Establishment and operation of system for industrial safety within the Hungarian disaster management
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Abstract. As a result of the appearance of New Disaster Management Regulations in the year of 2012, a unified Industrial Safety Authoritative and Supervision System was set fully operational on national, regional and local levels. Beyond the supervision of hazardous activities and the carriage of hazardous goods, there is also appeared the disaster management tasks of the authorities linked with the critical infrastructure elements. Based on general overview of the vulnerability of Hungary, in this paper I will review the measures related to the development of the legislation, the establishment of the organisational structure, and the tools and methods used for the purposes of industrial safety.

Key Words: industrial safety, hazardous activities, disaster management, vulnerability, Hungary.

Preface. The Hungarian Parliament, in order to improve the safety of the public and of the environment and the efficiency of the prevention of manmade disasters, to strengthen the system of disaster management organizations and to improve the results of emergency actions, by the adoption of Act CXXVIII/2011 on disaster management and on the amendment of individual, related acts (hereinafter: disaster management act) created on January 1, 2012 the standardized system of authority tasks, organizations and procedures for industrial safety. The newly enacted industrial safety regulations (the third individual sector beside civil protection and fire prevention) cover the prevention of major accidents involving dangerous substances, and the protection of shipments containing dangerous goods, protection of critical systems and installations and the disaster management tasks of nuclear safety (Kátai-Urbán & Vass 2013a).

In the present article the objective of the author is to identify the hazard sources being relevant for the occurrence of manmade disasters. The objective is furthermore to typify such hazard sources and then to evaluate the exposure to major dangers in terms of industrial safety. The article is dedicated exclusively to sources of danger (hazardous activities) that are relevant in terms of the application of the law by the disaster management authority and I prepare only a general status report about the present status (June 30, 2013) of the implementation of the legal regulations.

I have used basically the public data (prepared for the general information of the public) provided by the National Directorate General for Disaster Management of the Ministry of the Interior (MI NDGDM), National Chief Inspectorate for Industrial Safety. Furthermore I have used also the specialist literature that is rather limited in this field.

In this article, in a way not yet examined by others, I propose a hazard source classification system based on the industrial safety aspects of manmade disasters. In addition I provide a comprehensive overview about the exposure to hazardous activities in Hungary and describe the established industrial safety system for the protection against such hazards.

General classification of activities posing disaster risks. There are several versions of grouping disasters (hazard sources) known for professionals and scientists. In the legal provisions it is only the implementing regulation of the disaster management act, where there is a split related to effects posing hazards, applied in risk assessment procedures.
From the scientific point of view several grouping systems can be identified, however it is common in those systems that disasters are basically assigned to two groups: natural and manmade group.

In terms of industrial safety, we shall evaluate manmade disasters, major accidents and other events endangering human health and life, the environment and critical assets affecting, from the point of view of the disaster management act, „critical system components” covered by the regulations about critical systems and installations or related to „dangerous activities”, or the „transportation of dangerous goods”.

Dangerous activities are, in the application of the disaster management act (art. 3 §. clause 31.) “is an activity carried out by using industrial, biological (agricultural), chemical procedures, which, if it becomes uncontrolled, can endanger massively human health, the environment and the safety of life and security”.

Hazardous activities (as stationary sites) can be classified in terms of industrial safety basically as follows: activities related to dangerous substances and goods; activities related to hazardous wastes; activities related to radioactive materials and hazardous mining activities.

The transportation of hazardous goods (as mobile hazard sources) are differentiated in almost all technical literature in Hungary by transportation on public road, by railway, inland waterways and air transport.

Critical systems are defined in Act CLXVI/2012 on the identification, selection and protection of critical systems and installations in the explanatory provisions (1. § clause g) as follows: „a system component of systems, assets, installation belonging to one of the sectors defined in the annexes 1-3, that are essential for the completion of social tasks, thus in particular for healthcare, for the personal safety and security of the public, for economic and social public services, which, in case of their unavailability, due to the lack of the continuous completion of these tasks would result in major consequences”. Critical system elements can be assigned according to the law to 10 main groups: energy, transportation, agriculture, healthcare, finances, industry, information and communication technologies, water, law and order, government and public safety and defense.

Following the aforementioned concept, on Figure 1 the principal summarized results of the classification of activities (based on aspects of industrial safety) that pose risks of manmade disasters are illustrated.

Hereinafter I will cover the general evaluation of the hazards posed by hazardous activities in Hungary. The Figure 2 shows the classification of Hungarian Hazardous activities.
Figure 1. Classification of the civilization disaster hazards (prepared by the author).
Figure 2. Classification of Hungarian hazardous activities (prepared by the author).
Production, storage and processing of hazardous substances. In the course of major accidents happening during the production, storage, processing of dangerous substances (goods) there can be fire, explosion, substances harmful for the health and environment might be released into the air or watercourses, thus endanger the public and the environment. The harmful effects of fire and explosions will most probably cause damage in the direct vicinity of dangerous establishments only, harming human health or the environment, within a very short time after the accident. The release of dangerous substances into the air, depending on the type, quantity, physical properties, the meteorological, surface and other conditions, can cause danger several or in extreme case several tens of kilometers far away from the location of the accident. This takes, according to my experience, several tens of minutes, maybe hours. In case of substances with permanent effect the effects can be long-lasting, occasionally even for decades (Szakáll et al 2013).

In Hungary, because of the hydrography of the country, dangerous substances can get into watercourses because of incidents, low technological level of operation or human mistake. The effects of the catastrophic contamination of living waters can last for several days, maybe even several weeks, and the danger can emerge even several hundreds of kilometers far away. As 95% of the water catchment area of Hungarian rivers is located outside of our borders, in the course of the preparation it is not enough to consider only dangerous industrial establishments located in Hungary.

Explosions happening in the course of major accidents, radiating heat, or burning materials emitted can trigger, within or outside of the establishment, further major accidents (domino effect) and can cause massive panic resulting in major consequences.

