# Modern Trends in Disaster Planning and Management in the World and in Latvia

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*Abstract.* Efficient management of emergency requires the capability of various institutions involved throughout the world to coordinate their activities, decision-making, information sharing and the ability to share situation reports. The paper analyzes the term “disaster” explanation and the criteria to be set for this term both in Latvia and in the world, the disaster management criteria and the regulatory enactments, from which the numerical criteria of the disaster are derived. The article provides a review and analysis of the term "disaster" explanation and criteria put forward for this term in both Latvia and the world, the authors also look at the disaster management criteria and governing laws and regulations where the disaster numerical criteria result from. The existing most popular international databases relating to the accumulation of information on scale of disasters and damages caused by them have been reviewed. Implementation of Seveso III in Latvia has been considered as well as therewith associated regulatory enactments and their importance in the context of Latvia as a tool for reducing risks.
*Key words:* disaster, disaster management, disaster numerical criteria, risk reduction.

## 1.Introduction

Efficient management of emergency requires the capability of various institutions involved throughout the world to coordinate their activities, decision-making, information sharing and the ability to share situation reports. The study was conducted with the objective to identify gaps in disaster management measures. Over the world and in Latvia, a special place is occupied by disaster management measures related to the prevention of possible disasters, as well as the accumulation of statistical information, which can later be used to assess the degree of risk that depends on a particular type of threat. The article provides a review and analysis of the term "disaster" explanation and criteria put forward for this term in both Latvia and the world, we will also look at the disaster management criteria and governing laws and regulations wherefrom the disaster numerical criteria result. We will review the most popular existing international databases that deal with the accumulation of information on the scales of disasters and damages caused by them. We will review Seveso III implementation measures in Latvia and related regulatory enactments issued and look at their role in the context of Latvia as a tool to reduce risks. The result of this study is a general description of the disaster management system and revealing of deficiencies.

## 2. Criteria for Disaster Management in International Practice

Disaster risk management is becoming a growing UN priority. UN Resolution 42/169 of 11 December 1987 called [1] the last decade of the 20th century the “International Decade for Disaster Reduction” in recognition of natural disaster mitigation role for all people, and especially in developing countries. “The key step in the implementation of these activities was the adoption of the Hyogo action plan (hereinafter referred to as HFA) “Hyogo Framework for Action” 2005-2015 at 2005 World Conference on Disaster Reduction in Kobe, Japan. The objective of HFA was to significantly reduce damages caused in disasters by 2015 building the resilience of countries and communities against disasters [2]. The HFA sets

out five priorities for action and offers guidelines and practical tools for achieving disaster resilience:

- ensuring that disaster risk reduction is a national and local priority with a strong institutional framework;
- identification, assessment and monitoring of disaster risks and development of early warning systems;
- use of knowledge, innovation and education to create at all levels a culture of security and disaster resilience;
- reducing the underlying risk factors;
- implementation of disaster preparedness measures for efficient response at all levels.

UN Resolution 67/209 of 2013 called for the third World Conference on Disaster Risk Reduction to be convened in 2015 with the objective to review the implementation of HFA and to adopt a framework for action after 2015. The outcome of this conference was an agreement on Sendai Framework for Disaster Risk Reduction in 2015-2030 (Sendai Framework) which was subsequently approved also by the UN General Assembly. The Sendai Framework is a 15-year, voluntary, non-binding agreement that primarily defines the responsibility of each government for disaster risk reduction, while recognizing that the joint responsibility should be shared with other stakeholders, including local authorities and private sector. The primary objective of the Sendai Framework is to significantly reduce the risk of and damage by disasters in the areas of life, livelihood and health, as well as in economic, physical, social, cultural and environmental spheres of people, businesses, communities and countries [3]. The goals of the Sendai Action Plan are determined for global and regional level while guiding principles contained in the Plan specify the primary responsibility of each country for disaster risk prevention and mitigation, including international, regional, subregional, cross-border and bilateral cooperation. The principles also provide for the developing countries to take these measures in accordance with their capabilities and capacity, receiving support through sustainable international cooperation. At national level, the principles provide for cooperation with regional governments and involvement of the entire society. The seven Sendai global goals are:

