotes the specific material and spiritual values that the humans create by their activities and by which they enhance life of both, the humans and the whole human society. Society culture is integral system of substances, values and societal norms, which members of given society follow, and which through sharing they transmit to next generation. It is collection of values, symbols, company heroes, rituals and own histories that act upon exterior, and they have big influence on human behaviour at working positions [8]. *Safety culture* means that human at all roles (control worker, employee, employer, citizen or disaster victim) respects the safety culture, i.e. he / she behaves in a way so he / she may not cause to happen the possible risks realisation, and if risk realisation happens, he / she may contribute to the effective response, the protective interests' renovation and to start of further development.

Effective safety culture is fundamental element of safety management. It reflects safety concept and it goes out from values, attitudes and manners of top management workers and from their communication with all involved persons. It is obvious obligation to participate in solving the problems of safety and it promotes so all involved perform safely and so may observe the appropriate legal rules, standards and norms. Safety culture rules need to be incorporated into all activities in each entity and in each territory. Its principles are: outright, open attitude to weak spots, action directed to finding the solution; diversion from the culture of determination of responsibility for fault and punishment of such person; employees, employer and top management behave responsibly, separately and with orientation to team - "the safety culture" is a part of their life; safety standards are accepted and integrated to everyday company life; and safety and health protection form important value for both, the company workers and the whole company.

Safety culture for technological facility means that company undertakes to carry out manufacturing with the highest safety standards. For reaching such aim, it is crucial so it holds established the effective and without disincentives pursued advise of all accidents, incidents, near misses, random events and cases, experiences, doubts and further information and data that might adversely shaped the facility and its vicinity.

In link-up with safety culture there are necessary procedures as loss prevention and process safety. Loss Prevention is systematic approach to prevention of accidents, or at least to reduction of their impacts. It includes means for elimination of sources of risks or for reduction of probability of their realization, and for mitigation of impacts connected with this realization (preventive and consequential measures). Further it includes identification of suitable supervisory measures, identification and application of suitable remedial measures, by help of which it is ensured the safe entity with appropriate level of security and sustainable development that does not pose unacceptable danger for its vicinity [3].

Process safety or better the safety of processes is a branch of safety directed to safety in industry, in which there are series of manufacturing and additive processes that are necessary for setting up of final product of a given industry. Together with production it goes on averting the accidents that have special and characteristic features for a given specific industry. It deals with e.g. prevention of immediate leakage of chemical substances or energies in harmful amount, and in case if such leakage occurs by reduction of sizes of their impacts and consequences. It does not include the questions of classic safety and protection of workers at work, i.e. it deals with purely technical problems, by which it differs from the system safety that is directed to all public assets.

6. SAFETY MANAGEMENT PROCESS

Today's cognition shows that in all cases, the humans need to apply safety management process directed to ensuring the security and development of system and its vicinity. Due to the world dynamic development, the human security and development may be ensured by *permanent conflict management in human space* [3], especially in case of conflicts between technical facilities and their



vicinities at: sitting; building; operation; decommissioning. The image of process for coexistence formation is given in Figure 3.

