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# STRENGTHENING MOLDOVA'S DISASTER RISK MANAGEMENT AND CLIMATE RESILIENCE

## Facing Current Issues and Future Challenges







**WORLD BANK GROUP**



**GFDRR**  
Global Facility for Disaster Reduction and Recovery

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## **The World Bank's Engagement in Moldova**

The World Bank, like other international financial institutions and bilateral donors, has been supporting the Government of Moldova over many years on the DRM and climate resilience agenda, including a Post-Disaster Needs Assessment after the 2010 floods, the Disaster and Climate Risk Management IDA (International Development Association) project (US\$10 million, closed in 2015), and a Climate Adaptation Project (US\$27.2 million, approved in 2017 but canceled in 2018), as well as a

series of recent technical assistance activities focused on improving hydromet services and the disaster response capacity of the General Inspectorate for Emergency Situations. However, the activities do not constitute an integrated approach, and a renewed effort is required. Given the complexity and cross-sectoral nature of the required DRM reform actions, government commitment and ownership represent critical prerequisites for success.

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# ABBREVIATIONS

<b>CAT-DDO</b>	Catastrophe Deferred Drawdown Option
<b>CCA</b>	climate change adaptation
<b>DRM</b>	disaster risk management
<b>DRR</b>	disaster risk reduction
<b>ECLAC</b>	Economic Commission for Latin America and the Caribbean
<b>EIB</b>	European Investment Bank
<b>EU</b>	European Union
<b>GDP</b>	gross domestic product
<b>GFDRR</b>	Global Facility for Disaster Reduction and Recovery
<b>GIES</b>	General Inspectorate for Emergency Situations
<b>ICT</b>	information and communications technology
<b>IFAD</b>	International Fund for Agricultural Development
<b>INSARAG</b>	International Search and Rescue Advisory Group
<b>LPA</b>	Local Public Authority
<b>NAP</b>	National Adaptation Plan
<b>NATO</b>	North Atlantic Treaty Organization
<b>PDNA</b>	Post-Disaster Needs Assessment
<b>PPRD East</b>	Prevention, Preparedness and Response to Natural and Man-made Disasters in the Eastern Partnership Countries
<b>SHS</b>	State Hydrometeorological Service
<b>UNDP</b>	United Nations Development Program
<b>UNDRR</b>	United Nations Office for Disaster Risk Reduction
<b>USAR</b>	Urban Search and Rescue





# EXECUTIVE SUMMARY

Moldova is exposed to an array of natural hazards, and their impact disproportionately affects the poor. Floods, droughts, and severe weather events are the most recurring threats—but earthquakes, though rarer, could also have a devastating effect. Projected rises in temperatures, rainfall volatility, and incidence and severity of drought due to climate change are likely to render the impacts of disasters worse over the medium term. Moldova has some of the core institutional and legislative structures for disaster risk management (DRM) in place, but—as is common in many countries—the main emphasis is on “reactive” disaster response, not necessarily on “proactive” disaster risk reduction or disaster risk mitigation.

The Government of Moldova has been strengthening institutions to better prepare for and respond to disasters. It has improved the ability to forecast severe weather, including at the local level, through improved hydrometeorological services; it has reduced the agricultural sector’s vulnerability to climate change by improving irrigation services, strengthening the existing agriculture insurance scheme, and promoting climate-smart agriculture practices; and—importantly in light of the small size of the country—it has strengthened regional collaboration and knowledge sharing on DRM. However, much remains to be done, and the social and economic costs of disasters cannot be underestimated: over the past decade alone, floods and droughts caused US\$1.2 billion in damage; a major earthquake today could affect 60 percent of the country’s gross domestic product (GDP).

Strengthening Moldova’s DRM institutional architecture is not only essential to enable the country to better respond to natural hazards

but also other shocks and stresses, such as the ongoing COVID19 pandemic. Just like in the case of a disaster, emergency responses’ effectiveness hinges on the overall institutional governance arrangements not only at the national level but also at the local level – with local authorities being at the frontline of combating the COVID-19 epidemic jointly with the DRM agency and different sectoral actors. Local capacity is essential because Moldova’s ability to respond to COVID-19, or any other shock or stress, is not just determined by its level of preparedness and readiness to cope with such complex crises, but also by the level of effectiveness of its governance systems (particularly in urban areas), as well as its existing service delivery and infrastructure systems.

In this DRM country policy note, chapter one provides an overview of Moldova’s disaster and climate risk profile. Chapter two reviews the current institutional and legal framework for disaster risk management and financing, including measures and policies recently adopted. Chapter three is an assessment of the current disaster risk management situation in Moldova, including ex ante and ex post disaster risk financing and insurance (DRFI) instruments currently in use for budget mobilization, and explores a potential earthquake scenario for Chisinau in more detail. The fourth chapter concludes with a look at potential institutional and financial gaps, including a summary of recommendations and different sets of corrective measures that could be envisaged.

Moldova needs to clarify roles and responsibilities for strategic oversight, planning, coordination, and implementation of risk identification, reduction, and response measures. A comprehensive DRM and climate resilience reform agenda would need to

comprise multiple elements to improve all aspects of an operational DRM framework, ranging from improved risk identification, better risk reduction, and enhanced preparedness, to stronger financial protection mechanisms and resilient recovery and reconstruction policies. Moldova developed a draft National Strategy for Natural Hazard Mitigation in 2015, but it was never finalized.<sup>1</sup> The government should now consider finalizing the Strategy to ensure an overarching and comprehensive DRM framework is in place. Such a framework would need to gradually move the focus of DRM from reactive, ex post responses to proactive, ex ante risk management. Given limited resources, it would also need to ensure that risk mitigation priorities are adequately mainstreamed within existing national programs (agriculture, urban planning, flood risk management, among others). High-priority actions for such a framework would need to include the following actions, specified for each phase of the DRM cycle:



### DEVELOPMENT OF AN OVERALL DRM FRAMEWORK

- Adopting a National DRM Strategy would provide an overarching vision and ensure that risk mitigation priorities are incorporated in appropriate national development programs. A national DRM strategy should be developed by key institutions and stakeholders in a collaborative and participatory manner, with a view to establishing functional arrangements for coordination and defining critical areas where capacities need to be strengthened.
- A national DRM Strategy would also fill existing legislative gaps and bring the Moldovan legislation in line with commitments under the Sendai Framework for Disaster Risk Reduction. Establishing and empowering a dedicated focal point/national platform to coordinate DRM activities along the entire DRM cycle on behalf of the Government of Moldova could also accelerate these much-needed reforms.

- It would also be beneficial for Moldova to modify its current legal framework by introducing an overarching DRM law to introduce key DRM terminology, and define the key roles and responsibilities for risk identification, assessment, mitigation, management, and finance at the national, regional, and local levels. Institutional mandates will need to be clearly defined to clarify responsibilities and avoid institutional overlap. The process of adopting the proposed strategy and corresponding legislative amendments should not prevent Moldovan authorities from pursuing a set of priority actions to further the overall DRM agenda.



### RISK IDENTIFICATION

- A common shared platform dedicated to multi-hazard risk information, including exposure and vulnerability data, should be developed and needs to be available to all relevant ministries and agencies. DRM risk assessments should be mainstreamed into sectoral development strategies. This change would facilitate greater coordination in data sharing and management and help meet priorities such as seismic risk mapping and the development of a national database of infrastructure and buildings and their vulnerabilities.
- To identify the most at-risk areas and building types, there is a need to conduct a detailed seismic risk assessment across key sectors: residential, education, health, utilities, communication and infrastructure systems, and the public sector (including emergency service buildings), among others. At a minimum, buildings could be categorized through this risk analysis into those that do not require structural intervention, those that need seismic retrofitting, and those that will require demolition and reconstruction.

- Moldova should also promote risk-informed land use planning that draws on improved hydrological and seismic risk mapping. This would help prevent settlement in floodplains and could inform urban planning processes and decisions regarding development planning, construction permitting, and seismic retrofitting and/or reconstruction of vulnerable key facilities and lifelines.



## RISK REDUCTION

### *Nonstructural measures*

- The methodology for quantifying losses needs to be updated to include both direct and indirect economic losses from disasters; this will better guide investments into risk reduction and response efforts.
- The ongoing building code reform and its full adjustment to Eurocodes (Eurocodes 7 and 8) needs to be completed, including the incorporation of build-back-better provisions.

### *Structural measures*

- Moldova needs to invest in urgent, high-priority risk reduction works that have already been identified, such as the Investment Plan for Flood Protection, and develop such investment plans where they do not exist. Although Moldova has bolstered its capabilities in early warning, preparedness, and risk information, actual investments in risk reduction are limited, especially given the variety and complexity of climate and disaster risks faced by the country.
- Moldova should start considering the development of an investment program to retrofit its public buildings and housing stock to better resist earthquake tremors. This would include developing (1) an in-depth assessment that could form the basis of a comprehensive national strategy to reduce the seismic risk

in priority high-risk structures and networks, and (2) an investment plan articulating how these risk reduction efforts would be financed and overseen.

- Moldova needs to pursue the rehabilitation of irrigation schemes to increase command areas, increase water capture/collection infrastructure, and carry out knowledge transfer activities that promote climate-smart agriculture practices.



## EMERGENCY RESPONSE AND PREPAREDNESS

- Citizens' awareness about earthquake risks, the risk reduction mechanisms available, and post-disaster reconstruction processes is limited in Moldova. Local community groups could be good forums for engaging citizens and building their awareness of countrywide measures for seismic risk reduction, prevention, and preparedness, particularly in the housing sector.
- Early warning and communication systems should be improved given that emergency communication and disaster management information systems are deficient in Moldova, and emergency response equipment is currently absent or outdated. Enabling adequate early warning legislation and sufficient resource allocations for implementation and operations and maintenance would help sustain this overhaul.
- To ensure a rapid and reliable response, subnational emergency command centers and local response equipment need to be upgraded or rehabilitated. Given ongoing decentralization efforts, there also needs to be sufficient resources allocated for local level preparedness and/or contingency planning.
- Moldova should develop an integrated concept as part of a comprehensive upgrade of the warning systems for various types of hazards. Impact-based forecasting should be pursued

to increase understanding of the potential negative effects of hazards. While the State Hydrometeorological Service can improve the lead time and resolution of its forecasts through technical measures, making use of those data sets to achieve better outcomes requires improving current information dissemination and response measures. Hydrometeorological early warning capability could be strengthened through improved flood forecasting, modern ICT systems, and the use of SMS and (potentially) service apps.

- Technical rescue operational capacities within Moldova's existing DRM framework should be strengthened by improving the management, logistics, and communication protocols between response teams at the local, regional, and national levels.



## FINANCIAL PROTECTION

- The Government of Moldova should develop and implement a methodology for tracking, recording and incentivizing DRR/DRM budget allocations across the national system, and should replicate this at the local level.
- Disaster risk insurance mechanisms for non-agriculture-related disaster risk events, such as flood and earthquake, should be considered, and the existing agriculture-related insurance for farmers should be overhauled to protect against slow-onset disasters such as droughts.
- Ex post disaster risk financing mechanisms should be improved, in part by reforming the existing emergency funds or by developing new approaches, such as a Development Policy Loan with Catastrophe Deferred Drawdown Option (CAT-DDO), that would also reinforce the country's level of financial protection.



## RESILIENT RECOVERY

- Moldova should develop a coherent resilient recovery framework: by formalizing systems to enable effective assessment of post-disaster damage and needs, recovery needs will be more accurately quantified and characterized.
- Once developed, the resulting resilient recovery framework should be embedded into policies, legislation, and programs that promote (incentivize), guide (ensure), and support a build-back-better approach in recovery, rehabilitation, and reconstruction—for both the public and private sectors, and for individuals and households.

Such an improved DRM approach would also help manage other shocks and stresses, including public health crises such as the ongoing COVID-19 pandemic. It is essential to incorporate such crisis management aspects into Moldova's existing DRM system which is otherwise primarily geared towards responding to natural and climate disasters. As seen with the COVID-19 crisis, Moldova's existing DRM system could provide a good foundation to effectively respond to the urgent needs of cities and communities. To better anticipate such shocks or stresses in the future, it will be essential to adapt and scale up existing DRM infrastructure including early warning systems, linking disaster preparedness and response systems to other types of crisis (health emergencies for example), prioritize health service provisions and risk communication tools for the poorest households living in informal settlements and other vulnerable groups that are at-risk, generate education materials and public awareness programs, etc. For example, collecting, collating and analyzing DRM geospatial information, and making these analytics available to health stakeholders to help them to anticipate and mitigate future epidemics could facilitate crisis management measures.