From the four main groups of dangerous activities first I have checked the activities involving dangerous substances and dangerous goods in terms of industrial safety.

In the field of the production (manufacturing) storage and processing of dangerous substances and goods, activities designated as installed establishments can be divided into two main groups.

Establishments involving dangerous substances covered by the rules regulating major accident prevention, and so called below tier establishments belong to the first group. The establishments involving dangerous substances, the so-called „Seveso establishments” mean dangerous activities identified in line with the rules of the Seveso II Directive. Based on the definition of the disaster management act (3 §, clause 28) the establishment involving dangerous substances “is the complete area under the management of an operator, where, in one or more installations involving dangerous substances, common or related infrastructure included, there are dangerous substances present in quantities reaching the tier value specified in the legal regulation issued for the implementation of the present act.”

Establishments involving dangerous substances can be assigned on the basis of the methodology listed in the implementing regulation, annex 1, to lower and upper tier categories. The basis of categorization is the quantity of dangerous substances at the sites (including also materials that will expectedly be produced because of the runaway reaction of the process) and their danger categories. Dangerous substances (chemical agents and formulations) are assigned to danger categories in line with Act XXV/2000 on chemical safety and the related implementing regulation.

As of January 1, 2012, in addition to the lower and upper tier establishments involving dangerous substances covered by the Seveso II Directive also the procedures and obligations applying to the operators of below tier establishments have been added. The new regulation (Disaster management Act Chapter IV and its implementing regulations) impose, in addition to the existing regulations, obligations on operators as well, at whose sites there are dangerous substances in quantities exceeding one fourth of the lower tier quantity specified in the regulation but not reaching the lower tier level and on operators of installations that shall be handled with priority. The sites, where chlorine or ammonia is present in quantities of at least 1,000 kg, where hazardous wastes are neutralized by incineration, and installations used for the transportation of hazardous
wastes, dangerous substances beyond the battery limits are also included in this group (Bognár et al. 2013).

Installations used for the transportation of hazardous goods that are, as main rule, not covered by the Seveso II Directive belong to the second group of activities. When regulations were amended in Hungary in the year 2012, the codifier extended the effect of the regulations over establishments involved in the temporary storage of hazardous goods and installations used for the transportation of hazardous goods by pipeline.

However in the practice of the application of law in Hungary marshaling yards and ports are an exception. As the authority regards switching yards and ports to be part of the transportation activity, they are not yet deemed establishments involving dangerous substances. In connection with the modification of disaster management regulations the codifier subjected these activities to authority inspection. However the licensing and supervising activity at dangerous establishments and the application of emergency plans are still missing.

The dangers resulting from the dangerous establishments installed can be most simply demonstrated by the application of a GIS tool (danger map or hazard map).

The Major Accident Hazard Bureau working at the Joint Research Center of the European Commission has prepared, in line with the Seveso II Directive, Art. 13 on trans-boundary effects, the Seveso Plants Information Retrieval System (SPIRS). “Seveso establishments” can most simply be typed on the basis of the SPIRS system. In the SPIRS system - irrespective of the actual dangers of the dangerous establishment, the danger resulting from lower tier establishments is demonstrated by a circle with a diameter of 2 km, and in case of upper tier establishments by a circle with a diameter of 5 km (NDGDM 2011).

In the practice of the application of the law in Hungary the elements of SPIRS are integrated into the Industrial Accident Information System (hereinafter: IAIS) of the disaster management authority. IAIS includes, in addition to the Seveso establishments, also the basic data of below tier establishments, like their geographic location (address of the site), their status (lower, upper tier and below tier) or the industrial classification of the dangerous establishment.

Based on the IAIS the establishments producing, processing and storing dangerous substances can be assigned to a total of 17 groups (activities). The activities of the IAIS, because of the characteristics of below tier establishments, are not fully in conformity with the SPIRS classification. The disaster management authority sends every year the list, address, status and activities of the establishments to the Joint Research Centre of the European Commission.

The classification of below tier establishments is identical with that of Seveso establishments, with the difference, that among below tier establishments there are “installations to be handled with priority”. In these hazardous activities the 25% threshold of the lower tier is not considered. The establishments, where there is at least 1,000 kg of chlorine or ammonia present, if these establishments are not establishments dealing with dangerous substances, belong to the group of below tier establishments. The installations used for the transportation of dangerous substances by pipeline are registered as installations used for the transportation of hazardous goods, while installations used for the neutralization of hazardous wastes by incineration are recorded among establishments involving hazardous wastes.

Based on the data of MI NDGDM the number of 169 lower and upper tier establishments covered by the regulations before 2012 increased by 37% because of the new regulation taking effect. In Hungary, as of July 2013, there are 129 lower tier, 97 upper tier and 509 below tier establishments and 3 more establishments are being constructed. There are further 537 below tier establishments under the effect of the new regulation, and accordingly there are already 758 dangerous establishments covered by the disaster management act and by its implementing regulation.

The upper tier establishments covered by the agreement of the UN Economic Commission for Europe about the trans-boundary effects of industrial accidents are located along the Slovakian and Ukrainian border. The number of dangerous activities
identified within a 15 km zone of the state boundary is 9, whereas the number of activities identified in the water catchment areas and endanger Croatia and Serbia is 14 (NDGDM 2012). The Hungarian Disaster Management authority is responsible for the implementation of the technical, bilateral and multilateral provisions of the UN ECE international piece of legislation. The technical information provided for the purposes of the bilateral cooperation is written in safety documentation handled in by the operator of the upper tier establishments dealing with dangerous substances (Kátai-Urbán & Vass 2013b).

Installations used for the transportation of hazardous goods belong to the second main group of the so called “fixed” establishments involving dangerous substances. Installations used for the transportation of hazardous goods can be divided into five groups in line with the transportation methods, as follows: installations used for the road transportation of hazardous goods; installations used for railway transportation; installations used for the transportation over inland waterways; installations used for the preparation of air transport; installations used for transportation by pipeline.

