

INFORMATION & SECURITY

An International Journal

Scenario-based Security Foresight

Edited by
Alexander Siedschlag



Procon Ltd.

Volume 29, 2013

Volume 29, Number 1

- Alexander Siedschlag*
 “FOCUS”: Foresight Security Scenarios to Plan for Research to Support the “EU 2035” as a Comprehensive Security Provider 5

Methods & Techniques in Scenario-based Foresight

- Todor Tagarev and Petya Ivanova*
 Analytical tools in Support of Foresighting EU Roles as a Global Security Actor 21
- Todor Tagarev, Venelin Georgiev, and Juha Ahokas*
 Evaluating the Cross-impact of EU Functions as a Global Actor and Protector of Critical Infrastructures and Supply Chains 34

Threats, Scenarios, Roles

- Luca Urciuoli, Toni Männistö, Juha Hintsa, and Tamanna Khan*
 Supply Chain Cyber Security – Potential Threats 51
- David López and Oscar Pastor*
 Comprehensive Approach to Security Risk Management in Critical Infrastructures and Supply Chain 69
- Uwe Nerlich*
 Challenges in a 2035 Perspective: Roles for the EU as a Global Security Provider? 77
- Dana Procházková*
 The EU Civil Protection Upgrading Needs 88

*Volume 29, Number 2***Scenarios and Security Research Planning**

- Thomas Benesch, Johannes Goellner, Andreas Peer, Johann Hoechtl, and Walter Seboeck*
 Scenario Space for Alternative Futures of Security Research 111

Brooks Tigner
Referencing the Future: The EU's Projected Security Roles
and Their R&D Implications 120

Dana Procházková
Natural Disasters' Management and Detection of Priority Problems for Future
Research 127

The Way Ahead

Ricard Munné
Future Security Trends and Their Impact from an Industry Point of View 147

Uwe Nerlich
Towards Europe 2035 – In Search of the Archimedean Screw: FOCUS in Perspective 161

I&S Monitor

Acronyms used in this volume 185

THE EU CIVIL PROTECTION UPGRADING NEEDS

Dana PROCHÁZKOVÁ

Abstract: Civil protection has two pillars. The first one supports the humans' daily lives and the other ensures the protection of humans at emergency and critical situations. Both consist of systems aiming to provide human security, welfare and critical infrastructure protection. This paper describes the three types of civil protection systems existing in the EU Member States and summarizes the results of original research. The results demonstrate a need for individual public assets' protection. The paper includes suggestions on domains for future research to fulfil identified requirements.

Keywords: Security, safety, civil protection, daily human needs, critical infrastructure, protection in emergencies.

Introduction

For human life it is not sufficient to meet only physiological needs. Maslow showed that other human needs are security and safety, self-realization and social application.¹ Major re-orientation of research and state administration on security and safety and their management has occurred after terrorist attacks in the United States on 11 September 2001, in Madrid on 11 March 2004, in Beslan on 3 September 2004, in London on 7 July 2005, etc., after which security awareness rose. Therefore, the EU effort must be concentrated to ensure the support at problem solving connected with ensuring the daily needs of inhabitants and with human survival in emergency situations.

Summary of Knowledge

From the rational point of view, it is clear that for humans' protection, the EU, Member States and every citizen have to collaborate. According to its constitution, the state has a fundamental role in daily protection of its citizens. In the case of protection focused on survival in extreme situations, the state and the EU on the one hand and each citizen on the other must perform specified measures, that need to be coordinated and coherent.

The philosophy of protection of the population should be based on the requirement that every citizen has a duty to take care of himself/ herself and his/ her family, to secure his/ her property, to have food and water for at least 24 hours. In cases of extreme disasters, it is necessary that every citizen in the interest of his/ her survival admitted the loss of comfort, reduction of food and drink. The citizen must be ready to co-operate with the emergency institutions. The basic rule for survival, laid out by the Harvey-Evans theorem,² states that no matter how primitively equipped an individual is, he can and must withstand even the toughest conditions, if he/ she forces environment to serve him.

The analysis of responses to emergency situations showed that Europeans in most cases cling to their property (house, apartment, car, cottage, domestic animals, but also to clothing, etc.). In such situations, people safeguard their pets before evacuating themselves. Other problems are associated with the issue of crowd behaviour.² It is often sufficient to find a skilled “organizer” who can direct the crowd with reasonable agreement.

Focus on the human system allows on the one hand to use the apparatus of systems analysis and systems engineering on the other hand to understand the security and safety in a broader sense than usual; still mostly dominated by the military-political orientation, as was the case e.g. in documents of the Pan-European Conference, held in The Hague in 2004. The system concept also allows to understand the internal links that cause capital, information, materials, energy, weapons, as well as drug flows and human mobility. In addition to the above-mentioned, it is necessary to know the territory and its protected assets, the possible disasters that threaten it, forms of risk, available sources and resources of intervention forces, energy sources, sources of raw material, etc.

On the basis of the concept of human system safety adopted in 1994,³ the European Union launched the concept of “safe community” in 2004.⁴ The latter includes the protection of people, both in terms of individual necessities (food, safety, social needs, social recognition, and self-realization) and protection in emergency situations. This paper examines the concept of a safe community and assesses the level of competences of the EU in solving the problems of citizens in the field population protection.

