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Article

# Comparative Analysis of Disaster Risk Management Systems in Germany, USA, Russia and China

Vladimir M. Cvetković,<sup>1,2,3,\*</sup> Katarina Andrić<sup>3</sup>

<sup>1</sup> Faculty of Security Studies, University of Belgrade, Gospodara Vučića 50, 11040 Belgrade, Serbia

<sup>2</sup> International Institute for Disaster Research, Dimitrija Tucovića 121, 11056 Belgrade, Serbia;

<sup>3</sup> Scientific-Professional Society for Disaster Risk Management, Dimitrija Tucovića 121, 11056 Belgrade, Serbia; (K.A.) - kacaandr@gmail.com;

\* Correspondence: vmc@fb.bg.ac.rs

**Abstract:** The uniqueness of each system stems from the fact that the risks of disasters are specific and that their presence and manifestation are not universal and the same for every country. Just as no country is the same in all other segments, their disaster risk management systems are unequal. The paper describes the systems in four different countries, through observation and comparison of four areas of activity that are implemented in dealing with disasters. First of all, in the paper, the legal basis and institutional frameworks on which these systems rest in each of the countries were considered – starting from the international level and guidelines given at international conferences, to all by-laws and local disaster activity plans. It was considered how each of the states implements risk mitigation activities and how it increases preparedness for them. When the system recognizes risks, their probability and the frequency of their occurrence, activities are planned to prepare the country and every individual in it for a potentially unwanted event. Differences in the ways of mitigating risks and preparing all elements of the system and protected values for disasters are presented. The third element of action in the event of disasters concerns the response. In this segment, questions are raised regarding institutional solutions in the system, division of responsibilities, the priority of response and mobilization of resources at all levels. The last phase, the one that occurs after the disaster, and that is the recovery from it, depends on the reaction. In the paper, it was discussed how in the end, when a disaster occurs and when damage to the population, environment, material and other goods occurred, how each of the states implements reconstruction, i.e. how it recovers - whether that recovery was previously well planned or whether ad hoc solutions are applied.

**Keywords:** disaster risk management; mitigation; preparedness; response; recovery; Germany; USA; Russia; China

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## 1. Introduction

If the definition of risk given in the Terminology of the United Nations International Strategy for Disaster Risk Reduction (2009) is taken into account when considering the risk of disasters, where it is stated that risk is obtained from the combination of the probability of an event and its harmful consequences, the question can be asked, what are these events and what are the consequences if the subject of consideration is an organized state? In this case, the state can be viewed as an entity that has its laws, systems, geographical space, economy and sources of income, residents and their material, cultural and other assets. Harmful consequences that may occur due to the previously mentioned elements include the potential loss of life, injury, destruction or damage to property, interruption in the functioning of the economy, damage to critical infrastructure, interruptions in the supply of food, medical services, budget consumption and the like. If a disaster occurs, whether natural or man-made, all consequences come into play.

In large systems such as the state, the risks understood in this way and all the potential damages that the risks bring with them are difficult to quantify and predict completely. What can be implemented is, first of all, to recognize what is characteristic of the given territory and what are the possibilities for preventing the occurrence of damage. On those foundations, systems are further built that include the recognized risks of disasters. As no country is the same, disaster management systems cannot be the same. This means that all state characteristics must be considered in the social, economic, political, social, cultural and cultural-historical framework. Also, not all risks can be given equal priority. To prevent greater damages and losses, a smaller part of the losses i.e. risks must be accepted because if all resources are spent on many different dangers, not a single danger will be fully eliminated. Taking into account the increasing exposure of society to natural and other disasters, the extent of damage and the difficulty of recovery, there has been a development of awareness at the international level about joint action in the field of risk mitigation and preparedness of states for response and recovery from disasters and their consequences.

In the context of expressing increasing concern about the population affected by disasters, as well as the hindrance of further development, in Yokohama, Japan in 1994, member states of the United Nations, as well as other states, gathered within the framework of the World Conference on Disaster Risk Reduction. The conference included not only states but also non-governmental organizations, international organizations, the scientific community, the media, as well as interested parties from the field of industry and business. In the years leading up to the conference, there was an increase in suffering and economic losses due to disasters, and that societies became vulnerable, especially developing countries. As a result, the Yokohama Strategy and accompanying Action Plan were adopted, which set the foundations of the disaster risk management system. To establish and maintain a policy of sustainable development, indispensable elements must be disaster prevention, mitigation, preparedness and recovery after disasters, whereby environmental protection must have equal importance as the previously mentioned elements. Each country must incorporate these elements into development plans and ensure that all measures are implemented at the national, regional and international levels (World Conference on Natural Disaster Reduction, 1994).

Since disasters do not know borders between countries, there must be mutual cooperation and coordination between the affected areas to respond promptly to the occurrence of a disaster. To achieve this, it was necessary for there to be a consensus at the highest, international level about the elements of preparedness, response and recovery from disasters that will be implemented in national disaster risk management systems. Each country establishes, maintains and changes its system, adapted to its normative legal arrangement, development and possibilities for disaster management, and based on those given at the international level. As noted at the World Conference on Disaster Risk Reduction (1994) - establishing cooperation and joint and coordinated action is key to reducing the risk of disasters that spatially affect two or more countries. This cooperation is reflected in the exchange of knowledge, technology, and information, but also in joint activities in the field of prevention. These activities must be organized at all levels, which means that community involvement and active participation in the implementation of measures must be taken into account.

During the 1990s, an increase in the frequency of disasters was observed compared to the 1980s. 2.5 times as many people died, while the economic damages were three times higher. It showed that all measures related to disaster management policy require a certain time to show their effectiveness. Despite such negative growth trends, it is believed that the harmful consequences would have been even greater if efforts had not been initiated to establish disaster risk reduction at the international level. After these negative consequences, the Secretary General of the United Nations, Kofi Annan, emphasized the need for further work in the field of disaster risk reduction within the International Strategy for Disaster Risk Reduction, which emphasized the importance of society's

resilience to disasters. To achieve this, at the national level, it is necessary to integrate preventive strategies in the activities of achieving sustainable development (Bobrowsky, 2013).

These activities were followed by the World Conference on Disaster Risk Reduction in Hyogo, Japan from January 18 to 22, 2005, which was attended by approximately 4,000 people from both governmental and non-governmental organizations - 168 countries, 78 observer organizations, 161 non-governmental organizations and over 560 journalists. On that occasion, the Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters was adopted. The framework is a guide for countries in the field of disaster risk reduction and consists of various principles, priority areas and practical guidelines, the implementation of which increases community resilience. It is envisaged that all conference participants will implement this framework in their actions. The most important determinants of the Hyogo framework were primarily related to the fact that disaster risk reduction must become both a national and a local priority. To implement the above, there must be a strong institutional basis (Building the Resilience of Nations and Communities to Disasters, World Conference of Disaster Reduction, Japan, 18-22 January 2005). This reiterated the importance of the regulation of each state individually, which means that each state, with its own solution that are adapted to the community and regulation, must achieve that disaster risk management is equally regulated at all levels of functioning - from the individual to the national level. The institutional basis implies the establishment of a body whose functioning will be detailed and comprehensive.

## 2. Methods

The aim of the research is a scientific description and mutual comparison of the disaster risk management systems of the Federal Republic of Germany, the United States of America, the Russian Federation and the People's Republic of China concerning the international and national regulations that are the basis for the establishment and functioning of the aforementioned systems. The method of content analysis, comparison and historical methods used in the study of the mentioned problem. To find out about the foundations on which the disaster risk management systems of the mentioned countries were established, documents adopted at the international level will be used as data sources, followed by strategies, laws and other regulations of each country. Through the analysis of the mentioned sources, they try to explain the foundation and basic principles on which these systems were developed. In addition, for the sake of a comprehensive mutual comparison of systems, various reports and publications of international organizations, scientific and professional journals, monographs and other available domestic and foreign literature relevant to the subject of theoretical research will be used as data sources.

## 3. Comparative analysis of disaster risk management systems

### 3.1. Disaster risk management in Germany

When considering the normative legal framework for disaster risk management, it is necessary to start from the Basic Law, i.e. of the Constitution of the Republic of Germany (1949). The Constitution regulates mutual assistance between federal states and provinces during disasters, financial assistance in the event of disasters, as well as budget management at all levels, including disasters. In addition, acts of importance in the field of disaster risk are the Law on Food Safety and Food Supply from 2019, the Law on Prevention of Disasters from 1999, the Law (Agreement) from 1998 and the Law on Civil Protection and Assistance in case of disasters from 1997. Examples of norms at the national level include the following acts (European Civil Protection and Humanitarian Aid Operations, 2021): a) German strategy for adapting to climate change; Implementation of

the EU flood directive; "Flood Protection Program"; National strategy for the protection of critical infrastructure.