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# CHAPTER 1

## Moldova Disaster and Climate Risk Profile

***SUMMARY:** Moldova is exposed to floods, droughts, and other severe weather events; earthquakes, though rarer, have also had devastating impacts on the country. The projected rise in temperatures, rainfall volatility, and incidence and severity of drought caused by climate change are likely to render the impacts of disasters worse over the medium term, threatening hard-won development gains. To protect Moldova's recent socioeconomic gains and make development efforts in the country as sustainable, building climate and disaster resilience is essential.*

**Moldova is exposed to an array of natural hazards, whose impact disproportionately affects the poor and could roll back the country's development gains.**<sup>2</sup> Economic losses from disasters are mostly due to extreme weather events, but high-impact, low-frequency seismic events can also cause losses. Over the past decade alone, floods and droughts caused US\$1.2 billion in damage.<sup>3</sup> Over half (57 percent) of Moldova's population lives in rural areas, and 84 percent of the poor, many of whom depend on the agriculture sector for their livelihoods, are concentrated in rural areas. Hence the poorest households are hit the hardest by extreme weather events that disrupt agricultural production.<sup>4</sup> The ability to manage extreme hydrometeorological events is thus of critical importance for sustained poverty reduction in Moldova. The country's risk profile—which blends extreme weather events, probable climate change impacts, and seismic hazards—requires a robust risk management strategy and framework to reduce disaster occurrence.

**While earthquakes are infrequent, their impact could be devastating and could significantly alter Moldova's socioeconomic trajectory.**

The Republic of Moldova is situated in a high-seismicity area. The main source of earthquake risk is driven by the Vrancea seismic zone (which also encompasses Romania); in addition, there are more local seismic zones where numerous damaging earthquakes have been recorded. The relative earthquake risk is high in global terms, and very high in terms of European comparison. Statistically, "strong" earthquakes in Moldova of magnitude greater than 6,<sup>5</sup> which have the potential to cause widespread damage, on average occur more than 10 times per century. Over the past 200 years, Moldova has suffered 16 major earthquakes of magnitude 7 to 8, and the risk continues to grow with expanding cities, aging and inadequately maintained public infrastructure, and the lack of awareness of potential risks.

**The earthquakes that took place in 1940 (Mw 7.7)<sup>6</sup>, 1977 (Mw 7.2), 1986 (Mw 7.2), and 1990 (Mw 6.7; Mw 6.1) were the worst events of the last century and left thousands of buildings heavily damaged or destroyed (Kronrod et al. 2013).** In addition to severely damaging residential buildings, schools, and hospitals and leaving thousands of families homeless, these tragic events took people's lives, left many injured, and disrupted the economy. For example, the 1986 Vrancea earthquake in Moldova led to two deaths, 558 injuries, and approximately 1,200 collapsed houses (in addition to 55,000 damaged houses) and left 12,500 people homeless in the Kishinev-Kagul region, with total

damage estimated at US\$800 million<sup>7</sup> (BSSA 1987), which is approximately equivalent to 40% of the country's GDP. The education system was also heavily impacted, and more than 20,000 students had their education disrupted due to damage in schools (Daniell et al. 2020). Historical records reveal that immediate substantial damage in 1986 was aggravated by previous earthquakes as well. For example, the central and southern part of Moldova experienced a magnitude 7.7 earthquake in 1940 (1940 Vrancea earthquake); this event caused 78 fatalities, left approximately 2,000 homeless people, and in neighboring Romania in substantial destruction and losses equivalent to US\$10 million. From a building stock perspective, this seismic event was substantial: 256 buildings immediately collapsed, 681 buildings needed some major repairs, and over 2,300 buildings required minor repairs (Georgescu and Pomonis 2012), leaving approximately 400 families homeless—equivalent to 4 percent of the city population, which was estimated at 53,000 in 1940 (Cutia 2018).<sup>8</sup> Today, a major earthquake (with a 0.4 percent annual probability of occurrence—that is, a 250-year-return-period event) is expected to cause US\$4 billion in capital losses, equivalent to 62 percent of the country's GDP (World Bank 2017b).

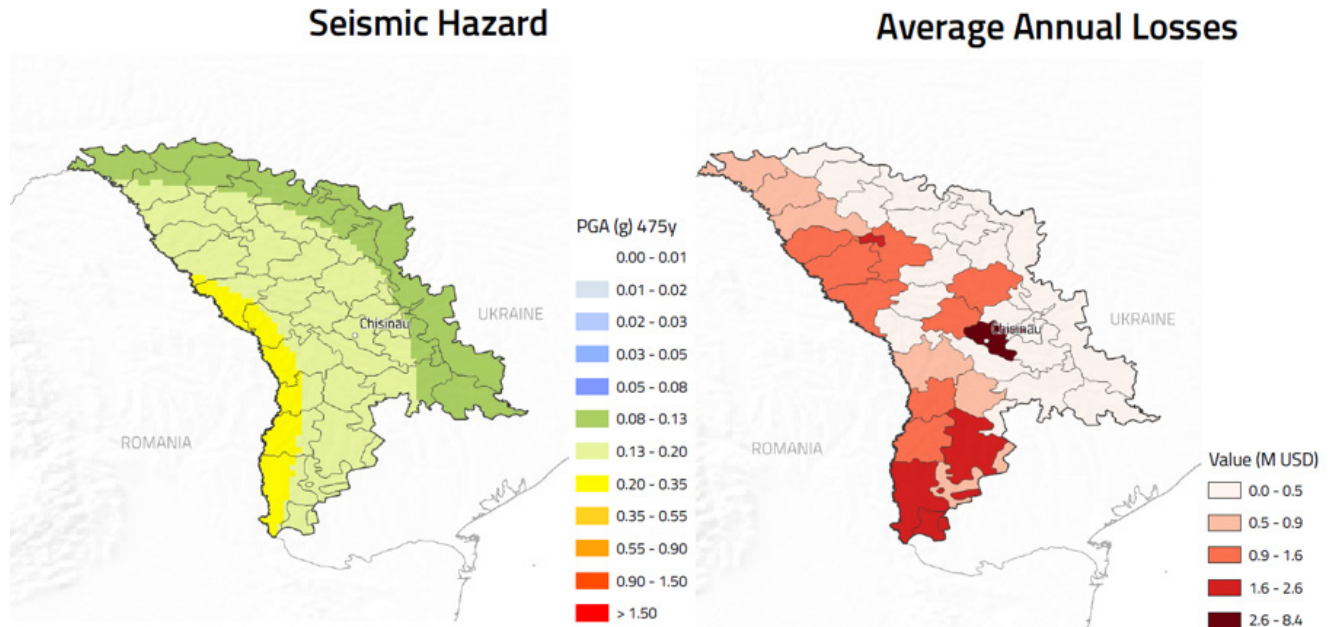
**In Moldova, the highest levels of earthquake hazard (i.e. the shaking intensity levels) are in the southwestern part of the country (figure 1, left), but the highest levels of earthquake risk (i.e. potential social and economic losses) are concentrated in the more centrally located Municipality of Chisinau (figure 1, right).** The area covering the Municipality of Chisinau hosts the majority of the country's economic activity, with average annual losses caused by earthquakes equivalent to US\$8.4 million (see box 3 for more details) out of US\$35.1 million (average annual losses caused by earthquakes for Moldova). Other areas of concern include the districts of Cahul and Cantemir as well as the Autonomous Territorial Unit of Gagauzia, which have high earthquake risk, limited transport network connectivity, and,

potentially, a more limited capacity to recover from a disaster shock, given that the southern regions have the lowest income levels in the country (UNDP 2017)<sup>9</sup> and are highly dependent on the agriculture sector, including major wine-producing zones.<sup>10</sup>

**Floods frequently affect the eastern and northern regions of the country.** Despite its overall dryness, Moldova is exposed to significant flood risks: approximately 659 settlements (42 percent of all settlements) are at risk of flooding.<sup>11</sup> In addition, torrential rains, hail, wind, and frost occur annually within localized areas. In 2008, the country experienced severe torrential rains, which together with releases from rivers upstream in Ukraine led to flooding in both the northern and southern parts of the country and caused US\$120 million in losses. The country's May–August storms are often localized, rapid, and intense events that include torrential rains, hail, and heavy winds, sometimes separately and sometimes in combination.<sup>12</sup> Torrential summer rains impose a recurrent and cumulatively heavy cost, as they wash out roads, damage the electric power distribution network, and cause other infrastructural damage. On smaller rivers, the level of flood protection is limited, as dams and dikes need substantial repair. The safety level of small dams therefore remains a major concern and local floods are caused by torrential rain within the country, with short warning times. In 1991 and 1994, flash floods in small rivers—specifically Raut, Ciorna, and Calmatui—caused the deaths of 50 people and did significant material damage (UN-Habitat 2016). Current annualized costs of flooding are estimated to be around US\$100 million and are expected to increase by several times by 2080, as flood frequency and the volume of assets at risk increase (World Bank 2017b).

**Moldova is also at high risk of drought and extreme heat, both of which are exacerbated by climate change.** Moldova's economic comparative advantage is its fertile soil and temperate continental climate, which have the potential to transform the country into an important agricultural

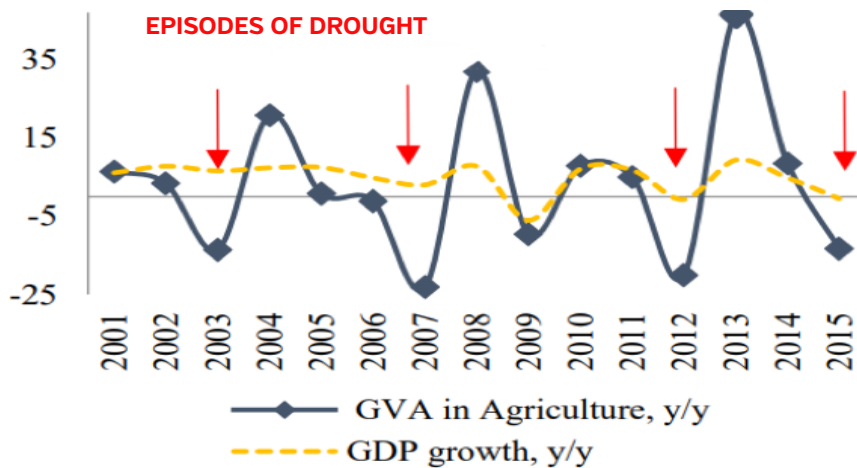
**Figure 1: Seismic Hazard Map for a 475-Year Ground Shaking and Geographical Distribution of Average Annual Losses Due to Earthquake-Related Direct Damages**



Source: Global Earthquake Model, Moldova Seismic Risk Profile [2018]. Licensed under Creative Commons Attribution ShareAlike 4.0 [CC BY-SA 4.0]. For more information, see Silva et al. [2018].

Note: The seismic hazard map (left) depicts the geographic distribution of the peak ground acceleration (PGA) with a 10 percent probability of being exceeded in 50 years, computed for reference rock conditions [shear wave velocity,  $V_{s30}$ , of 760-800 m/s]. The seismic hazard maps are based on the Global Earthquake Model [GEM] Global Seismic Hazard Map [version 2018.1], clipped to the country boundary. The average annual loss (right) represents the long-term mean loss value per year due to direct damage caused by earthquake ground shaking in the residential, commercial, and industrial building stock, considering structural and nonstructural components and building contents.

**Figure 2: Added Value in Agriculture and GDP Growth, 2001-2015**



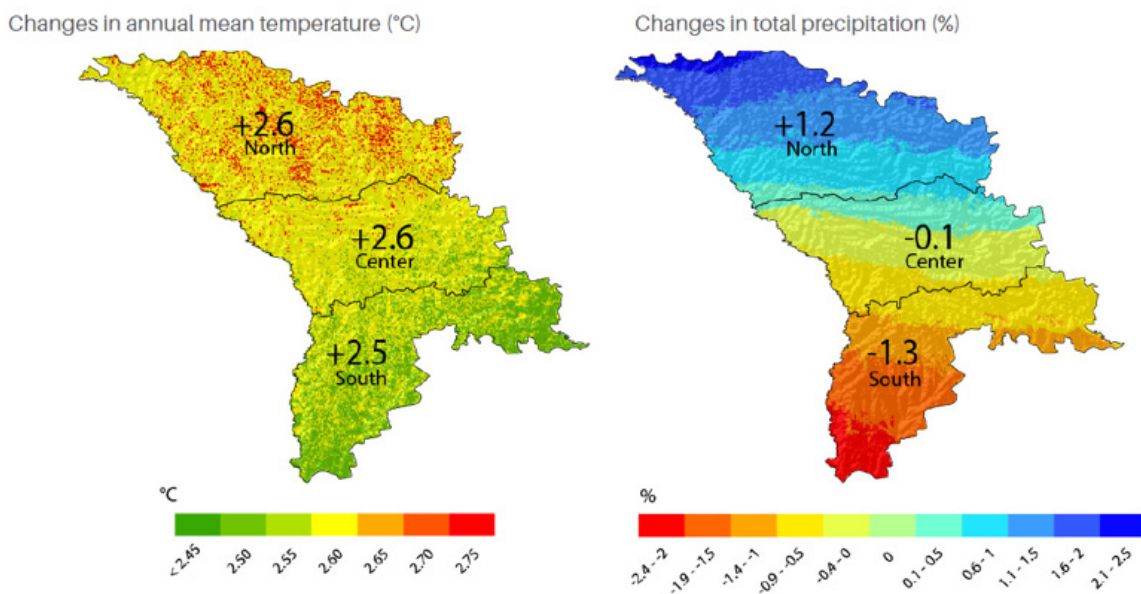
Source: World Bank 2016.  
Note: GVA = gross value added.



producer in the region. Agriculture employs 30 percent of the population and is the backbone of the rural economy. However, the country's agricultural sector has been increasingly affected by global climate trends (USAID 2017). For instance, 7 of the 10 warmest years in Moldova's history occurred within the past two decades. Historically, Moldova has experienced drought once every 3 to 10 years, depending on geographic location. In 2007, Moldova suffered the worst drought in its recent history, affecting 80 percent of the country's territory and roughly 135,000 people. The 2007 and 2012 droughts caused estimated losses of about US\$1.0 billion and US\$0.4 billion, respectively (World Bank 2007; GoM 2015). Episodes of drought, the most recent in the summer of 2015, are increasingly driving fluctuations in agriculture value added, disrupting household consumption, and constraining overall GDP growth (see figure 2).<sup>13</sup> The likelihood of multiyear droughts will probably increase, and, if not properly managed, the repercussions could be devastating to the economy.