The state has a special role in providing security. It decides on the rules (measures and activities) of safety and determines the embodiment of processes (forms of application of measures and actions) of safety, and thus, what kind of security is provided and by whom. The state has authority to protect its citizens, but the guardian authorization in the interest of legitimacy will ensue new threats and new enemies. Mike Raco argues that “the concept of danger and risk environ based on the selective for-

mation of fear became a central part of government strategy to encourage new economic development agendas. The risk has become an instrument of neoliberalism and the *predominance of fear can lead to reactionary social policy*.”⁵ In the perception of danger by public administration there is a conflict between the public interest in security and safety and private interests, as the privatization of public space always means a denial of civil rights. Maria Łoś focuses on efforts to privatize security as a public service in Eastern Europe and notes that privatization “contributes to social uncertainty....”⁶

An in-depth assessment of the civil protection level in the EU yields these three types of civil protection:⁷

1. The original civil protection system is an integrated management, protection, rescue and relief system. The partner organisations—police, fire services, health services, technical services and P&S (protection and support)—are in charge of their specific tasks, and provide mutual support. Joint management ensures coordinated planning and preparation, and operational command in case of deployment.
2. The joint civil protection system is the ‘ideal’ response to current security challenges. It enables a comprehensive protection of the population, its vital resources and cultural property. Its mission is to protect the population and its vital resources in case of disasters of all kinds. The joint system brings together the combined forces of the five partner organisations mentioned in the first case, and other institutions, private organisations and companies, alternative civilian service units, and the army that may also be enrolled where necessary.
3. Advanced civil protection is created by a strategic safety management of human system, i.e. its aim is ensuring the human system safety; it is represented by system integral management including the system nature of object with several assets that are not commensurable, approaches as All Hazard and pro-activity, long-term objectives and three different levels of management: ‘current,’ directed to security and sustainability (it ensures prevention, preparedness to response and renovation); ‘emergency,’ directed to qualified rapid response to emergencies of all types; and ‘crisis,’ directed to qualified rapid response to possible crisis situations.⁸

Disasters are of a different nature. Due to the concentration of people and property, especially in densely populated areas, and increasing dependence on interacting infrastructures, disasters cause much bigger damage than previously. Protecting the population and its vital resources requires precautionary measures and activities, above all for disasters that appear unlikely, but may cause enormous damages. Such measures,

meaning comprehensive risk-oriented planning and preparation, are a major hazard management instrument. Because the best protection is the prevention, we must include it into civil protection, even though its results are not seen immediately and some consider that investments in prevention are unavailing.

To ensure qualified civil protection we must establish the structure (system elements with links and flows) and mechanisms of its behaviour (knowledge; management tools – instruction and command systems; technical, legal, financial and IT support means; personnel – education, training; rules of co-operation).⁷ The integral risk management projection is represented in Figure 1. It must be applied for each relevant disaster and for the set of relevant disasters that can threaten a given territory because some measures or activities that are suitable for one disaster can be disserviceable for other relevant disasters.⁹

Data and method of study

Ten experts with university education and long experience as first responders in the Czech Republic and abroad were asked for their expert judgement regarding public protection in the EU and with specification of problems that might be solved by future research in the civil protection domain. The expert investigation had two parts. The first one was the answer to question “What the EU must do for reaching the aim “to be a global actor in 2035?” and the other was to fill out the questionnaire shown

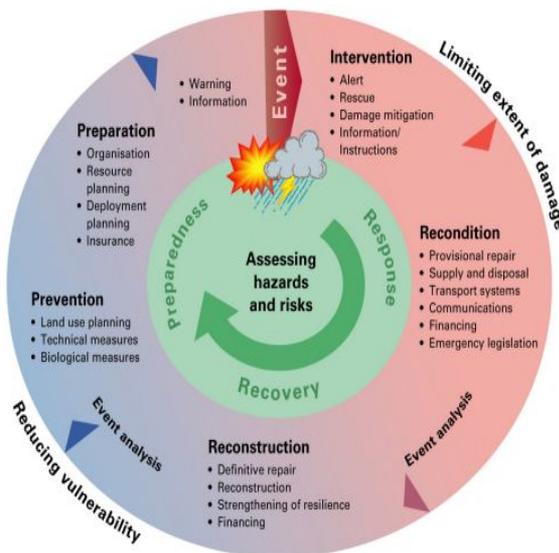


Figure 1: The Integral Risk Management Projection.

Table 1. Form of questionnaire.

Protected asset		Problems	Proposal of countermeasures
Lives and health of humans			
Human security			
Property			
Public welfare			
Environment			
Critical Infra-structure	Energy supply (electricity, heat, gas)		
	Supply of water drinking/ utility		
	Sewage		
	Transport network		
	Cyber infrastructure (communication and information networks)		
	Banking and financial sector		
	Emergency services (police, fire fighters, paramedics)		
	Essential services in the area (food supply, waste disposal, social services, mortuary services), industry, agriculture		
	Local government		

in Table 1. Five CVUT experts performed the synthesis of both parts of expert judgements by the panel discussion method.

Needs Related to Strategic Management

The critical assessments performed in the FOCUS project revealed the critical items that might be considered for the EU development strategy, research and legislation. FOCUS research:¹⁰

- deals with the EU governance level from the viewpoint of natural disaster management. It identifies deficits at natural disaster management from the viewpoint of safe community concept that has been promoted by the EU since 2004. It is necessary to comprehensively manage the disasters that damaged the security of community and its assets, i.e. to apply measures and activities of prevention, preparedness, response and renovation. For practical purposes, the technical solutions and correctly aimed governance of public affairs supported by legislative with sufficient legal force, finance, qualified human personnel and material base is already in place.
- focuses on the social domain in which many phenomena, that threaten security of humans, public assets and whole communities, occur. Considering the

number of victims of extremist Breivik on 22 July 2011, civil disturbances, socially segregated minorities, etc., it becomes necessary to manage disasters that are caused by prejudicial phenomena at social domain.