Around 200 million people are affected every year by extreme natural events such as earthquakes, severe storms, prolonged droughts and major floods. More and more people, infrastructure and assets are located in densely populated and increasingly vulnerable areas that can be affected by disasters. However, with the rapid development of urban areas and economic zones, little consideration is given to disaster risks. Many German actors have many years of experience in disaster risk management, but they have not always used this knowledge in a collaborative and coordinated way to tackle global challenges. German and regional actors working in networks have jointly developed and strengthened approaches to improve disaster risk management worldwide. The German federal government established the Global Initiative on Disaster Risk Management under the authority of the Federal Ministry for Economic Cooperation and Development (Global initiative on disaster risk management, 2022). The global initiative promotes networks that bring together German and international stakeholders from the government, the private sector, academia and civil society. Its goal is to develop customized solutions for specific challenges in disaster risk management and to meet global demand by devising high-quality, innovative and sustainable approaches.

The Global Initiative (2022) focuses on strengthening civil protection and disaster risk management, protecting critical infrastructure, preserving economic cycles and developing, upgrading and expanding early warning systems. The initiative thus supports the implementation of the international Sendai framework for disaster risk reduction and regional action plans. It develops demand-driven products and systems to ensure more effective disaster risk management. The Swiss Agency for Development and Cooperation acts as a partner in financing and conducting regional disaster risk management simulation exercises within the initiative.

In many Southeast Asian countries, small and medium-sized enterprises make up about 97 to 99 per cent of the economy. These businesses are often particularly hard hit by the economic impact of extreme natural events. In globally networked economic cycles, failure caused by local disasters often not only affects individual businesses, sectors or industries. It can also have systemic repercussions on entire economies (Global initiative on disaster risk management, 2022).

Together with the Asian Center for Disaster Preparedness, the Asian Development Bank and the relevant authorities for small and medium enterprises in Indonesia, the Philippines, Thailand and Vietnam, the initiative is putting together country studies to be able to determine the scope of services needed and look at local institutional, legislative and operational frames. In each country, the focus is on establishing one-stop centres with the support of government agencies and trade associations. The role of these centres is to advise on all disaster risk management issues. Risk analyses are conducted as a way to better assess vulnerability. Together with the actual jobs, the measures that will reduce the risks are identified. Risk transfer and financing options, as well as business continuity management strategies, are also being designed (Global initiative on disaster risk management, 2022).

Also, the initiative (2022) covers the areas of public transport infrastructure and basic services such as water and health care are vital for the efficient functioning of society. If such critical infrastructure is destroyed or services disrupted as a result of extreme events, this can often have a devastating effect on the population and a long-term detrimental impact on socio-economic development. When planning and implementing public investment projects, it is important to take into account the risks of disasters and the risks arising from climate change, as this can be effective in achieving sustainable development.

The range of services offered by the Global Initiative is based on an approach first implemented in Peru that systematically identifies the risks associated with investment projects. Risk mitigation measures are then selected and deployed according to cost-benefit projections. This also protects the sustainability of the investment itself. The Global

Initiative is now refining and expanding this approach, focusing on its application in corrective management and disaster-resilient reconstruction (Global initiative on disaster risk management, 2022).

### 3.1.1. Disaster mitigation and preparedness

Germany's federal structure is reflected in its national disaster management system with shared responsibilities between the Federation and the federal states. "Civil protection" in the general sense is "protection of the population". It is a comprehensive concept and consists of 2 different elements: disaster protection and civil protection. According to the Constitution (1994), federal states are responsible for disaster management in times of peace. They enacted appropriate laws on disaster management, defining, among other things, the responsible authorities for disaster management and delegating several administrative and operational tasks to regional and local levels. In the case of defence, for example in times of war or armed conflict, the Federation is in charge of civil protection, as stated in the Federal Law on Civil Protection and Aid in the event of disasters from 1997 (European Civil Protection and Humanitarian Aid Operations, 2021). For some of its civil protection tasks, the Federation relies on the resources of the federal states and supplements them if necessary. This means that there is an integrated emergency management system. The Federation provides additional equipment, supplies and training to the states as needed and can support them in the event of a disaster at their request (disaster assistance).

The Federal Ministry of the Interior, Buildings and Communities is the superior federal state authority for civil protection. The role of this ministry is to coordinate interdepartmental cooperation and is generally responsible for national/internal security. The Federal Ministry of Home Affairs, Buildings and Communities oversees 2 national civil protection agencies. The Federal Office for Civil Protection and Disaster Relief performs specific tasks of the Federation related to civil protection, such as risk management, public warning, information and resource management, chemical, biological, radiological and nuclear defence and health protection, protection of critical infrastructure and cultural goods, research, international cooperation, etc. Specialists of the Federal Chancellery for Civil Protection and Aid in Disasters develop strategies, conduct crisis management exercises and raise public awareness in order to improve self-protection (European Civil Protection and Humanitarian Aid Operations, 2021).

The Federal Technical Assistance Agency is a government non-profit organization. As a technical-operational agency, its tasks include technical assistance and assistance in a large number of emergency situations, in Germany and abroad (Kohlmann, 2021). The operational base at the local level relies on the volunteer potential of, for example, fire services, local disaster management authorities and relief organizations. More than 1.8 million volunteers form the backbone of the system, which is reinforced by full-time professional staff. Civil-military cooperation, due to shared responsibility in times of peace or conflict, as described earlier, is particularly relevant in Germany and is carried out at all administrative levels and includes planning, training and exercises. At the national level, the Federal Office for Civil Protection and Disaster Relief and the Joint Support Command of the Federal Armed Forces (Bundeswehr) coordinate civil-military activities. Identifying risks and contributing to disaster prevention through risk reduction requires a cross-sectoral approach. Both at the national and sub-national level, preventive elements are incorporated into the legal and conceptual frameworks of various sectors such as the environment, health, agriculture, water management, critical infrastructure, urban planning, education, development cooperation and consumer protection, etc. At the regional and local level, the competent authority can also consider preventive aspects in the sector concerned, involve appropriate disaster management authorities and thus contribute to a harmonized approach (European Civil Protection and Humanitarian Aid Operations, 2021).

Disaster risk control and disaster relief are public tasks in Germany. But the government has transferred the responsibility of managing these tasks to the 16 states, because Germany is a federal republic. The same applies to civil defence and civil protection in case of military or international risks. These 16 states are also responsible for rescue service, fire service and disaster risk control legislation (natural and technical disasters). Districts and cities without districts are responsible for the organization of these services (Domres, 2000). The German system is based on the principle of subsidiarity between official and private institutions. Many official and private humanitarian organizations are responsible for carrying out disaster relief tasks. In Germany, there are the following organizations: Federal Technical Support Service, Fire brigades/professionals and volunteers, Academy for Emergency Planning and Private Civil Protection German Rescue Association, German Red Cross, and Ambulance. Various organizations specialize in the fields of rescue, medical and social services, and disaster relief. These NGOs carry out 80% of disaster rescue activities and 95% of disaster medical assistance (Domres, 2000).

Non-governmental and governmental organizations employ more than 1.2 million volunteers and approximately 100,000 professionals. Rescue service is performed by professionals and assistance in disasters by volunteers. The German constitution allows the federal army to be called up in the event of a disaster, to support disaster relief organizations (for example: the Oder river flood in 1997, the train crash in 1998). In all districts and district-free cities, the administration establishes disaster control headquarters. During disaster relief operations, the operational command is on site (Domres, 2000)-

In most counties and county-free cities, medical directors, rescue personnel managers along with fire officials are responsible for the organization of medical assistance and rescue. All emergency physicians and medical managers have undergone special training or a 520-hour course. All medical service volunteers in disaster relief organizations are trained in special courses (90 hours). In recent years, civil protection, disaster relief and rescue services have been reorganized. Civil protection was reformed in 1997 by a new federal act. Federal disaster relief is supported by the Federal Government with approximately 9,000 vehicles and a training budget (Kohlmann, 2021).

Emergency physicians must participate in (80) eighty hours of emergency medicine from an interdisciplinary perspective; they are allowed to perform rescue missions only after proving basic experience in emergency medicine as well as after completing at least (18) eighteen months of the postgraduate training period. Senior emergency doctors receive additional (40) forty-hour theoretical and practical training - after at least three years of practice in rescue services. Various institutions and organizations offer special training courses for medical and non-medical personnel to deal with disaster situations (Kohlmann, 2021).

### 3.1.2. Disaster response and recovery

When the first floods hit southwestern Germany in 2021, local emergency authorities were the first to launch rescue operations on the ground. However, soon after their response to the resulting disaster, it became apparent that the resources available at the local level were insufficient, as was the local governance itself. Such a disaster required a response that would have to be coordinated from the highest level in a defined chain of disaster management and responsibility. Competent authorities at the level of the affected districts coordinated the tasks of the police, firefighters and emergency services, which carried out activities to save the lives of the affected population and provide first aid in the most vulnerable areas (Kohlmann, 2021).