- until 2030 to significantly reduce the global catastrophe mortality so as within 2020 and 2030 to reduce the global average mortality rate per 100,000 inhabitants compared to the period 2005-2015;
- until 2030 to significantly reduce the number of people affected by disasters in the world so as within the decade 2020-2030 to reduce the global average rate per 100,000 inhabitants compared to the period 2005-2015;
- until 2030 to reduce the direct economic losses from disasters in relation to world gross domestic product (GDP);
- to significantly reduce damage to critical infrastructure caused by disasters and interruptions of basic services, including health and education services, also developing their resilience until 2030;
- until 2020 to substantially increase the number of countries with national and local disaster risk reduction strategies;
- to significantly strengthen international cooperation with developing countries by providing adequate and sustainable support to complement until 2030 the national measures for implementation this framework;
- until 2030 to significantly increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments.

The achievement of these goals is unthinkable without reliable statistics on disasters. In recent years, the international community has made a significant progress in improving the documentation of damage from natural disasters. These achievements are first and foremost visible in the growing number of countries that are now using the disaster hazard databases either through government, non-governmental, academic and/or private organizations. There are currently 3 most known disaster databases in the world (CRED EM DAT, MunichRe, NatCatSERVICE and SwissRe Sigma); however, only a small amount of data from these databases is publicly available. At the national level, there are currently more than 55 loss databases, although they differ in terms of data quality, time coverage, loss rates and update frequency. Approximately 35 national databases offering loss data until 2010 can only do it with the financial and/or technical support provided by UNISDR. Thus, database sustainability and long-

term maintenance are essential for many database operators [4]. Many databases have a significant data gap. It relates to:

- time intervals with missing years and/or months;
- spatial referencing with missing messages from some regions, communities, etc.;
- missing loss estimates, especially for low impact/high frequency events;
- incompletely filled out loss rates in events.

Most databases include some types of human and economic loss (such as property damage, number of people killed) while no common set of loss indicators in all databases is created, and these indicators are not defined based on a common understanding or standard. It would therefore be necessary to agree on a common standard for data comparison purposes. To improve the comparability of existing loss databases, the event classifications should be codified. If the event and hazard categories are different, all future efforts to standardize human loss rates will fail. Consistent hazard classification will allow data users to compare losses, such as landslides in database A with loss of landslides in database B, thus illustrating that the differences are related to the loss assessment and not the definition of landslides or their classification. UNISDR promotes a global initiative to build national disaster databases with a well-defined methodology - DesInventar. It is a free, open-source methodology and software allowing to capture, analyze, and graphically display homogeneous information about the occurrence of disaster and loss. Since its inception in Latin America at the end of 1993, it has been permanently evolved and improved. The disaster loss databases are essential for all countries to report on the achievement of Sendai's core goals, especially with regard to the first four goals of reducing disaster losses and impacts. Loss accounting will allow countries to monitor progress in achievement of such goals and can be used as a powerful disaster risk reduction tool. Today, 95% of all national disaster databases in the world have been created using this methodology and instrumentation, creating a unique set of compatible and comparable data. In many of these countries, disaster management agencies have used and are now using these disaster databases as a contribution to the risk analysis, risk reduction, early warning systems, as well as in order to follow or develop their risk reduction plans over time.

The 5 pillars of the UNISDR disaster data collection methodology are:

- Standard definitions for hazard factors and their effects;
- A common set of common indicators (16 quantitative, 12 qualitative) plus an unlimited amount of adjustable indicators;
- A comprehensive list of disasters, regardless of their scale;
- Subdivision of data into sub-national units (county/municipality);
- Data collection and validation in the country [5].

DesInventar classification system is divided into three levels: the family, the main event and the hazard. There are six broad categories of threats in the family group:

- Geophysical: hazard arising from solid soil. This term may be replaced substituted for the term "geological hazard";
- Hydrological: hazard caused by movement and spread of surface and underground freshwater and salt water;
- Meteorological: hazards caused by short-time, micro- to mesoscale, extreme weather and atmospheric conditions, which last from minutes to days;
- Climatological: dangers of persistent, meso- or macroscale atmospheric processes, from seasonal to multiannual climate changes;
- Biological: danger from exposure to living organisms and/or their toxic substances (e.g. poison, mold) or vector-borne diseases. Examples include poisonous wildlife and insects, poisonous plants, algal blooms and mosquitoes containing pathogenic agents, such as parasites, bacteria or viruses (such as malaria);
- Extraterrestrial (cosmic): hazard caused by asteroids, meteors and comets when they enter the Earth's atmosphere and/or collide with the Earth, or change the state of the cosmic bodies that affect the Earth's

magnetic field, ionosphere and thermosphere.