- concentrates not only on basic system elements (assets), but also on the links among assets (physical, territorial, cyber, logical) and flows which create couplings that determine the behaviour of the human system. Such disasters damage critical infrastructure and supply chains. Therefore, with the increase of human demands on life quality and drop of natural resources, disaster management has gained increased significance.
- concentrates on challenges in public administration (governance of public affairs) management, as the economic slump experienced in 2008 was exacerbated by failures of state regulation.

Needs Related to Individual Public Assets

On the basis of the experts' outputs and data for ensuring the human safety and assets (citizen welfare and infrastructure integrity) the proposals were analysed to identify which security concerns are to be addressed and how.

Human lives and health

The experts considered the following aspects: physical constitution, food, drinking, comfort and homeland. Their conclusion was that the problem has to be approached comprehensively when assessing the impact on humans.² Interrelations between these concepts exist, even though they are not obvious at a first glance.

Many legislative acts do not a priori anticipate that one will take care of himself/ herself, but that the government provides him/ her with everything necessary for survival. The philosophy of this approach is indeed very humane, but to some extent encourages humans to think that they do not have to worry about themselves and that the state will solve everything for them ('welfare state').

The philosophy of population protection must be proceed from the assumption that everyone is obliged to take care of himself/ herself and his/ her family. Individuals must secure their property, should have basic food and water for at least 24 hours. Governments address the issue by the Rescue Service, which prepares rescue brigades to the commissioning activities in evacuation centres and other related activities to help the citizen.

Human security

The experts considered the following aspects: psychological harm and loss of security. Their conclusion was that human safety is a major issue (i.e. personal safety and

safe environment). It is necessary to have life-support systems set up in a way to keep threatened public in peace and secure. If a person feels safe, it is easier to communicate with him/ her, and he/ she better cooperates with rescuers. Under stress, people cease to believe that rescuers are working in their favour and will complicate rescue efforts.

Property

The experts considered the aspects: buildings and fittings – loss, damage; domestic animals – death and loss. Their conclusion was that the Europeans in most cases cling to their property – houses or apartments, cars, cottages, domestic animals, but also clothes or similar belongings. It is also one of the reasons why many people do not like to get evacuated and why they do not like to leave their homes unattended. It often happens that they care for pets before evacuating themselves.

Frameworks for protection of the population recently moved away from mass population shelters in favour of provisional shelters. This introduces the so-called resistance factor of buildings.¹¹ Each object is somehow resistant, because it is developed mostly under the applicable technical standards, in which certain safety coefficients are already implemented. In theory, we can say that each object can be strained only by such forces where the destruction factor is smaller than the resistance factor. In fire protection, for example, this is usually solved by the degree of fire-safety, in the nuclear power plant by PSA analysis and by globally accepted security value 1×10^{-6} .

The crisis situation (epidemic) in terms of mass animal disease occurs when special veterinary measures in place of dangerous contagion cannot be undertaken only by forces and resources of the veterinary authorities, authorities of the *Integrated Rescue System (IRS)* components and breeders, and for solution it is necessary to adopt such measures, whose implementation requires to declare a State of emergency. The possibility of prediction is based on the monitoring of the epidemiological situation on the territory of the developed countries carried out in accordance with the methodology of animal health control, specific prophylaxis, and information on diseases in the other States, and finally from information from local sources (breeders, private veterinarians, state veterinary supervision).

Public welfare

The experts considered the aspects: deterioration in the quality of living together and the loss of security. Citizens affected by emergency situations feel best if they believe the State administration and rescue forces of IRS can handle the situation. In that case citizens are calm and cooperate with the emergency forces. It can be reasonably assumed that the situation will be more easily managed and that the greater part of

forces and resources will be released for localization and containment of the incident. Action will also probably take a shorter period of time.

In case rescue forces and the government fail to fulfil their tasks, citizens will experience adverse impacts, which in turn requires even more forces to calm the situation, forces which spend their time to sooth the atmosphere instead of doing actual rescue tasks. Another issue is crowd behaviour.² If the government nominates a leading voice with contradicting behaviour to the rescuers measures, those measures will be even more complicated. It is also necessary to guard the abandoned territory. Some citizens may take advantage of this situation for their own enrichment.

Environment

The experts considered the aspects: air, surface water, ground water, soil, rocks, landscape, forest, flora and fauna. Every large-scale accident causes harm to the environment. In case of fires, air and surface water will get affected. During the process of combustion air is subject to toxic gases and fumes from burning and from reaction processes with extinguishing agents. If fire fighting takes place in an industrial enterprise, it is likely that extinguishing agents will be caught in the corporate sewage treatment plant. If fire fighting takes place in an urban area, then extinguishing agents will be caught in the municipal sewage treatment plant. But it is also possible that the contaminated extinguishing agent—such as water—escapes into the environment, which will contaminate the surface water and possibly cause water scarcity.