**The severity and frequency of extreme events have been increasing in Moldova and are predicted to continue increasing in the coming years, posing a heightened risk to Moldova's agriculture sector in particular.** By mid-century the air temperature in Moldova is expected to be 1.7–2.0°C higher than in 1961–1990, and by the end of the century to be 4–5°C higher, unless greenhouse gas emissions are significantly reduced. The projected rise in temperatures, rainfall volatility (see figure 3), and incidence and severity of drought could undermine the long-term positioning of the country as one of the region's major agricultural producers. Under this scenario, Moldova would likely experience a significant reduction in the productivity of most crops, and be impacted by more frequent extreme weather events—such as hailstorms, late frosts, major floods, and droughts (see box 1)—and changes in disease incidence patterns and the spread of pests. By 2050, crop yields are also expected to fall by up to 25 percent in Moldova's central and southern regions. Altogether, climate variability, which may be responsible for repeated severe weather patterns, is expected to have dramatic impacts on Moldova's economy and environment (ENVSEC and Zoi Environment Network 2012).

**Figure 3: Projected Changes in Temperature and Precipitation in Moldova by 2050**



Source: World Bank and CIAT 2016.

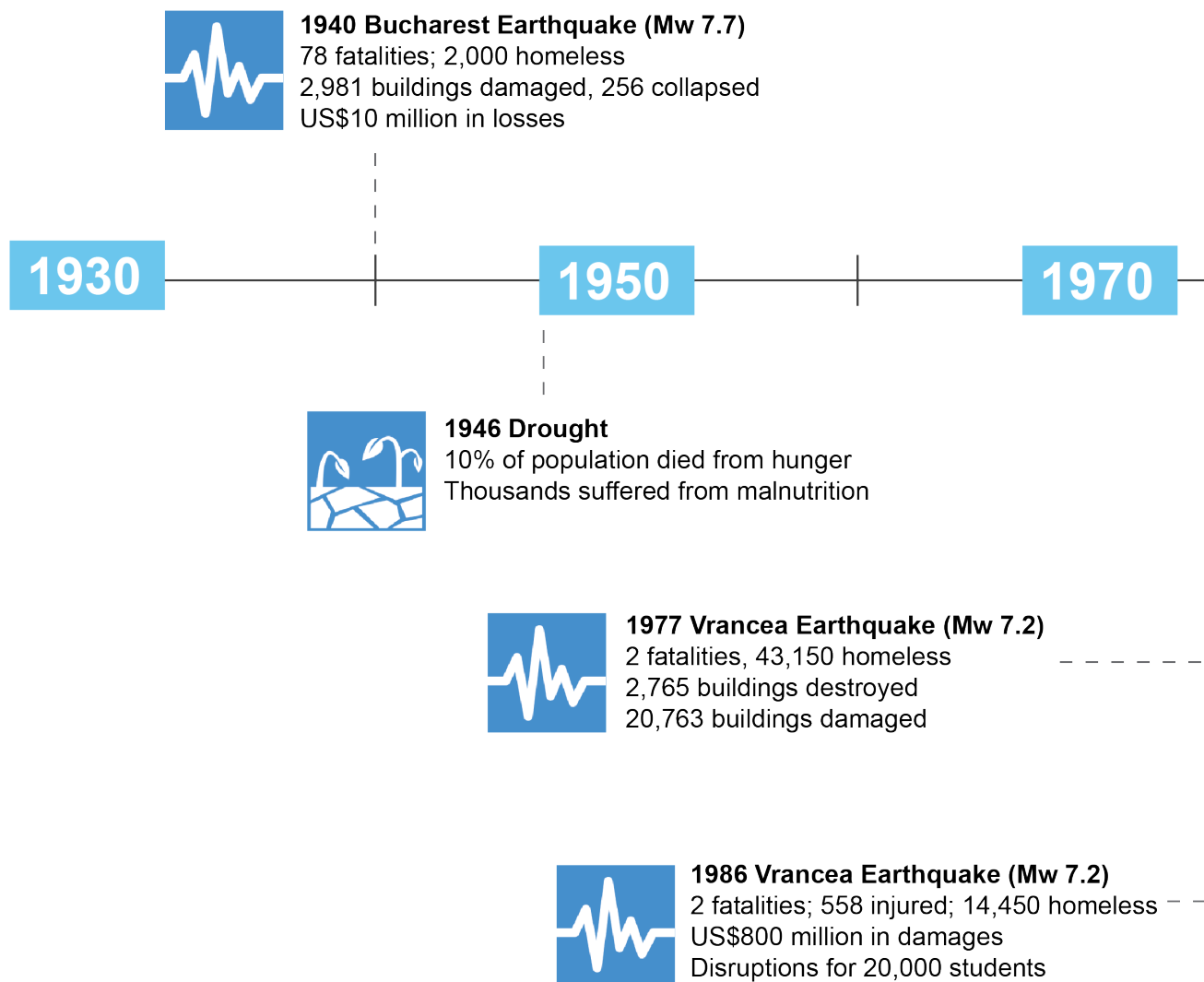
### Box 1. The Abnormally Hot Summer of 2010

The summer of 2010 was the hottest of the last 100–120 years. The peak of the heat wave was in the European part of Russia, Moscow in particular, where the temperature reached 42–45°C. Scientists have linked this event strongly with climate change. In Moldova, the summer of 2010 also saw rainstorms and associated floods along with fires related to the abnormally high temperatures. In July 2010, heavy rains affected 12,000 people. A total of 3,183 houses spread across half of the country [across 85 settlements] were flooded, and most of them were

destroyed. The most affected district was Hincesti, where 700 houses were destroyed. The month of June 2010 was one of the warmest on record, with air temperatures that peaked at 36°C. In addition, around 300 percent of the normal monthly precipitation fell in June: a record in the last 124 years. In August, there were 15 days with air temperature above 35°C, something that had never been recorded before.

Source: State Hydrometeorological Service of Moldova, 2011.

Figure 4: Overview of Disasters in Moldova in the last 80 Years





**Abnormal summer of 2010**

June: 300% of normal precipitation  
July: Heavy rains affecting 12,000 people;  
3183 houses flooded in 85 settlements  
August: 15 days with temperatures >35 Celsius



**1997 Floods**

9 fatalities  
~US\$70 million in damages  
28/40 provinces affected



**2008 Floods**

3 fatalities  
288 houses destroyed  
US\$120 million in damages



**1994 Floods**

Worst floods since independence  
~50 fatalities  
~US\$500 million in damages



**2007 Drought**

80% of country impacted  
Worst drought on record  
US\$1 billion in losses

1990

2010



**1990 Vrancea Earthquake (Mw 6.7)**

4 fatalities; dozens injured  
US\$2 million in damages



**2000 Drought**

75% of territory affected  
US\$170 million in losses



**2012 Drought**

US\$400 million in losses



**2014 Vrancea Earthquake (Mw 5.7)**

14 injured; disruption of telecommunications  
network; loss of electrical power

# CHAPTER 2

## Institutional, Policy, and Legislative Framework for DRM

***SUMMARY:** Moldova is currently strengthening its legal and regulatory framework for disaster risk management (DRM), but much remains to be done. An improved framework would enhance coordination across institutions and levels of government, build capacity across institutions, and generally become more proactive and less reactive in its approach to DRM.*

**Disaster risk management (DRM) in Moldova is currently performed at different government levels and is gradually becoming more comprehensive.** The institutional set-up for DRM is complex and covers various natural, biological, health, and man-made hazards. Moldovan institutions involved in disaster risk mitigation can be roughly divided into coordinating emergency commissions, early warning and weather forecasting bodies, sectoral line ministries, and disaster management bodies. None receive adequate budgetary allocations. Although an adequate legal and regulatory framework is in place, there is a need to improve coordination and contingency planning, and capacity building is necessary at every level of the disaster management structure (World Bank, EU, and UNDP 2010). Recent government reforms have reduced the number of ministries, created new agencies, and shifted some of the DRM responsibilities from the older institutions to the newly established ones. Hence the overall institutional arrangements are still in a state of flux. As in other countries with a similar disaster risk profile and level of socioeconomic development, the legal and institutional framework dedicated to DRM

in Moldova is mostly articulated toward emergency response, rather than preventing risks and reducing the country's vulnerability to hazards (World Bank 2010b). Proactive risk management—centered on strengthening preparedness and mainstreaming risk reduction principles—therefore needs to be given a higher priority by government authorities at national and local levels.

**The legislative framework for DRM in Moldova is centered on the Law on Civil Protection adopted in 1994 (Law 271/1994).**

The law establishes the **Civil Protection System** “to protect people and property from the consequences of disasters caused by natural and man-made hazards.” The Law on Civil Protection defines the fundamental principles of the civil protection organization at national, regional, and local levels and establishes principles, rights, and obligations of national authorities, local authorities, and citizens. Moldova has two key institutions that deal with emergencies and disasters:

1. **General Inspectorate for Emergency Situations.** The Civil Protection Force, created in 1993, has undergone various institutional and legislative reforms and is currently housed under the Ministry of Interior as the General Inspectorate for Emergency Situations (GIES). The GIES is an all-hazard emergency response agency with the duty to save lives and property. It oversees planning, coordinating, and managing disaster preparedness and emergency management.

The GIES coordinates the activities of national and local agencies and authorities; informs local authorities of emergency situations; organizes trainings for paramilitary, nonmilitary, and rescue agencies for emergency response; develops educational programs for the public; drafts normative acts and civil protection plans to be submitted to the Parliament; and coordinates research activities related to civil protection. It coordinates the political and technical actors involved in emergency management and preparedness, including representatives of all relevant ministries. The GIES is the operational point for the National Command Center and ensures the coordination of interinstitutional disaster response efforts, with a focus on information management. GIES creates five-year preparedness and response plans and carries out emergency response exercises every five years.

**2. Republican Commission for Emergency Situations.** In 2001, Moldova created the Republican Commission for Emergency Situations as the main entity responsible for managing the activities of state executive organs during major emergencies and for implementing long-term programs to prevent emergencies and eliminate their consequences. The chair of the commission is the prime minister; the first deputy chair is the first deputy prime minister; and deputy chairs are the state secretaries of the involved ministries and the head of the GIES of the Ministry of Internal Affairs. The commission is a permanently operating institution and is convened if danger is detected or when various emergencies begin. The commission also meets semiannually and includes representatives from all line ministries and executive branches. Like the GIES, the commission creates five-year preparedness and response plans. The two institutions hold regular meetings to discuss, update, and ratify these plans.