Germany has a total of 294 districts and 107 self-governing municipalities, including major cities such as Potsdam, Cologne and Leipzig. In major emergencies, district governors may request assistance from other, less affected regions to pool their crisis-fighting capabilities into task forces. They are usually established and run by a regional

state government, of which there are 16 in Germany's federally-based political system (Kohlmann, 2021). Only when crisis management at the federal level fails is the central government in Berlin allowed to ally with the Federal Office for Civil Protection and Disaster Relief. But for the Federal Office of Civil Protection and Disaster Relief to become actively involved in a crisis, the relevant community or municipality must first declare a state of emergency. And only then, the German armed forces can join the rescue effort, or the federal police forces are allowed to maintain law and order (Kohlmann, 2021).

Another organization often assigned to emergencies or natural disasters in Germany is the Federal Agency for Technical Assistance. Federal Technical Assistance Agency teams have special technical capabilities and expertise to provide effective relief, particularly in flood and earthquake disasters. The agency's membership of 80,000 members is primarily made up of semi-professional volunteers, who are also often deployed on relief operations abroad, for example, to restore utilities such as water and electricity to the grid (Kohlmann, 2021). During the current flood crisis in Germany, pumping crews within the Federal Agency for Technical Assistance have successfully prevented several dams from bursting (Ullrich, 2021).

Volunteerism is also the main feature of the work of millions of other rescuers and helpers organized in associations such as the charity and humanitarian organization - the German Red Cross (DRK), the DLRG German Life Saving Association and church humanitarian organizations such as St. John's Disaster Relief or the Maltese Help Desk (Ullrich, 2021). In Germany's most populous state, North Rhine-Westphalia, nearly 400 volunteer fire brigades are part of the state's fire protection structure and complement around 30 fully professional fire brigades (Ullrich, 2021).

Monitoring water levels in German rivers and lakes is the task of flood control centres, which are also run by each of the 16 federal states. They should set off alarms in case of likely flooding. However, transboundary waterways, such as the Rhine River, are monitored by international commissions (Reuter, Kaufhold, Leopold, & Knipp, 2017). The German Meteorological Service is in charge of weather forecasting and uses a three-level warning system: early warning, forecast/premonition, and special district warnings (Reuter, Kaufhold, Leopold, & Knipp, 2017). Weather alerts are often disseminated to the general public through the NINA application developed by the Federal Office of Civil Protection and Disaster Relief. It informs users anywhere in Germany about dangers near their location. In the current disaster, however, it appeared that only a few Germans had NINA installed on their mobile phones (Reuter, Kaufhold, Leopold, & Knipp, 2017).

The aid package that the German government approved after the disaster was about (400 million euros, ie 472 million dollars) intended for emergency aid for all flood victims in the affected areas. After the financial aid was approved, the German government promised to quickly begin the reconstruction of the devastated areas. At that time, it was not possible to precisely define the financial resources needed for full recovery after the disaster, but according to preliminary estimates, it was assumed that this amount would be over several billion dollars (AXA XL Reinsurance & Cambridge Center for Risk Studies, 2013).

In addition, the situation was such that there was a possibility to allocate additional funds, which was confirmed by Finance Minister Olaf Scholz. According to the study (2013), he then said that the package, half funded by the federal government and half by the German state government, to help people deal with the immediate consequences of the floods, would eventually be bigger if more money was needed. According to the study, the finance minister at the time said: "We will do whatever it takes to help everyone as soon as possible." The authorities in the two affected states are responsible for the details of who receives how much money and how, but Minister Scholz said at the time that it was indicated that there would be no means test and that it would be a "very unbureaucratic process" (AXA XL Reinsurance, 2013).

### 3.2. Disaster risk management in the USA

In the United States alone in 2014, there were eight weather and climate-related disasters with losses exceeding \$1 billion per event. These events resulted in the deaths of 53 people and had significant socio-economic effects on the affected areas, particularly on vulnerable populations including indigenous peoples (Lindell, 2013). The National Disaster Recovery Framework of the Federal Emergency Management Agency of the US Department of Homeland Security (FEMA) (National Disaster Recovery Framework, 2016) is a guide that enables effective recovery support for states, tribes, territories and localities affected by a disaster. In addition, it provides a flexible structure that allows responsible disaster recovery structures to work in a unified and collaborative manner. It also focuses on how best to recover, restore and re-establish normal flows for the health, social, economic, natural and ecological fabric of the community and build a more resilient nation. The framework (2016) defines the basic principles of recovery; roles and responsibilities of recovery coordinators and other stakeholders; a coordinating structure that facilitates communication and cooperation between all interested parties; guidelines for pre- and post-disaster recovery planning, and the overall process by which communities can take advantage of opportunities to rebuild stronger, smarter and safer.

The National Preparedness System is an organized process for moving the entire community toward preparedness activities and toward achieving the national disaster preparedness goal. This system integrates efforts in all five areas of disaster preparedness and response: prevention, protection, mitigation, response and recovery, to achieve the nation's security and resilience. The National Disaster Recovery Framework, which is part of the National Preparedness System, describes the strategy and theory of how the entire community should build, maintain and coordinate the use of available resources for response and recovery, identified by the national preparedness objective integrated into other parts of the mission. The second edition of the framework looks back at lessons and insights from past incidents and integrates them into the national preparedness system (National Disaster Recovery Framework, 2016).

### 3.2.1. Disaster mitigation and preparedness

Understanding hazard mitigation in the United States first requires an understanding of how emergency management activities have historically developed. E. L. Quarantelli, one of the leaders in the sociology of disasters, described the beginnings of disaster research as "almost exclusively supported by US military organizations with very practical concerns about war situations". He notes that these "organized research activities took place from about 1950 to 1965" and that their primary goals were civilian organizing in wartime situations, assuming that "morale is the key to disaster control" and that "effective disaster control involves ensuring compliance with emergency regulations' and 'reducing and controlling panic reactions'. The federal government took further action during the 1950s by undergoing several reorganizations within the Department of Defense (Drabek & Evans, 2007).

Before and during that time, the federal government was primarily concerned with civil defence, so "private, voluntary agencies such as the American National Red Cross, the Salvation Army, and many others bore the primary responsibility for disaster relief; and state and local governments managed as best they could". Federal aid was available as an absolute last resort through "special relief acts enacted by Congress." However, this system had operated essentially unchanged since 1803, and because of its reactive nature, there were "frequent delays before federal aid reached affected areas, and the nature of the aid was limited to selected purposes" (Drabek & Evans, 2007).

Two interesting notes about the observations in the disaster: first, the basis of the government's emergency management activities came from a military and national defence perspective. The first "emergencies" in this regard were wars or attacks by foreign invaders. This militaristic approach – managing the disaster as an enemy attack – would significantly shape emergency management in later years. Second, government activities in the early years were largely reactive. Planning, especially with an emphasis on



mitigation, is not mentioned. The reactive war approach may seem antiquated outside of a Cold War context, but it is essential to understanding the development and determination of current feelings towards planning within local authorities. Such a previously present and inherited defence mentality is still the dominant approach to loss prevention at the local level and helps to explain actions at all levels of government, in all modern aspects of emergency management (Slovic & Weber, 2002).

Disaster preparedness in the US involves implementing measures to help populations and communities improve preparedness. This is achieved by developing the resources needed for disaster prevention and protection, response and recovery. Improving community preparedness encompasses all disasters, whether earthquakes, cyber-attacks or accidents – the goal is always the same, which is to achieve safety and resilience (National Preparedness Report, 2021). On March 30, 2011, the President of the United States of America issued a Directive related to the preparedness of the nation for disasters (Presidential Policy Directive: National preparedness, 2011). The goal of this document is to strengthen the resilience of the United States of America through systematic preparation for all potential threats that threaten the nation's security, including terrorism, cyber-attacks, accidents and natural disasters. Preparedness cannot be seen only as a national issue – it must involve a greater number of participants such as all levels of government, the private and non-profit sectors, but also us citizens. What experience has shown is that the results in situations where there is a danger for the entire nation are better if all the actors have a defined role and assume that role. This means that it is not just the government that is responsible for responding (National Preparedness, 2021).

The directive provided for the Ministry of National Security to draft a document related to the national goal of disaster preparedness. The second edition of this document was published in 2015 and defines basic activities in the field of prevention, protection, mitigation, response and recovery in case of disasters. These activities are not exclusive when it comes to all actors participating in disaster activities, but require joint efforts of the entire community (National Preparedness Goal, 2015).

The national preparedness system consists of six parts: risk identification and assessment (collection of both historical and modern data on all existing, potential and predicted hazards, which are then evaluated to provide a basis for further steps), assessment of requirements system (some resources may already exist, some need to be formed or improved), building and maintaining readiness (determine which resources are most suitable for increasing readiness - based on risk assessment), planning to make all recognized resources available to relevant actors, resource assessment (determine whether the activities produce results, through exercises, simulations and the like), checking and improvement (all risks, resources, activities need to be reassessed from time to time to make changes promptly).