Oil from poorly secured tanks will escape into water in which case a relatively long-term disruption of equilibrium will occur, directly threatening fauna and flora. The scope of disruption will depend on the type and extent of the incident. In extreme cases (e.g. nuclear accident) the environment will be significantly harmed for decades. Conversely, extensive emergency measures will also influence the environment in a negative manner.

Infrastructures and technologies

Human society crucially depends on electricity. Electricity can not be easily stored, and must produced. Further, reaction upon changes in demand needs to be immediate. In case of failure of a large resource, the consequence does not necessarily have to be a fatal failure—a black out—as it is often possible to replace a failed resource with energy from other sources. But if appliances along the critical supply path start to fail, the electric system will start to collapse.

In local cases we can protect ourselves against such failures by having our own independent source, such as a diesel generator. These generators can provide power only in a limited way, for essential facilities, such as hospital operating rooms and the like.

However, we cannot count on them for long-term operation. A possible way to mitigate the impact is to decompose large energy producing entities into local resources. Smaller electricity sources will be more easily replaced across the supply network.

The lack of electricity affects other energy supplies such as gas and heat. In cities, heat is often produced by heat exchangers relying on electricity. If electric power fails, pumps will not work and therefore the heat supply will stop. A similar situation may occur in family houses, as modern heating systems need electric power to operate, for example, to power the central heating pump. Another important problem may occur in situations where we need to keep cold temperatures, such as cool storages, supermarkets and warehouse management, but also mortuaries. Disruption of transport can be expected only in cities where public transport is based on electricity. IT is in most cases backed by the UPS devices with limited capacity. If power loss is short, e.g. 3-6 hours, the situation is manageable.

The power supply system is very sensitive to the proper working and desired interaction of its components, which are closely linked and influence each other. Given that electricity cannot be easily stored, the balance between production and consumption must be continuously maintained. Electricity systems as a whole must continuously meet requirements of electricity consumption, which changes in time.

Examples of the United States losing power along the east coast up to Canada for days, California's constant struggle with electricity shortage or India's outage in 2012 highlight the dependency and vulnerability of the society on constant power supply. Major accidents can exceed the system operators' capacity to ensure immediate resumption of operations or may require planned shutdown of parts of the system, which in turn would cause a crisis in the supply of electricity to customers.

Currently there are three main types of power sources: nuclear power plants; power plants burning solid, liquid and gaseous fuels; and hydroelectric power stations. Electricity generating plants may be shut down due to direct damage to a manufacturing facility (due to technical failures, structural defects, maintenance, neglect, natural disaster, terrorist attack, war); control system malfunction; dispatcher intervention or improper handling (human error); decay of electric-powered network of manufacturing; lack of fuel or other essential materials. Each power plant has certain technology nodes, the decommissioning of which could lead to shutdown of source and outage of service for a long time. Disposals of other technological equipment cause only temporary difficulties.

Nuclear power plants are the most dangerous energy source in respect to failures caused by the effects of large disasters or terror attacks. A larger damage to the main production unit may take the power plant out of operation for a long time or even permanently. Failure of fossil fuel power plants burning liquid fuels may cause dev-

astating fires and large impacts because of ecological impairment. Gas burning plants can cause fires or explosion, followed by the complete devastation of the factory. Comparatively small effects on humans and environment can be expected in plants burning solid fuels. Hydroelectric power stations (either conventional or pumped-storage) are put out of service during a flood because the difference in tide level renders them ineffective. These production facilities are also sensitive to breakage, causing severe flooding.

Failure of heating supply. A specific feature of heating industry is that heat supplies are provided by a number of district heating companies, often operating independently of each other. These plants usually have the productive equipment to support at least emergency supplies (e.g. heat, but not hot water). A disproportionately higher will be the risk by a failure in the distribution network of these small entities, as it would lead to a complete disruption of supply.

The severity of thermal energy supply disruptions stems from the fact that 70 % of thermal energy is used for ensuring heating and hot water, and 30 % to ensure the supply needs of the industry. 80 % of the thermal power of the total annual consumption for heating is concentrated in the winter months of October to April in the northern hemisphere. In this period, energy needs are strongly dependent on the outside temperatures. The consumption of thermal energy by the industry is evenly distributed over the year and can only be affected by planned technology shutdowns of large buyers.

Causes (originators) and duration of crisis situation:

1. Natural disasters: Impacts of natural disasters are a risk of damage or destruction of equipment for production and distribution of thermal energy by affecting the external sources and transmission elements. Damage or destruction of transportation routes (rail, road), gas or oil may lead to limited supplies of energy sources for heating. Indirect resources such as water supply and electricity also represent a problem for the production of thermal energy.
2. Technological disasters (accidents): The most significant risks during normal operation are man-made accidents. They may have local effects when they do not exceed the limits of production, distribution and ancillary elements, but also on a regional scale, induced by networks failures, causing long-term loss of electricity, water, and transport capacity for the supply of raw materials.
3. Terrorism can impose a serious risk for heating supplies. Depending on the nature of terrorist threats or terrorist acts, production and distribution of heating can be confined or interrupted.

4. The embargo of supplies of raw materials and energy resources does not currently represent a serious threat to the heating supplies. Brown and black coal can still be provided from sources within the EU. Reliability of gas supply is ensured by diversifying sources and pipeline routes.

Failure of gas supply. Depending on the spatial extent and intensity of exposure to natural disasters, transport of gas between the suppliers, the transmission system operator, distribution system operators, operators of underground storage and end-customers can be disrupted. Natural disasters can cause gas companies both direct damage (damage or destruction of equipment) and indirect damage caused by the subsequent halt of consumption from affected customers.