As installations used for the road transportation of hazardous goods warehouses used for the storage of hazardous goods in ADR packaging are recorded. Almost all warehouse facilities that are of great significance in terms of logistics are located in the agglomeration of Budapest. This is otherwise also logical, as most of the consumption and business life is concentrated in Budapest and in its direct surroundings. From this region the products desired can be transported to any point of the country within 2-3 hours (Kátai-Urbán & Szabó 2013).

Installations used for railway transportation are first of all marshaling yards that do not belong to the group of establishments involving dangerous substances. These installations shall prepare an internal emergency management plan in line with “Regulation concerning the International Carriage of Dangerous Goods by Rail, RID” 1.10 and this plan regulates basically the consequence mitigation and prevention rules of the Seveso Directive applied to safety reports. On the basis of the data of Hungarian Railways identified a total of 14 yards in the area of Hungary, the most significant ones are the yards in Budapest (Ferencváros), Miskolc, Szolnok and Záhony (Horváth & Kátai-Urbán 2013).

Another major type of the installations of rail transport are the switching yards and sidings of establishments producing, processing and storing dangerous substances. Switching yards located in the area of establishments involving dangerous substances or in the area of below tier establishments or sidings closely related to the sites pose major hazards. Sidings connected to sites can cause individual and significant dangers, as there is a high number of wagons there without any physical protection, without the supervision of the operator and of the authority.

Railway-public road transshipment facilities can be establishment dealing with dangerous substances or establishments not classified. The most significant operating establishment is in Budapest (Bilk Kombiterminál Zrt.). During the transshipment of containers the fact that the safety of containers arriving at the terminal depends on the variable quality of dispatch in Hungary or abroad and on the technical condition of the wagons is a frequent problem.

Loading and unloading facilities of establishments involving dangerous substances and ports dealing also with dangerous substances are registered as installations used for inland waterway transportation. In Hungary there are loading and unloading installations at the petroleum port in Csepel (MOL Csepel base site, and Oil Tanking Kft), at MOL Plc. Danube Refinery in Százhalombatta and at the site of Lukoil in Dunaföldvár (Kátai-Urbán & Kiss 2014).

In case of the facilities used for the preparation of air transport the warehouses used for the storage of dangerous goods at the airport (Liszt Ferenc Airport) are registered, which cause, due to the relatively low material quantities, no significant danger compared to other transportation methods.
Prevention, preparedness and response measures in connection with the protection against major accidents involving dangerous substances. The community-level integration of the prevention of industrial accidents looks back to a history of more than two decades, the Seveso directive undergoes smaller or bigger modifications and getting stricter and stricter every five years. In line with the European integration activity and the international obligations of the country the Hungarian Parliament and government has prepared the regulations about the prevention of major industrial accidents. The effective date of the Hungarian regulation is January 1, 2002 and has been modified significantly two times (2006 and 2012).

Our country undertook as of January 1, 2002 to integrate the Seveso II Directive into the legal regulations of Hungary and to implement the provisions specified in the same until the date of the EU accession. The directive (2003) took effect in 2006 in Hungary with the objective of the prevention of major industrial accidents involving hazardous substances, to mitigate its effects on man and environment, and to ensure a high-level of protection in a consequent and efficient way on the territory of the European Community. The UN ECE Convention on Industrial Accidents introduced simultaneously with the Seveso regulation handles also the transboundary effects and consequences of industrial accidents potentially occurring in upper tier establishment using dangerous substances identified according to the Seveso II Directive.

One of the triggers of the changes in legal regulations between 2010-2011 serving for the improvement and development of the disaster management system was the strengthening and establishment of more efficient protection against major accidents involving dangerous goods. Recent events, like the industrial catastrophe caused by the damburst of the mining waste reservoir in the outskirts of Ajka on October 4, 2010 or major accidents that happened in establishments processing hazardous wastes, in meat processing establishments, in establishments using chlorine and in establishments handling pyrotechnic products have contributed to the changes of the disaster management regulations concerning the legal field of industrial safety.

Disaster management act and the regulation 219/2011 (X. 20) on the protection against major accidents involving dangerous substances (hereinafter: implementation regulation) - in line with the Seveso II Directive - clearly define the scope of activities covered by the regulations, the tasks of the authorities related to the activities, the tasks of the operators of dangerous establishments, of the government and municipalities related to the prevention of and preparation for major accidents, and to the emergency management of the same and also the obligations related to the information to the public.

There are new tasks and competences of industrial safety specified in the disaster management act and in the implementing regulations: extension of the rights of the disaster management authorities (licensing, supervision, inspection) over establishments below the lower threshold level; introduction of new legal institutions (emergency management fine, administration service fee); disaster management tasks of the protection of critical infrastructure; making the authority activities and procedures more simple and efficient; extension of the controlling and fining authorisations of the disaster management authority with regard to the transportation of dangerous goods by rail, air and inland waterways (Bognár et al 2013)

The last modification of the Seveso II Directive was necessary among others to adapt the Seveso regulation to the CLP regulation (Regulation 1272/2008/EC of the European Parliament and Council on the classification, labelling and packaging of materials and blends). The directive 2012/18/EU of the European Parliament and Council (Seveso III directive) on the management of the hazards of major accidents involving dangerous substances and on the modification and latter cancelation of directive 96/82/EC has been adopted on July 4, 2012. The Seveso III Directive shall be introduced by the EU member states and thus also Hungary by the end of May 2015.

The implementation regulation includes the definition of the transportation of hazardous substances by pipeline (as establishment to be handled with special attention). Transportation pipelines, pump, compressor and distribution stations belong to this group, with the exception of the distribution pipelines used for natural gas supply to the
public, and the collection pipelines with a nominal diameter below 400 mm used for hydrocarbon mining.