Each hazard family can be classified according to the overall hazard set, or main events. For example, the geophysical hazard category can be further subdivided into earthquakes, mass movements and volcanic activities. Hydrological hazard category is further differentiated into effects of floods, landslides and waves. Meteorological hazard category include storms, hurricanes, tropical storms, extreme temperatures and fogs. The main events in the climatological family include drought, glacial lake exhaustion and forest fires. The biological hazard family describes in detail animal incidents, diseases and infections. Finally, the cosmic danger family includes collisions with the Earth, explosions in the atmosphere and cosmic radiation.

DesInventar is becoming more and more widely used throughout the world, and in April 2018 it was used for summarization of disaster losses already in 99 countries [6]. In addition, this instrument has a range of analytical options that enable national and local authorities and disaster risk reduction authorities to systematically understand disaster trends and model their impact. With a greater awareness of disaster trends and their impact, better prevention, mitigation and preparedness measures can be envisaged to mitigate the consequences of disasters. The UNISDR methodology proposes to gather detailed and homogeneous disaster data at all levels using DesInventar. The prepared and processed information can be presented in different time periods and is linked to geographic data. DesInventar is a free open-source software, it supports many standards and languages and can be adapted to any needs.

## 2.1. Implementation of Sendai Plan in Latvia using Seveso III Directive

At the European Union level, there is a legal framework that imposes certain obligations on the Member States for the collection, systematization and summarization of disaster data. The Union Mechanism is the main legal instrument that relates to disaster risk prevention and thus promotes the decisions at both EU and national level. Under this framework, the Member States are obliged to submit a risk assessment summary to the Commission every 3 years.

Today's disaster planning and management trends are clear: large-scale disasters call for involvement of large-scale resources in a wide range of areas of knowledge. Efficient emergency situation management requires the ability of various institutions involved throughout the world to coordinate their activities, decision-making, information sharing and the ability to share situation reports. Rapid decision-making is also vital. Latvia, as other EU countries, has a developed industrial production, storage, handling and transportation of hazardous chemicals and materials. In each of these processes, there is a danger and a risk of a disaster, the size of which can be local, regional or even national. In order to minimize such risks, there is relevant legislation for the EU Member States, including Latvia. At EU level, it is the Seveso III Directive, but in Latvia it is integrated through the Cabinet of Ministers Regulation No. 131 of 01.03.2016 (hereinafter referred to as the CM Regulation No.131) "Procedure for Risk Assessment of Industrial Accidents and Risk Reduction Measures". The Regulation is binding on those facilities that deal with the above-mentioned processes of hazardous chemicals.

The Seveso III Directive applies to more than 12,000 industrial enterprises in the EU where hazardous substances are used or stored in large quantities, mainly in chemical and petrochemical industries, as well as in the wholesale and storage of fuels, including liquefied petroleum gas and liquefied natural gas. Given the high level of industrialization in the EU, the Seveso III Directive has contributed to a low incidence of major accidents. This directive is considered as a benchmark for tackling industrial accidents and has been a model in many countries around the world. The EU directive sets common goals for the European Member States. They must be incorporated into the national legislation within the deadline defined by the Directive. This is done by the local legislature - the parliament. Unlike the EU Regulation, the Directive sets specific objectives,

which make possible to adjust them when they are incorporated into national legislation in line with the needs of the Member State and the objectives of the Directive. The Directive sets specific objectives to be achieved by the EU Member States, allowing them to freely choose techniques. It can be addressed to one Member State, several Member States or all Member States together. If a country does not implement the directive within the deadline, it will enter into force in full in its territory after expiry of the deadline. It means that the directive itself is binding in the form adopted by the EU.

## 2.2. Review of Latvian legislation introducing the requirements of SEVESO III Directive

The aim of the Seveso Directive is to prevent serious incidents involving dangerous substances. However, as accidents still may occur, its purpose is also to limit the consequences of such accidents not only for human health but also for the environment. The Directive applies to companies where hazardous substances may be contained (for example, during processing or storage) in quantities exceeding a certain threshold.