The destruction of objects operating the gas system has a direct impact on the reliability of gas supply. The higher the gas pressure level is hit, the more general impact on gas supply the accident has. From a European perspective, the closer the damage to the pipeline systems is to the source, the larger is the affected area by the restriction or interruption of steady gas supplies. Accidents in underground storage have a significant impact on the supply state in winter months.

The embargo and interruption of long-term gas supplies from abroad is currently a minor threat to the EU, although almost full dependence of the EU on imports is considerable. Provision of gas from multiple sources and more than one transport route is the defence against possible political leverage. Long-distance gas transmission systems in recent decades developed into a fully connected form, which is an important prerequisite for ensuring the reliability and security of supply. Therefore, new large scale providers entering the gas supply system can operate independently of their origin and future customers. Thus, the continuous supply of gas to the EU is relatively secure, despite of relations between Russia (producer) and the Ukraine (pipeline holder).

In the experts' judgement on the *failure of water supply (drinking water supply, utility water supply)* the conclusion was that the disruption of drinking water is a large-scale emergency situation, which can occur at any place. Interruptions affecting a smaller population will be dealt with by replacement of drinking water supply infrastructure. However, if large-scale disruption of drinking water supply occurs, it will be addressed by emergency supply of drinking water, which can only be sensibly organized by the state. Water loss is far more significant than the loss of electricity – the average human can sustain three days without water. The probability of loss of drinking water may be aggravated by obsolete pipeline systems where loss through leakage reaches up to 40 %. Even if we put aside the need for water to extinguish fires, every living creature needs water for living. The loss of water may occur for ex-

ample due to floods, when the contaminated ground water becomes non-potable. Utility water is necessary in power plants, which requires water for cooling.

In the experts' judgement on the *sewage system failure*, the conclusion was that the sewer system is just as important as drinking water supply system. Sewage systems in towns and larger villages with a population of over 2 500 should end in wastewater treatment plants. In small villages, waste water flows into under drains, where each house has its drain and leakage leads to infiltration of drinking water.

With increasing population density, sewer systems are subject to significant claims. A relatively large percentage of our cities is covered with concrete such as paving, and from all of these areas rainfall water flows into the sewer system. This greatly increases the volume of water transported. When floods occur, the sewage system regularly reserves its functionality, with waste water coming in instead of running off due to the increased levels of rivers. In this case, houses, streets, etc. are contaminated with waste water. Petroleum-based contamination of waste water will kill bacteria, WTPs become dysfunctional and wastewater is discharged untreated into rivers and streams or affects ground water resources.

In the experts' judgement on the failure of the *transport network*, the conclusion was that the *road transport* is a critical part for the supply-chain and includes fixed installations necessary for its use and safety. Roads are divided into the following categories: highways (freeways); roads; local roads; purpose-built roads and pathways. Critical situations are divided by scope in:

- local incidents which affect usually local roads, public authorities and their organizational units and equipment designed for their maintenance and renewal;
- regional incidents which generally affect Class I and II roads, their administrative offices and organizations and their organizational units and equipment designed for their maintenance and renewal; and
- national incidents which usually affect national primary roads and highways, their administrative offices and organizations and their organizational units and equipment designed for their maintenance and renewal.

Critical situations on roads usually occur due to external factors, and their effects will depend on the type and extent of the initial critical situation (e.g. due to flooding). The evaluation of the impact of critical situation must be based on local conditions and particularly on specific transportation needs. The following exemplary incidents may occur in road transportation: restrictions or total closures of traffic on some roads, damaged bridges and road body; slowing or stopping at the expense of maintenance or renewal; slowing or stopping of the construction program. Long-lasting

transport impairments are usually followed by a recession or halt of economic activities.

Rail transportation. Security of rail transport may be adversely affected both in situations where such development can be predicted from the perspective of the rail network (like prolonged flooding) or out of situations resulting from several relatively small events that occur anywhere on the network at random. Railway accidents cause great material damage to property carriers, shippers and passengers, loss of production or shortages in the affected areas of individual consumption. They may also result in environmental pollutions resulting from damaged cargo and release of hazardous substances into the affected area.

Air transport. The field of aviation security is given major importance. All operators of airports and aviation activities (excluding sport and recreational flying, air shows and public air events) have elaborated a “Program of civil aviation protection against acts of unlawful interference” which sets out measures and procedures to protect civil aviation in accordance with the Civil Aviation Act in each developed country, and its implementing regulations.

Emergency impacts on airport operations:

- as a result of natural disasters as flooding, earthquake, etc., the following can occur: threats to life and health of passengers, airline personnel and others at the airport or its neighbourhood (including support staff); destruction or damage to airport infrastructure (buildings, equipment and technology); restrictions to air traffic or closing of airports;
- in case of people with contagious diseases: endangering lives and health of passengers, airline personnel and others at the airport or in its vicinity; restriction or interruption of air traffic;
- due to strong winds, snow calamity, ice on the runway: restriction or interruption of air traffic;
- due to operational failures and accidents associated with infrastructure (big fire, destruction of buildings, shortages of energy, environmental disaster, etc.): endangering lives and health of passengers, airline personnel and others at the airport or in its vicinity; destruction or damage to airport infrastructure (buildings, equipment and technology); restriction or stop air traffic.

