Natural Hazards Governance in Russia

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Summary and Keywords

A major implication of the dissolution of the Soviet Union in 1991 involved the radical transformation of the national security system. Its fundamentally militaristic paradigm focused on civil defense to prepare and protect communities against the strikes of conventional and nuclear warheads. It called for a more comprehensive and balanced civil protection policy oriented primarily to the communities' and facilities' preparedness and response to natural hazards impact and disasters. This change in policy was further catalyzed by the catastrophic results of the major disasters in the late 1980s, such as the Chernobyl nuclear power plant explosion of 1986 and the Armenian earthquake of 1988.

As a result, in 1989, a specialized body was organized, the State Emergency Commission at the USSR Council of Ministers. A year later in the Russian Federation (at that time a part of the Soviet Union), an analogous commission was established. In 1991, it was reorganized into the State Committee for Civil Defense, Emergency Management, and Natural Disasters Response at the request of the president of the Russian Federation (EMERCOM). In 1994, this was replaced by the much more powerful Ministry of the Russian Federation for Civil Defense, Emergency Management, and Natural Disasters Response (which kept the abbreviation EMERCOM). In the early 21st century, this ministry is the key government body responsible for (a) development and implementation of the policy for civil defense and the regions' protection from natural and technological hazards and disasters, and (b) leading and coordinating activities of the federal executive bodies in disaster policy areas within the Russian Federation's Integrated State System for Emergency Prevention and Response (EPARIS). In addition, as well as in the former Soviet Union, the scientific and research organizations' efforts to collect relevant data, monitor events, and conduct field and in-house studies to reduce the risk of disasters is crucially important.

The nature of EPARIS is mainly a function of the geographic characteristics of the Russian Federation. These include the world's largest national territory, which is vastly extended both longitudinally and latitudinally, a relatively populous Arctic region, large mountain systems, and other characteristics that create high diversity in the natural environment and combinations of natural hazards. Meanwhile, along with the natural conditions of significant size and a multiethnic composition of the population, distinctive features of a historical development path and institutional factors also contribute to diversity

of settlement patterns, a high degree of economic development, and a level and quality of human life both within and between the regions of Russia. For instance, even within one of the region's urbanized areas with a high-quality urban environment and developed socioeconomic institutions, neighboring communities exist with a traditional lifestyle and economic relations, primitive technological tools, and so on (e.g., indigenous small ethnic groups of the Russian North, Siberia, and the Far East).

The massive spatial disparity of Russia creates different conditions for exposure and vulnerability of the regions to natural hazards' impacts on communities and facilities, which has to be considered while preparing, responding to, and recovering from disasters. For this reason, EMERCOM's organizational structure includes a central (federal) headquarters as well as Central, Northwestern, Siberian, Southern, and Moscow regional territorial branches and control centers for emergency management in all of the 85 administrative entities (subjects) of the Russian Federation. Specific features of both the EMERCOM territorial units and ministries and EPARIS as a whole coping with disasters are considered using the 2013 catastrophic flood in the Amur River basin in the Far East of Russia as a case study.

Keywords: natural hazards, disasters, civil protection, disaster risk reduction, disaster response, EMERCOM of Russia, EPARIS, the Amur River catastrophic flood

Natural Conditions and Natural Hazards in Russia

Russia is the largest country in the world, stretching extensively both in the sub-latitudinal and sub-meridional directions. This provides for contrast and diversity of its geological, climatic, and landscape conditions. Russia is located in the northeastern part of the largest continent, Eurasia, and occupies some onethird of its area. It incorporates different physiographic zones including Arctic deserts, tundra, forest-tundra, the most extensive taiga zone, mixed and broad-leaved forests, forest-steppe, steppes, semi-deserts, and deserts (Natsional'niy, 2004), with typical sets of natural hazards and their combinations. Over 30 types of natural hazards affect communities and assets in Russia, with the most catastrophic impacts following earthquakes, floods, droughts, forest fires, and extreme frosts (Vladimirov, Vorob'yev, & Osipov, 2002).

Given that in addition to extensive flatland areas, including the two largest plains, Eastern European (Russian) and West Siberian, a significant area is occupied by mountains (Russian parts of Fennoscandia and Greater Caucasus, the Urals, the Far East and South Siberia regions), and high-altitude zoning and hazardous slope processes are typical for many parts of Russia (Perov, 1992). In general, 25% of Russian territory, where more than 20 million people live, is seismically dangerous, meaning having a high probability of earthquakes with magnitude intensities exceeding 6 (Ushakova, Ushakov, & Shnyparkov, 2003). Some 5% of the national area, including Northern Caucasus, Southern Siberia (Altai and Sayany, Baikal Rift Zone), and Far East (Kuril-Kamchatka Zone, Sakhalin) regions

extending along or crossing the borders of large lithosphere plates, are characterized by from 8 to 10 points on a 12-point MSK-64 earthquake intensity scale (Sobolev, 2000). All active volcanoes are located in eastern Russia within the so-called Pacific Ring of Fire accommodating Kamchatka Peninsula and Kuril Islands. Within the context of earthquakes and volcanoes' hazardous impacts, worth particular mention is that this activity may trigger a tsunami that in turn poses a significant threat to communities and facilities in the Pacific coastal zone in the Russian Far East. Within the past 90 years, more than 100 high-intensive tsunamis were registered in the Asian and Pacific world regions, including some 20 near the Russian coasts.

Mountainous and foothill areas are highly exposed to mudflow activity (20% of Russian territory is at risk from mudflows). According to their genesis, warm (mostly rain-mudflow) and cold (snow-mudflow) zones are distinguished according to the boundary between temperate and subarctic climate zones. The maximum mudflow activity is observed in the Northern Caucasus and Baikal mudflow areas (Perov, Budarina, Chernomorets, & Saverniuk, 2017). Mudflow process development triggered by economic activity is most active in the Southern Ural and Sakhalin regions.

Landslides as a hazard impact some 40% of Russian territory and affect mostly the Northern Caucasus, Kamchatka, Sakhalin, Trans-Baikal, and Volga regions. Almost two thirds of Russian cities are at risk from landslides. In addition, every mountainous region of the country, or 18% of Russia's area, is avalanche-prone, with the highest points registered in the Northern Caucasus, Southern Siberian, and the Far East regions (Atlas, 2005). Hotbeds of active avalanche formation are also observed in the mountainous areas of the Russian north (Murmansk region, northern Urals). Increasing development of infrastructure for tourists and recreation (e.g., ski resorts at the beginning of the 21st century) in these areas exacerbates the risk of avalanches (Koltermann, Sokratov, Seliverstov, & Shnyparkov, 2013).