Of great importance for improving preparedness are exercises and training that help the population to check resources, gaps, strengths, established practices, etc. Examples of such exercises supported by the US Department of Emergency Management are the National Training Program and the National Security Training and Evaluation Program. The first consists of multiple cycles of 2-year exercises that are conducted across countries and aim to test and improve preparedness in all areas of disaster response. Priority is given to strategically priority activities. The second program provides users with a guide that any organization can apply to establish an effective training and evaluation program within its framework in accordance with recommendations related to management, design, development of programs, implementation of evaluation, and, subsequently, improvement planning (National Preparedness, 2021).

An example of using technology and smartphones to increase preparedness is an application developed by the US FEMA that is a source of data on all types of disasters. The user of the application can learn from it how to quickly and easily prepare for the upcoming danger. First of all, the application contains a territorial exposure to disasters,

which means that the user can find what dangers exist in the territory where he is located. Using the app, insights can be gained that can help users create their family disaster communication plan that includes important phone numbers and medical conditions of family members that can be made available to others in case of medical emergency. Next, the app can help users pack a first aid kit (flashlight, extra batteries, copies of important documents, water, and non-perishable food), as well as information on what to do immediately after a disaster. Through the application, users are provided with current weather data and emergency warnings issued by the National Weather Service. Also, the application makes it possible to find the nearest shelter if there is a need to evacuate citizens. When it comes to recovery, you can find out from the application whether FEMA assistance is organized and available in the vicinity of the affected area, whether there is a Disaster Recovery Center nearby. The app allows users to automatically connect to a FEMA center at their point of need. Information on free first aid courses can also be found through the app (FEMA App: Take Charge of Disasters, 2022).

### 3.2.2. Disaster response and recovery

In the United States, the president declares disasters to free up vital federal resources for state and local governments. At the same time, the United States regularly provides essential support to foreign countries affected by tragedy. The increasing frequency and intensity of disasters, which many associate with global warming and human development patterns, present urgent new challenges to the preparedness and efforts of the United States of America. US states and territories, as well as tribes, typically respond to disasters and smaller-scale emergencies on their own or with the help of nearby jurisdictions and volunteer groups. But in cases where the scale of the disaster exceeds local capacity, these authorities can appeal for help from Washington. Normally, the federal government only comes in when the governor makes a formal request to the White House. These appeals are generally based on a preliminary damage assessment conducted by a team of local, state and federal officials. Housed within the Department of Homeland Security, the Federal Emergency Management Agency (FEMA) is responsible for coordinating Washington's response to disasters on US soil (Labrador & Cheatham, 2020).

The president, after deciding that federal aid is warranted, initiates a physical and financial government response by issuing either a major disaster or a state of emergency declaration. Alternatively, he may deny the claim if he finds that jurisdiction can be recovered independently (Labrador & Cheatham, 2020). Under the Stafford Act, the main law governing federal disaster response, "major disasters" are defined as both natural and man-made events, including "any hurricane, tornado, storm, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm or drought." In addition, serious fires, floods and explosions may require determination. This category generally does not include disease outbreaks. However, following the 2020 novel coronavirus pandemic, President Donald J. Trump declared simultaneous major disasters in all fifty states, an unprecedented move that some experts saw as a violation of Stafford's Law (Labrador & Cheatham, 2020).

The National Disaster Recovery Framework (2016) provides effective recovery support to states, tribes, and territorial and local jurisdictions affected by a disaster. It provides a flexible structure that allows disaster recovery managers to work in a unified and collaborative manner. The National Disaster Recovery Framework focuses on how best to restore, restore and rebuild and restore the health, social, economic, natural and environmental fabric of the community and build a more resilient nation. The National Disaster Recovery Framework is the first step toward achieving a shared understanding and shared, integrated perspective to achieve unity of effort and build a more resilient nation (What a Successful Disaster Recovery Looks Like, 2013). This framework can be understood as a guide published by the US government to promote effective disaster recovery in the United States, especially for those large-scale or catastrophic incidents (National Disaster Recovery Framework, 2016).

This framework (2016) provides a comprehensive interagency coordination structure for the recovery phase of incidents covered by the Stafford Act. Elements of the framework may also be used for significant incidents that do not comply with the Stafford Act. It serves as a companion document to the National Response Framework (NRF). The National Disaster Recovery Framework (2016) defines basic principles of recovery, the roles and responsibilities of recovery coordinators and other stakeholders, a coordination structure that facilitates communication and collaboration among all stakeholders, guidelines for pre- and post-disaster recovery planning, and the overall process by which communities they can take advantage of the opportunities for renewal.

After Hurricane Katrina, the United States government passed federal legislation that mandated the creation of a national disaster recovery strategy. FEMA took the lead in developing the NDRF, issuing the first edition in September 2011 and the second edition in June 2016. The National Framework (2016) has been updated to include guidelines for effective recovery by defining roles, responsibilities, coordination and planning among federal, state, local, tribal and territorial jurisdictions.

### *3.3. Disaster risk management in Russia*

In Russia in the early days of its existence as a separate country, the disaster response scheme was not so well defined. Some ministries had their own disaster services, but their training was highly specialized for specific activities. The legal effectiveness of the former civil defence system was conditioned by a number of problems, the most serious of which are (Disaster Management in the Russian Federation, 2006): the absence of a permanent governing body with sufficient powers and experience to coordinate prevention and response in disasters; the absence of rapid reaction forces; the absence of professional rescuers and the legal basis for disaster prevention and response activities. As is the case in other countries, as well as in Russia, the area of disaster prevention and response must be legally established and regulated. Examples of regulations in this area are the Law on the Protection of Population and Territory from Disasters of Natural and Technological Origin, the Law on Civil Defense, the Law on the Supply of Federal Needs, the Law on State Reserves of Material Assets for Response to Disasters (Disaster Management in the Russian Federation, 2006).

As for the institutional framework, against the background of the monstrous number of victims in the Spitak earthquake (1988), the absence of an appropriate system was all too evident. By its decree of December 27, 1990, the Government of the Russian Federation established the Russian Rescue Corps on a par with the State Committee, and in 1994 the Committee was reorganized into the Ministry of Civil Defense, Emergency Situations and Elimination of the Consequences of Disasters (EMERKOM of Russia) (Roffey, 2016). The Ministry is a federal agency that directs and coordinates activities in the field of civil protection, prevention and response to disasters caused by accidents, natural and man-made disasters, use of conventional and other weapons, and special underwater rescue operations. The Ministry of Civil Defense, Emergency Situations and Elimination of the Consequences of Disasters work in cooperation with federal authorities, entity agencies (regions and republics) of the Russian Federation and administrations of local communities. The Ministry of Civil Defence, Emergencies and Disasters is an executive federal body that is responsible for the development and implementation of government policy and legal regulations, control and supervision in the field of civil protection, protection of citizens and territories from natural and man-made disasters, and providing protection against water and fire. The President of the Russian Federation supervises and controls the activities of the Ministry of Civil Defense in emergency situations and disasters. The first and major step of the Ministry of Civil Defense for Emergency Situations and Disasters was the construction of a modern system for prevention and response to disasters, where the Ministry acted as its central body for organization, direction, coordination, etc. The creators of the new Russian state system of disaster management (RSDM) guided their activity according to a series of principles considering the current situation (Roffey, 2016).

The principles were as follows (Disaster Management in the Russian Federation, 2006): the principle of adhering to a comprehensive approach to the formation of the System, that is, taking into account all possible types of disasters, all stages of their progress, the variety of their effects, all possible methods of their suppression and all resources which are required to take effective actions; it is accepted that the so-called zero risk is impossible; the system was based on the principle of preventive security.

The state system of disaster management includes state bodies of the Russian Federation at all levels, administrations of local communities, various industrial and economic entities and organizations whose activities are related to the problems of protecting the population and territories from disasters, as well as units and facilities necessary for disaster response. The systems consist of territorial and functional subsystems and have five levels: federal, regional, territorial, local and on-site. The subsystem of territorial prevention and response to disasters is formed in entities (regions and republics) of the Russian Federation for prevention and response to disasters on their territory and consists of units that correspond to the administrative division of these levels. Functional subsystems are formed by federal agencies for the organization of prevention and response to disasters in the respective branches of industry and economy. There are more than thirty such subsystems, for example the forest fire subsystem based on the Federal Forestry Service, the seismology and earthquake forecasting subsystem based on the Russian Academy of Sciences, and others (Disaster Management in the Russian Federation, 2006).

The interdepartmental commission is made up of representatives of federal ministries in the rank of deputy ministers whose responsibility is the problems of protecting the population and territory from disasters. The interdepartmental commission is fully responsible for making decisions. All bodies belonging to the Commission at the federal and local levels are obliged to implement the decisions of the Commission. The system is organized so that responding to disasters is the responsibility of a unit at the local level or a body in the territory affected by the disaster. The response is carried out under the direct command of the relevant disaster commission. When disasters are of such a scale that they exceed the available forces of the lower level of management, the local level can request the help of commissions at a higher level. Assistance is reflected in the coordination of response or in the provision of humanitarian aid. Apart from this, help can also be requested at the federal, highest level (Disaster Management in the Russian Federation, 2006).