Emergency impacts on air traffic services:

- as a result of flood, earthquake, etc., may lead to same effects as in “emergency impacts on airport operations”;

- due to acts of unlawful interference with the aircraft the following can occur: threats to the safety of air traffic, endangering the lives and health of staff, endangering the lives and health of passengers and aircraft crew, destruction or damage to infrastructure (buildings, equipment and technology), reduction or interruption of provided service.

The announcement of a crisis situation may already have implications to the civil air transport such as limits to or prevention of flying over certain areas.

Inland navigation. Disasters and major accidents in inland navigation may result in death, injury or damage to long-term health of the people and in significant material harm to carriers, waterway administrators and passengers. The failure to transport within a specified time causes extra costs for shippers. Leakage of hazardous substances from freight cargo can cause pollution of the surrounding environment, worsened by the waterway which contributes to disperse the leaked freight over a wide area.

In the experts' judgement on *failure of cyber infrastructure (communication and information networks)*, the conclusion was that the emergence of a crisis situation in information and telecommunication systems (hereinafter referred to as ICS) may have a number of reasons. ICS usability limitations or a complete breakdown may be caused by excessive bandwidth abuse, telecommunications network technology unit's breakdown or failure of information systems appliance. Every component of an ICS must be risk assessed, taking into account the specifics of the environment in which the risks may occur.

If a crisis has large scale, devastating effects, failures of ICS caused by network effects have to be expected. After state of emergency has been declared, measures implemented in accordance with pre-processed recovery plans must be deployed for affected ICS. It is valid to suspend legal regulations constraining radiating or transmitting power of ICS infrastructure for a short period of time to restore at least emergency communications for rescue services and other civil entities entitled to take rescue measures.

ICS outage will have an impact on: disruption (disabling) of a coordination among emergency management, public administration and local government, and the integrated rescue system; paralysis or restriction of activities of government bodies and organizations in charge of public administration; loss of information support in a crisis situation; disruption of management and monitoring systems of crisis management dependent on access to data sources and transmission of information; paralysis or restriction of activities of state critical infrastructure assets. It may further lead to malfunction of the early warning information system and limitations on the use of telecommunications services and technical means for situational monitoring of critical in-

frastructure. ICS is the backbone of the 21st century. ICS breakdown will strongly influence essential functions of the state and will constrain the interactions among citizens. It will adversely affect economic, political and military commitments, reducing or disabling international cooperation.

In the experts judgement on the *failure of the banking and financial sector* the conclusion was that the bank risk is generally defined as the potential financial loss of a bank, future losses resulting from a given commodity or financial portfolio and general loss of confidence in the financial system. There are five main banking risks: credit, market, liquidity, operational, and business. In addition, there is systemic risk in the event that any one of them causes problems that have a negative impact on many other subjects or, in extreme cases, even on larger part of the financial system. Credit risk is the risk that a client fails to comply with the bank contracted conditions of financial transactions and bank incurs a financial loss. Market risk is the risk of losses arising from changes in prices and rates on financial markets. This is a general term for interest rate, foreign exchange, equity risk and other risks associated with movements in market prices. Liquidity risk is the risk of loss in case of instant insolvency. Market liquidity risk is the risk of loss in case of low liquidity of the financial instruments, which prevents rapid liquidation of positions and thus restricts access to necessary cash. Operational risk involves transaction risk, operational risk management, risk of failure of information systems, etc. The business risk can be divided into different types: legal risk, credit rating change risk, reputation risk, tax risk, currency convertibility, and the risk of disasters, e.g. natural disasters.

In addition, there are systemic risks with potential negative impact on many other operational fields or, in extreme cases, even on larger part of the financial system. Systemic risk is essentially the inability of one institution to meet its obligations, which affects the ability of other institutions to meet their obligations. This failure may cause significant liquidity problems and difficulties in repaying loans to banks and, consequently, may threaten the stability of the banking system as a whole. Protection against systemic risk is part of the activities of regulators of financial markets (including institutional banking supervision) and central banks.

The International Monetary Fund describes banking crisis as a problem where at least one of the following conditions is met: ratio of bad assets to total assets of the banking system exceeds 10 %, the cost of rescuing banks exceeds 2 % of GDP or problems in the banking system result in nationalization of banks. The Government responded to problems of the banking system in 2008 and 2009 by freezing deposits, which resulted in a banking panic or responded by introducing bank holidays or providing guarantees on deposits in banks. International implications of bank crisis depend on the linkage of the local banking sector to foreign banks. A crisis in the banking sector may be affected by the international impact of the global financial cri-

sis in this sector with regard to the interconnection of domestic banks and foreign branches of foreign parent banks (mainly from EU countries). As a consequence, the credibility of the country as a whole—its credit rating—is adversely affected.

The economic impacts of the crisis situation in the financial (banking) sector can have an influence on direct costs, including costs for refunds from the Deposit Insurance Fund (DIF) in the event of bank default to meet commitments to beneficiaries under legal and contractual conditions. If funds in the DIF are sufficient, refunds will be fully covered by the available resources of this fund; in case of insufficient funds in the DIF, refund sources will be obtained on the market. Indirect costs may be incurred by decline in state revenues, e.g. due to the decline in GDP caused by the state in the banking sector as a result of stopping of financing of manufacturing and other businesses, or by unexpected expenses for the state budget which may be necessary under certain circumstances to provide stability of the banking-financial system in a situation where this will be undermined by a crisis that could jeopardize the functioning of the system as a whole, and thus the economy of the state.