The Disaster Management Act requires the operators of hazardous establishments to demonstrate that their activities do not pose an unacceptable hazard to the population, material assets and the environment, and that they made every reasonable effort to prevent major accidents and reduce their effects. Depending on the hazardous impact, the operator can be required to provide data, prepare safety reports, safety analyses or serious damage prevention plan, and an internal protection plan for the site (as part of the safety report or safety analyses), ensure the conditions for carrying out the responsibilities specified in the internal protection plan, information of the population on the hazardous activities, potential hazards to the population and protection measures taken.

The plants subject to the Disaster Management Act shall assess the realistic possibility, probability, causes and conditions of major accidents on grounds in the documentation submitted to the authorities. These assessments shall describe the external or internal causes of accidents, and the probable stages of the course of accidents. The operator may use any method to identify the risks and assess the risk of major accidents that are used in the international practice and generally recognised by the professional community. The most widespread method used in Hungary is the quantitative risk assessment method (Szakál et al 2013).

The operator of a dangerous establishment shall draw up an internal emergency plan meeting the requirements of content and form determined in national legislation to eliminate the consequences of hazards identified in the safety report and safety analysis. The operator shall provide conditions necessary for the accomplishment of tasks defined in the internal emergency plan. The task within the hazardous establishment for limiting the consequences of major accident involving dangerous substances shall be determined by the operator, while the tasks outside the hazardous establishment of the concerned state and municipal organs shall be determined in external emergency plans. An important step in the evaluation of the risk assessments submitted in the safety documentation is to compare the risk indices calculated on the basis of these assessments with the authorization criteria defined in the legislation. The most important authorization criteria are the value for individual risk and social risk.

According to the national legislation in force, the responsibilities of the National Directorate General for Disaster Management (NDGDM) and of the 20 regional directorates, established in the protection against major accidents involving dangerous substances, include the operation of the administrative authorization system and the supervision and control system for the plants subject to the Seveso II Directive and for below tier plants (establishments under lower-tier threshold is 25%). The preparation of the external emergency plans is the duty of the competent local organs of the NDGDM with the cooperation of the mayors of the relevant localities endangered. The cost of the preparation of external emergency plans and their exercise are provided in the own budget of the NDGDM (Bognár et al 2013)

**Activities dealing with hazardous wastes.** Among activities involving hazardous substances own temporary storage facilities used for the storage of hazardous wastes produced at establishments involving hazardous wastes are listed. There might be hazardous wastes produced in below tier establishments, and in low quantities at a high number of non-classified sites.

The hazardous wastes accumulated in these facilities are assigned to hazardous waste categories on the basis of the environmental regulations and are transported to neutralization plants or to other sites specializing in the preparation and collection of hazardous wastes. The classification of hazardous wastes according to European Waste Catalogue (EWC), is, based on the KöM (Ministry of the Environment) regulation No. 16/2001 (VII. 18) the task and duty of the producer. Classification is influenced also by other objective aspects and interests. If a waste is hazardous or not, is determined by the aforementioned KöM regulation, according to the presence of components expressed in % and characterized by R-phrases. New hazardous wastes or hazardous wastes with
unknown composition can be classified on the basis of the composition and hazard parameters. Based on the production technology of wastes (statistical approach), the EWC systemizes wastes in predefined groups. In the technical content of these groups some of the exact physical, chemical and other parameters applied in ADR can be found in exceptional cases only.

Among the neutralization activities, from the point of view of hazards, establishments neutralizing hazardous wastes by incineration are regarded most dangerous. There is just a low number of hazardous waste incineration plants in Hungary, the most significant ones are in Dorog, Győr, Sajóbánya, Balatonfüred, Tiszăújváros and Tiszavasvár.

Among the activities involving hazardous wastes the ones that are most significant from the point of view of hazards are subject to the regulations about the prevention of major accidents.

One of the unresolved questions of the last decades is environmental safety, and within this the handling of hazardous wastes as independent hazard sources. In Hungary several millions of hazardous wastes are produced every year. The quantity of industrial wastes and liquid and sludge-like hazardous wastes drops, while the quantity of solid hazardous wastes increases. Some 30% of the hazardous wastes recorded (based on the calorific value) can be combusted. Other wastes need further treatment, first of all physical, chemical, biological decontamination, whereas unavoidable residues require professional disposal. Some 0.5-0.7 % of domestic solid wastes are hazardous wastes (NDGDM 2011)

In my opinion hazardous wastes are first of all an environmental and health problem and jeopardize mainly the environment, human health is only indirectly endangered. The risk of danger occurs in case of the various environmental elements, usually as permanent environmental pollution.

**Activities involving radioactive substances.** Activities dealing with radioactive substances can be divided in terms of industrial safety into two main groups: nuclear installations and isotope laboratories.

**Nuclear installations.** In Hungary, the following facilities exist, which could release significant amount of radioactive material into the environment, during a nuclear or radiological accident:

- Paks Nuclear Power Plant (Paks NPP) with 4 reactor units supplying about 40% of the required electricity of the country; the units (1485 MW thermal power each) were set into operation in 1982, 1984, 1986 and 1987;
- Spent Fuel Interim Storage Facility, for interim storage of spent fuel rods produced throughout the lifetime of Paks NPP; operated since 1997;
- Budapest Research Reactor (10 MW thermal power); operated since 1959;
- Institute of Isotopes Co., producing different radioactive isotopes and other products for healthcare, research and industry applications; since 1993,
- Training Reactor of the Institute of Nuclear Techniques of the Budapest University of Technology and Economics (100 kW thermal power); since 1971 (Bognár et al 2013).

The most serious nuclear and radiological event happened in Hungary was a serious incident in Paks NPP in 2003 (radioactive release through chemical cleaning of spent fuel assemblies, Level 3 on International Nuclear Event Scale - INES).