### 3.3.1. Disaster mitigation and preparedness

The basis of the national structure for the coordination and implementation of activities in the field of disaster risk reduction is the unique state system of prevention and elimination of emergency situations (RSES), which was founded in 1992. The new regulations of the RSES are supported by the decree of the government of the Russian Federation no. 794 of December 30 "Unified state system for preventing and eliminating emergency situations". The state system for the prevention and elimination of emergency situations integrates management bodies, the strength and means of federal executive bodies, executive bodies of subjects of the Russian Federation, local administration bodies and organizations authorized to solve problems in the area of population and territory protection in emergency situations. Within the framework of the system, activities are carried out on the development and implementation of legal and economic standards in this area, thus ensuring the readiness of the population (National Report of the Russian Federation at the World Conference on Disaster Reduction, 2004).

The basic activities and goals of the system are the prevention of incidents from disasters and natural disasters; reduction of losses and damages in emergency situations; elimination of emergency situations, including the execution of emergency rescue operations, as well as other measures to eliminate non-immediate danger to people's lives (National Report of the Russian Federation at the World Conference on Disaster Reduction,

2004). The unique state system for preventing and eliminating emergency situations consists of territorial and functional subsystems and has five levels: federal level - covers the entire territory of the Russian Federation; regional level - covers the territory of several subjects of the Russian Federation; territorial level - covers the territory of the subject of the Russian Federation; local level - includes the territory of the district (urban settlement); facility level - includes the territory of the commercial facility. RSES has management bodies at each level; permanent working bodies of control; reserves of financial and material and technical resources; systems of communication, notification, information supply, and special educational institutions (National Report of the Russian Federation at the World Conference on Disaster Reduction, 2004).

Also, research into natural hazards and risks in the territory of the Russian Federation and the former Soviet Union is significant. Disaster research is considered important for risk mitigation as it provides familiarity with the risk, identification of its basic elements, etc. There are many studies of disasters in Russia, however, they were not available outside the borders of the country because there was no translation of them. The aim is to promote such research so that it is available to the wider community. Despite the significant research efforts undertaken by Russian scientists, the methods and results are hardly known among non-Russian researchers and are neglected by the international research community simply because many sources are available only in Russian. One example of such research is the textbook "Fundamentals of Avalanche Science" by Bozinski and Losev (1998), the Russian version originally published in 1987, which was translated only at the initiative of the Swiss Federal Institute for Snow and Avalanche Research in Davos, Switzerland. Also, on the topic of disaster and risk research efforts, a movie can be downloaded from Springer's Natural Hazards journal website that reports on the first full-scale debris flow tests conducted by the Kazakhstan Scientific Research Institute of Hydrometeorology in the early 1970s. them. As with many other works and records, there was no adequate translation for this film until a collaboration between Lomonosov Moscow State University, Russia, and the University of Natural Resources and Life Sciences in Vienna, which made the translation and thus the availability of the film possible (Fuchs, Shnyparov, & Jomelli, 2017).

The Russian Federation is systematically working to improve the protection of people and territories from natural or man-made disasters within the framework of the state policy of strengthening the national security of the state. Through the efforts of the Russian Ministry of Civil Protection and Danger, a legislative framework was created in the area of population and territory protection in emergency situations, as well as effective management bodies in this area. In addition, Russia's unique state system for prevention and response in emergency situations is successfully developing and functioning. In addition, national and sectoral plans for adapting to climate change have been drawn up and approved by normative acts, and work is underway to improve the monitoring and forecasting system for the rapid development of dangerous natural phenomena (Soloviev, 2022).

The Russian Ministry (EMERKOM) is guided by the ideology that it is much cheaper to act preventively and predict or prevent a disaster than to repair its consequences. At the same time, Russia is developing a culture of civilian training, in order to be sure that they will act properly and timely in emergency situations. Guidelines and instructions for the protection of people and territory from disasters provide all the necessary education and training of citizens, in order to prepare them for the worst of disasters. These activities are supported by governmental and public organizations. The significant contribution to disaster risk reduction that UN agencies make was highlighted, while Russia, on the other hand, supports a number of their initiatives. In particular, Russia participates in the United Nations Global Campaign "Make cities more resilient - 2030". This Global Campaign, which envisages the introduction of a self-assessment system for city governments in the area of disaster risk reduction, is one of the more effective mechanisms for local implementation of the Sendai Framework for Disaster Risk Reduction for 2015-

2030. Ten Russian cities joined this global campaign. The pilot project "My city is safe" was implemented in seventy constituent subjects of the Russian Federation in 2020, in order to strengthen the resilience of cities against disasters. Within this project, a competition was organized between 285 Russian municipalities. The main goal is to use the best domestic and foreign practices in the field of disaster risk reduction, due to the assessment of the preparedness of Russian cities and municipalities for natural and man-made disasters. As a tool for assessment, along with methodological recommendations developed on the basis of the All-Russian Research Institute for Civil Defense and Emergency Situations, an adapted list of UN results was used. In order to successfully implement the mentioned project, it was decided that such a competition would be held regularly (Soloviev, 2022).

The all-Russian comprehensive system of information and warning of the population in places with a large number of people (OKSION) is a Russian complex system for monitoring, reporting and warnings. It was created within the framework of the Federal target program "Risk reduction and mitigation of consequences of natural and man-made disasters in the Russian Federation until 2010". In May 2011, 596 OKSION terminal facilities were built and put into operation in 37 data centers. OKSION actually represents an organizational and technical system - a combination of hardware and software for processing, transmission and display of audio and video information (Information Center OKSION, Ministry of Civil Defense, Emergencies and Disaster Relief of the Russian Federation).

The system established in this way contributes to better preparedness of the population for situations such as emergency situations, fire protection, maintenance of public order and peace, terrorist attacks, surveillance in case of mass gatherings of the population and the like. Not only does the system contribute to information and early warning of the population, but also increases security culture and awareness of the risks present (Information Center OKSION, Ministry of Civil Defense, Emergencies and Disaster Relief of the Russian Federation).

AUCTION devices (so-called terminals) are LCD panels (placed in places of mass gathering such as educational institutions, shopping centers, markets, railway stations, airports, cultural, sports and health institutions), LED screens (placed outdoors space-entering and exiting cities, city roads, interchanges, squares, streets, stadiums, etc.), mobile LED screens that have independent power supply, navigation, video surveillance, radiation and chemical control, and the like.

The first devices of the system were installed in 2006, and since then the number of devices that are part of AUCTION has been growing. By 2016, a total of 657 terminals had been installed. The central and managing body of AUCTION is the Information Center, which organizes the establishment and development of all elements, and manages and controls them. In addition, the Center monitors technological development and continuously develops all equipment used by the system, both hardware and software (Information Center OKSION, Ministry of Civil Defense, Emergencies and Disaster Relief of the Russian Federation).

### 3.3.2. Disaster response and recovery

The Ministry of Civil Defense, Emergencies and Consequences of Natural Disasters of the Russian Federation, also known as the Ministry of Emergency Situations or internationally as EMERKOM (derived from "Ministry of Emergency Situations") is a Russian government agency that oversees civil emergency services in Russia (Roffey, 2016). President Boris Yeltsin established the Ministry on January 10, 1994, although the ministry can be traced back to December 27, 1990, when the Russian Soviet Federative Socialist Republic (RSFSR) established the Russian Rescue Corps and assigned it the mission of rapid emergency response (Roffey, 2016). The history of civil defense services in Russia goes back to the years of the reign of Muscovy and the decree of the Russian Emperor Alexios "Instructions on the rescue of municipalities" of 1649, which officially established the Moscow Municipal Fire Service, the first active fire department in Russia. When Peter the

Great was emperor, St. Petersburg got its own fire department modelled after the Western practice of the time. By 1863, it was transformed, by order of the Russian Emperor Alexander II, as the first professional fire service in Russia and Eastern Europe. Beginning in 1932, civil defense tasks were performed by local air defense units within the newly created Soviet Air Defense Forces, which were transferred to the NKVD in 1940 (and served with distinction, together with the NKVD Fire Service Command established in 1918, in the Great Patriotic War ). In 1960, it was returned to the Ministry of Defense as an official branch of the Soviet Armed Forces (Civil Defense Forces of the Ministry of Defense) and a direct reporting agency, while the MVD retained the fire service (USSR: Reorganization Of Civil Defense, 1965).