State budget expenditures will be focused in particular on elimination of threats, respectively on prevention of large financial (currency) crises, including the so-called “domino effect.” The domino-effect can be prevented by providing public support to selected organizations that are critical for the stabilization of budgetary and contributory organizations (e.g. municipalities, schools, medical facilities, etc.) in the event that their operation will be jeopardized by the loss of funds exceeding the limit of payment of compensation for insured deposits. These subsidies can even get extended to commercial entities such as health insurance companies and pension funds.

Social impacts. Besides physical disruption of the banking sector infrastructure components (banks and central bank, including technology and staff), a disruption of energy infrastructure (electric power) and communications and transport networks has to be expected. Extensive failures of critical infrastructure components, which lead to a degradation of the network structure, will also have a serious impact on the infrastructure of the banking sector.

In the experts’ judgement on the *failure of emergency services (police, fire-fighters, paramedics)* the conclusion was that each developed country has an integrated rescue system in place, which brings together emergency services and facilitates their effective deployment in the identification and mitigation of emergency situations for the benefit of the citizens. Police, fire brigades and medical services are the three basic components of the integrated rescue system. These services are unlikely to fail. The rescue system is set up in a way that each of the basic components of the IRS is ready to replenish the required forces from unaffected parts of the country. Emergency preparedness of IRS is an integral part of emergency and contingency plans.

The disruption of *food supply* constitutes a major *failure of essential services*. Other essential services are waste disposal, social services, funeral services, industry and agriculture. With massive supermarket chains and warehouse networks in the Western hemisphere, large-scale disruption of food supply in peacetime is almost impossible to be the single reason of a crisis. However, it may be a secondary consequence of the occurrence of other incidents such as floods, lack of drinking water for food production, prolonged power outages, disruptions in transportation and major epidemics. The timely and spatial extent of disruption of food supplies are directly dependent on the time interval and scope of effects resulting from the above mentioned incidents. In the past, crisis situations caused by food supply disruption occurred during the floods in Moravia in 1997, where difficulties in supplying basic food products affected the population.

Among the causes of food supply disruption are:

- flooding of large areas accompanied by devastation of buildings, transport and supply networks, the environment, large losses of life and thereby seriously affecting the food supply for the affected population;
- catastrophic, prolonged drought: in affected areas, food production will be reduced or interrupted;
- disruption of transport infrastructure: failures of transport services may occur for many reasons, leading to restrictions in the distribution of food, or to inability to buy food;
- epidemics affecting humans: after the proclamation of quarantine and other sanitary measures, basic food supply for the affected population will get complicated by respecting mandated safety procedures;
- epidemics in animals: with the proclamation of quarantine and other sanitary measures, shortage in basic food supplies due to mandated emergency veterinary measures have to be expected;
- large scale nuclear accidents will require to move a large number of people into unaffected regions with respective challenges to restoring nutritional supply. As these are planned measures, they should not result in large-scale supply disruptions;
- terrorism: poisoning or destroying food resources, rendering them unavailable for consumption in an act of terror will require rapid response. Response measures will include removal of contaminated soil and controlled killing of poisoned animals, testing the edibility of food and water and, in case those tests are negative, shifts in the supply chain.

Such crisis situations will lead to a decline of food production and food trading capacity, and possibly death or injury to people who produce or sell food. The secondary effects of such crisis situation might include widespread deaths or illnesses resulting from ingestion of contaminated food or failure to comply with hygiene when preparing or eating meals under emergency supply conditions, with further limitations on medical help due to lacking transport, spread of diseases and epidemics, harm to the environment, proliferation of insects and concentration of rodents.

In the experts' judgement of the *failure of state and local governments*, i.e. of area management and management of society, the conclusion was that the threats to the basic functions of state (including the functionality of critical infrastructures) will lead to threats to population and society as well as to inadequate provision of security services, armed forces and of law and administrative offices. For this reason—to avoid domino effects resulting from the limited capabilities of crisis solvers—it is necessary to plan the protection of critical infrastructure and prioritize the preservation of basic state functions, e.g., providing priority services to security forces, IRS, army, etc. Such basic functions include:

1. the need to handle crisis situations emerging after threats to law and order, e.g. an accident after a terrorist attack, or economic instability, food shortages, etc.;
2. the need to comply with the established scope of crisis management in the implementation of emergency measures in the crisis teams – not to exceed the scope of assigned activities and not to replace executive branches. In the case of inability to operate within normal circumstances, it is necessary to use back-up emergency departments staffs. For the creation of contingency plans it is necessary to plan the dislocation in alternative entities and their emergency operation.