In Hungary, the system of preparedness, as all over the world, was boosted by the Chernobyl accident. The developed National Nuclear Emergency Response System integrates all state, regional, local and facility level players as the subsystems of preparedness and response in order to cope with a nuclear or radiological accident of any kind and extent in Hungary. The national system is governed by the National Nuclear Emergency Preparedness and Response Plan, to and with which all the plans of the subsystems are adjusted and harmonized.
The risks resulting from nuclear installations in Hungary can be characterized on the basis of the planning zones applied in response activities following nuclear accidents, as shown in Figure 3 (Bognár et al 2013).

![Figure 3. Nuclear hazards in Hungary (Bognár et al 2013).](image)

There is a Preventive Precautionary Zone marked in Hungary around the Paks Nuclear Power Plant only, this is an area with a radius of 3 km. There is an Urgent Precautionary Zone marked in Hungary around the Paks Nuclear Power Plant only, this is an area with a radius of 30 km and the KFKI site that includes the Budapest Research Reactor. The circles with a radius of 300 km around the Paks Nuclear Power Plant and around foreign nuclear power plants, that is the Precautionary Zone of Food Consumption Restrictions (ÉÖZ) cover practically the whole area of Hungary. Due to the location of nuclear power plants abroad their marked Preventive and Precautionary Zones do not reach Hungary.

Nuclear legislation in Hungary is based on the Act on Atomic Energy (Act CXVI of 1996) that came into force on 1 June 1997. The Act establishes the basis for the development of a legislative and regulatory system for the safe application of nuclear energy. The Act specifies that the tasks of control and surveillance of the safe application of nuclear energy are the responsibility of the Government.

The structure and functions of the National Nuclear Emergency Management System (hereinafter: NNEMS) is regulated by the Government Decree 167/2010 (V. 11) Korm. and the establishment, organization and operation of the Inter-ministerial Disaster Management Coordination Committee is regulated by the Government Decision 1150/2012 (V. 15).

The National Environmental Radiological Monitoring System (NERMS; in Hungarian: OKSER) consists of different ministries, authorities and special installations, whose responsibilities could be related to the different societal or economic aspects of the general use and protection against the ionizing radiation. According to the Government Decree 275/2002 (XII.21), which established the NERMS, its main tasks are the determination of the radiation burden of the Hungarian Population arising from either natural or artificial sources, and the collection of activity concentrations measured in the environment.

In Hungary a National Radiation Early Warning, Monitoring and Surveillance System (hereinafter: NREWMS) is operated for supporting the decision making activity of...
the governmental coordination body. The Minister of Interior coordinates the operation and controls the professional work of NREWMS. The central body of the NREWMS is the Nuclear Emergency Information and Analysis Centre (hereinafter: NEIAC) that carries out the central tasks of the country's radiological early warning and international radiological monitoring data exchange systems. Currently six subsystems operate altogether 132 gamma dose rate measuring stations and send their data to the national radiological monitoring centre, NEIAC. The Mobile Disaster Management Laboratories are the second subsystem of NREWMS. They detect, locate and analyse the contamination in case of a radiological emergency. The third subsystem of NREWMS is the network of fix laboratories that analyse the samples taken throughout the country (food, milk, soil, water, etc.). These measurements provide the basis of the long term countermeasures (grazing prohibition, restriction of food and water consumption, etc.).

The disaster management prepared plans for the evacuation, relocation and hosting of the whole population living in the urgent protective action zone. The technical device of the alarm is the Population Information and Alerting System installed in the 30 kilometre zone of the Paks NPP. The 227 modern population information-alert devices provide the possibility of alerting about 225,000 inhabitants of 74 settlements on 2800 square kilometre area.

**Facilities producing radioactive materials (isotopes).** Based on the data of MI NDGDM there is a total of 33 pieces of „B” and „C” category isotope laboratories with no patients working in the country, which pose only limited danger to their environment in terms of disaster management. There are 12 installations, mainly medical and industrial gamma-irradiator, which contain relatively large amount of radioactive material (Co-60), but the consequences of incidents with these sources would surely be limited to the immediate vicinity of the event.

The aspects used for the civil defense classification of isotope laboratories depend mainly on the classification of the laboratory (A, B, C levels), and on the category of importance of the installation (priority, I, II, III category). In addition to the aforementioned aspects the factors of the activities of laboratories dealing with radioactive substances posing a risk to the public influence the classification as well. The EüM regulation No. 16/2000 (VI. 8) on the implementation of the Nuclear Energy Act No. 1996/CXVI includes detailed provisions about the aforementioned point.

With regard to the civil defense classification, the establishment of adequate safety systems in laboratories that frequently work with volatile, gas- and steam phase radioactive isotopes with long half-life period, and with toxic radioactive isotopes with long half-time period, and the regular inspection of such laboratories, combined with environmental sampling is highly important.

In addition to radioactivity measurements, in justified cases, the inspection shall be carried out by sampling and by radioactivity analytics, chemical, biological measurement carried out in special laboratories. The frequency of the authority inspections at isotope laboratories is properly described in the regulation 16/2000 (VI.8.) EüM, Annex 7 (Bognár et al 2013).

**Hazardous mining activities**

**Mining activities.** I have anticipated in the field of hydrocarbon production the mining of crude oil and natural gas, the primary processing of the raw material takes place still within the battery limits of the mine. In the course of the processing of the produced and imported hydrocarbons intermediate products; fuels and lubricants; and the byproducts of processing (e.g.: bitumen) are produced. Most of the substances are highly flammable and explosive, and can cause major industrial accidents, disasters and environmental disasters.

In the course of the extraction and processing of hydrocarbons the following dangerous situations might arise: danger and environmental damage caused by unexpected bursts during the extraction of crude oil and natural gas, and exploratory drills; fire or explosion, environmental damage during the storage or primary processing
of the extracted crude oil and natural gas in the area of the mine; fire or explosion, or environmental damage caused during the processing and storage of imported and extracted crude oil (crude oil refining, production of secondary products (PB gas); fire and explosion, environmental damage during storing and logistic activities (product pipeline).