Karst processes have been registered in areas covering some 60% of the national territory (Leonenko & Tolmachev, 2004; Kutepov & Sheko, 2002). They develop both at platforms that often overlap river valleys (e.g., within the Moscow syneclise [a vast sedimentary basin] and the Volga Upland) and in folded areas (e.g., the Urals and North Caucasus). Erosion is almost ubiquitous (Kutepov & Sheko, 2002). Over one half of farmland is prone to sheet erosion, while gully erosion is most typical for the Central Chernozem (Black Soils) region. Dry soil deflation, including dust storms, is observed in the south of the European part and in the continental Far East.

The permafrost area covers about 64% of Russian territory, which creates geocryological hazards such as thermokarst, solifluction, frost heaving, and icing formation (Garagul & Yershov, 2000). In general, the depth of seasonal freezing as well as permafrost stability increases with the continental climate, escalating from west to east. Seasonal freezing is deepest (up to 4–8 m) in the central and south Trans-Baikal areas, with an extremely continental cold climate with little snow and severe winters. Since the beginning of the 21st century, the impact of global climate change has been most pronounced in circumpolar

regions and has exacerbated permafrost degradation in urbanized areas in the Russian Arctic accompanied by deterioration and destruction of buildings and structures, roads, and oil and gas industry infrastructure (most prominently pipeline systems) (Grebenets et al., 2011; Baburin et al., 2015).

The major factors of climate formation in Russia are influenced by its geographical position in middle and high latitudes, its vast areas in the north that are open to the impact of the Arctic Ocean, its western and eastern parts that are significantly influenced by the Atlantic Ocean and the Pacific Ocean, respectively, and the huge area lying deep within continental Russia, covering four climatic zones: arctic, subarctic (islands and the mainland coast of the Arctic Ocean), temperate (most of the territory), and subtropical (the Caucasus Black Sea coast and the Crimea southern coast).

A pronounced cold winter season, with an average January temperature below 0°C and snow cover persisting in different regions from 1 to 9 months, is typical for the bulk of Russia. The average temperatures of the coldest months range from 0°C to –4°C in the southern regions, to –45°C in Eastern Siberia; and the average temperatures of the warmest months range from + 1°C in the Arctic zone to + 25°C in desert and semi-desert areas. In the lower reaches of the Volga River and the Siberian Arctic coast, the average annual rainfall is less than 300 mm, increasing to 400–500 mm in the northeast and to 600–700 mm in the west and northwest, and soaring to over 1,000 mm in the mountains and foothills of the Urals and the Caucasus, and in the southern part of the Far East (Natsional’niy, 2004).

Meteorological hazards are widespread (Golitsyn & Vasil’yev, 2001). However, due to highly contrasting natural and socioeconomic conditions in different regions, hazards with the same physical characteristics can produce (and be perceived as) either a “normal” event, with its impact having an acceptable level of risk, or an extreme event or emergency followed by a disaster. To illustrate this point, think of the –13°C frost in the inner continental regions, including the Yakutia Republic and that at the Caucasus Black Sea coast. Heavy snowfalls and snowstorms are most frequent in the mountainous and coastal areas, with intensive cyclonic circulation (e.g., in the Northern Caucasus, Altai, Western Sayans, and Far East coast).

Droughts are inherent in the central and southern regions of Russia. In Povolzh’ye and the Northern Caucasus, droughts occur every 2 to 3 years, with their frequency decreasing to every 3 to 5 years in the Central Black Earth region and Eastern Siberia and to every 3 to 10 years in the non-Black Earth region and Western Siberia. Historically, severe droughts caused crop loss, which, up to the first half of the 20th century, was often followed by famine. In Trans-Baikal, Primorsky, and Khabarovsk Krais, severe droughts result in enlarged (often transboundary) forest fires. The scale and severity of wildfire hazards call for collaborative efforts of neighboring countries: Russia, China, Mongolia, and Kazakhstan.

Hurricanes with a wind speed exceeding 50 m/s are registered in a minor part of the Russian territory, mainly in its poorly populated northern and eastern outskirts. However, in densely populated areas even less intensive wind gusts may result in disaster. One such storm occurred in Moscow in the summer of 1998 (Porfiriev, 2009), with another in the spring of 2017, both with wind gusts of up to 30 m/s and resulting in people killed, dozens injured, and significant economic damage.

The average annual river flow in Russia contributes about 10% of total world flow into oceans and ranks second in volume after Brazil. The largest rivers include the Volga, Oka, Don, Pechora (in the European part of Russia, west of the Urals), and the Ob with Irtysh, Yenisei, Lena, and Amur (in the Asian part). The main causes of flooding from these and other rivers in Russia are spring snowmelt, heavy rain, strong winds that create a back-water effect in the estuaries (storm surge), ice blocking (especially typical in large rivers flowing from south to north through various physiographic areas where the breaking up of ice occurs from upstream to downstream), and ice jams.

The areas prone to the hazard of flooding make up from 2 to 2.5% of the total Russian territory. These involve thousands of rural settlements located within adjacent agricultural lands and more than 700 cities historically established in places with the most favorable transport routes and geographical positions, that is, on large river banks that are thus exposed to risks of flooding (Frolova et al., 2017). Given such development, no one should be surprised by multiple historical examples of regularly repeated floods forcing the relocation of such cities, starting from as early as the 13th century: Tver (1223), Kostroma (1413), Tobolsk (1600), Yakutsk (1642), and so forth, up to Lensk (2001). Spring floods of varying intensity are almost ubiquitous while major rainfall floods are typical and most intensive primarily in the monsoon climate areas in the Far East. There Pacific typhoons cause catastrophic floods on an average of once every3 to 10 years.

Worth special mention is the modern sea level change at the Caspian Sea, which began at the end of 20th century and has caused flooding of tens of thousands of hectares of agricultural land as well as inundation of the many districts in the coastal cities of the Dagestan Republic

Overall, in summing up the frequency and intensity as well as the geographical patterns of natural hazards observed and registered in Russia’s four macro-regions, those with the highest exposure can be distinguished (in descending order) as follows: the Arctic zone, Northern Caucasus, Southern Siberia, and the Far East (Gladkevich, Kruzhalin, & Mazurov, 2000; Osipov, 2016). However, in terms of the vulnerability of communities and facilities to the impacts of natural hazards as related to population density, level of economic development, and civil protection, the central and southern areas of the European part of Russia as well as Povolzh’ye and the Urals are the most high-risk regions.