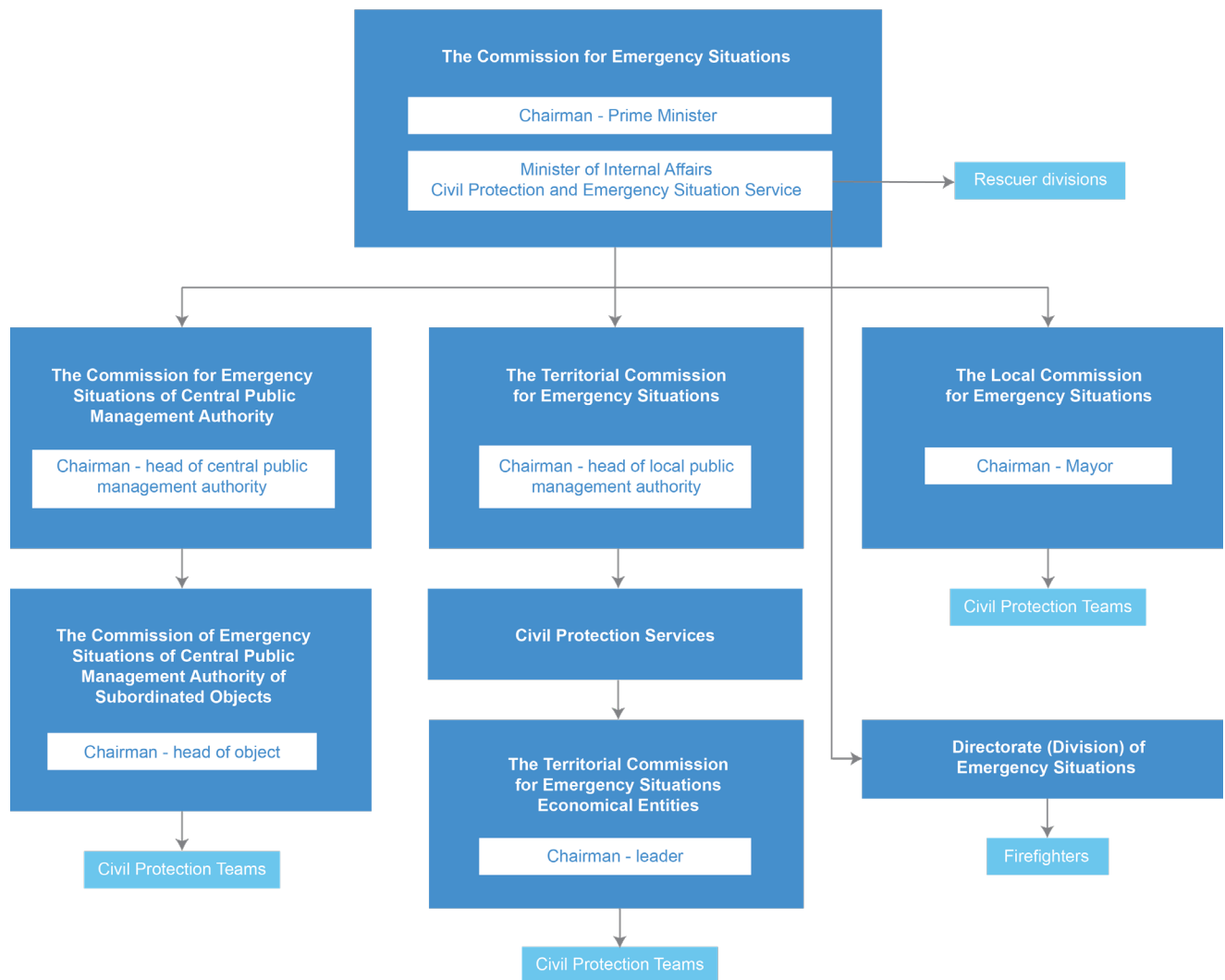
**Regional and local governments are also involved in coordination with GIES and other local departments, as well as in mobilizing local funds and other resources for relief and recovery operations.** District and local emergency commissions have a structure similar to that of the national commission and include heads of local governments and relevant public services. As shown during the ongoing COVID-19 crisis (see box 2), heads of regions and city mayors are responsible for the day-to-day implementation of civil protection activities, ranging from response to prevention, and they strive for the highest level of autonomy possible in order to take decisions on a timely basis. During emergencies, district representatives of GIES as well as members of local emergency commissions are notified immediately and meet to evaluate the level of threat to people, the economy, and infrastructure, and to agree on responses. District and local emergency plans are updated annually, as are sector plans (for example, for flood protection). In addition, heads of regions and city mayors are also in charge of emergency planning with GIES, and handle planning, zoning, and construction codes for mitigation of floods, earthquakes, and subsurface flooding. Figure 5 shows how resources are mobilized for “ordinary” disaster relief/emergency response purposes.

**In the event of a disaster, the Parliament has the authority to issue a state of national emergency,** regulated by Law 212/2004, *On Declaring the State of Emergency, Martial Law and War*. The law regulates the conditions under which a state of emergency or war is declared and how it affects citizens’ rights and obligations as well as the enforcement of other laws. It establishes a common methodology for assessing emergency situations, delineates emergency situation zones, calls for an adequate response, and establishes how information will be collected and presented to the population. Other relevant laws are listed in annex 2, and figure 6 shows the available resources in case a state of emergency is declared.

Finally, considering the small size of the country, regional cooperation is very important for disaster risk management, particularly for cross-border emergencies. The country has made significant effort to increase regional cooperation, associated with the regional disaster mitigation activities of the European Union (EU) PPRD East (Prevention Preparedness and Response to Natural and Man-Made Disasters in the Eastern Partnership Countries) program<sup>14</sup> and the North Atlantic Treaty

Organization (NATO).<sup>15</sup> Moldova has also asked for assistance through the EU Civil Protection Mechanism on multiple occasions. With assistance from the World Bank, Moldova is also upgrading its technical urban rescue capabilities in line with the guidelines set by the International Search and Rescue Advisory Group (INSARAG); the goal is to strengthen its domestic capacity to receive and coordinate international Urban Search and Rescue (USAR) efforts, particularly in the aftermath of earthquakes and collapsed-structure disasters.<sup>16</sup>

**Figure 5: Institutional Arrangements for Disaster Risk Management in Moldova**



Source: PPRD East 2 2015.

Note: In 2016, the Commission for Emergency Situations was converted into the General Inspectorate for Emergency Situations. ES = Emergency Situations; CP = Civil Protection; ESC = Commission for Emergency Situations of the central public management authority; CES = Territorial Commission for Emergency Situations.

## Box 2. DRM implications for COVID-19 crisis in Moldova

In Moldova and elsewhere, local governments are currently at the frontline of combating the COVID-19 epidemic together with DRM agencies both at national and subnational levels and different sectoral actors. Local governments have important responsibilities in carrying out:

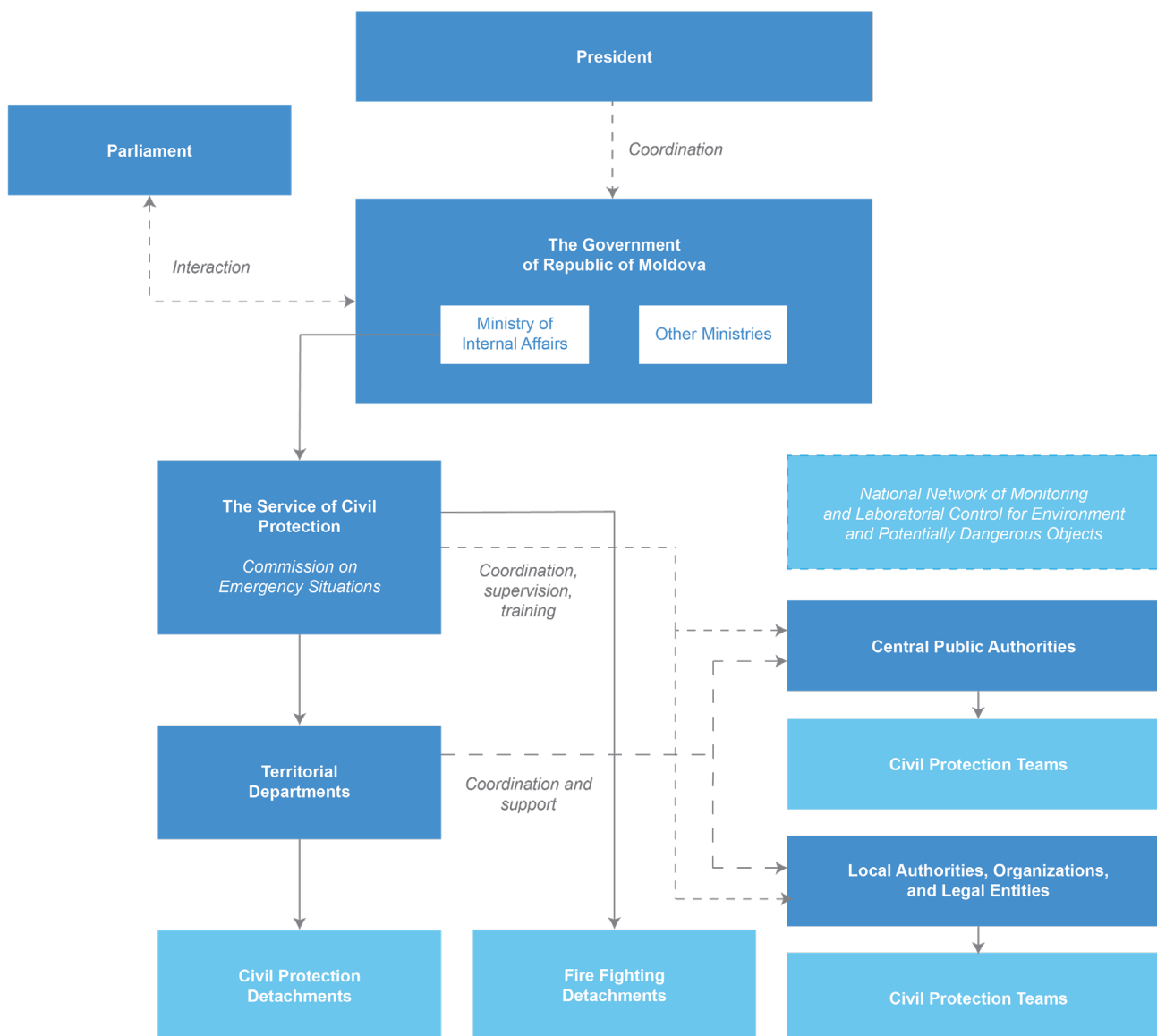
- Community-wide emergency responses to prevent the transmission of the virus and care the affected through (i) regulating the use and operation of public facilities; (ii) providing essential public services; and (iii) coordinating among local governments, communities, and other sectoral actors.
- Targeted emergency responses for the most vulnerable people from a health and economic perspective, through (i) providing comprehensive support package for people living in informal

settlements and other vulnerable groups [the elderly, informal workers, women and children]; (ii) accessing immediate emergency funding through increased fiscal transfers and conditional grants to local governments.

- Recovery by revisiting institutional systems to strengthen local governments' jurisdiction, preparedness and resources with which to combat such epidemics and disasters. This includes (i) developing a multifaceted action plan for early economic recovery; (ii) establishing territorial coordination plans; (iii) strengthening zoning, land use, and territorial planning.

Source: World Bank 2020.

Figure 6: Available Resources in Case of State of Emergency in Moldova



Source: PPRD East 2 2015.

# CHAPTER 3

## Assessment of the Current DRM Situation In Moldova

**SUMMARY:** *The current situation of DRM in Moldova was assessed through the World Bank’s operational framework for DRM. This approach makes it possible to compare Moldova’s progress and gaps with those in countries with similar risks and levels of socioeconomic development. The framework identifies five DRM pillars: (1) **risk identification**, covering hazard and risk assessments and their communication; (2) **risk reduction**, including structural and nonstructural measures; (3) **preparedness** through early warning systems, contingency planning, business continuity planning, etc.; (4) **financial protection**, which aims at assessing and reducing contingent liabilities, including ex ante and ex post financing instruments; and (5) **resilient recovery and reconstruction** policies. All pillars are underpinned by a functioning institutional, political, normative, and financial context. These elements align with the 2015 Sendai Framework for Disaster Risk Reduction priorities for action.*



### RISK IDENTIFICATION

*A better understanding and quantification of hazard, exposure, vulnerability, and risk are crucial preconditions for reducing the adverse effects of disasters. With access to comprehensive disaster risk information, policy makers and the public can better understand the potential impacts of hazards and carry out risk-informed planning and investment before a disaster strikes.*

**Moldova lacks a coherent disaster risk management strategy to identify hazards, conduct risk assessments, prioritize risk reduction efforts, and mainstream risk information into its national, sectoral, and regional development programs.** Moldova previously attempted to introduce a national DRM framework, drafted a National Disaster Risk Management Strategy in 2015, and aimed at transforming the Republican Commission for Emergency Situations into a national DRM platform by revising relevant regulations. However, for various reasons, the draft strategy has never been adopted, and the required legislative and institutional changes were never implemented (PPRD EAST 2 2015).<sup>17</sup> The experience of these previous and ongoing risk assessment initiatives across several sectors should be considered when seeking a focal point/platform for the risk identification and assessment system as part of an overall DRM framework for the country. Over the years, Moldova has developed several strategies designed to mitigate the major hazards it faces, such as floods, droughts, and landslides.<sup>18</sup> The defining characteristic of these strategies has been underfunding and reliance on fluctuating donor funding for implementation. As a result, many of the action plans remain unimplemented—though flood risk management is a notable exception—and have migrated to new or updated strategy documents.

**Moldova has instituted a climate adaptation framework, but gaps and challenges in its implementation remain.** In 2014, the government approved the Climate Change Adaptation Strategy



as an umbrella strategy to create the enabling environment allowing specific sectors and ministries to mainstream climate change adaptation and risk management into existing and future strategies; this process is meant to occur through a series of National Adaptation Plans (NAPs) and Sectoral Adaptation Plans for the following six climate-sensitive sectors: agriculture, forestry, water resources, health, transport, and energy. The overall costs for implementing the Climate Change Adaptation Strategy and action plans were estimated at approximately US\$155 million (World Bank 2017c). There are important implementation and sectoral mainstreaming challenges within this framework. The first iteration of the country's National Adaptation Planning (NAP-1) process, carried out between 2013 and 2017, aimed to include climate change adaptation needs in national budgeting processes, but the climate budget tagging guidelines developed under NAP-1 were not implemented due to lack of funding for training. Current budgets for sectors do not refer to or include climate change adaptation. Finally, the NAP process left out important sectors with implications for disaster prevention and risk reduction and management, such as urban and regional planning and construction. Hence, the NAP process does not currently serve as a solid basis for a comprehensive DRM framework in Moldova.