Major crude oil fields are in Algyő and the oil field in North and South Zala. There are major natural gas fields in Jász-Nagykun-Szolnok, Hajdú-Bihar and Zala County. There are some 700 exploratory and extraction wells, MOL Plc. carries out crude oil and natural gas extraction activities at 5 mining plants, and six business organizations specialized in crude oil exploration. In Zala, in the course of crude oil extraction the danger of fire and explosion, and the potential release of carbon dioxide used in high quantities can be anticipated. Toxic gases that are harmful for human health (H₂S) that are more heavy than air and that are released in a mixed condition, can jeopardize several settlements and several thousands of people for several days due to the local relief conditions and in case of unfavorable weather conditions. The extracted crude oil and natural gas and significant quantities of the PB gas produced are stored in 5 underground gas storages (e.g. gas storage in Pusztadecses in Zala) at 8 PB gas filling sites and in above-ground facilities (e.g. PB gas storage in Algyő - 30,000 m³). Among the industrial plants processing crude oil the white and black storage capacities of the Danube, Tisza and Zalaegerszeg refineries are significant.

The danger related to hydrocarbon transportation pipelines is covered in the subchapter "Transportation of hazardous goods", but due to its nature it shall be mentioned here. In case of transportation pipelines the starting and relay stations and process installations used for operation (e.g. pressure booster, loading, unloading etc. stations) pose major hazards. The exposure to dangers results mainly from above-ground installations, where the accidents and disasters described in the chapter about dangerous industrial installations might happen.

Coal and lignite mining pose no special hazard in terms of industrial safety. The facilities used for the storage of crude oil drilling mud considered hazardous waste can pose a danger to the environment (NDGDM 2011).

**Facilities used for the storage of mining wastes.** Facilities used for the storage of mining wastes can be divided into two main groups: (1) sludge reservoirs and sludge settlement ponds and (2) pit-heaps and soil depots. Sludge reservoirs are divided into four main groups according to the raw material extracted: (1) red sludge reservoirs, (2) spent nuclear fuel storages, (3) non-ferrous sludge reservoirs, and (4) iron ore sludge reservoirs. The wastes produced in the course of coal and lignite mining are stored on pit-heaps and on soil depots. According to the records of the NDGDM there are 400 facilities for the storage of mining wastes in Hungary and most of them are not classified. The total number of qualified “A” type facilities is 12 pieces. Some storages e.g.: the red sludge storage in Ajka is split into several cassettes. The disaster management authority pays special attention to the safety of facilities used for the storage of mining wastes following the industrial disaster in Kolontár.

In connection with the dam break of the red sludge reservoir on October 4, 2010 in Kolontár the Environmental Chief Inspectorate of the European Commission (EiB) sent an official notice on October 22, 2010 regarding the disaster at the site of MAL Zrt. in Ajka. EiB asked for information among others on the classification under 96/82/EC Council Directive (Seveso II) about the inspection of hazards of major accidents related to dangerous substances. With regard to the applicability of the Seveso II Directive the European Commission accepted in its reply the standpoint of MI NDGDM, as Hungarian authority, namely that the red sludge and sodium hydrate do not qualify as dangerous substances under the Seveso II, thus the installation is not covered by the Directive.

The first step in Hungary in the elimination of deficiencies affecting environmental and mining law identified and complained by the European Commission was the amendment of regulations in Hungary regarding mining wastes. In the topic of mining wastes the Hungarian Parliament has adopted Act CLXXXI/2010 on the amendment of individual energy acts and of Act LXXVIII/1997 on the alteration and protection of the
built-in environment. According to the law, the Mining Act No. XLVIII/1993 was amended as of January 1, 2011. Certain parts of the amendments were aimed at the conformity with the Directive No. 2006/21/EC (March 15, 2006), namely the treatment of wastes produced in the mining of minerals.

Accordingly the effect of Act No. XLVIII/1993 covers mining wastes (wastes produced during mining and red sludge produced during the processing of bauxite).

The competence of the Mine Inspectorate was extended by authority procedures related to the management of mining wastes and to the construction, commissioning and operation, closing and aftercare of related facilities and installations. Resulting from the change of the legal regulations, the regulation No. 267/2006 (XII. 20) on the Hungarian Office for Mining and Geology has been amended, and this allows the disaster management authority to participate, as specialized authority, in the construction and occupancy licensing procedure to check the internal emergency management plan. With the amendment of the GKM regulation No. 14/2008 (IV. 3) GKM (Ministry of the Economy and Transportation) the regional organizations of MI NDGDM will prepare, revise, along with the majors of the settlements concerned, the external emergency plans serving for the protection of the settlements and have them drilled.

With the modification of the regulation of mining rights, with the introduction of external emergency response actions, there is a possibility to manage the coordinated activities of disaster management, and of the state and municipal organizations involved in the rescue and emergency response.

**Transport of hazardous goods.** In Hungary the transport of dangerous goods mainly happens on main road and on rail. The track of transport in most cases leads through built-up area in which case the population is exposed to increased danger because of the quality of the transported dangerous substances. The main tracks are not only used for inland transport, but because of our geographical location also for the European transit traffic. In Hungary approximately 20% or railroad transport is dangerous goods transport. Its big advantage compared to main roads transport is a more economical transport of high quantity for a long distance (NDGDM 2011).

In Hungary in 2010 it meant 33 700 million tonnes of km main road transport and 8 800 million tonnes of km railway transport. Because 19-20% of Hungarian railway transport's capacity is dangerous goods transport, catastrophic situations cause a real problem and their solving requires careful preparation (NDGDM 2011).