Natural Hazard Emergencies and Disasters in Russia

Within the national security policy framework, the concept of an emergency integrates a set of effects produced by the hazardous impact of natural or technological agents that are transformed into a direct and serious threat to human life and health and the functionality of a community at risk.[1] The term “disaster,” which is dominant in Anglo-Saxon law and the state policies of many countries, is widely used as such or as the term “natural disaster” in the Russian public lexicon, including mass media, and in scientific literature, or as the term “ecological (environmental) disaster” in environmental law.[2]

Perhaps one of the key reasons why the concept of emergency is employed in practical civil protection policy in Russia involves the conceptualization of both natural hazards and their impact on communities and facilities as objects of management that call for an urgent response from all levels of authority to a sudden threat to people and their values. However, the notion of disaster more closely corresponds with people’s experiences with hard conditions and times, and their need for help remains implicit or not specially emphasized from a policy point of view. Given the specificity of the Russian language and its interpretation (both in law and in everyday civil protection policy), the term “emergency” (*чрезвычайная ситуация*) is used as a key concept. However, considering an international context and experiences as a lens for obtaining a comprehensive and correct understanding of modern Russia’s civil protection policy, one should think of the terms emergency and disaster as synonyms (Porfiriev, 2011), as used in this article.

In accordance with contemporary Russian legislation, emergencies are classified following the criteria of scale and severity of the socioeconomic aftermath produced by hazardous impacts.[3] These include the number killed and injured and economic losses, which are the bases for distinguishing three major emergency categories: federal (over 500 killed or economic damage exceeding 500 million rubles);[4] regional and interregional (from 50 to 500 killed or damages of 5 million to 500 million rubles, respectively); and local and municipal (fewer than 50 killed or damages of 5 million rubles, respectively).[5]

Dynamics of Natural Emergencies and Losses and Damages Incurred

In the global picture of vulnerability to natural hazards, Russia takes an intermediate position. Using the social criterion of human losses, Russia is close to but fails to coincide with developing countries. However, contrary to the latter, while the number of those affected by hazardous impacts has been increasing, the number of killed in Russia has exhibited a tendency to decrease. Regarding economic damage, with its cost exhibiting a steady upward trend elsewhere in the world, in relative terms (in relation to the GDP), the level of such costs in Russia is close to that in the developed nations. At the same time, in absolute terms, economic damage incurred by emergencies and disasters in Russia is significantly inferior to that in the developed nations given its much lower (several times) welfare level. In terms of insured damage, this gap is even wider, soaring to an or-

der of magnitude given the poor development of insurance and reinsurance in Russia (Porfiriev, 2015A). Given this situation, the state (federal government) acts as “insurer of last resort” and is efficient enough in this capacity.

Available statistics on natural hazard emergencies reveal that the time frame from 1997 to 2015 averaged some 200 events per year (Figure 1). Wildfires represent the major contribution, making up 43% of the total number of emergencies, followed by a set of hazardous meteorological (29%) and hydrological (10%) events. On an average annual basis, natural disasters kill 56 people, with some two thirds of those victims of hazardous hydrological events, primarily floods.

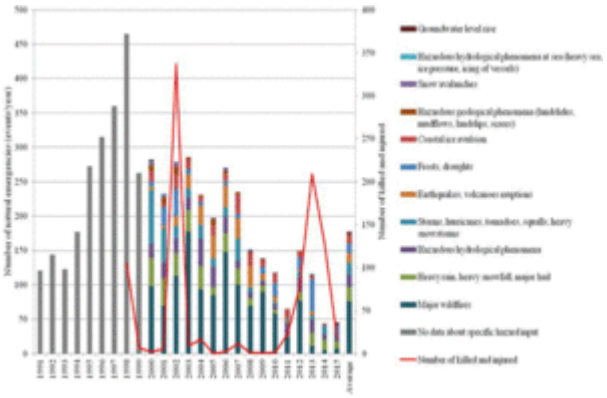

Figure 1. Frequency and composition of natural emergencies in Russia (1997–2015).

Adapted from data from EMERCOM of Russia, 2016 report (Gosudarstvenniy, 2016).

Floods also provide the largest share of direct and indirect economic damage. Reasons for this include high population and facilities’ density in areas most exposed to hydrological hazards (i.e., zones of maximum risk of flooding), and the frequency of major floods, with catastrophic flooding more likely than earthquakes. The mortality peaks evident in Figure 1 correspond to devastating floods in recent years: 1998 (Yakutia Republic), 2002 (south of the European region), 2012 (Krasnodar Krai), 2013 (Far East), and 2014 (South Siberia) (Badina, 2018).

Natural hazard emergencies in modern Russia resulting in large human losses and economic damage include the 1995 Neftegorsk earthquake disaster in the Sakhalin region, with 2,040 killed (Porfiriev, 1998); the 2002 Karmadon gorge glacial mudflow in North Ossetia (125 killed); the 2010 heat wave and wildfires, mostly in the European part of Russia (with over 54,000 more deaths as compared to the multiannual average; Porfiriev [2013]); and the hurricanes in Moscow in 1998, 2017, and 2018, with the total number of victims at more than 30.

The National Government as a Major Policy Institution in Natural Hazards and Disaster Areas

In Russia, the national government is the principal policymaker in disaster risk reduction and damage alleviation (Shoygu et al., 1999), providing over four fifths of funding from all sources against similar global indicators of some three quarters. The federal government is a key policy actor, while regional authorities, with the notable exception of Moscow, the capital of Russia, play a subordinate role. These regional authorities include the administrations of the 85 Russian Federation entities (46 oblasts, 22 national republics, nine krais, four autonomous okrugs, one autonomous oblast, and three federal cities: Moscow, St. Petersburg, and Sevastopol) integrated into eight Federal Districts of Russia (see Figure 2).

Figure 2. Federal districts of Russia, 2018.

Emergency preparedness and response funding comes from different budgets depending on the scale and severity of the disaster. The main burden is carried by regional budgets, which include two expense items associated with natural hazard preparedness, response and recovery: “Communities and areas protection against the aftermath of natural and man-made emergencies and disasters, civil defense,” and “Reserve funds of an executive authority.”[6] Reserves of financial and material resources are accumulated by the federal, regional, and local executive authorities in advance to provide urgent fund raising when a natural hazard emergency strikes.[7] The reserves make up 0.4% to 1% of regional budgets, with most funds accumulated in Moscow city, Rostov oblast, Bashkortostan and Tatarstan republics, Krasnodar and Stavropol krais, and St. Petersburg. The average per capita reserves are the highest there as well as in the sparsely populated resource-extraction regions of the Far North and other areas with extreme natural conditions (Chukotka autonomous okrug, Sakhalin oblast, Khanty-Mansiysk, Nenets and Yamalo-Nenets autonomous okrugs). Given that reserves funds for a community’s protection in emergencies and disasters in Russia correspond with available regional budget resources more than with the severity and scale of impact of a natural hazard, no one is surprised by a huge gap between the required and the actual level of funding.