After the 1988 Armenian earthquake and the Chernobyl disaster, on July 17, 1990, a directive decision of the Presidium of the Supreme Council of the Russian Socialist Soviet Republic led to the formation of the Russian Rescue Corps, which was finally formed by the Soviet government on December 27, 1990. This date is marked as the official anniversary of the Ministry (Roffey, 2016). On April 17, 1991, the Presidium of the Supreme Council of Russia appointed Sergei Shoigu as the chairman of the State Committee for Emergency Situations, which succeeded the Russian Red Cross, and on November 9, 1991, the State Committee was merged with the Staff of Civil Defense of the USSR (within the Ministry of Defense ) to form the State Committee of the Russian Federation for Civil Defense, Emergency Situations and Liquidation of Natural Disasters and was subordinate to the President of Russia. On January 10, 1994, the State Committee became part of the Government of Russia, and the ministry was renamed the Ministry of Civil Defense, Emergency Situations and Disaster Relief, with Sergei Shoigu as a minister, and on January 1, 2002, the Russian State Fire Service, the national fire service, became part of the ministry with 278,000 firefighters, removed from the control of the Ministry of the Interior after 84 years (Roffey, 2016). An example of recovery from disasters in Russia can be seen in the case of the floods that hit Russia in 2013. In 2013, Russia was hit by flash floods caused by heavy rains. The far eastern region of Russia was most affected by this disaster, with three regions being the most vulnerable. Due to heavy rainfall, the level of the Amur River has risen to its all-time high of 6.88 meters above the normal level. At that time, the state hydrometeorological service predicted that the water level would rise up to 7 meters (Disaster relief emergency fund (DREF) Russian Federation: Floods, 2013).

According to the reports of the Russian EMERKOM, 137 settlements, 6321 houses, 34135 people, 216 sections of roads and 25 bridges were flooded in 25 municipalities in the affected region. According to estimates and reports from the Russian Red Cross, 3,000 families were seriously affected by the consequences of the floods in the far eastern region of Russia. Since the local authorities were unable to deal with the consequences of the flood, humanitarian aid was requested. Since the demands exceeded the available resources at the level of Russia, the Red Cross requested the help of the International Federation of Red Cross. The assistance was reflected in the provision of funds for food packages, hygiene kits, and bedding sets that were intended for 3000 of the most vulnerable families in the affected area. At the end of August, the Ministry of Emergency Situations set up a mobile tent camp with a capacity for 500 people. The camp consisted of 110 tents, and included a school, a health center, a laundry area, and other facilities necessary for the population (Disaster relief emergency fund (DREF) Russian Federation: Floods, 2013).

Despite the fact that the Russian government mobilized all the financial and material resources available at the time, they were not enough to cover the damage that occurred, both to the population and to the infrastructure. The Ministry of Finance has officially confirmed that all funds earmarked for disasters and emergency situations have been fully spent after the floods (315 million US dollars). As a result, the government was requested to transfer the disaster budget that was planned for the following year to be used then. According to estimates, the resulting damage amounted to 265 million US dollars (Disaster relief emergency fund (DREF) Russian Federation: Floods, 2013). According to

the then government decision (Government Decision On budget allocations from the Reserve Fund for eliminating the consequences of rainstorms accompanied by floods in some regions in the summer of 2013, 2013), additional funds were approved for recovery immediately after the disaster. The states of the affected region submitted to the government lists of citizens who need help in the form of material resources, then a list of citizens who need financial help, and finally a list of institutions that were damaged by the flood. The said decision approved 3.21 billion rubles.

#### 3.4. Disaster risk management in China

While China has made significant progress in establishing disaster response infrastructure, the causes and consequences of various disasters continue to evolve. Along with global climate changes and its own economic progress and increased urbanization, pressure on all resources, ecology and environment is increasing in PR China, which is significantly related to disasters and their consequences (China's Actions for Disaster Prevention and Reduction, 2009). The legal framework and institutional basis for the disaster risk management system in the People's Republic of China are very diverse. This framework consists of various, numerous documents that are regularly updated. In addition, new laws and regulations are passed very often. There is no single law that simultaneously covers prevention, mitigation and recovery from all disasters (Law and Regulation for the Reduction of Risk from Natural Disasters, 2012).

The Emergency Response Law of the People's Republic of China (2007) was adopted at the 29th meeting of the Committee of the Tenth National People's Congress of China, which was held on August 30, 2007. The law normatively regulates areas related to prevention and preparedness for response to disasters, monitoring and early warning, response and rescue activities in emergency situations, response after disasters, i.e. recovery and reconstruction, legal responsibility. The main purpose of the law governing disaster preparedness and response in the People's Republic of China is to provide preventive action that will reduce the likelihood of unwanted events. In addition to the above, the law creates the basis for control, reduction and prevention of large social damage that may occur in the event of disasters. On such a basis, a unified system can be established to protect the lives and property of the affected population and maintain public safety and order, as well as environmental security.

It is envisaged that the provisions of the law will be applied in all stages of response to disasters: prevention, preparation, monitoring and early warning, response, rescue, rehabilitation and reconstruction. At the same time, we do not mean only cases of natural disasters, but also accidents, incidents related to public health and social security and all other disasters where there is a possibility of serious social losses. Taking into account the degree of damage and the scope of the disaster, four levels of so-called disasters are distinguished in the People's Republic of China: particularly serious, serious, major and ordinary. It is envisaged that this division will be adopted at all levels of management. With this in mind, the PRC establishes an emergency response and management system based on unified leadership, comprehensive coordination, shared management, levelled responsibility and territorial management (Emergency Response Law of the People's Republic of China, 2007).

##### 3.4.1. Mitigation and preparedness

In response to the initiative of the United Nations International Decade for Natural Disaster Reduction, the Chinese government established a committee in 1989, now called the National Committee for Disaster Reduction. An inter-ministerial coordination mechanism within China's State Council, the committee is responsible for developing key policies and plans for disaster reduction. Housed in the Ministry of Civil Affairs before March 2018, the commission is now housed in the Ministry of Emergency Management (China's Actions for Disaster Prevention and Reduction, 2009).



In the three decades since its establishment, the National Disaster Reduction Committee has taken a leading role in drafting comprehensive national disaster reduction plans: the Disaster Reduction Plan of the People's Republic of China (1998–2010), the National Comprehensive Disaster Reduction Plan of the 11th Five-Year Plan (2007–2010), and the National Comprehensive Plan for Disaster Prevention and Mitigation 12th Five-Year Plan (2011–2015). Each of these plans was announced by the State Council of China. On October 25, 2019, the Board began preparations for the National Comprehensive 14th Five-Year Plan for Disaster Reduction. China's National Disaster Reduction Plans have been instrumental in ensuring that the country's disaster reduction practices are guided by appropriate planning. Consistent with the Hyogo Framework for Action (2005–2015) and the Sendai Framework for Disaster Risk Reduction (2015–2030), each of these plans also emphasizes China's commitment to integrating disaster risk reduction into its sustainable development agenda. Since 1998, the Chinese government's disaster reduction work has been guided by the principle of prioritizing prevention and combining prevention and relief. A closer look at China's recent national disaster reduction plans reveals several key trends in the evolution of the country's national disaster reduction planning. The plans reflect the transformation of China's comprehensive disaster reduction work from reactive to proactive, from disaster loss reduction to disaster risk reduction and from single hazards to multiple hazards. In line with this transformation, China's national comprehensive capacity for disaster prevention and mitigation has been strengthened on multiple fronts, including significant improvement of disaster prevention and mitigation mechanism systems, disaster monitoring and information processing capabilities, as well as emergency response and comprehensive risk prevention capabilities. China's disaster prevention and mitigation plans have always focused on reducing disaster mortality and direct economic losses. Since 1991, the country's death rate from disasters and direct economic loss as a percentage of national GDP have shown a clear downward trend, in line with the expected goals of the plans (Disaster Reduction Action Plan of The Peoples Republic of China (2006-2015), 2006).

As a result of its 2008 disaster prevention and mitigation plan, China selected over 12,000 communities across the country to become "demonstration communities" for disaster risk reduction. More than ten years since the beginning of the initiative, spatial analyzes suggest that the so-called In-country disaster risk reduction "demonstration communities" are not only effective in combating disasters, but also achieve their intended effect of fostering disaster risk reduction capacity building in surrounding communities (Ghesquiere, Xiao, & Piccio, 2020). After the 2008 Wenchuan (or Sichuan) earthquake, the government made significant efforts to reduce disaster risk by implementing new building codes, implementing extensive emergency drills in schools, and strengthening earthquake early warning systems. Yet the mitigation sector lags behind the response and recovery sectors, despite official rhetoric and policies promoting a "mitigation first" approach. Some of the reasons include inadequate funding for disaster risk reduction at both local and national levels, lack of an integrated system for storing and sharing risk-related information, and lower awareness and coordination of disaster risk reduction among civil society compared to disaster management. Back in December 2016, the Party and the Government jointly issued a document on system reform, which pointed to an excessive focus on rescue over prevention as one of the main problems of the system that needs improvement (Yue, 2018).