In our country water transport is the less significant part of transport. The use of harbour infrastructure is low, their services are way below the European standard. For the safer and economical travel on the Danube its water path needs significant improvement. On the Hungarian part of the Danube's water path seven harbours are dangerous in putting goods. Hungary has approximately 1500-1600 km water path, which can be travelled by boat. On our main rivers there is also passenger- and goods transporting – the last takes up 5% of the national goods transporting.

In the air transportation, two civil airports may receive and send dangerous goods. The airports have permission for service of terrestrial goods and for handling of dangerous goods. In 2011, the amount of dangerous goods arriving in Hungary was 3.9 tons, while the amount of dangerous goods departing from Hungary was 2.2 tons. In Hungary, volume of air transport is not outstanding within Europe: on our biggest airport there happened about 100 000 landing–take-off (LTO) events. Otherwise, the volume of this decreased permanently in the latest few years: from 2005 it relapsed by about 15%. Nevertheless it is stated as to be remarkable, so we have to get ready for a catastrophe originating from an airplane crash (NDGDM 2011).

According to the Figure 4 it can be stated in 2011, that the share of main road goods transport (67%) is still 3 times more than the share of railway transport (18%).
There is a difference of opinion among experts as to whether the rail or road transport of hazardous goods represents a higher degree of danger for those living in the area concerned. In terms of transport mode's preferences there are no special transportation authority measures or provisions in the territory of the EU member states. In general it can be stated that it is mainly economical and logistic considerations that play a role in the selection of individual transportation modes. However it is sure that in case of the transportation of significant volumes over a long distance (more than 200 km) rail transportation services and facilities are preferred.

**Risk reduction measures stated in Hungarian regulations.** The main road transport of dangerous goods are strictly restricted by judiciary norms. This judiciary norm the "European Agreement concerning the international carriage of dangerous goods by road" is an international agreement, ADR in its common name, which is a measure since 1972 since its naturalisation. The current measure taking The European Agreement according to the transport of dangerous goods (hereinafter: ADR) with A and B appendix into the national rule of law creates the 2013 year CX. Act. The second most common way of transporting dangerous goods is railway transport, which is controlled by the 2013 year LXXX. Act which is an organic structure of the "Regulation concerning the International Carriage of Dangerous Goods by Rail" (hereinafter: RID), which is annex "C" to the Convention concerning International Carriage by Rail (COTIF) C, and which was concluded on June 3, 1999 in Vilnius. The water transport of dangerous goods is controlled by the 2013 year CXI. Act according to the European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (hereinafter: ADN). The air transport is controlled by the 2007 year XLVI. Act (ICAO) according to the agreement on international civil flight signed in December 7th 1944 (Chicago Convention). The provisions of ADN, ADR and RID are similar and contain cross-references.

The tasks of the disaster management authority related to the transportation of dangerous goods are completed in line with the Hungarian and international legal regulations. The ADR authority inspections and fining tasks are within the competence of disaster management organizations since 2001. Simultaneously with the reorganization of disaster management effected on January 1, 2012 new tasks have been delegated to the disaster management authority as well. The inspection and fining of rail and water transport is within the competence of the disaster management authority. On the side of co-authorities the competent organizations of the National Transportation Authority, the National Tax and Excise Bureau, the National Police Office is participated in the inspections activities.
The rules of the standardized procedure applying to the inspection of dangerous goods and to the fines to be imposed in the course of the actions of the professional disaster management organization and the amount of fines that can be imposed in case of the violation of the rules and the general rules of authority tasks related to fines are stipulated in Gov. Decree No. 312/2011 (XII. 23).

The local organization of the disaster management authority has the right to carry out inspections within the competence area of other disaster management authorities based on previous approval (Horváth & Kátai-Urbán 2013).

Critical infrastructure protection. The legal regulation of the EU on the identification and selection of critical infrastructure in Europe and on the evaluation of the necessity of the improvement of their protection was adopted (the directive 2008/1145/EC, hereinafter: Directive). The objective of Act No. CLXVI./2012 on the identification of critical systems and installations, their selection and protection (hereinafter: CIP act) following the line of regulations of the Directive is on one hand the identification of critical system elements, on the other hand the protection after the selection. The act took effect on March 1, 2013. In the CIP act fundamental relevant definitions are established: system element of national and European importance, operator, branch-related and horizontal criteria. There is a separate code of procedure for the selection of system elements of national and European importance. In the act there are common rules in terms of national and European critical system elements, with regard to registration, data protection, inspection, the safety plan of the operator, the safety liaising person and sanctions. The regulation No. 65/2013 (III.8) on the implementation of Act No. CLXVI./2012 on the identification of critical systems and installations, their selection and protection (hereinafter: implementing regulation) took effect on March 11, 2013 (Kátai-Urbán et al 2014.)

The implementing regulation, in addition to the provisions helping the legal application and not defined in the CIP act (see the definitions of identification, risk assessment) regulates also the identification of national critical system elements by the operator. Within the framework of the identification procedure the operator sends his identification report in line with the requirements stipulated in the legal regulation to the selecting authority responsible for the branch, which will convey it to the proposing authority responsible for the branch, for commenting. The proposing authority responsible for the branch concerned sends its proposals, after checking the report, to the selecting authority.

The selecting authority responsible for the branch, in view of the standpoint of the competent professional disaster management organization, makes a decision in a resolution about the selection of a system element of national or European importance. The precondition of the selection is that the occurrence of at least one of the branch-related and horizontal criteria each is possible. The resolution about the selection, in addition to the approval of the identification report, also determines the selection, the registration of the system element selected, the obligation to prepare the operator’s safety plan and the employment of the safety liaising person and can furthermore determine other conditions in order to protect the critical system element.

With regard to the qualifications required of the safety liaising person in the implementing regulation technical, defense management, disaster management and police management qualifications are preferred. In the act also the requirements of the operator’s safety plan, the individual rules of the inspection, and the general rules of procedure to be followed in case of extraordinary events, and the amount of the public administration fine that can be imposed on the operator are specified.