In Latvia, the Seveso III Directive is integrated into the Cabinet of Ministers Regulation No.131. In accordance with the provisions of Seveso III Directive and the Cabinet of Ministers Regulation No.131, there are 30 facilities of the highest risk level and 39 lower risk objects [7]. List of these facilities is available on the Environment State Bureau website (State Environmental Bureau, 2019).

When examining accidents at Seveso III facilities in Latvia, it can be concluded that Latvia has not previously encountered industrial accidents that would have major consequences, but accidents and fires at these facilities tend to happen. To prevent these initial accidents and fires from becoming an industrial accident with great consequences, the ability of facility personnel and operational services to respond to such accidents and fires is crucial. Consequently, in order to provide an operative action and coordinated action of the institutions in emergency at such facilities, the Seveso III Directive requires the Member States to develop internal and external emergency plans for high-risk facilities.

Emergency action plans in national legislation, or the Cabinet of Ministers Regulation No.131, have been integrated as the Civil Protection Plans (hereinafter referred to as the CPP). The internal emergency action plan in the Cabinet of Ministers Regulation No.131 is defined as the facility CPP while the external action plan is defines as the off-facility CPP.

Facilities of increased hazard are classified into three categories (A, B and C) depending on the scale of the disaster that the facility may cause:

- Category A high-risk facility - an object that due to the influence of various factors may cause a national-scale disaster or do a significant harm to the safety of people, environment and property;
- Category B high-risk facility - an object that due to the influence of various factors may cause a regional-scale disaster or do harm to the safety of people, environment and property;
- Category C high-risk object - an object that due to the influence of various factors may cause a local-scale disaster or do harm to the safety of people, environment and property [8].

The Cabinet of Ministers Regulation No. 563 of 19.09.2017 “Procedures for Recognition and Identification of Increased Hazard Objects as well as for Planning and Implementation of Civil Protection and Disaster Management” (hereinafter referred to as the Cabinet of Ministers Regulation No. 563) was issued on the basis of the Civil Protection and Disaster Management Law (hereinafter referred to as the CPDM Law). It lays down procedures for the recognition and identification of high-risk objects and for the planning and implementation of civil protection and disaster management [9]. According to the above-mentioned CPDM Law classification of high-risk objects into categories A, B and C, the Cabinet of Ministers Regulation No. 563 determines which objects belong to these categories according to the specified criteria.

Information on facilities of increased hazard shall be each year identified, updated and until 20 January submitted to the State Fire and Rescue Service by the Environment State Service. After the State Fire and Rescue Service has evaluated the information provided by the Environment State Service, the State Fire and Rescue Service shall prepare a list of increased hazard objects for submission to the Cabinet of Ministers [10]. The current list of high hazard facilities is approved by issue of the Cabinet regulation, and the list of high hazard facilities currently in force is included in the Cabinet of Ministers Regulation No. 568 of 11.09.2018 "List of objects of increased danger" [11], as well as published and available on the official website of the Environment State Bureau [12]. According to the CPDM Law, a civil protection plan must be developed for all increased danger objects, including high-risk facilities. This plan is to be coordinated with the State Fire and Rescue Service and requires an official approval by the State Fire and Rescue Service [13]. However, only high-risk facilities need a safety report to be developed in addition to the civil protection plan [14]. The overview of Latvian legislation is graphically illustrated in Figure 1.

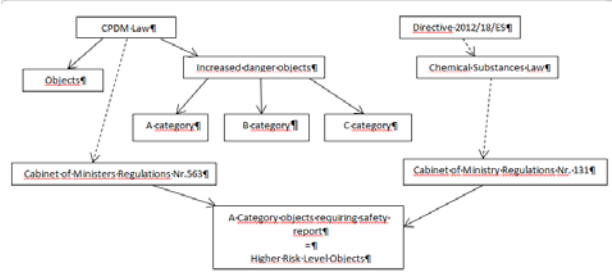


Figure 1. High-risk facilities classification diagram

## 3. The term "disaster" in Latvia and in the world

Modern trends of disaster planning and management are obvious: large-scale disasters call for involvement of large-scale resources in a wide range of areas of knowledge. Efficient management of emergency situations requires the capability of various institutions involved throughout the world to coordinate their activities, decision-making, information sharing and the ability to share situation reports. Rapid decision-making is also vital.