**Maps for natural hazards exist, but risk assessments that include exposure and vulnerability analyses are lacking.** Despite the lack of a coherent disaster risk assessment process, Moldova has produced (or is building the capacity to produce) hazard maps for most of its natural hazards. The Institute of Geology and Seismology produced an updated map of seismic zoning in 2013 that reflects the seismic intensity of the territory more accurately than the older map from the early 1980s (Cutia 2018).<sup>19</sup> The institute also developed a methodology of seismic micro-zonation and produced such maps for the Municipalities of Chisinau (see box 2) and Cahul. With technical

support provided by the European Investment Bank (EIB), Apele Moldovei (Republican Water Management Agency) has produced flood hazard, risk, and reforestation maps, but its capacity to develop such products without technical assistance is extremely limited. With the exception of flood risk mapping, very few risk assessments have been conducted that take into consideration not only the hazard but also the vulnerability of physical assets and people, which is critical to identifying the risks to households, public buildings, assets, and critical infrastructure.

**To identify the most at-risk areas and building types, there is an urgent need to conduct seismic risk assessment across key sectors:** residential, education, health, utilities, communication and infrastructure systems, and the public sector (including emergency service buildings), among others. The extent of risk must be charted in order to develop DRM policies and efficiently target investments dedicated to reducing risk in the existing stock of buildings (including residential housing stock). For example, public education facilities, emergency services, and national, regional, and municipal government buildings should be constructed to a minimal life safety level, with minimal damage allowing rapid reoccupation and commencement of services. These buildings—especially those built before the first building code, or those that underwent additional unapproved expansions in the 1990s or during a weaker period of code enforcement—should be assessed for structural and seismic safety. In many countries, an inventory of these buildings is compiled as part of exposure data creation, enabling the prioritization of buildings for more detailed assessment and then (as required) retrofitting. At a minimum, buildings should be categorized through this risk analysis into those that do not require structural intervention, those that need seismic retrofitting, and those that will require demolition and reconstruction.

### Box 3. Seismic Risk in Chisinau: The 1940 Earthquake, Then and Now

In Moldova, one of the areas most exposed to earthquake risk is Chisinau, the capital and the country's largest city, with a population of approximately 800,000 (2017) and a population density of 5,576 inhabitants/km<sup>2</sup>. Chisinau is also the country's financial and business center—its GDP comprises about 50 percent of the national economy (2016)—and largest transportation hub. Recent analyses for Chisinau indicate that expected average annual losses due to earthquake are over US\$8 million, the highest in the country. Given Chisinau's proximity to Vrancea (one of the most active seismic areas of Europe), the relatively unknown structural vulnerability of buildings constructed during the Soviet era and afterwards, and the features of its soft soil conditions<sup>a</sup>, evaluating the seismic risk that citizens and the country's economy are exposed to is essential. Moldova has experienced several major earthquakes in the last 200 years, the largest being the 1940 Vrancea earthquake, which caused 78 fatalities, left approximately 2,000 people (approximately 400 families) homeless, and in neighboring Romania resulted in substantial destruction and losses equivalent to US\$10 million. In Chisinau – with a population of 115,000 at that time living in low-rise housing – some 256 buildings were destroyed, 681 required major repairs, and 2,300 required minor repairs (Cutia, 2018).

Since then, Chisinau has changed dramatically due to the country's demographic evolution and recent urbanization patterns. Two different trends can be identified. The 1950–1990 period featured intensified urbanization and increased population growth: in Moldova, the total population increased by 90 percent, while the urban population increased by 5.4 times due to rural-urban migration and administrative changes (large villages were assigned the status of urban settlements) (UN-Habitat 2016). The rapid population growth from the 1950s in Chisinau and other cities meant large-scale housing had to be constructed by the Soviet administration; currently, the share of dwellings built during the Soviet period (1951–1990) represents 72.5 percent of total households in Chisinau (National Bureau of Statistics 2016). The 1990–2015 period was characterized by slow demographic decline exacerbated by massive emigration, internal economic factors, and external shocks, resulting in a decline of the urban population – with the present population of Chisinau being at the level it was in the early 1980's. The large growth in urban population in the last 50–60 years, coupled with Moldova's aging infrastructure, unfortunately means that the earthquake risk has increased since the 1940s, especially given that approximately 40 percent of existing buildings in Chisinau have been affected by four major seismic events (Cutia 2018).<sup>b</sup>

Given the characteristics of the Vrancea fault line, the lengthy engineering damage checks currently in place, and the local population's low level of preparedness, seismic engineers and disaster management experts anticipate significant issues that could prolong or complicate post-earthquake recovery and reconstruction efforts. These include damaged critical infrastructure, disruption of businesses and living conditions, significant duration for the completion of building damage-safety assessments and challenges in debris removal. If the 1940 Vrancea earthquake happened today, the consequences could be devastating:

- Recent studies for a repeat of the 1940 earthquake estimate that in a nighttime scenario, there could be approximately 190 fatalities, 286 individuals with severe and in some cases disabling injuries, and at least 4,200 individuals with light injuries, in addition to 300 people trapped and in need of life-saving rescue efforts.<sup>c</sup> Although

no major structure collapsed in Moldova during the 1977, 1986, 1990 earthquakes, the possibility of buildings collapsing cannot be excluded as many structures have aged, been modified and many have suffered the effects of the three past earthquakes that may have diminished their capacity. These numbers would put a tremendous strain on the emergency and rescue services as well as the health care system. It is critical that the national authorities and local first responders are sufficiently prepared for such catastrophic scenarios: emergency response plans and clear coordination mechanisms across institutions must be in place, while emergency service buildings and health care facilities must sustain limited damage and remain functional.

- In this scenario, more than 725,000 buildings are damaged across Moldova, and 338,000 of these have structural damage and require urgent assessment for safety. As a consequence, 1,141,000 people become temporarily homeless because they will be able to go back into their houses once engineering checks or aftershocks occur. This population is in addition to 339,000 people who are permanently homeless – which correspond to those who were living in buildings that have been completely destroyed by the earthquake. Both types of homeless population will require immediate shelter. Trained engineers will need to be mobilized to conduct damage assessments and immediately undertake safety checks to determine whether buildings are safe to reoccupy; this process is often a major constraint on earthquake recovery, since related planning and training need to be carried out in advance. Even with critical assistance from other countries to support damage assessments, this process may take four to six months.
- Rescue and longer-term reconstruction efforts will be constrained by the fact that many of the roads and bridges are likely to be impassable: more than 25 bridges are expected to be destroyed or damaged, and 750,000 tons of debris is likely to obstruct road networks (out of the total 7.5 million tons to be cleared). Plans for debris removal will need to be established in advance: 7.5 million tons of debris would require 1.5 million five-ton truck removals, equivalent to 200,000 truck days of work, in addition to bulldozers, cranes, etc. If 6,000 trucks can be mobilized, this would take approximately one year.
- The cost of reconstruction to the buildings will be significant given that up to US\$5.8 billion is anticipated in terms of economic losses (due to damages to the building stock) out of US\$62 billion in economic exposure. This cost will put a large strain on the government budget, the resources and capacity of local authorities, and the socioeconomic situation of affected households. A timely reconstruction funding mechanism must be in place to ensure a rapid recovery.

This scenario would likely cause severe social, infrastructural, and economic losses that will have long-lasting effects on the people and the economy. There is an urgent need to implement the necessary measures to address seismic risk in existing infrastructure (including residential buildings), maximize public safety and local preparedness by engaging civil society institutions, and streamline recovery and reconstruction efforts (including the need to better manage the transition between response-related efforts and long-term reconstruction strategies) (James et al. 2020).

Sources : Alcaz et al. 2016 ; Cutia 2018 ; James et al. 2020.

Note: a. In terms of geotechnical hazards, Chisinau is characterized by its soft soil properties. A layer of sandy clay is present throughout the center of the city, including around the river (especially in the old city), at a depth of 2 to 25 meters (depth of bedrock varies across the city). This feature makes the city more vulnerable to geological hazards given the potential for slope instability and large ground motion amplification (especially where the depth of the sandy clay soil is closer to 25 meters).

b. The first high-rises (more than four floors) were built in Chisinau in the mid-1950s, and today the most common building type is residential high-rises. Some buildings from the beginning of the 20th century remain, though many are becoming unusable. Overall, only 33 percent of the buildings in Chisinau were built after 1980, which coincides with the phase during which seismic building codes were introduced (SNIP II-7-81). Another 27 percent were built before 1940, meaning that a significant

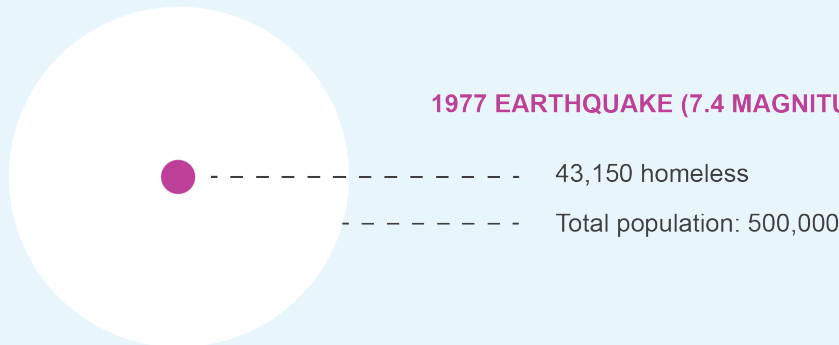
portion of buildings have already been used for more than 50 years and probably have insufficient seismic resistance. Engineering studies show that 20 percent of buildings in Chisinau (in which 8 percent of the city's population currently lives) exhibit the highest levels of seismic vulnerability; these are local buildings of one to three floors built with less durable materials (such as raw clay, straw, clay mesh). The height distribution of existing buildings suggests that most of them are one or two stories, with only a small share taller than eight stories. However, the few tall buildings host around 80 percent of the residents, making the seismic vulnerability of these buildings especially important (Alcaz et al. 2016).

c. It's also worth noting that a "pancake collapse" of the structures would influence the death toll markedly.

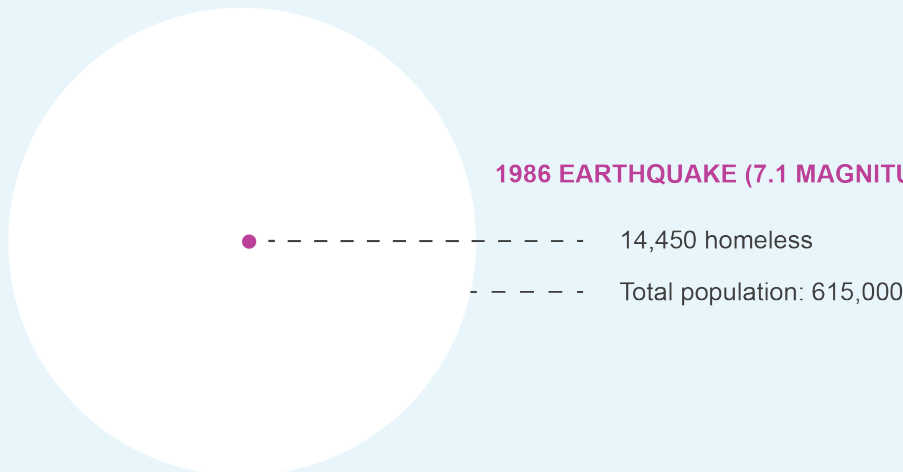
### 1940 EARTHQUAKE (7.7 MAGNITUDE)



### 1977 EARTHQUAKE (7.4 MAGNITUDE)



### 1986 EARTHQUAKE (7.1 MAGNITUDE)



**Better understanding and quantification of hazard, exposure, vulnerability, and risk are crucial preconditions for informed DRM.**

Moreover, several requirements under the EU–Moldova Association Agreement (described in box 4) require hazard information, including the adoption of several EU directives and regulations such as the 2007 EU INSPIRE Directive and EU Floods Directive. Moldova is currently revising its legal framework so that the management of georeferenced data is in line with the provisions of the EU INSPIRE Directive. Moldova currently has a clear plan that foresees establishment of the National Spatial Data Infrastructure and National Geoportal to store all official geospatial information in an INSPIRE-compliant mode and guarantee interinstitutional data exchange.<sup>20</sup> The Agency of Land Relations and Cadaster of Moldova is the main agency responsible for coordinating the National Spatial Data Infrastructure of Moldova.<sup>21</sup> In addition, GIES has developed a disaster information system that collects data on crisis situations for real-time emergency management and management of rescue operations (PPRD EAST 2 2015).

**Moldova has implemented the flood risk assessment requirements of the EU Floods Directive.** In the last few years, the country's water and flood management legislation has been extensively transformed and harmonized to several EU directives. One of the commitments that Moldova undertook under the EU Association

Agreement was to complete a flood risk assessment. The exercise was supported by the EIB under the framework of the European Neighborhood Policy. A National Master Plan for Flood Protection and Prevention was completed in 2016. The process was initiated in 2014 through a nationwide preliminary flood risk assessment that resulted in a four-level risk assessment of all 12,000 km of rivers in Moldova. Flood hazard mapping and flood risk mapping were subsequently performed on the 3,400 km of high-risk rivers identified in the preliminary assessment (about 30 percent of all rivers). Moldova is now developing subnational flood risk management plans for the river basin committees. While a lot of progress has been achieved, the domestic capacity to operate these exercises without donor support is limited, and is currently being built or strengthened (EIB 2016).