The first time when the operator has to submit the identification report is within 180 days as of the effective date of the implementing regulation.

In the CIP regulation, in the field of the protection of critical infrastructure, the primary scopes of responsibility of the minister (minister of the interior) being responsible for protection against disasters are defined as follows:

- tasks of the special authority in case of all sectors, in order to examine horizontal criteria;
- CIP registration authority;
- proposing authority in case of the sector within its scope of tasks;
- coordination of authority inspections;
- operation of a CIP Information Security Event Management Center in order to respond to events related to network safety;
- management of extraordinary events;
- CIP POC tasks (Kátai-Urbán et al 2014.)

For so-called coordinated inspections and for the registration of European and national critical system elements the central organization of the professional disaster management organization (hereinafter: MI NDGDM) was given authorization. In the implementing regulation IM NDGDM is appointed, in terms of certain functions (public order, public security, protection of the public, national security, counter-terrorism) also as proposing authority.

The rules related to network safety are covered in a regulation on the tasks and scope of the event management center of critical systems and installations and of the governmental and branch-related event management centers of electronic information systems ((Gov. decree No. 233/2013 VI.) 30.) MI NDGDM operates an event management center under the name Event Management Center of Critical Systems and Installations in order to carry out activities ensuring the network safety of national critical systems and installations. The minister in charge of disaster prevention supervises the center. Within the scope of the tasks of the National Chief Inspectorate for Industrial Safety operating in the organization of the MI NDGDM since January 1, 2012 the protection of critical infrastructure is a preferential area.

The minister of the interior is in charge of the tasks of the national liaising officer and coordinator as ECIP contact point. Furthermore the minister of the interior is in charge of the coordination of the civil crisis management, disaster management tasks and the tasks of critical infrastructure protection on government level, and prepares in particular the legal rules related to the critical elements of infrastructure (Kátai-Urbán et al 2014).

With regard to the empowering provisions of the CIP act the particular rules related to the identification, selection and authority inspection branches and the branch-related criteria are specified in separate government regulations for each individual branch. By the end of March 2014 the following branch-related regulations have been adopted by the government of Hungary:
- Gov. decree No. 360/2013 (X. 11) on the identification, selection and protection of critical systems and installations in the energy sector;
- Gov. decree No. 512/2013 (XII. 29) on the identification, selection and protection of the critical systems and installations of individual police organizations and on the amendment of the regulation No. 329/2007 (XII. 13) on the organizations of the police and on the tasks and scope of police organizations;
- Gov. decree No. 540/2013. (XII. 30) on the identification, selection and protection of critical agricultural systems and installations;
- Gov. decree No. 541/2013. (XII. 30) on the identification, selection and protection of critical water management systems and installations and hydraulic structures.

The aforementioned regulations are already effective and the period for the completion of operator tasks has started. With regard to the other sectors the implementing regulation is still in the regulatory phase.

Based on the implementing regulation, the safety liaison person shall have the professional qualification relevant for the sector concerned. The safety liaison person, in addition to the professional qualification relevant for the sector concerned, shall also have a college or university degree obtained at a faculty for emergency management or police administration; a professional qualification as police administration manager specializing fire safety, industrial safety, civil protection or equivalent; a completed course for industrial safety; university or college degree at a course for industrial safety or a practice of at least 5 years in the field of industrial safety, spent at professional disaster management organizations.
After July 1, 2018, the safety liaison person, in addition to the professional qualification relevant for the sector concerned, shall also have a college or university degree specializing in industrial safety and relevant for the sector concerned, or a practice of at least 5 years in the field of industrial safety, spent at professional disaster management organizations.

Qualification in industrial safety can be obtained at the foundation course for industrial safety that was started at the Disaster Management Institute of the National University of Public Service in the year 2013 for the first time. At this course, in addition to general disaster management, fire prevention and emergency management also so-called industrial safety is part of the curriculum. The special knowledge about industrial safety cover also the safety of hazardous plants and dangerous shipments, the response to events occurring in the presence of hazardous substances, response to nuclear accidents and the protection of critical systems and installations (Bleszity & Kátai-Urbán 2014).

Conclusions. In the article the dangers resulting from hazardous activities in Hungary covered by industrial safety regulations, being part of disaster management have been generally analyzed. The evaluation of the activities in Hungary that pose risks of disaster, based on the aspects of industrial safety can essentially be found in case of establishments involving dangerous substances only, where dangerous establishments have maps illustrating the individual risk of fatalities and the hazard zones of establishments will be integrated into the land-use plans. The database of MI NDGD (IBIR) offers adequate possibilities for the extraction of statistical data. The results of the hazard analyses are available for each establishment in the safety documentation, however the maps applied there are not standardized. The data of events related to industrial safety are also separately recorded, and these records shall continuously be updated to prepare executive summaries and reports. With regard to sludge reservoirs and isotope laboratories there is a separate registration not linked to central data bases. In terms of nuclear hazards we are aware of precautionary action zones established empirically. These zones are visualized as map as well.

All in all it can be stated that most of the activities covered by industrial safety regulations in Hungary are visualized on so-called hazard maps, where data can be analyzed as to the main parameters and location of the hazard source. The danger maps corresponding to the quantitative risk criteria are available in case of the establishments involving dangerous substances, but at the present they are not visualized on the GIS platform. The identification of activities that pose risks of manmade disasters (hazard identification), the creation of standardized data bases, the completion of hazard analyses, the visualization of the results on maps are the continuous task of disaster management organizations. It is possible to develop mainly by bundling the authority and professional data bases and by standardized data handling.

The Hungarian industrial safety authority as part of the Hungarian Disaster Management Organisation have been applied the European and international regulations regarding industrial safety. It also should also be stated that the Hungarian regulations and their appliance by the Hungarian industrial safety authority provide a high level of protection of human life and the environment in Hungary.

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