To achieve these goals, there is a need for extensive and reliable cooperation, both between European countries and outside Europe, between different organizations, between different sectors and areas of competence. A prerequisite for this kind of efficient cooperation is the understanding of different ways to solve problems and the desire to exchange comparable data. Various tools are available for disaster management entities to increase public safety, such as risk assessment and early warning systems. In turn, these two tools cannot function properly and provide useful information for decision-making if they are not based on reliable and complete statistics.

When a person thinks of the term "disaster", (s)he usually thinks of things like hurricanes, earthquakes, floods or epidemics. However, depending on the point of view, this concept may refer to any type of accident that affects at least one life, causes irresistible difficulties or affects the livelihood of at least one victim. Even the term "victim" may include not only people but even any living beings or ecosystems. If, suppose, flood occurs in a deserted place and does not cause damage, the term disaster does not apply. However, where flood has a significant impact on the livelihood of any plant or animal species or causes changes in ecology with an extended impact, it can be considered a disaster. To simplify, it can be said that a disaster is any event that has negative consequences in the long term.

Disaster awareness and definition may vary depending on the organization. For example, report of the UNISDR intergovernmental expert working group on indicators and terminology related to disaster risk reduction defines a disaster as "a major disruption to public activity at any scale in relation to the interaction of dangerous events with risk exposure, vulnerability and response capacity factors leading to one or more of the following: Human, material, economic and environmental losses and impacts" [15]. In opinion of the International Red Cross and Red Crescent Federation, disaster is a "sudden accident that seriously disrupts the activity of society or community and causes human, material and

economic or environmental damage that goes beyond the ability of the community or society to cope with its own resources. Although disasters are often caused by nature, they can be of human origin" [16]. Taking into account the primary area of work of the International Red Cross and Red Crescent Federation, this definition puts more emphasis on society and interaction within it, also in case of humanitarian disasters.

To support the Seveso III Directive, the European Commission Joint Research Center Accident Danger Office has developed two major databases for reporting, of which use is mandatory for the EU Member States. eSPIRS (Seveso Plants Information Retrieval System), which includes information on companies that are considered to be a serious threat in relation to the potential risk of accidental presence of hazardous substances as defined in the Seveso III Directive. The minimum information collected pursuant to Article 21 (3) of this Directive shall include the name or the trade name of the operator, full address and activity of the company.

EMARS (Major Accident Reporting System), which includes reports of chemical accidents in the EU Member States (as well as in the countries of EEA, OECD and the United Nations Economic Commission for Europe in accordance with the Convention on industrial accidents transboundary impacts) when a Seveso enterprise is involved and the measure corresponds to criteria specified in Supplement VI of Annex III. The minimum information collected includes the date of the accident, the Seveso location classification, the type of industry and any special circumstances (i.e. involvement of businessmen or domino effects, technological incidents caused by natural phenomena - events or cross-border effects).

In addition, operators, competent authorities and Member States shall report on the circumstances of the accident, including the hazardous substances involved, as well as on the immediate effects on human health and the environment, the causes and the findings of such accidents and the preventive measures taken to prevent recurrence.

### 3.1. Disaster criteria in some EU Member States

From 01 July 2018 to 30 June 2019, Latvia is the presiding state of the Council of Baltic Sea States) (hereinafter referred to as CBSS). Within the framework of this presidency, the National Fire and Rescue Service conducted a survey of Member States with a view to find out how the process of collecting disaster data is organized in the CBSS countries.

Table 1

Summary of information on CBSS Member States

| Country | Whether there is available a national level document containing definition of disaster | Definition of disaster | Whether qualitative and quantitative criteria of disaster are specified? | Whether there is available national or sectoral disaster loss database? |
|---|---|---|---|---|
| Sweden | Definition of disaster is not available | Definition of "emergency situation" is available | Specific institution has responsibility to identify the situation severity | There are two databases which cover disasters. The first one is for all kinds of serious accidents on which incomplete information is available, and the second database on natural disasters. Unfortunately, the database on natural hazards had technical problems and it is closed. There are plans to join both databases. |
| Norway | No national level document that contains disaster definition. However, similar in content terms are used: unwanted | Large-scale accident or disruption where many people are affected and where rescue work and mitigation of require | There are not set qualitative and quantitative criteria, the achievement of which is a prerequisite for disaster | The database is available |