**RISK  
REDUCTION**

*The key tenets of risk reduction include both nonstructural measures (those not involving physical infrastructure) and structural measures (those related to infrastructure and physical strengthening) that focus on preventing new risks or reducing existing risk. Risk reduction should consider public assets and infrastructure; private residential, commercial, and industrial assets; building amenities; and the urban*

**Box 4. International DRM Commitments: Moldova–EU Association Agreement**

The Moldova–EU Association Agreement foresees that signatory parties shall “aim at preserving, protecting, improving, and rehabilitating the quality of the environment, protecting human health, sustainable utilization of natural resources and promoting measures at international level to deal with regional or global environmental problems.” Article 87 discusses cooperation in the key environmental and civil protection sectors, particularly as it relates to floods and droughts. The Association Agreement sets a rigorous roadmap that foresees [1] undertaking preliminary flood assessment by 2018; [2] preparing flood hazard maps and flood risk maps by 2021; and [3] establishing flood risk management plans by 2022. Moldova has received and is receiving substantial EU

and bilateral technical assistance to ensure that it meets the obligations under the Association Agreement. Moldova is also committed to harmonizing its infrastructure standards with international and European standards by adjusting the national standardization system to the European one. Adjusting the national construction standards and norms to the Eurocodes is an action of the National Implementation Plan of the EU–Moldova Association Agreement.

*Source:* Moldova–EU Association Agreement/National Implementation Plan for EU–Moldova AA, 2014.

and rural environment. The risk reduction areas reviewed below are based on Moldova's hazard and risk profile.

### **Nonstructural Measures**

#### **Technical regulations required for construction and urban development in Moldova need to incorporate climate and disaster risks.**

Preventing serious consequences of disasters caused by geophysical and hydrometeorological factors involves additional costs in construction of buildings, restrictions on land use, and land protection measures at local and national levels. Interior and exterior finishes, equipment, and utility systems (sometimes called "nonstructural components" by engineers) as well as building contents can represent 80–90 percent of the capital investment at risk in commercial, office, and residential buildings during an earthquake. Reconnaissance following earthquakes in countries with a similar seismic risk profile indicates significant economic losses are the result of damage to architectural elements (such as windows, suspended ceilings, and doors), equipment, contents, and building utility systems. Damage to these items as a result of earthquakes can cause deaths, injuries, loss of the building's function, and economic losses. Any of these nonstructural components or contents placed close to exits may also impede evacuations following earthquakes. Thus construction in earthquake-prone regions requires adequate steps in the design stages to ensure that damage to these elements is limited.

**The design standards will depend on the functions and structure of the building and the nature of the equipment and utilities within the building.** In addition, guidelines and procedures for pre-disaster structural and seismic evaluation of buildings should be reviewed (and improved, if needed). Based on the identification and inventory of vulnerable buildings, a program and investment strategy to improve their structural safety should be undertaken in Moldova. The program should define

the level of acceptable minimum standards for existing buildings mandate that buildings identified as vulnerable undergo a structural evaluation by a licensed engineer to determine the level of required intervention. The program should be accompanied by development of guidelines for possible retrofitting solutions in order to standardize interventions, give guidance to practicing engineers, and facilitate program implementation. The program should also be considered in tandem with an energy efficiency program in order to maximize the benefits of building interventions. Developing a phased investment strategy for systematic risk reduction would help ensure that investments are first made into buildings that concentrate the largest amount of risk.

#### **Guidelines for post-earthquake building inspections and safety evaluations should also be assessed, along with the existing capacity of dedicated engineers to carry these evaluations.**

When a damaging earthquake hits a populated area, authorities must promptly inspect all the buildings in the affected area to identify which are unsafe and so prevent deaths and injuries resulting from aftershocks. Identification of all safe buildings for immediate use will minimize the number of homeless, thus reducing the required temporary shelters and the load for emergency provisions. The inspections will be part of an earlier planned operation designed to cover efficiently and reliably large numbers of affected buildings under the usually chaotic emergency conditions created by an earthquake. Emergency interventions will be carried out to demolish dangerous buildings or portions thereof and provide shoring to weakened buildings to protect them from the aftershock sequence. For more information, see Anagnostopoulou and Moretti (2008).

**Moldova should also consider developing standardized and cost-effective solutions for buildings requiring seismic retrofitting to improve their structural safety and seismic performance (including residential buildings**

– see box 5 for example). This will also require assessing the current capacity of engineers to design retrofit solutions, and review the adequacy of existing retrofit guidelines. For building types that require seismic retrofitting, standardized engineering solutions for retrofitting should be considered where appropriate.<sup>22</sup> Furthermore, to speed up the implementation process, preapproved designs can be created for standard building types, with practical guidelines developed for engineers. These steps will allow engineers to reduce design costs, achieve standardized building performance, and have confidence in performing retrofit design for unfamiliar structural types.

**The development of updated Master Plans is another major challenge for Moldova, given that the country inherited inadequate Soviet norms for urban and regional planning.** In most cases, Master Plans do not even exist; those that do date back to Soviet times and no longer reflect current development needs and realities.<sup>23</sup> The lack of

available resources means that only 61 percent of urban settlements and 5 percent of rural settlements have been able to develop Master Plans. Risk-informed planning and zoning is therefore not an embedded practice, even when hazard maps exist (UN-Habitat 2016). For example, the Municipality of Chisinau has developed a map of dangerous geo-environmental processes, but its value and usefulness are undermined by the fact that the Master Plan does not incorporate this information for zoning restrictions (UNECE 2015). Ideally, mapped geological risks should be included in zoning restrictions within the plan to promote safe and efficient use of higher-risk areas.

**With support from the EU,<sup>24</sup> Moldova drafted a new Urban and Construction Code that has more specific and clear environmental protection and disaster risk reduction (DRR) provisions than the existing legislation.<sup>25</sup>** Moldova's legislation on civil engineering/construction is being adapted to reflect EU

### Box 5. Addressing Seismic Risk in Pre-1990s Large Panel Buildings in Bulgaria

Bulgaria's exposure to earthquakes has increased over the last century due to its expanding building stock and infrastructure, most of which were constructed prior to the development of modern seismic standards. Still, efforts to quantify this exposure or better understand the underlying risks have been limited. It is in this context that the World Bank undertook a study in 2018-2019 to understand Bulgaria's earthquake vulnerability and inform decision makers about the actions the government can take to prepare for and reduce the negative impact of earthquakes.

This study looked specifically at the impact of earthquakes on large panel buildings (LPBs), which are home to almost a quarter of Bulgaria's population. This study aimed to quantify the seismic vulnerability of residential LPBs through thorough analytical and numerical methods and understand how lack of maintenance and occupants' behavior reduces the structural strength of these buildings. The study sought to establish the distribution and current condition of LPBs, their risk from damage or collapse in an earthquake along with associated financial and social impacts, and key actions that could be taken to reduce these impacts.

The structural integrity and seismic resistance of LPBs were found to be affected by quality of construction, inadequate maintenance, weather-related deterioration, and post-construction modifications. In addition to

compromising life safety, the following factors were found to significantly increase the costs of repair after an earthquake: (i) deterioration of facade and parapet panel connections; (ii) quality of dowel connections; (iii) partial or full removal of internal walls; (iv) structurally unsafe balcony enclosures; and (v) soft roof story.

That said, the uniform style and construction of LPBs provides a unique opportunity for strengthening and improving these buildings at relatively low cost. This includes strengthening facade panel connections from inside the building, or from the outside along with energy efficiency improvements, to reduce the financial impact of earthquakes and to reduce temporary homelessness associated with earthquakes. Alternatively, for some LPBs there is an opportunity to add floors as part of their modernization, which would have the co-benefit of increasing the supply of housing units. The sale of the apartments added to the building could offset investments in seismic strengthening, energy efficiency, modernization, and improvement of common areas and utilities. There are many other actions identified in this study that can be taken to increase the seismic resilience of large panel buildings, including technical, administrative and legislative changes.

Source: World Bank 2019b.

standards for seismic design of building codes (Eurocode 8), which provide the basis for building codes considering a 475-year return period (10 percent probability of exceedance in 50 years) and a 95-year return period (10 percent probability of exceedance in 10 years). The Ministry of Economy and Infrastructure has currently secured funding to adapt its norms to the first five Eurocodes. There are ongoing efforts to adopt the remaining four codes, including the DRR-related Eurocode 7 (Geotechnical Design) and Eurocode 8 (Design of Structures for Earthquake Resistance). Further work is needed to develop the National Annexes and National Determined Parameters for the Eurocode, which would reflect Moldova's local hazard profile and local design and construction practices. This work is especially critical for Eurocode 8, since the seismic hazard parameters must be developed based on the country's official seismic hazard map.

**Moldova has taken steps to address the increased risk of droughts through climate-resilient interventions.** Recognizing the substantial risk that slow-onset disasters pose to the agricultural sector, one of the pillars of the Moldovan economy, the country has invested in rehabilitating some of its centralized irrigation schemes and (increasingly) in implementing climate-resilient agricultural techniques, such as moisture-preserving tilling and water collection/capture infrastructure. While many demonstration pilots have been set up in recent years and a growing number of farmers are adopting climate-resilient techniques, the country will need to conduct a stock-taking exercise to understand the scale of the remaining needs, streamline its agricultural funding programs, and establish a concerted investment program to achieve the transition to a climate-adapted agricultural sector (World Bank and CIAT 2016).

### **Structural Measures**

**Given the country's significant seismic risks, a comprehensive inventory of the entire housing stock is urgently needed (especially in urban areas) to assess the needs for renovation and rehabilitation.** After a disaster, the largest damages and reconstruction costs are often in the housing sector. Without a well-developed and highly functioning insurance market, these costs typically fall on government as an implicit liability. In addition, a recent regional analysis by the Global Earthquake Model Foundation (Silva et al. 2018) has confirmed that the expected earthquake loss per year in Moldova (for the entire country), averaged over many years (i.e., average annual loss), is US\$35.1 million, with 85 percent of these losses arising from damages to residential properties. This shows that the largest concentration of seismic risk in the country is by far in the housing sector. Moldova has a relatively new housing stock, but it is in generally poor condition, lacks sufficient maintenance, and requires capital repairs.<sup>26</sup> For example, the Ministry of Regional Development and Construction (now the Ministry of Economy and Infrastructure) identified 468 urban homes with considerably modified or damaged structural elements. Such buildings necessitate a structural safety assessment and will likely require major repairs or demolition. Currently, examination of dwellings to determine their compliance with the minimum requirements is done upon request of the tenants or the Local Public Authority (LPA), usually in relation to some emergency (UN-Habitat 2016). Despite the poor condition of its housing stock, 20–30 percent of which is currently unsafe for residents, Moldova has no ongoing plans to undertake inventories of at-risk buildings and develop retrofitting programs for seismic rehabilitation to address structural weaknesses (UNECE 2015).

**Moldova has no systematic national program for assessing and reducing risk to public buildings to maximize their safety and continued use (with the notable exception of public hospitals; see box 5).** In the event of a strong earthquake, it is critical to ensure that hospitals and primary medical facilities remain undamaged and functional, with backup electricity and communications, to enable the care of injured as well as to sustain key functions such as maternal health. Emergency services (police, ambulance, civil protection agencies) should equally remain functional. Public education facilities and emergency services, as well as national, regional, and municipal government buildings, should be constructed to a minimal life safety level, with minimal damage allowing rapid reoccupation and recommencement of services.<sup>27</sup>

These buildings—especially those built before the first building code or during a weaker period of code enforcement, or those that underwent unapproved expansions in the 1990s—should be assessed for structural and seismic safety. Moreover, any effort to improve the amenities and/or energy efficiency of buildings constructed during “riskier” time periods should consider seismic resilience of the construction before action is taken. In many countries, a register of these buildings is created as part of exposure data creation, enabling the prioritization of buildings for more detailed assessment and then capital repairs or even retrofitting, as required. In Moldova, these data are currently incomplete and/or scattered across national, regional, and municipal authorities.

**The costs to the transport sector from disasters can substantially affect recurrent maintenance**

**budgets.** After a large event, reconstruction in the transport sector often represents one of the greatest fiscal liabilities for national and subnational governments. Detailed digital maps of transport networks, including attributes such as traffic volume, surface type, and level of maintenance, together with detailed flood hazard and landslide susceptibility maps and historical locations, can support evidence-based decision making on flood-related road closures and future transport routes. Information on bridges’ location and vulnerability to collapse after seismic events is also critical for this type of decision making. Once this information is collected, criticality assessments of transport systems can be combined with data on vulnerability to support prioritization of resilience investments in the transport sector.

**Moldova has developed an investment plan for flood risk management and has selected strategic options for each part of the river system through a multi-criteria analysis.**

Supported by the EIB under the framework of the European Neighborhood Policy in 2016, the analysis includes structural and nonstructural measures costed at €445 million, which would reduce annual flood losses by 63 percent. The 20-year phased investment plan includes identification of the most important measures that could be practically implemented in the short term. The short-term investment plan costs 22 percent of the total; it would protect 44 percent of the targeted population and would produce 54 percent of the annual benefits of the full investment plan. Given the limited domestic resources, the EIB worked with the Moldovan government to develop a €60 million

### Box 6: Strengthening the Structural Safety of Moldovan Hospitals

Following the 2010 earthquake in Haiti, Moldova implemented a hospital retrofitting program based on a World Health Organization (WHO)-funded inventory of hospital safety and resilience to disasters undertaken in 2010. The inventory assessed the structural, nonstructural, and functional safety of hospital buildings. The structural safety aspect reviewed the soundness of structural elements and compliance with construction and refurbishment standards. Of 66 hospitals, only 55.9 percent were deemed

structurally safe; 32.4 percent had an average score, while 11.7 percent had a low score. In 2016, following the implementation of the National Program and Action Plan for Hospital Safety Strengthening, WHO reported marked improvements, with 64.1 percent of hospitals deemed structurally safe and 35.1 percent having average structural safety.