Regional Contrasts

Within this context, it is worth noting that the vastness of the Russian territory provides for regional high heterogeneity, diversity, and contrast, not in terms of exposure to natural hazards alone but also in terms of socioeconomic characteristics that directly or indirectly affect a region's vulnerability and resilience to natural hazards and disasters. In particular, inter- and intraregional inequality is pronounced (Zubarevich, 2010). This reveals itself in a development gap between different regions: in the European part of Russia, over 80% of the population is concentrated within an area almost three times smaller than Russia's Asian part: the average population density of 27 people km^{-2} versus 3 people km^{-2}, respectively. In the least developed Arctic territories (e.g., Chukotka, Nenets, and Yamalo-Nenets autonomous okrugs), the population density is less than 1 person km^{-2}. In these regions, indigenous minorities of the Russian North live within extreme natural conditions and carry on a traditional nomadic lifestyle, including reindeer herding and hunting. A lack of developed infrastructure in residence areas necessitates special measures on the part of the state to protect these vulnerable groups from natural disasters (e.g., using small aviation vehicles to transport injured people).

The implications of differences in development levels can be illustrated using the abnormally hot summers of 2010 and 2012 as an example. In 2010, densely populated areas of central Russia were the most affected, while in 2012, the heat affected the much less populated Arctic zone and Southern Siberia areas. Accordingly, despite a more intensive 2012 emergency and its stronger impact, many fewer people were exposed (10 million as opposed to 35−40 million), and thus the economic costs in 2012 were less.

Differences in the degree of urban and agricultural segment contributions to regional economies also significantly affect the structure and value of expected losses from natural disasters. The most urbanized areas (excluding Moscow and St. Petersburg) include the Russian Arctic regions and long-established regional centers of industrial production (e.g., Kemerovo, Sverdlovsk oblasts). For regions with highly efficient agricultural production (Krasnodar, Altai, Stavropol krais) as well as for national republics with a traditional lifestyle (e.g., Northern Caucasus republics), the percentage of the rural population typically exceeds that of Russia's average.

Economic inequality can be illustrated by the examples of differences in gross regional product per capita between the leading and the most lagging regions, which skyrocketed to a 55-fold difference in 2016; the analogous gap in terms of per capita income is much smaller and amounted to a five fold difference (not adjusted to the cost of living) (Regiony Rossi, 2017). Regional inequality is also great in the fiscal (budget) capacity area: in 2017, the so-called donor regions (needing no equalization transfers from the federal budget) made up only 14 of the 85 administrative entities of the Russian Federation, with Moscow and the key hydrocarbon production regions as leaders. Thus, every region in Russia is unique, not in terms of exposure to natural hazard impact alone, but in its vulnerability resilience, and adaptive capacity as well. These factors contribute to and make up the integral level of natural risk for communities and areas, which serve as a key indi-

cator which is needed to develop disaster risk reduction and response and recovery policy models tailored to specific regions.

Natural Hazards Governance: Disaster Risk Reduction and Disaster Policy

Evolution of the National Emergency Management System and Disaster Policy: From the Soviet Union to Contemporary Russia

The radical political change in the former Soviet Union in the second half of the 1980s coincided with a set of major emergencies, disasters, and catastrophes, the 1986 Chernobyl radiation accident and the 1988 Armenian earthquake being the most devastating. This specific combination of circumstances facilitated and accelerated drastic changes within the existing national civil defense system (Profiriev & Simons, 2012).

In 1989, a special government regulation established the State Emergency Committee of the Soviet Union. Approximately a year later, an analogous committee was organized in the Russian Federation as part of its Council of Ministers (the government of Russia). In 1990, this committee was moved to the administration of the Russian president and changed its name to the State Committee of the Russian Federation for Civil Defense, Emergencies and Natural Disaster Response (EMERCOM) (EMERCOM, 2019). This was an official recognition that the protection of communities and regions in both peacetime and wartime emergencies was a relatively independent and important area of national policy.

In 1992, EMERCOM’s role was strengthened by vesting in it the responsibility for the development and enforcement of the national state system for preparedness and response to natural hazards and technological disasters, with other federal bodies retaining their responses to other kinds of emergencies. For instance, the Ministry of Health is responsible for preparedness and responsiveness to epidemics and pandemic diseases.

In December 1994, Federal Act No. 68-FZ for Communities’ and Territories’ Protection against Natural and Technological Emergencies and Disasters (the1994 Federal Emergency Act) was adopted. This transformed EMERCOM into the Russian Federation Ministry for Civil Defense, Emergencies and Natural Disaster Response (keeping the Russian acronym EMERCOM) and established the Integrated State System for Emergency Prevention and Response of the Russian Federation (EPARIS).

The National Security Strategy of the Russian Federation was first approved in 1997 and then updated in 2000, 2009, and 2015 (National Security Strategy of the Russian Federation, 2015). The latest version of this strategy considers disasters caused by the impact of natural hazards, including global climate change, as a major threat to the Russian state and to public security. However, overall the issues of natural hazards and disaster risk reduction have been only mentioned in the 1994 Federal Emergency Act as opposed to

those of national defense, sustainable economic growth, and environmental protection, considered there in much more detail.

Institutional and Legislative Issues of Natural Hazards Governance

The radical political and socioeconomic permutations that followed the dissolution of the Soviet Union led to crucial changes in Russian legislation. In particular, these involved the development and enforcement of federal law (the1994 Federal Emergency Act) and supporting governmental regulations that provided the legislative foundation and the institutional framework of the national disaster policy, including establishment of EPARIS as an all-hazard organizational system to reduce the risk of and cope with actual disasters.

Unlike most Western nations where long-established regional (subnational) legislation has served for decades as the cornerstone of both socioeconomic development and disaster policy, most of the entities making up the Russian Federation until recently simply copied the existing federal acts or altered them slightly. This underestimated the Russian constitution’s provision for shared responsibility and governance of both federal and regional authorities, on one hand, and, on the other, revealed an increased federalization or centralization of natural hazards governance (Sistemy, 2012).

In the late 1990s and early 2000s, disaster legislation and financing still prioritized disaster preparedness and response rather than disaster risk reduction or natural hazards governance. In part, this follows directly from the centralization of the national emergency management system and disaster policy which, in turn, is a manifestation of Russia’s many centuries-old history and cultural legacy. With the bulk of powers and funds concentrated at the federal government level, regional and municipal authorities experience shortages of resources, although they are key agents in mapping and assessing natural hazards, preparedness efforts, and early responses to disasters.

In force for 25 years, the 1994 Federal Emergency Act serves as an umbrella overall and makes up the core of the set of over 1,000 federal and regional laws and regulations in the area of natural hazards governance and disaster management. To ensure that it remains efficient, 13 amendments have been made to it since it was first passed. These involve adjustments and improvements introduced via adopting new federal laws, with the latest one dated June 2016, and leaves governmental regulations alone. Worth emphasizing are three sets of legal improvements.

One of these involves the Russian Federation President’s Decree No.1515 of October 23, 2008 that established the National Crisis Management Center attached to EMERCOM as a focal point of EPARIS. To increase the quality and timeliness of decision-making processes, the Government of the Russian Federation Regulation No. 577 of July 16, 2009 provided for the organization of panels of experts charged with counseling on disaster risk reduction and protection of communities and areas in disasters as well as fire safety and human safety regarding water. Expert panels were established both (a) at EMERCOM

as the federal disaster policy coordinator and the EPARIS system integrator and (b) at every department and region of the country as the EPARIS elements.