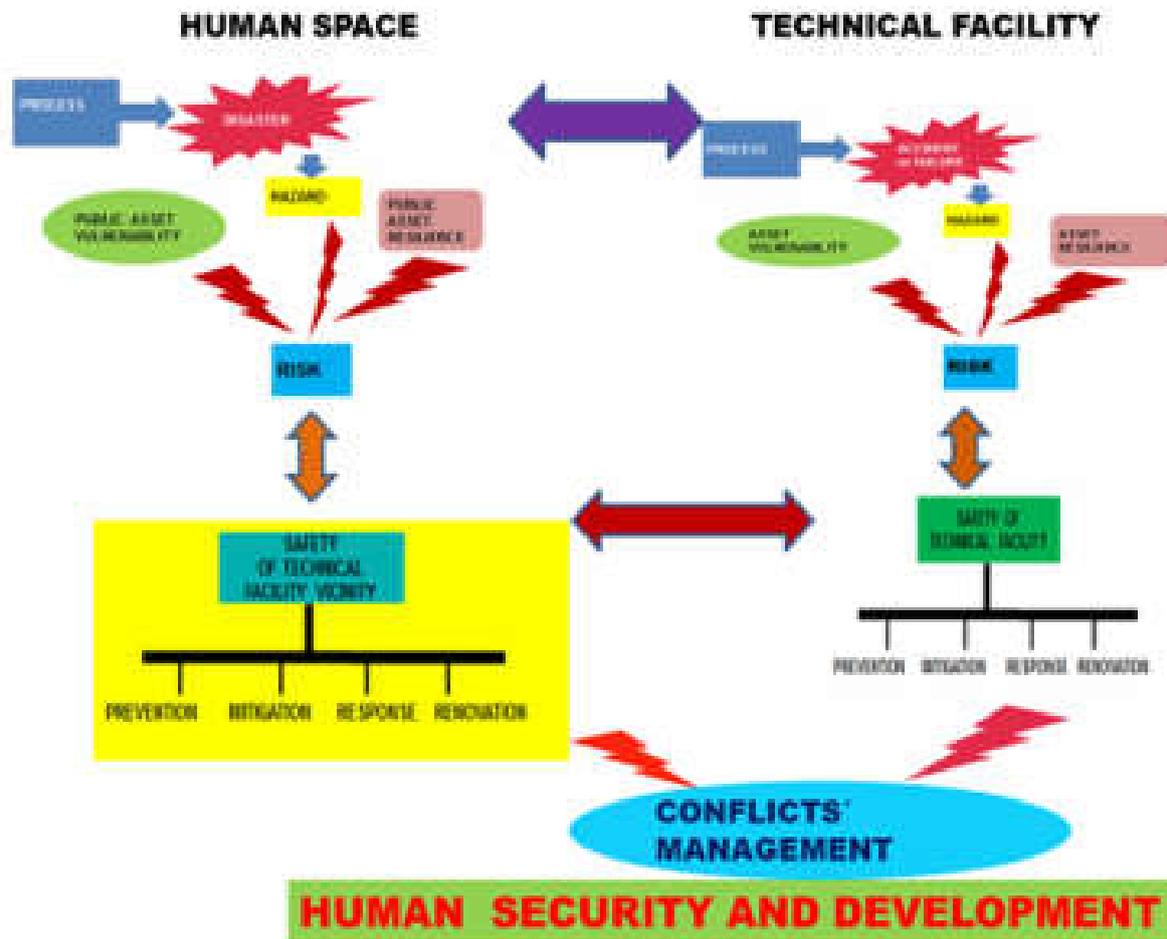


Fig. 3 - Principle of coexistence is permanent solving the conflicts [5].

5. TOOLS, METHODS AND TECHNIQUES FOR SOLUTION OF PROBLEMS

The humans did not come with intent to subvert the nature. They wanted to transform it for their needs. The conflicts have started in time when they tried to separate from the nature and between them and the nature they 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 [5, 9]. 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 [3, 5], which is based on realistic,



systemic and proactive view on human system and its problems; i.e. existing risks. 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 human system 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 [3, 5, 9] each quality management, i.e. also both, the technological facility management and the human system management need to 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.

According to principles of advanced management of human society the *TASKS HAVE ALL PARTICIPATED IN* [5, 9]. 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 [5, 9] 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.

7. CONCLUSION

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. Therefore, the conservation of quality environment, existence, stability and development of state there need to be used the safety concept and with it connected concepts of development codified and implemented by safety management into practice [3, 5, 9].

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 [5]. Both concepts require structured system approach and qualified utilization of planning the scenarios for decision-making support.

Both, the territory management and the technological facilities management are understood as strategic and proactive safety management [3, 5, 9].

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