Source: Pişla 2016.



project that funds the priority structural measures, but a decision on proceeding with the project is pending. The implementation of such measures should be a priority, as the 2008 and 2010 floods cost the country US\$120 million and US\$42 million respectively in damages and losses (EIB 2016).



## EMERGENCY RESPONSE AND PREPAREDNESS

*Adequate preparedness is essential, as risk can never be completely eliminated or reduced. Preparedness through early warning systems saves lives and protects livelihoods and is one of the most effective ways to reduce the impact of disasters. To be effective, early warning must lead to action. Preparedness activities therefore include enhancing the capabilities of local organizations to plan for and respond to the effects of disasters.*

**As mentioned in section 2, strengthening institutional frameworks to better manage disaster risks has been a government priority in past few years (cf. figure 7 for more detailed information).** Most progress has been made on the preparedness and response side. The GIES oversees disaster prevention, response, relief, and recovery. It is the responsible authority for alerting the population to hazards, while the State Hydrometeorological Service (SHS) provides operational meteorological and hydrological forecasts to all relevant authorities and to the public. In 2001 Moldova also created the Republican Commission for Emergency Situations as the main entity for managing major emergencies. More recently, Moldova established a legal framework for a single emergency phone number, which allows people to spontaneously call 112 to request any emergency services across the country. Since March 29, 2018, the unique emergency number 112 has been operational for all services.

**Given the country's disaster risk profile (especially earthquake risk), the Government needs to keep enhancing the country's response capacity and preparedness level, particularly at a local level.** This includes enhancing early warning systems, modernizing equipment required for search and rescue operations, integrating preparedness and response procedures for both medical and non-medical emergency situations, and developing information campaigns targeting local communities to raise awareness on exposure levels and on possible protective measures. The CPSS has developed a Strategy for Communication and Prevention of Emergency Situations since 2015 and the Government has intensified practical trainings and education sessions in the area of DRR, but local organizations could play a more significant role to increase ownership and sustain these efforts, while involving a wide range of population groups, including vulnerable individuals (the elderly, minorities, displaced, low-income communities, etc.). Several promising and innovative initiatives in this regard have been pioneered by civil society organizations in neighboring Romania and could provide some impetus to develop a countrywide public awareness and participation strategy, and stimulate a culture of resilience and safety within urban but also within rural communities (see box 7 for more details).

**Moldova has also considerably strengthened its hydrometeorological early warning capability, but important challenges need to be addressed to make it more effective.** With the support provided by the World Bank, United Nations Development Programme (UNDP), and bilateral donors, SHS has strengthened its capacity to monitor meteorological, hydrological, and climatological hazards and has improved its weather forecasting. Lead time for severe weather warnings has been improved from 10–60 minutes to three to six hours, providing critical additional response time for farmers, the public, and civil protection authorities. To ensure that these critically important services are provided sustainably, SHS will also

have to address institutional and legal challenges related to outdated hydrological forecasting, limited autonomy, chronic underfunding, and a limited ability to attract and retain qualified staff due to unattractive employment packages. A follow-up World Bank grant recently developed verification and quality management systems in the SHS to systematically improve forecasting and help ensure reliable services that respond to user demand. The grant has also developed a National Framework for Climate Services, which provides the enabling environment for user-focused scale-specific climate products in important economic and security sectors (World Bank 2018).

**Currently, Moldova's warning systems are outdated and have limited reach.** The SHS is required to inform the GIES about dangerous hydrometeorological and environmental events. While the GIES receives daily information from the SHS and has in-house capacity to analyze meteorological data, the early warning systems used are obsolete (dating back to Soviet times) and have poor reach (the sirens are in the rayon centers, often far from the communities located in the floodplains). In addition to upstream sources of early warning systems, it is also important to highlight the importance of reaching the "last mile": such warnings are only effective if information

### Box 7. Community Resilience & Private Sector involvement: the CSO experience in Bucharest

Known as 'The Silicon Valley of Transylvania', Romania's growing tech scene is home not only to entrepreneurs, but also to engaged civil society voices looking to build Romania's resilience from the ground up, particularly in Bucharest. This growing and dynamic coalition currently has more than 70 affiliated members representing around 15 different organizations active in Romania, and is driven by proactive leadership and creative talent, as it continues to help transform Bucharest from a vulnerable city to a community of resilience.

Bucharest has a vibrant and innovative civil society network dedicated to scaling-up urban resilience considerations in collaboration with local authorities, especially in light of the Colectiv nightclub fire tragedy in 2015. Many are also deeply concerned about the potential for a damaging earthquake given that Bucharest retains the highest seismic risk profile among all EU capital cities and its proximity to the Vrancea fault line.<sup>26</sup>

One promising example of this kind of innovative partnership comes from MKBT: Make Better, a civic-minded local development advisory group, which gathered crowdsourced data to identify more than 8,000 residents living in Class 1 buildings that are in severe danger of seismic collapse - highlighting the importance of generating actionable risk information to shape inclusive disaster risk management policies. Clubul Cânilor Utilitari, is another Civil Society Organization (CSO) that works to train dogs in Bucharest to be at the frontline of forest and earthquake search and rescue efforts.

Another example is Code for Romania, a local tech community, which has developed a new app, in collaboration with Romania's Department

of Emergency Situations (DES) and the World Bank, that will enable the government to better channel resources and coordinate volunteers in the event of a major earthquake (or any other disasters) to build a culture of safety and resilience. Interestingly, Code for Romania has also imported best practices from Mexico in terms of tech solutions to develop an ecosystem of open-source apps to boost awareness and crowdsource preparedness and relief efforts at a national level. Code for Romania is currently collaborating with Code for Moldova to explore similar tech-enabled community resilience initiatives in neighboring Moldova.

Other initiatives include the Bucharest Community Foundation, which launched the "Bucharest Prepared" program<sup>29</sup>; and Civic Tech, that developed the "Fii pregatit" platform for the DSU, the Romania Red Cross, SMURD Foundation, Romanian Health Observatory, National Institute for Research and Development of Earth Physics, 4X4 Rescuers Volunteer Association, and ARCEN, which, together with ReRise, launched "Antiseismic District", a community-oriented program with the aim of transforming one of Bucharest's most seismic vulnerable historical neighborhoods into a risk-informed community prepared for future earthquakes. Romania's DES and the General Inspectorate for Emergency Situations (GIES), in collaboration with municipal decision-makers, are also spearheading decisive efforts to support, involve, and empower communities, including large-scale earthquake simulation drills as well as other participatory methods to improve preparedness efforts, local response capabilities, and effective risk communication.

Source: Calin 2019.

is received, understood, and acted upon by the exposed population. This is because providing clear and verifiable information and guidance on the potential impacts of a given hazard event can improve end-user decision-making, resulting in more effective actions. SHS and GIES therefore need to work together to ensure last-mile delivery of early warnings and guidance, in particular taking advantage of modern ICT through SMS and (potentially) service apps. Redundant communication systems are also needed, not just because mobile systems may fail, but also because some areas are not covered by the mobile network and some people lack mobile phones (and so need to receive critical warnings through radio, etc.). This is particularly crucial in several rural areas given that Moldova's economy relies significantly on agricultural activities and has a predominantly rural population. While GIES operates a modern national Emergency Command Center in Chisinau (financed by a World Bank-funded investment project), subnational centers and response equipment (such as response vehicles) need to be rehabilitated and upgraded to ensure rapid response in all parts of the country (Kull, 2019).

**Despite promising advances in forecasting and warning technology in Moldova, it is still difficult to present forecasts and warnings in a user-friendly way that results in protective behavioural reaction, particularly in isolated rural areas.** Global best practices also indicate that marginalized populations (such as women, children, elderly, and disabled) are often those most overlooked by disaster risk management strategies, and require special consideration and focused attention to ensure they are not left behind. To effectively strengthen the links between wider preparedness efforts (including early warning systems) with the end-users themselves requires multi-sectoral partnerships (disaster management agencies, national hydro-meteorological services, critical infrastructure operators and civil society organisations) and their information sources that promote information and data sharing. Early

warning systems that are reliable, effective, and inclusive are therefore essential tools in disaster risk management for saving lives and protecting livelihoods.<sup>30</sup> A shift to impact-based forecasting is also needed, emphasizing not just what the weather will be, but also but what the weather will do. For example, for many people a forecasted peak wind gust velocity such as 120 kph does not mean much, but instead a warning describing “wind that is potentially strong enough to knock over an empty truck” is understandable and is more likely to prompt an effective reaction.

**Seismic monitoring capability has been enhanced in Moldova.** Moldova is in a unique location to benefit from earthquake early warning (via wave arrivals or through crowd sensors such as phones or internet); it is one of few locations in the world where the earthquake type is at distances far enough to allow for shutdown of essential systems, and warnings could give 30 seconds to one minute of lead time. Moldova collaborates with the Romanian National Institute for Earth Physics, and the two-exchange data from the monitoring stations regularly. Moldova lacks a warning system for earthquakes, which in the absence of retrofitting programs should be a critical priority for the country.

**The World Bank has recently mobilized a grant to support enhanced disaster and emergency rescue capabilities in Moldova.** The grant funds are used to develop urban rescue standards in Moldova that are compatible with INSARAG guidelines. The expected outcome of the grant is to develop a local medium-size USAR team, build the local training-of-trainers capacity, and develop a national training and accreditation process for other central and regional rescue teams. While this is a useful step forward, the civil protection force requires more in-depth investment, both to streamline its capabilities in business processes and to upgrade its rescue equipment, including the building of regional command centers in Balti and Cahul.

**Finally, from a pandemic preparedness standpoint, it is essential to ensure that lessons learned from previous public health crises<sup>31</sup> and related considerations are incorporated into existing DRM systems which are otherwise primarily geared towards responding to geological or climate disasters (and man-made disasters such as industrial accidents).** Recent public health crises and pandemic outbreaks such as the ongoing Coronavirus have demonstrated the value of having robust DRM investments in place to support preparedness more broadly (see box 8). More generally, DRM-related activities that could strengthen the health sector include: (i) strengthening health systems capacity to respond to disasters by incorporating emergency response into national health plans and improving emergency surveillance and response; (ii) strengthening pandemic responses, especially in the context of regional and multilateral cooperation; and (iii) strengthening emergency primary health care services. For instance, collecting, collating and analyzing city-level and disaster-related geospatial data, and making these analytics available to decision-makers in the health sectors (and other sectoral stakeholders) to help them to anticipate and mitigate future epidemics, should be a priority.<sup>32</sup>



## FINANCIAL PROTECTION

*In the aftermath of disaster, the financial costs of response, recovery, and reconstruction are a significant burden on government finances, at both the national and subnational levels. Following disaster, both explicit and implicit contingent liabilities of government may be realized. Explicit liabilities include the reconstruction of public buildings and infrastructure. Implicit liabilities arise from public pressure to partially or fully contribute to the replacement of private housing (for the uninsured), emergency housing, medical care, etc. At the household level, poor and near-poor families may adopt negative coping mechanisms after a disaster. The major asset of many of these families is their home, so damage or loss of the home represents a severe financial setback. Ex ante financial planning is thus critical to manage the financial shock associated with disasters.*

**Moldova's budget legislation framework is based on Law 181/2014,<sup>33</sup>** which determines the general legal basis for public finance: it establishes budget and tax principles and rules; determines

### Box 8. Moldova's Preparedness lessons learned from the 2009 H1N1 influenza pandemic

The 2009 H1N1 influenza pandemic revealed challenges and gaps in the National Pandemic Preparedness Plan (NPPP) in 2009. Intersectoral interaction, coordination and communication proved to be weaker than expected, and public and private sector organizations and essential services providers were not sufficiently engaged in pandemic preparedness and response. A NPPP working group updated the plan to ensure a high-level political commitment and involvement by the whole of society. Pandemic Preparedness Self-Assessment Indicators were developed and tested in collaboration with ECDC and WHO partners. The following corrective measures were introduced:

- An intersectoral working group was established to review and update the NPPP.
- The existing legal framework for pandemic preparedness and sentinel surveillance was adjusted based on the recommendations of the NPPP working group and international experts: 1) case definition guidelines and clinical management protocols were elaborated; 2) a set of documents related to preventive measures was issued; and 3) documents for implementing laboratory-based sentinel surveillance were approved
- The MOH held a successful series of national planning exercises.
- Assessed national capabilities for pandemic preparedness and response together with ECDC and WHO using monitoring and evaluation tools to optimize planning

Source: WHO 2011.

components of the national public budget and regulates inter-budget relations; regulates the budget calendar and general procedures of the budget process; and differentiates competences and responsibilities in the field of public finance. The budget planning starts from mid-term planning of budget expenditures (every three years) through the Medium-Term Expenditure Framework, which is based on financial sectoral strategies that are revised every year. This work is coordinated by the Inter-ministerial Strategic Planning Committee. When the Medium-Term Expenditure Framework is approved, the planning continues with annual budget planning for the fiscal year. However, the structure of the state budget does not allow individual disaster risk prevention, preparedness, and response expenditures to be identified. The only exception is dedicated funding for civil protection and specific contingency funds. Nearly all agencies involved in DRM lack the financial resources to procure and properly maintain relevant equipment or to develop and implement programs and plans for hazard prevention, mitigation, and response.