Preventive measures are: intensification of intelligence activities, data collection and evaluation of the situation with a particular focus on monitoring of radical and extremist groups, organized crime, including hostile activities abroad (intelligence services, police, public authorities, etc.); activation of command and crisis management of security services and of respective administrations and staffs for emergency security activities (workplace crisis management); supervision of crowded places (the so-called “soft targets” such as shopping centres, transport hubs, sports and cultural events, sources of drinking water, etc.); tightening the road transport control system, road traffic restrictions in selected high-risk areas; increased performance of patrol services, principles of warning service, preparation and possible use of riot police services; restrictions on the movement of people in places used by extremist or criminal elements; tightening entrance controls of administration office buildings, critical infrastructure and other important objects; intensifying operational and investigative

activities in selected areas; review of logistics systems (material inventory, stores, repair, etc.) used by the security forces and government bodies; review of communication and information systems used by the security forces and government bodies; possible reintroduction of checks at internal Schengen border; increased control activities in prisons, detention centres for foreigners, etc.; operational and timely deployment of police forces in places of gathering of large numbers of people to prevent disruption of public order; enhanced oversight of road safety at major transport nodes; increased cooperation of security forces and emergency management authorities with the media; ensuring the operational readiness of selected phones, radio stations, computer networks, Intranet and Internet, police information systems at the time of crisis, and the same for selected vehicles, boats and helicopters, incl. fuel and repairs; ensuring of police ICT operational service and special techniques in field of counterfeiting (IR and UV banknote detectors), accumulator batteries for laptops and portable printers, portable external hard drives, external burning equipment, portable mobile power generators, CD-R/RW media, etc.

Conclusion

Every capable inhabitant should be involved in setting up integral safety measures in the area he or she lives, contributing to a safer region, country and the whole of Europe. It is important to *teach* people in mutual civil help and protection in emergency situations. Security and disaster research needs to address in a comprehensive manner the findings about disasters' impacts, the survival of humans and the quality of their everyday life, considering:

- the systematic concept of reality, strategic targets and proactive approach with concentration on most prominent aspects, and accounting for the constrained sources, forces and means;
- the variability of an organic system consisting of many overlapping systems that have their own individual peculiarities.

People must appreciate and understand the interrelation of systems, their co-existence and interaction, and this may turn into a creed for developing security research in the 2035 timeframe. We need to work towards making this world a better place to live in, to raise support for new technologies and new infrastructures enabling a more sustainable development and reduction or mitigation of impacts on human health and security by strategic risk management.

Critical infrastructure has to be protected by continuity plans, renovation plans, crisis plans, and contingency plans. To bring civil protection to the next level it is necessary to educate citizens with robust teaching material and technical background. We have

to teach inhabitants how to behave in emergency situations to get out safely. We have to build an effective integrated rescue system prepared to respond to all kinds of disasters under normal, abnormal and critical conditions.

Acknowledgement: The research was supported by the Czech Technical University, Faculty of Transport Science (Institute for Security Technologies and Engineering), by the EU – project FOCUS, grant No. 261633, www.focusproject.eu, and by the Ministry of Education of the Czech Republic, grant No 7E11072. This publication reflects only the author's views and the Union is not liable for any use that may be made of the information contained therein.

Notes:

- ¹ Abraham Maslow, *Motivation and Personality* (New York, NY: Haper, 1954).
- ² Pavel B. Drašar, *Survival: některé psychologické a teoretické aspekty přežití /Some Psychological and Theoretical Aspects of Survival/* (Ostrava: SPBI, 1997). – in Czech.
- ³ Sakiko Fukuda-Parr et al., *Human Development Report 2004* (New York, NY: United Nations Development Programme, 2004), <http://hdr.undp.org/en/reports/global/hdr2004>.
- ⁴ See for example “Community Safety,” Karolinska Institutet, Department of Public Health Sciences, Stockholm, <http://www.eurosafe.eu.com/csi/eurosafe.nsf/asw/Taskforces-Community%20Safety>.
- ⁵ Mike Raco, “Risk, Fear and Control: Deconstructing the Discourses of New Labour's Economic Policy,” *Space and Polity* 6:1 (2002): 25-47, <http://dx.doi.org/10.1080/13562570220137880>.
- ⁶ Maria Łoś, “Post-communist Fear of Crime and the Commercialization of Security Fear and Control,” *Theoretical Criminology* 6:2 (2006): 165-188, <http://dx.doi.org/10.1177/136248060200600203>.
- ⁷ Dana Procházková, “Civil protection,” paper presented at the International Conference on “Global Existential Risks” (Globálne existenciálne riziká), ESE-8, Žilina, 2012. ISBN 978-80-89281-79-4.
- ⁸ Dana Procházková, *Strategic Safety Management of Territory and Organisation* (Praha: CVUT, 2011).
- ⁹ Dana Procházková, *Methods for Estimation of Expenses on Renovation of Property in Territories Affected by Natural or Other Disaster* (Ostrava: SPBI SPEKTRUM XI, 2007).
- ¹⁰ FOCUS project study, www.focusproject.eu, ‘Documents’ section.
- ¹¹ Michail Šenovský, Milan Oravec, and Pavel Šenovský, *Theory of Crisis Management* (Ostrava: SPBI, 2012). – in Czech.

DANA PROCHÁZKOVÁ studied in the Faculty of Mathematics and Physics, Charles University in Praha, and worked as a researcher in the Czechoslovak Academy of Sciences, the Ministry of the State Control, the State Office for Nuclear Safety, the Ministry of Interior and the Czech Technical University in Praha. In parallel, she has been lecturing at Charles University in Praha, the Komensky University in Bratislava, the Czech Technical University in Praha, the Technical University in Ostrava, the College on Regional and Legal Studies and in the Jan Amos Komensky University. Among the areas of her research are seismicity, seismic engineering, seismotectonic relations, responses of constructions and their equipment to earthquakes, impact of soil conditions on construction behaviour, nuclear engineering, disasters, crisis management, emergency management, risk and safety management, etc. She has published 25 professional books and more than 500 professional papers in English, Czech, Russian, and German, as well as in Chinese.

E-mail: Dr.Prochazkova.Dana@seznam.cz