| | | | | |
|---|---|---|---|---|
| | events emergency events, breakdowns, crises | resources daily needs. | | |
| Lithuania | The law "On Civil protection" gives definition of extreme situation (in Lithuanian: *ekstremalioji situacija*) | The extreme situation is a natural, technical, ecological or social event that has reached or exceeded certain criteria and causes threat to life or health of inhabitants, social conditions of their life, property and/or environment | If natural, technical, ecological or social event does not meet or has not reached the emergency situation criteria and poses a threat to life or health of inhabitants, social conditions of their life, property and/or environment, this is an accident. In accordance with volume of caused damage, extreme situations are distinguished between municipal and national level | Alternative tool is available. Losses are recorded after the accident in accordance with information provided by municipalities, and after approval by the Ministry of Finance a decision is made on compensation for damages |
| Germany | Each of 16 federal states (länder) has the Disaster Management Act, and each of them gives definition of disaster | Disaster is an interruption of or a threat to public security or order, of which overcoming requires strengthened daily use of resources and funds and unified control of protection measures taken by more institutions | Qualitative and/or quantitative criteria of "Major accident" differ much in each state. Head of self-government in affected region has the right to declare the situation as a "disaster" | No information is available about existence of such databases |
| Finland | "Disaster" has no definition in legislation. Law "On | According to the government resolution on public | No answer provided | Not. There are several databases, from which it is |
| | extraordinary powers" confers to governmental institutions the broadened powers, including "in case of disaster if within regular circle of powers authorities cannot mitigate consequences" | security strategy, definition of disaster or emergency situation is based on whether the incident threatens vitally important public functions, which are: • administration • international and EU activities • defense capabilities • internal security • economy, infrastructure and safety of supply • maintenance of functional capacity of services provided for inhabitants • psychological resilience | | possible to receive incomplete information |
| Estonia | According to Extraordinary situation law", emergency situation is an event or event chain, which threatens life or health of many people or causes significant material damage or material damage damage to the environment or serious and extensive disturbances in continuous provision of important | No answer provided | No answer provided | No answer provided |

| | | | | |
|---|---|---|---|---|
| | services, and of which solution requires immediate coordinated activity of several institutions or involved persons | | | |

The table shows that the CBSS countries (which are simultaneously the EU Member States) currently have a very different approach to disaster data acquisition. Several countries do not define the term "disaster", as well as there are differences in relation to whether disaster management is within the competence of the State, federal state or local government. Data on disasters and their losses are fragmented, not comparable between countries and difficult to be analyzed. In some countries, data is available in Microsoft Excel format or not available at all.

As concluded in the paper, the creation of loss databases of 3 countries, if such are created at all, is often a response to disasters or disaster management needs in each country. In addition to their different spheres of activity, such databases differ in terms of institutional approval, legal context, and not always are in line with relevant disaster risk reduction policies and systems in Member States or at the EU level. In fact, the existence of legal enactments is not a mandatory requirement for a Member State to establish a disaster database. There is simply a need for constant involvement at national level in order to institutionalize the collection and recording of data on losses using a common and harmonized methodology. In addition, public investment mechanisms should be introduced to ensure the maintenance of loss databases. An overview of current practices in recording of disaster loss data in the EU Member States evidences that the methodologies used in each of them are rather fragmented and mostly sector-specific (not multisectoral) [17]. In order to adapt the existing disaster loss databases to requirements for data exchange both between Member States and with international organizations, adjustments should be made both in the data registration process and in data processing. Damage recording practices should also be strengthened to make data useful at national level, beyond narrowly defined objectives such as use for disaster prevention policy objectives or for risk assessments. The fact that the EU does not have a single system for recording disaster loss data is nothing new. In addition, many initiatives have proposed and developed their own databases, depending on the threat or specific objective at both national and EU level.

### 3.2. Developing a disaster database model and criteria scale

Obtaining a common set of information about each disaster or event is now a heavy task, because processes in Latvia are not formalized and not automated. Similarly, this should be done carefully in order not to leave any relevant information non-summarized. The main task is to create a detailed but flexible database structure that can include all threats and event types without losing valuable information.

The creation of a database of disaster risk management losses should follow the below principles:

- it must comply with current legislation (EU and national);
- it must be capable to collect and summarize data compatible with the Sendai structure reporting format;
- it must be compatible with the national risk assessment structure and provide data for risk analysis;
- must be compatible with the INSPIRE Directive.