Another group of modifications concerns modernization and diffusion of technical equipment and systems in issuing public warnings and providing urgent response information to communities affected by the impacts of natural hazards (including the 2013 law amendment on using mass media). In 2017, Federal Law No. 126-FZ, "On Communication," was amended to establish a mandatory requirement for telecom operators to transmit alert signals and emergency information about natural hazards as well as to inform communities about necessary protection measures and behavior rules in emergency conditions. To ensure information data and alerts about natural and other hazards are communicated and reaching authorities, emergency and civil defense units, and local people, warning systems have been established and function at all levels of EPARIS. By 2014, the warning systems were organized in some 80% of municipalities, and by the middle of 2018, all municipalities were covered by the systems.[8]

In addition, an emergency early information system amalgamating all phone calls to urgent response services using a single number,"112" (as in Europe), was organized in every part of the Russian Federation. Segments of hardware−software complexes organic to the "Safe City" concept were approved by the government of the Russian Federation in 2014.[9] These segments include community emergency warning systems for monitoring hydrometeorological hazards, forest fires, radiation and chemical hazards, critically important and potentially dangerous facilities, fire safety, environmental quality, and so on.

The latest legislation improvements deliver better harmonization of existing legal regulations of communities and area protections against the impact of natural hazards and disasters in Russia with the principles and rules of international law. By the same token, the Russian Federation has signed cooperation agreements in the field of industrial accidents and natural disaster risk reduction as well as response to and recovery from disasters with most European nations (including Germany, France, and Italy) (Kuvshinov, 2011), the former USSR republics (Belarus, Armenia, and so on), the Shanghai Cooperation Organization (SCO) member countries, the United States (until 2017), some African (Tunisia, Egypt) and Latin American (Cuba, Peru) nations, as well as various multilateral treaties.

Protection of communities and areas implies three kinds of additional legal provisions. One set of provisions would clarify federal and regional authorities' powers and facilitates use of military rescue units to cope with natural hazards impact and disasters. The next set of provisions, in addition to those adopted in 2012, would strengthen regional and municipal authorities' still insufficient powers and resources to cope with natural hazards and disasters. A third set of provisions would cover poorly regulated areas of natural hazards governance and disaster policy (e.g., floods, wildfires), extending and strengthening earlier improvements like those relating to wildfire hazards management introduced in 2015 and 2016.

Increased focus on legal support for and the strengthening of fire safety emerged as early as 2004 when the EMERCOM ministry was established and took responsibility for the federal fire service (earlier part of the Ministry of Interior) and some 300,000 fire fighters, creating a new federal department. In July 2008, Federal Act No. 123-FZ,"Technical Regulations on Fire Safety Requirements," provided for complex requirements for every area of fire safety activity—from settlement design to specific facilities, buildings, and products—and introduced standards for fire safety and fire protection. In 2011, the Federal Act "On Voluntary Fire Service," facilitated the loosening of legislative barriers to organize effective voluntary fire teams as a core of the first responders to fire disasters.

A year earlier, in 2010,a major disaster involving heat waves and wildfires during an extremely arid summer triggered legislative activity on a specific aspect of fire safety: wildfire risk reduction and fire suppression. The Regulation on Federal State Forest Fire Supervision was approved in 2013. This regulation established organizational procedures and provided a list of federal executive bodies authorized for supervision and the subject and types of inspections as well as the legal framework for these activities. In the field of forest and steppe fires protection, the federal government has signed a number of agreements with regional authorities (e.g., those of the Tuva and Buryatia Republics) and neighboring countries (Gosudarstvenniy, 2018). For instance, such agreements have been signed with the Commonwealth of Independent States and the Mongolian government regarding forest fire protection, which facilitates border crossing to allow for joint suppression of transboundary fires. In 2013 as well, the Russian Federation State Program was adopted for communities and area protection in emergencies, as well as for assurance of fire safety and public safety regarding water hazards by 2020. Its intention is to minimize social, economic, and ecological damage to communities, the economy, and the environment incurred by wildfires and other natural hazards' impact as well as by water damage.

Analysis of the existing legal framework and development trends in the area of natural hazards governance and disaster policy reveals that a substantial number of statutes and regulations take into account the best examples from Europe and the rest of the world and provide a solid basis for the mitigation, preparedness, and response to and recovery from disasters. Most Russian regions are steadily developing disaster legislation of their own, harmonizing it with that at the federal level.

Organization of the National System for Natural Hazards Governance

EPARIS is the national system responsible for community and area risk reduction of, preparedness and response to, and recovery from disasters caused by natural and technological agents. Given its coverage of civil defense issues as well, EPARIS actually should be considered as an all-hazard (or in military terms, total defense) national system.

This predetermines, first, that EPARIS covers every operation area, function, authority, and decision-making level of natural hazards governance and disaster policy. Second, the system's hierarchy integrates bottom-up (municipal and regional) efforts to reduce disaster risk and compose contingency and operation plans at the local level with top-down,

centralized strategic planning and coordination of regional contingency planning. Given significant shortages of resources at regional and especially municipal levels, the federal component of EPARIS plays a decisive role in implementation of regional plans, providing both materiel and personnel assistance when disaster strikes.

Thus, assuming a shared governance concept of tackling hazards and coping with disasters, EPARIS actually implements this concept only partially, given resource constraints at regional and municipal levels. However, the salience of the shared governance approach to disaster policy is clearly manifested in EPARIS's structure, incorporating two subsystems, spatial (territorial) and functional (Figure 3).

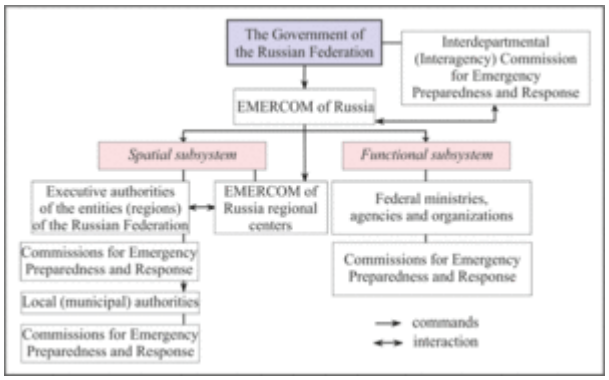

Figure 3. EPARIS organization chart.