China's inattention to disaster risk reduction is largely the result of two long-standing and interrelated issues: ministries are uncertain about exactly where responsibilities lie and often compete to address disasters. These issues, which have hampered disaster response efforts, led to the creation of a new ministry. Each Chinese ministry has control over a specific economic sector or issue, including response to natural and man-made hazards. This rigid division of duties does not always work well in practice. For example, a grass fire spreading to a nearby forest is administratively managed by two ministries –

the forestry department and the agriculture ministry – potentially requiring the intervention of two different firefighting units. It also creates gray areas of responsibility where the mandates of ministries intersect (Yue, 2018).

This is problematic because most disasters do not fit neatly into predetermined categories and often have widespread and far-reaching consequences. For example, the ice storm that hit southern China in 2008 caused a series of inter-infrastructure failures, which caused power plants to fail, which led to the closure of railways which in turn prevented the delivery of coal to the power plants. Moreover, ministries seeking to expand their mandates have often used blurred governance boundaries to engage in rivalries. Together, these issues have often resulted in poor information sharing, coordination bottlenecks, redundant investments, and wasted resources, impeding effective disaster risk reduction and disaster response (Yue, 2018). In order to demonstrate the preparedness of the People's Republic of China for various types of disasters to which this country is exposed, an example of various courses and training organized and held by institutions responsible for certain disaster activities can be used. One such course is an advanced course in the field of crises, recovery and transitions. This course was organized by the Humanitarian Policy Group and Tsinghua University School of Public Policy and Management (Zyck, 2013).

Disasters that are not only characteristic of the People's Republic of China, but this country shows exceptional vulnerability to them are: earthquakes, floods, droughts, fires, typhoons, storms and pandemics. This conclusion was derived from the fact that natural disasters during three quarters of 2013 caused damage of 84.5 billion dollars. From January to September 2013, 856,000 homes were destroyed in disasters. On average, disasters cost the PRC 1.6% of the gross domestic product, while, for example, the "costs" of disasters cost the United States 0.57% and the Philippines 0.80% (Zyck, 2013). The earthquake that hit Wenchuan in 2008, killing 90,000 residents, is a disaster that has had the most severe consequences for the People's Republic of China and its people. The second disaster, the SARS epidemic in 2003, had the greatest impact on state authorities, which had to reconsider the way in which disasters are managed in the People's Republic of China, i.e. emergency situations. What has been identified as a shortcoming of the response system is the fact that disaster preparedness and response are too centralized. This led to the reorganization, i.e. delegation of management to lower levels of government and to the Central State Office for Emergency Management and the National Committee for Disaster Reduction (Zyck, 2013).

Not only did response capacities develop within the borders of the People's Republic of China, but the developments also took on an international character. China's international search and rescue team, which draws on civilian, military and police expertise, was deployed to help in 2003 in Iran (earthquake), in 2004 in Indonesia (tsunami), in 2010 in Haiti (earthquake) and so on (Zyck, 2013). For the preparedness of a country for disasters, technologies can be of great importance and represent a significant advantage for the prevention of potential losses. The People's Republic of China can be said to have used technology in the field of disaster response in a creative way. The National Center for Disaster Reduction has operating rooms available from which disaster monitoring is carried out using devices such as, for example, three satellites and drones operated by private companies. The staff of the National Disaster Reduction Center in China consists of young programmers, scientists, technicians, geographic information system specialists, as well as many other experts in the field of information technology and crisis management. Such tools are also available in other countries. This means that maps and satellite data created by the National Disaster Reduction Center in China can be made available to countries around the world (Zyck, 2013).

One of the major problems of the People's Republic of China concerns documentation - public documents, especially those that are not in Mandarin. Many actors involved in the disaster preparedness and response system in the People's Republic of China are not aware of the experiences of the wider international humanitarian community. The

excessive dominance of Western humanitarian institutions had an impact on the People's Republic of China in the sense of not being included in aid bodies, non-governmental organizations, etc. This is also contributed to by the tendency of humanitarian and development bodies to view Chinese aid bodies as unprincipled policies (Zyck, 2013).

#### 3.4.2. Disaster response and recovery

China produced its first multi-year, comprehensive national disaster reduction plan for the period 1998-2010, and since 2007, the country has been preparing comprehensive plans for disaster prevention and mitigation, following the government's five-year planning cycle. These plans have proven to be key to guiding risk reduction interventions. Strikingly, over the years, the shift from reactive to proactive disaster reduction has been prominent in the development of China's disaster risk reduction plans (Ghesquiere, Xiao, & Piccio, 2020). The People's Republic of China establishes a disaster response system through the State Council. A disaster response plan exists at the state level, and in addition, such plans are adopted and adapted to specific disasters and the demands they pose to the state. Ministries of the State Council adapt disaster response plans to their capacities and those plans must be aligned with the plans at the highest level. Apart from this level, there is a local level and their responsibilities in case of disasters. Plans made at the local level are aligned with all relevant laws, administrative rules, and top-level plans (Emergency Response Law of the People's Republic of China, 2007).

Once such plans are adopted, their content is not final. The plans are updated from time to time depending on the practice. When there are changes in the nature of disasters and in the demands, they place on the authorities and the population, then the plan is changed, i.e. its alignment. The State Council establishes the procedure for the adoption and amendment of these plans. As for the content of the plans, they consist of several parts. The plan details the way of command, organization and responsibility in cases of response to disasters, implementation of preventive activities and establishment of early warning mechanisms, as well as operational procedures, ways of recovery, reconstruction and rehabilitation after disasters. When working out all of the above, the starting point is the nature and characteristics of disasters, then the seriousness of the social damage that threatens the state (Emergency Response Law of the People's Republic of China, 2007).

In the organization of the district authorities, risk determination, registration and assessment are carried out in order to take preventive measures and measures to control the dangers that may arise from natural disasters, accidents and incidents concerning public health. The same applies to the provincial level in the People's Republic of China. When potential sources of disasters have been identified, either at the local or district level, the Law (2007) provides that this information should be immediately made available to the public, in accordance with the Emergency Response Law of the People's Republic of China, 2007 ). Article 21 of the Law (2007) shows the decentralized principle of action in case of disasters. It states that the authorities and competent bodies at the district, city level, town councils and village councils must respond in a timely manner and face any threat that could potentially endanger security. This means that each of these entities establishes a system, controls the application of prescribed preventive and control security measures and promptly removes all early detected risks and problems that may cause harmful consequences. These levels are intended to prevent the further spread of all incidents. The authorities of the lower level must inform the competent authorities and bodies within them about all the measures taken and the recognized dangers, depending on the territory that is the subject of danger.

Law (200) in the People's Republic of China provides for the establishment of training systems at the district level, i.e. training systems for managing emergency situations. The role of such centres would be to conduct training and train people to respond in emergency situations. In addition to the establishment of training centres, the establishment of rescue teams is also planned. Each entity, in accordance with its estimated disaster response resources, considers options and establishes rescue teams

accordingly. Such teams can be general in character and composition or specialized for a certain type of activity. It is recommended that such teams consist of adults and that the teams be based on a volunteer approach and participation.

Also, companies can establish such teams with full or part-time work and such teams should be made up of employees themselves. If there are specialized and non-specialized teams, their cooperation is necessary. It is reflected in joint training and simulations, which achieve a unified and coordinated response to disasters. All members of specialized disaster response teams must have personal injury insurance and must be equipped with all protective gear and equipment. It is essential in responding to disasters and rescuing vulnerable persons, to reduce the risks that exist for those who participate in those activities (Emergency Response Law of the People's Republic of China, 2007). Of all the mentioned entities, the People's Liberation Army of China, the armed police forces of China and militia organizations also participate. These organizations are in charge of carrying out special operations. In addition, they organize and conduct training for special responses to disasters.

All information, plans, conducted trainings, acquired experience and others should be available to the public. When it comes to transparency in the response to disasters, the media play an important role. Information important to the public is that which concerns experiences at all levels, specific responses, conducted exercises, conducted rescue actions and the like (Emergency Response Law of the People's Republic of China, 2007). In addition to its strengths in disaster response, the PRC's disaster response infrastructure also has weaknesses, including the problem of coordination between all ministries and other government bodies, as well as agencies at the national, provincial and local levels. Decentralization in the People's Republic of China exists, but it can also have a negative side when a unified and fully coordinated response is needed. Decentralization can lead to unclear boundaries where one body's jurisdiction begins and another body's jurisdiction ends. As can be seen from the above, the level that first responds to disasters and is the most important in that first response are communities. This fact is not only valid for the People's Republic of China. Numerous international and non-governmental organizations, officials and experts are studying ways in which communities at the local level can better and more comprehensively prepare for disasters so that they can face them and their consequences themselves. What is a common problem, both in China and internationally, is that the government and experts find it difficult to mobilize resources and focus much of the political attention on strengthening and improving preparedness, even though this brings long-term positive results despite the immediate increased costs. (Zyck, 2013).