The proposed database structure is based on the event. But another two categories are also needed to be implemented for data collection: assets and losses. Various types of assets are possible and other information may be associated with them. An asset can cause economic, environmental, cultural heritage and even human life loss, an asset may be associated with real estate, jobs or other categories. An asset may cause direct or indirect economic losses.

The event-identifying parameters in the proposed database schema are:

- event identifier;

- start date;
- duration/end date;
- event type;
- date of data updating;
- region/district/civil parish;
- event coordinates.

Events must have related refining parameters. Those are:

- Earthquake: magnitude , intensity, depth, affected population, affected area;
- Storm: category (Beaufort Scale); maximum wind speed; affected population, affected area;
- Storm tide: maximum sustained wind speed; affected population, affected area;
- Landslide: type of soil, speed of landslide/avalanche; depth of snow/landslide, affected population, affected area;
- Flood: flood source, flooded area affected area, rainfall, duration of precipitation, water depth, affected population;
- CBRN event: substance/allergen type, invasion, level of hazard, wind direction, wind speed, affected population, affected area, evacuation area;
- Cyberattack/terrorist attack: type of affected infrastructure, data loss/damage, attack object, hardware/equipment loss, affected area, evacuation area;
- Cosmic event: magnetic disturbance level, location of meteorite impact; level of solar and cosmic radiation, affected population, affected area;
- Forest/bog fire: wind direction, affected population, affected area;
- Drought: relative air humidity, number of days since last rainfall, soil composition;
- Nuclear safety event: scale of disaster (INES scale), radiation leakage, affected population, affected area, evacuation area; type of leakage of radioactive material;
- Climatological event: maximum/minimum temperature, number of days, affected population, affected area.

The Assets section should contain information about various assets, mainly real estate. The main source of information for the section output data is cadastral data of the State Land Service.

Assets have the following refining parameters:

- asset identifier;
- asset name;
- asset description;
- asset value;
- asset location identifier;
- population identifier;
- owner identifier;
- asset economic identifier;
- asset environmental identifier;
- asset cultural and historical identifier;
- asset coordinates.

The Assets section is linked to several other subcategories. The economic identifier provides information on economic data (if any) related to the asset. The cultural historical identifier provides additional information on cultural heritage data (if any) related to assets, such as year, type of heritage or costs of restoration. The environmental identifier provides additional information on environmental data related to the asset, such as environmental damage, costs of purification. The population identifier, based on cadastral data and information from other systems (Population Register, etc.), automatically provides data on people registered in the property and, if possible, performs it in a sufficiently detailed manner:

- gender (male/female);
- age (up to 18/adults/pensioners);
- incomes (low/medium/high);
- disability.

It should also be possible to enter/refine the data manually.

Value and loss categories indicate the asset damages, restoration or repair costs, costs of mitigating the consequences of the event. The value of real estate can be assumed as the average market value of one square metre in given area. The category of values and losses will be associated with the event category as well as the asset category by means of the event identifier. The basic scheme of the database is shown in Supplement 3. To ensure the comparability of data entry methodology and the results, it is proposed to adhere to the DesInventar methodology as well as

to use the DesInventar open source tooling that is available on the UNISDR website.

The criteria for including a disaster in the database must be clearly defined, not too low to prevent recording of daily event but also not too high to avoid losing information about events.

To place an event in the database, any of the following criteria must be met.

- ≥ 10 deaths;
- ≥ 500 injured;
- ≥10,000 affected inhabitants;
- ≥ EUR 500,000 losses;
- Announcement of disaster;
- Announcement of emergency situation;
- Announcement of exceptional situation;
- Requesting international assistance.

## 4. Conclusions

In the world and in Latvia, a special place is occupied by disaster management measures related to the prevention of possible disasters, as well as the accumulation of statistical information, which can later be used to assess the degree of risk, which depend on a particular type of threat. The paper analyzes the term "disaster" explanation and the criteria to be set for this term both in Latvia and in the world, the disaster management criteria and the regulatory enactments, from which the numerical criteria of the disaster are derived. The existing most popular international databases relating to the accumulation of information on scale of disasters and damages caused by them have been reviewed. Implementation of Seveso III in Latvia has been considered as well as therewith associated regulatory enactments and their importance in the context of Latvia as a tool for reducing risks.

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