The spatial subsystem is organized by the executive authorities of Russian Federation entities and municipal authorities according to existing administrative and spatial divisions of the national territory. In total, the EPARIS spatial subsystem includes more than 5,000 elements in 85 territories of the Russian Federation, with over 1,000 of these in urbanized areas and major cities, and some 20,000 in towns, hamlets, and villages in rural areas. These elements are the key agents responsible for local communities' preparedness, response to, and recovery from disasters caused by both natural and technological hazards' impact. Acting within this all-hazard framework, they interact and coordinate their efforts to provide integrity and consistency of planning and implementation of measures to protect local communities using the joint (universal) tools of early warning, evacuation, rescue, and reconstruction applicable to efficiently coping with any kinds of disasters. This in no way ignores specificity of preparation and response to technological accidents caused by chemical or radiation agents. This response requires and involves regional and local authorities' close cooperation with professional communities from industry and business and the respective federal ministries that are part of the functional subsystem.

The functional subsystem is organized by federal executive authorities and consists of management, units, and resources of EMERCOM and 15 other federal ministries and agencies. These include the following: Ministry for the Interior (police); Ministry of Defense; Ministry of Finance; Ministry of Economic Development; Ministry of Construction, Housing, and Public Utilities; Ministry of Labor and Social Security; Ministry of Science and Higher Education; Ministry of Education; Ministry of Health; Ministry of Agriculture; Ministry for Industry and Trade; Ministry of Energy; Ministry for Transportation; Ministry

for Digital Development, Communication, and Media; and the Ministry for Natural Resources and Ecology. These are accompanied by the State Agency for Atomic Energy (ROSATOM), Federal State Hydrometeorology Service (ROSHYDROMET), and the Federal Service for Industrial Safety Surveillance (ROSTEKHNADZOR).

Acting within the all-hazard framework of EPARIS, these elements are, however, more specific, focusing on particular industries (economic sectors) or areas of competence (management function), including monitoring (observation and control), operation management (risk reduction, preparedness, response, and recovery), and logistical support (material, technical, financial, and so on). For instance, ROSATOM is responsible for risk reduction of, response to, and recovery from nuclear (radiation) accidents alone; ROSTEKHNADZOR is responsible only for risk reduction of technological accidents; ROSHYDROMET and the Ministry for Natural Resources and Ecology is responsible for monitoring of both natural and technological hazardous agents and assessment of their impact on communities and ecosystems; the Ministry of Economic Development is responsible for food and material supplies from the State (Federal) Reserve to communities and industries affected by the impact of natural and technological hazards.

EPARIS's spatial and functional subsystems and their elements are operational at five basic levels, corresponding to those making and implementing decisions with respect to the severity of disasters. These include the on-site or facility level; local or municipal level; regional level or the Russian Federation entity level; the macro-regional level, which involves two or more neighboring members of the Russian Federation; and the federal level. Each of these levels is composed of a similar set of operation and control elements, including those for coordination, permanent operation, and control, and are especially authorized to provide everyday operation and control in communities and areas in disasters, as well as staff and resources, financial, material, and technical reserves, communications, and warning and information support systems.

The EPARIS coordination elements conduct strategic and tactical planning primarily associated with disaster risk reduction, preparedness, and response. The Federal Targeted Program for Risk Reduction and Mitigation of Natural and Technological Disasters in the Russian Federation (initially effective by 2015 and extended beyond) is a cornerstone in this area of natural hazards governance and disaster policy. Its major tasks involve risk reduction of disasters caused by natural hazards and technological accidents, decreasing the number of those affected and killed, and lowering economic damage and losses. Despite a significant shortage of funding following the 2008 to 2009 economic downturn, the measures implemented within this program contributed to a conspicuous decrease in the number of those killed in disasters (by some estimates, by 15% from 2005 to 2015). Conceivably, this resulted from efficient responses because of the high quality of rescuers' training and the efficient coordination of rescue team operations, given the number of those rescued increased in such operations. Meanwhile, the number of people affected by disasters and the value of economic damage and loss from 2005 to 2015 increased (according to the author's rough conservative estimate, by 5−7%).

At the federal level, the EPARIS coordinating bodies include the Interdepartmental Commission for Emergency Prevention and Response, composed primarily of deputy ministers and directors of the 15 federal ministries and agencies, respectively, responsible for disaster policy. These are headed by the prime minister who, in accordance with Russian law, is the chief of Civil Defense of the Russian Federation, with its daily routines managed by EMERCOM. The EMERCOM minister is the Deputy Chief of Civil Defense and Commander-in-Chief of the Civil Defense troops. Since 2009, the EPARIS daily routine operations have been the responsibility of and handled by the National Crisis Management Center at EMERCOM.

The EMERCOM and emergency commissions of the 15 ministries and agencies make up the body of the federal coordinating organizations, with EMERCOM as the key coordinator of civil protection and fire planning, search and rescue, and evacuation in disasters, including major fires. Medical care, transportation, public order support, and other crisis management functions are carried out by other elements of EPARIS.

At the macro-regional level, the EPARIS coordinating bodies involve EMERCOM's seven regional centers. At the regional, local, and organizational (facility) levels, coordinating bodies include the Commissions for Emergencies and Civil Defense at the executive authorities of the Russian Federation entities, municipalities, and organizations' management, respectively. The more crisis situation worsens and natural hazard impact transforms into a major disaster, the higher the EPARIS level of involvement.

Resources for urgent responses are provided by units dedicated to fire, search and rescue, emergency and rescue, emergency technical support, and emergency recovery within EPARIS's permanent operation and control bodies. At the regional, local, and organizational (facility) levels, these resources involve firefighters, urgent technical support, emergency medical care, and police units. Depending on the situation, EPARIS operation routines are classified as everyday (ordinary), alert (increased readiness), or emergency (extraordinary).

Science and Education in the Field of Natural Hazards Management

The EPARIS facilities for monitoring and operational control also include interdepartmental organizations that are not direct parts of the federal government. Fundamental and applied research in the field of natural hazards and disaster risk reduction is carried out at universities in Moscow, St. Petersburg, North-West, South, Northern Caucasus, Ural, and the Siberian and Far Eastern Russian regions. These academic institutions complement the efforts of research institutions of the Russian Academy of Sciences (since 2018, organic to the Ministry for Science and Higher Education) and comprise a part of the National System for Surveillance and Laboratory Control of Hazardous Substances coordinated by EMERCOM.

In addition, comprehensive studies are conducted at research organizations of the federal departments and agencies, primarily at the Russian Hydrometeorological Service or Roshydromet (e.g., by the A. I. Voeikov Chief Geophysical Observatory) and at EMERCOM

Russia. Within these two research organizations, given their specific focus on high-level studies of natural hazards' analysis, assessment, and disaster risk reduction, are these: All-Russian Research Institute for Civil Defense and Emergency Situations (established in 1976), and All-Russian Center for Monitoring and Forecasting Emergencies (*Antistikhia*) (established in 1999) (Faleev, 1998). Furthermore, there are the EMERCOM Center for Strategic Civil Protection Studies (established in 1995) and the All-Russian Fire Protection Research Institute—EMERCOM's oldest research unit, organized as early as 1937.