According to a statement from China's Ministry of Emergency Situations on July 30, 2021, 1 billion yuan (\$154 million) is earmarked to help local governments carry out basic flood prevention and disaster relief. Chinese funds for disaster relief, recovery and reconstruction are mainly allocated from the public treasury, and a small part is made up of private donations. However, the increased frequency of natural disasters in recent years has put a strain on China's budget. Currently, only a small percentage of the budget is reserved at the beginning of each year for natural disasters, which poses a problem when disaster strikes and reconstruction and rehabilitation are necessary (Feng, 2021).

When the anticipated amount of funds is not sufficient, the procedure involves redirecting the funds allocated to other sectors, or spending the funds originally reserved for the next year's budget, something that makes long-term planning and development difficult. Catastrophe insurance is one option (Feng, 2021). Insurance adapted to local characteristics. China is increasingly recognizing the importance of disaster insurance to promote rapid recovery after natural disasters (Ghesquiere, Xiao, & Piccio, 2020). Insurance plans enable the transfer and balancing of risks before a disaster occurs and are already well-established in most parts of the world. From 2009 to 2014, 43.6% of damages caused by natural disasters worldwide were covered by insurance (Li, 2016). However, catastrophe insurance is still in its infancy in China—the country's average catastrophe

insurance coverage rate is only 1%. Direct economic losses caused by Hurricane Katrina in the United States were \$125 billion, half of which was covered by catastrophe insurance. In contrast, after the Wenchuan earthquake three years later, insurance covered only 0.2% of the 845.1 billion yuan in damages. One reason for this is that insurance premium income makes up a small percentage of China's GDP – just 3.2%. In comparison, it accounts for 12.3% and 9.8% of the GDP in neighbouring East Asian countries, South Korea and Japan (Feng, 2021). Residents of the People's Republic of China are still not fully familiar with the principles of insurance, so they do not use it. This is particularly noticeable in rural regions. Catastrophe insurance is barely known to the public, and many do not believe they will ever be personally affected by a disaster. Another key reason is that for most Chinese, insurance is almost impossible to afford. The main recipients of post-disaster insurance compensation in China are large factories, commercial companies and wealthy families, while only a small portion of compensation is awarded to ordinary individuals, especially poor families. This is mainly because poor families cannot afford any of the insurance options currently available. To close this gap, government subsidies can be used to encourage insurance companies to offer low-cost, inclusive catastrophe insurance products to everyone. Policymakers should also develop risk transfer mechanisms before natural disasters, such as dedicated lotteries. This will enable fundraising before disasters and ensure they are available when needed (Feng, 2021).

## Conclusions

Just as every disaster has its own specifics - the way of development, appearance, territorial distribution, duration, and consequences it causes, so every country has its own specific disaster risk management system. As shown, some societies prioritize response and resources used in response to disasters, while others emphasize preparedness and activities that will educate an active and up-to-date population about the risks that exist and how they can protect themselves. What they all have in common is the recognition of the importance of prevention and building resilience. Every country has recognized the long-term benefits that come from building resilience to disasters, but also from taking preventive measures that either mitigate or eliminate risk.

Looking at the analyzed countries, it can be concluded that it is difficult to establish whether the harmful consequences of disasters have a more serious impact on fully developed or less developed and poorer societies. When a disaster occurs in developed societies that are modernized, that have high living standards, developed technologies, specific critical infrastructure and the like, those societies at the time of the disaster suffer great losses if, for example, critical infrastructure is affected and, for example, the use of technology or the functioning of the economy is prevented. Such companies have financial and other opportunities for quick recovery. Poor societies have less preparedness, they do not lose many resources in a disaster, but they remain without the basic necessities of life and it takes a lot of time for reconstruction and recovery.

Also, analyzing the response to disasters in the mentioned countries, it can be said that in each of them, there is delegation and decentralization, i.e. that the first response lies in the hands of the lowest level of government and the resources available to that level. The response goes to a higher level depending on whether the rescue and protection requirements exceed the lower levels or not. As far as recovery is concerned, it can be said from experience that it is necessary to plan for the occurrence of disasters with the budget. At the same time, it is necessary to provide financial resources not only for response to disasters, resources, equipment and everything needed for response to disasters, but also for recovery and reconstruction of what was destroyed. If not adequately planned, there may be sudden and additional costs in situations where the damage is large and the previously planned budget is insufficient.

All this suggests that adequate assessment and planning is necessary so that disasters threaten the community and its assets as little as possible. What is noticeably more prevalent in the field of disaster recovery is insurance. Although this type of assistance is

still in development, since not all regions of a country are equally developed and able to afford insurance, it represents an effective element when it comes to the recovery of individuals, families, businesses and the like.

Comparing Germany, the USA, Russia and China, it can be concluded that each country has established and regulated a normative legal basis on which the disaster risk management system is further built. In Russia, there is a simple division of disasters into those related to conflicts between states and those originating from sources such as nature and the human factor, and on the basis of such a simple division, laws have been passed that focus on the terms "defence", "resources" and the like and where there is no large number of laws and by-laws that regulate the area of disaster risk and disaster response. On the other hand, there is the example of China, where a large number of laws and other regulations governing this area have been passed, which are often changed and updated. A problem arises from such a broad regulation, which is reflected in the insufficiently defined division of responsibilities. If we take into account the number of the population of China, but also the fact that it is subject to serious disasters (earthquakes, typhoons, floods, droughts, etc.) and that the consequences are serious, excessive regulation and various insufficiently clear responsibilities can pose a problem in practical operation - when disaster happens.

Within the German normative legal framework, one can see an example of preventive action - a focus on adapting to climate change, which can be considered the cause of certain disasters, but also an example of action in accordance with the identified flood risk. In German legislation, great importance is given to the infrastructure and its protection, as well as the financial aspect in cases of disasters. Germany, as a developed country, thinks beyond its borders and response range and establishes a system that will enable mutual assistance and the participation of other countries in joint activities. As part of such an initiative, issues related to business, risk transfer, financial insurance and the like are also considered. What is characteristic of the USA is that there is noticeable progress in the regulation of disaster response - from completely neglecting preventive action and emphasizing only armed threats to action based on experience and lessons learned. An example is the acts that were adopted after disasters that had serious consequences for the USA. With these acts, changes were made in the way of responding and especially in the way of providing assistance from the highest to the local level.

Risk mitigation in each studied country implies good planning of the risk itself, its possible outcomes, but also all the activities that follow when a disaster occurs. The focus is on mitigating the consequences that arise first of all for the population and then for the economy. When it comes to the population, the paper provides interesting examples of how countries prepare the population for response through various pieces of training and exercises - the example of the USA and Germany, which hold training for a response, first aid, evacuation, and the like, and the example of Russia, which organized competitions between cities in the preparedness area, etc. In addition, the use of technology to increase preparedness for response is noticeable in each country. Smart devices, mobile applications, weather alarms and the like have been used in different ways for the purpose of educating the population, gathering information, and conducting surveillance.

When considering responding to disasters, the principle of subsidiarity is represented in the countries in question. In each state, it ranges from the lowest local, provincial and other lower levels. When the demands placed by the disaster on the local level are too great, then resources from a higher level are used. With Germany, the USA, Russia and China, one can observe the respect of one of the priorities of the Hyogo framework for action - and that is the effort to make disaster risk reduction a priority at the national and local level. Each state has an established body (council, ministry, agency, office) at the highest level, whose responsibility is mainly the coordination of activities during disaster response. In the USA, such a body deals with research, education, training, response, assistance and other activities, while in Russia, for example, the Ministry in the event of disasters supervises all civil services.

For recovery after a disaster, it is crucial to adequately assess the risk and determine as closely as possible the potential damage it can bring. The framework for recovery in the USA is based on such estimates. Post-disaster planning is carried out within it. Financial resources are very important in recovery. Reserves and funds must be well planned, as was the case that was shown in the paper on the example of Germany. On the contrary, the example of Russia was given, which had to withdraw the reserves planned for the following year in the current one, since the damage caused in the event of a disaster exceeded all planned financial resources. Noticeable in every country is the existence of disaster insurance. In some countries, it is regulated and recognized as a solution, as is the case in the USA and Germany, while for China it is considered that such a solution would give results, but it has not yet been implemented. By comparing Germany, the USA, China and Russia, conclusions can be drawn about the successful functioning of the system, which is of key importance for the protection of the values of each state. In order for a system, such as a system that is activated before, during and after disasters, to function, it must be developed on an adequate basis that is adapted to the actual situation and practical operation. Its elements must be connected, and the flow and exchange of information must be organized and functional. In addition, a clear division of responsibility and competence is important when a quick and timely response is required, and it must first of all be normatively regulated. Also, such a system cannot be uniform and unchanging. As the assessed risks on which it is established change, so must it. The system must be comprehensive, ie. it must take into account both the entire state embodied in the government representatives and their institutions, and it must also take into account the individual and his possible contribution to responding in emergency situations. Established systems cannot be ideal, losses must occur, but it is important that they are developed in such a way that they can preserve the vital interests of states - human lives and that they can enable a quick recovery for the entire society based on good planning of all relevant resources.

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