One should not overlook the so-called disaster medical centers' activities that make up a critical area of research and practice for reducing the impact of epidemics, epizootics, and epiphytotics following natural hazards and community vulnerability. These centers focus on development and implementation of prevention, preparedness, and coping measures to reduce damage to human health and life and to assist in the effective recovery of those affected or injured. These centers are located not only in populous areas and other mega-cities, which are increasingly vulnerable to natural and other hazard impacts, but also in smaller regional settlements, including those in remote areas located in zones of high natural risk (Buryatia, Krasnodar Krai, etc.).

Regarding education in this field, the discipline of study of Life Safety in most general and higher education institutions includes topics such as studying natural hazards, risk reduction measures, and ways of ensuring community protection in natural disasters. It facilitates the educating of lay people, business leaders, and civil authorities concerning natural hazards and their impact on communities and facilities, thus strengthening resilience, including the population's readiness to effectively prepare for, response to, and recover from such disasters.

Natural Hazards and Disaster Risk Reduction Policy in Practice: 2013Catastrophic Flooding in the Russian Far East

Given an affected area exceeding eight million km^{-2} and over 170,000 people isolated there (an area 15times the size of France and almost the same size as the United States), the 2013 flood that occurred in Russia's Far East is unprecedented in modern history. Caused by unusually heavy and the longest rainfall in 115 years, it encompassed practically the entire Amur River basin, including the areas of five territories of the Russian Federation and the northeastern part of China.

A total of 388 settlements in 74 municipal districts were affected, 23,000 people were evacuated, and 621,000 hectares of farmland, more than 13,000 residential houses, and 22,000 suburban and household plots were flooded. A total of 610 social meeting places, 14 agricultural facilities, 10 hazardous material venues (including an oil tank farm, four animal burial sites, and five cemeteries), 34 waterworks (dams and other structures) were damaged. Segments of transport and energy infrastructure were inundated (about 2,000 km of roads, 185 bridges and bridge crossings, and over 546 km of power transmis-

sion lines) (Katastroficheskoye, 2016). The large-scale aftermath of the flood qualified it as a “catastrophic event” corresponding to all federal emergency criteria except for lives lost (thanks to rescue efforts by EMERCOM and EPARIS).

A federal disaster declaration in the affected territory triggered the deployment of a large-scale operation, including a combination of evacuation, search, rescue, and early recovery measures. These were carried out by urgent response units of over 46,000 personnel using 7,000 special equipment units (including 51 aircraft, four unmanned aerial vehicles, and over 1,000 watercraft). Over 11,000 personnel and 1,500 pieces of equipment were under the authority of EMERCOM. This response operation was unprecedented in EMERCOM’s history and had almost no analogue in recent history.

Our estimate shows that direct economic damage to the Far Eastern Federal District’s communities and facilities soared to 85–90 billion rubles, or some US$4.8 billion (at purchasing power parity) and 3.1–3.2% of gross regional product (GRP), or 0.14% of GDP in 2013 prices (Porfiriev, 2015B). Almost one half of the damages (40 billion rubles) fell to the residential sector and citizens’ property followed by transport infrastructure (roads, bridges) at 30 billion rubles, agriculture (including loss of soil fertility) estimated at 14 billion rubles; housing and utilities infrastructure (2 billion rubles), and the energy infrastructure (0.5 billion rubles).

The total damage from this one flood accounted to some two fifths of the average annual direct economic damage incurred by all natural disasters in Russia in recent years and exceeded by more than an order of magnitude average damage from all global floods (0.01% of the gross world product). Adding the costs of disaster responses (about 2 billion rubles) to direct and indirect damages, the total cost of the Amur River basin flood skyrockets to some 527 billion rubles, or over US$29 billion (in purchasing power parity), equivalent to 0.8% of the Russian GDP in 2013 (Porfiriev, 2015B). By comparison, this is roughly onefourth the size of the cost of Hurricane Katrina in the United States in 2005, which was over US$120 billion (Pielke, Rubiera, Landsea, Fernández, & Klein, 2003).

Whatever the scale of the economic damage incurred by this major flood, it can hardly blur the key outcome of the large-scale emergency operation: no human lives were lost. This success resulted from several factors. One of these was timely operational forecasts and scientifically proven models of human settlement inundation. The forecast that assumed the first flood wave occurring on July 20, 2013 on the Zeya River upper tributaries proved to be correct. In addition, the EMERCOM Antistikhiya Center issued a timely warning about a dangerous water level rise, which allowed for operational planning of a set of response measures well in advance. The urgency of the event was further reduced significantly by the Governmental Emergency Commission’s operative decision to control water discharge from the reservoirs at the Zeya and Bureya hydroelectric power plants. Last, but not least, the rapid and coordinated efforts of EMERCOM and the other EPARIS urgent response units, supported by local volunteers in creating protective sandbag dikes, made a decisive contribution to the efficient handling of the disaster.

The urgent response system included the Government Emergency Commission, its operational headquarters, and similar regional commissions organized in the affected Far Eastern entities of the Russian Federation, as well as the executive and municipal authorities of these affected entities of the Russian Federation. In addition, mobilization included EMERCOM operational headquarters, military and rescue units, response forces (over 300 task groups), and over 200 task groups of the regional executive bodies of federal departments. The rescue teams of the EMERCOM military units and its civil rescue units in the Far Eastern region were reinforced by other regions from the Russian Federation, and these made up the bulk of the response in the affected area.

The overall operational management of forces and assets was organized by the EMERCOM National Crisis Management Center. The management of the response grouping as outlined was successively transferred from the Government Emergency Commission's Operational Headquarters to the interregional and finally to the regional level when the situation was under control. As the water level in the flooded areas decreased, the urgent rescue units were replaced by emergency and recovery teams who carried out primary restoration work under local government guidance. Komsomolsk-on-Amur city's protection against the impact of flooding provides a vivid illustration of the efficient combined use of EPARIS and local volunteers. To ensure the safety of city dwellers and industrial facilities, these people toiled hard for 2 weeks to increase the height of existing dams, which stretched over 13 km along the coast, from 6 m to 9.5 m, and to erect the new protective structures. This hard work was further exacerbated by bad weather conditions and required the use of water protection screens, which were held by EMERCOM rescuers and servicemen periodic shifts, thus making a "living wall" against the surging water.

The main result of these heroic actions to protect communities and facilities was that no one was killed by the disaster except for one rescuer. Such an outcome is even more significant given that in China, which is just across the border, witnessed over 200 killed or missing as a result of the same flood despite the fact that at the beginning of the 21st century, the Asian Development Bank implemented a large-scale investment project to reduce the risk of Sungari River flooding in that part of China.

When the hydrological situation in the flood zone stabilized, the president of Russia signed the decree: "On Measures to Alleviate the Aftermath of Large-Scale Flooding in the areas of Sakha Republic (Yakutia), Primorsky and Khabarovsk krais, Amur and Magadan oblasts, and Yevreyskaya Autonomous Oblast." To implement the measures, the federal government issued a number of orders. These involved allocations from the Reserve Fund of the federal budget to the affected regions for subsidies for compensatory measures to balance regional budgets: subsidies to provide co-financing of regional expenses and to reimburse part of the interest rate on loans for land reclamation and agrotechnical works restoration of flooded and water-logged crop areas; and the provision of temporary housing to groups whose houses were damaged or lost. In addition, the federal Depart-

ment of Finance issued an order that temporarily exempted those affected by the flood from payment of land and property taxes.

Considering the lessons from the 2013 catastrophic flood in the Far East, the Russian government introduced two groups of institutional measures to reduce the hazard of floods and to improve flood risk management effectiveness. In the domestic policy field, the Federal Law on Flooded and Inundated Zones was in force as early as November 2013. It amended the existing Water and Town Planning Codes of the Russian Federation, the Code of Administrative Offenses, and other legislative acts. In particular, the Water Code of the Russian Federation was supplemented by Article 67.1 on the prevention of and recovery from the impact of hazardous floods. To implement the law, on July 10, 2014, the Russian government introduced the Integrated System for Flood Risk Reduction in the Far Eastern Federal District.

In the foreign policy area, international agreements were signed with China for cross-border cooperation regarding flood risk management and control. These included the 2015 interdepartmental memorandum of understanding between the bodies responsible for flood control and the 2017 agreement on the exchange of data on hydrological conditions in the border areas to facilitate preparedness and response. However, existing disagreements still remain to be solved. These relate to hydraulic structure development on both the Chinese and Russian banks of the Amur River, and these structures' joint impacts, including erosion of the opposite bank, alteration of the riverbed, and increased risks of flooding (Siminov, Nikitina, Osipov, Egidarev, & Shalikovsky, 2016).

Conclusion

The existing national system for emergency prevention and response (EPARIS) provides for efficient protection in disasters caused by natural and technological agents. After 15 years of EPARIS's existence, clear evidence exists of an ever-increasing number of rescues and decreasing deaths in the largest disasters caused by natural hazards in the early 21st century. In addition, the rescuers of EMERCOM, the cornerstone of this system, have an international reputation as one of the world's best responders to disasters, helping to extinguish wildfires in Greece and Spain and rendering aid and brining relief to those affected by earthquakes in China, Turkey, and Indonesia.

However, these achievements leave no room for complacency given increasing numbers of those affected by hazardous impacts and the steady upward trend of the costs of economic damages and losses. These increases, on one hand, result from existing limitations in EPARIS preparedness and recovery functions, which in turn are precipitated by deficiencies in its organization (under review as of 2019) and a shortage of funding, especially of its spatial subsystem (the regional component). On the other hand, rising social and economic costs of natural hazards impacts and disasters are not a Russia only phenomenon, but are a worldwide trend which manifests in the increasing vulnerability of communities and facilities to the combined impact of natural and technological agents. In recent decades, this impact has been further exacerbated by global climate change, particularly

noticeable in Russia in its vast Arctic zone, but (as the 2010 heat wave and consequent wildfire disaster show) is not limited to this area.

Natural hazards governance as well as disaster policy as a whole are becoming increasingly more complex and call for further development and improvement of EPARIS. Three coupled action strategies are envisioned in the foreseeable future.

One of these involves the integration and matching of two currently conceptually and organizationally separate policies for disaster risk reduction and adaptation to climate change. This follows from commonalties (cross-points and cross-areas) existing between the two policies. The value of this suggested integration extends far beyond the boundaries of academic or natural hazard governance or emergency management efficiency alone (Porfiriev, 2015C). It would provide for a systemic (all-hazard, macro-regional, and multidisciplinary) policy that would result in significant economic benefits, including reductions of transaction costs and capital and operational expenditures. Such reductions are especially valuable during the economic slowdown that continues to persist in Russia.

This strategy is closely associated with another strategy providing for enhancing resource support, including increased funding and modern monitoring, fire safety, rescue, and the acquisition of other equipment for raising the efficiency of natural hazard governance and civil protection as a whole. In turn, improvements in funding and modern equipment supplies depend directly on the pace, level, and qualitative metrics of economic growth. The persisting economic slowdown in Russia constrains the potential of the betterment of existing systems. Given this situation, the suggested integrated policy of marrying disaster risk reduction and adaptation to climate change would not only contribute to saving more human lives, bettering health, and increasing wealth, but also serve as a specific driver to improve the quality and dynamics of the currently sluggish economic picture in Russia.

Last, but not least, development of EPARIS demonstrates its increasing cooperation with national and international civil protection organizations using the Sendai Framework for Disaster Risk Reduction (2015−2030) as an institutional basis for improvement in two directions. First, in the area of natural hazards governance, the UN document focuses on disaster risk reduction as both a policy and expected outcome and strengthens resilience (UNISDR, 2015) as opposed to the earlier Hyogo Framework for Action (2005−2015) (UNISDR, 2005), which focused on a broader disaster management paradigm. Second, the Sendai Framework’s broad concept of disaster risk reduction, which accommodates natural and man-made hazards and related environmental, technological, and biological hazards, provides for strengthening of the role of an all-hazard approach to preparedness, response to, and recovery from disasters as the basis for increasing efficiency and expanding international cooperation and aid beyond specific types of disasters.

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Notes:

(1.) The National Security Strategy of the Russian Federation (1997).

(2.) Federal Law, " About Environmental Protection," January 10, 2002, No. 7-FZ, as amended (revised December 31, 2017); Federal Law of 29.07.2018, No. 252- FZ, "On Amendments to the Federal Law 'On Environmental Protection'" and Articles 1 and 5 of the Federal Law "On Amendments to the Federal Law 'On Environmental Protection' and Specific Legislative Acts of the Russian Federation," with consideration of development of systems for automated control of pollutant emissions and discharges.

(3.) Resolution of Russian Federation Government of 21.05.2007, No. 304 (edited May 17, 2011), " About classification of natural and man-made emergencies."

(4.) In January 2019, the exchange rate between the U.S. dollar and Russian ruble was roughly $1 = 66₽ (current) and $1=24₽ (PPP terms).

(5.) According to the Bank of Russia, the exchange rate on November 18th, 2018was 1 U.S. dollar = 66 rubles

(6.) According to the 2015 annual report of the Russian Federal Treasury: *Consolidated budgets of Russian regions and the budgets of territorial state extra-budgetary funds*.

(7.) Article 25 of the Russian Federation Federal Law of December 21, 1994, No. 68-FZ, “About Population and Territories Protection from Natural and Man-Made Emergencies.”

(8.) See (Gosudarstvenniy, 2019) for more details.

(9.) See Shneps-Shneppe et al. (2016) for more details.

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