**Civil protection funding is governed by Law 271/1994, On Civil Protection, which establishes funding responsibilities for the various actors.**

The GIES undertakes its own budget planning following the three-year financial sectoral strategy plan, but available funds are limited and cover only staff salaries and operational costs of the civil protection organizations. They do not provide sufficient resources for disaster risk reduction or management expenditures, including trainings and modernization of equipment. The situation is similar for other ministries and agencies involved in DRM (see annex 4), which have funds to cover mandatory costs (salaries, etc.) but not development, upgrades of technologies and equipment, etc. Hence these latter costs often need to be covered via external resources (from the EU, World Bank, UN projects, etc.).

**Contingency funds in Moldova are managed by the Ministry of Finance on behalf of the government.** Law 181/2014, About Public Finance and Budget and Tax Responsibility, established two contingency funds: (1) the Reserve Fund, used to fund recovery needs in case of emergencies or unforeseen events for which no budget allocations exist; and (2) the Intervention Fund, used to fund response efforts in case of natural disasters, epidemics, and biological and technogenic/man-made emergencies.<sup>34</sup> Overall, some 70 percent of the Reserve Fund goes to compensate losses emanating from natural hazards. The allocation can be augmented by transfers from other budget lines in case of a widespread disaster. Public authorities at national, regional, and local levels, as well as public institutions and nongovernmental organizations, can request assistance from the Reserve Fund. Requests for use of the Intervention Fund are considered by the Republican Commission for Emergency Situations or the National Commission for Public Health Emergencies. Requests for use of the Reserve Fund can be reviewed by these commissions, or by the Prime Minister's Office. While much of the Reserve Fund is used to provide reconstruction support for damages caused by disasters, the funds can be used for any contingency. In practice, however, the limited financial resources available at all levels mean that disaster victims rarely receive financial compensation. In some cases, in-kind compensation in the form of construction materials to rehabilitate damaged infrastructure (houses, schools, kindergartens, hospitals, etc.) is offered. The government normally appeals to the international community for support, but the process can be hindered by the absence of clear mechanisms for loss and damage calculation (see below) (World Bank 2007).

**While Moldova does not have any flood or earthquake insurance, agriculture insurance for a defined list of crops is offered, regulated under Law 243/2004.** However, the current

agricultural insurance scheme needs a substantial overhaul. Although the government subsidizes 50 percent of the value of insurance premium, there is weak demand for crop insurance among farmers. Farmers are reluctant to be enrolled in insurance schemes for several reasons, including the expensive insurance premium (7–13 percent of insurance value),<sup>35</sup> a relatively weak legal foundation, and mistrust of insurers (there are cases in which farmers were not compensated against the insured losses) (UNDP 2016). The market penetration is estimated to be 2–3 percent of total acreage. Subsidies of 50 percent are provided and can be applied depending on the quantity of agricultural outputs, not based on their quality or price. Moreover, there is no clear regulation to assess the impact of the damage in order to adequately plan for the allocated budget (see next section); loss assessment is often undertaken by insurance company experts on site with the participation of local authorities. Reinsurance is provided by international reinsurers, but is not required by law. Nor does the law regulate triggers or deductibles; these are negotiated between the insurer and insured on an ad hoc basis. No compulsory insurance for all fields with the same crop is foreseen. In this sense, the introduction of alternative instruments, such as weather index insurance (drought insurance) and multi-peril crop insurance (for hail, temperature, and precipitation risks), could help improve small-scale farmers' access to agricultural risk transfer schemes and reduce the public sector's burden (World Bank and CIAT 2016).



## RESILIENT RECOVERY

*Recovery efforts offer a window of opportunity to reduce risk, as they occur when people are aware of risk, politicians are motivated, and funds are often made available. Anticipating disasters as*

*almost inevitable, governments can put in place policies, standards, and institutional arrangements for managing recovery prior to a disaster. Disaster readiness makes it possible to integrate DRR in recovery—and only well-executed recovery guarantees resilient recovery. Establishing institutional arrangements, policies, and financing sources for recovery before a disaster allows governments to avoid the post-disaster political pressures and confusion of roles that so often produce ineffective recovery. However, making a commitment to institutionalization is not easy. Allocating the resources needed to institutionalize disaster preparedness requires financial support and political will. Inertia can hamper efforts to introduce recovery-related legislation and corresponding implementation arrangements.*

### **Moldova has no systematic approach to comprehensive and efficient collection of data on hazard extent and intensity after an event.**

Nor does it systematically collect information on sectors affected, direct damage and indirect losses,<sup>36</sup> or requirements for recovery and reconstruction. The national loss and damage system usually focuses on “damage” assessment, and it will require substantial improvement to ensure that Post-Disaster Needs Assessments (PDNAs) can be completed and lead to an efficient and comprehensive recovery strategy (PPRD EAST 2 2015). To be specific, there is no unified methodology for collecting, calculating, and recording damage or associated economic losses, direct and indirect.<sup>37</sup> Such an approach can lead to inaccurate disaster loss amounts and in some cases underestimation or duplication of economic losses. The existing legal and regulatory framework does not provide a clear division of roles and responsibilities, and therefore, clear expectations among stakeholders—local authorities and the representatives of the relevant ministries at the local level—are lacking. The Ministry of Agriculture, Regional Development and Environment already uses the ECLAC (Economic Commission for Latin

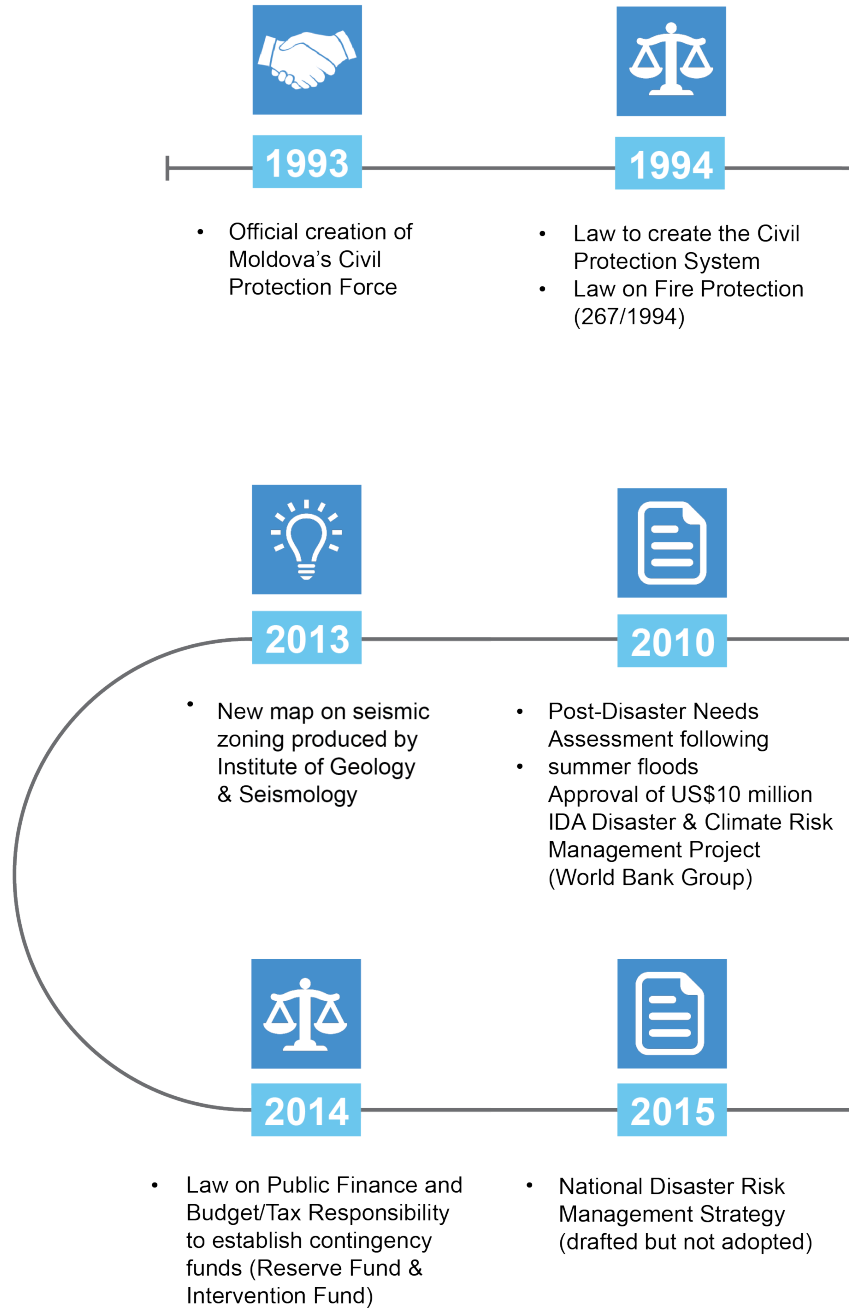
America and the Caribbean) methodology but without operational guidelines,<sup>38</sup> the GIES staff and local authorities generally acknowledge the importance of disaster loss calculation, but have no clear guidance and mechanism for assessing losses. For example, the timing of damage and loss assessment is not regulated: in some cases, the assessment is carried out a couple of days following a disaster, and in other cases—depending on the type of hazard, accessibility of affected sites, etc.—it begins after months have elapsed. As a result, the existing damage and loss assessment system produces an incomplete picture of the economic impact of disasters (UNDP 2016). A consistent methodology—and potentially an information management IT system—for post-disaster data collection could help collect, verify, and aggregate data across administrative and sectoral levels in a streamlined manner, up to the central government. Such a system would allow for a more comprehensive understanding of the cost of disasters in Moldova over time, and could support efforts such as timely post-disaster compensation and recovery tracking, DRM budget allocation, international loss reporting, and risk modeling.

**Moldova currently lacks a build-back-better framework to guide its post-disaster reconstruction efforts.** Disasters cause destruction, but also present an opportunity to build more resilient societies through the build-back-better approach to recovery,<sup>39</sup> in which a community's physical, social, and economic aspects are simultaneously developed to a "new normal" that is more resilient than the pre-disaster state. Experience shows that this approach significantly reduces asset and welfare losses to the affected communities. However, resilient and effective recovery and reconstruction are possible only if the appropriate legislation, policies, and tools are made available to affected households, businesses, and local and national authorities before the disaster hits. These are usually incorporated into a disaster recovery framework that includes contingency plans

and institutional arrangements with a clear allocation of responsibility during the recovery period, access to actionable knowledge and information, and strong and inclusive financial protection provided by a combination of disaster-responsive social safety nets, insurance mechanisms, and access to borrowing to finance the reconstruction (Hallegatte, Rentschler, and Walsh 2018). Such a framework is particularly important in the housing sector, which is in many cases the sector most affected by a disaster. Even though housing is a private asset in most countries, the economic and social benefits of housing recovery inherently justify government support, especially when households are impoverished and have no access to insurance or other means for recovery. A standardized and predictable mechanism for post-disaster financial assistance should therefore be developed. This would streamline and provide standards for reconstruction efforts and help ensure a transparent assistance process for affected households. Citizens should likewise be made aware of the process for assistance and reconstruction.<sup>40</sup>

**Figure 7: Moldova's Recent Progress in Building Disaster and Climate Resilience**

# 25 YEARS OF DRM







1996

- Law on Principles of Urban Planning & Territorial Development (835/1996)



2001

- Official creation of the Republican Commission for Emergency Situations



2002

- Law on Temporary Requisitions (1384/2002)
- Law on Humanitarian Assistance (1491/2002)



2007

- Legal framework for Civil Protection and Emergency Situations Service (93/2007)



2005

- Government Decision on Mandatory Civil Protection training for population (GD 282)



2004

- Law to authorize parliament to declare state of national emergency (212/2004)



2016

- Completion of National Master Plan for Flood Protection & Prevention (with European Investment Bank support)



2017

- World Bank/GFDRR supports technical & service delivery capacity for hydromet services & weather forecast



2018

- Activation of 112 Single service emergency number
- Moldova receives technical assistance to enhance Urban Search & Rescue capabilities from World Bank/GFDRR

# CHAPTER 4

## CONCLUSIONS AND RECOMMENDATIONS

**SUMMARY:** *Much of the current DRM in Moldova is still “traditional,” i.e., focused more on emergency preparedness and response and less on disaster prevention and long-term resilience. There has been significant progress in selected DRM areas, particularly flood risk assessment and (to some degree) flood protection, but additional work is required to ensure preparedness to seismic risks. Effective emergency response needs further strengthening through improvements in subnational command structures, facilities, and equipment, as well as better preparedness of local first responders, authorities, public services, and businesses. On the funding side, Moldova should consider fostering disaster insurance mechanisms, streamlining existing emergency funds, and participating in international risk-pooling mechanisms; these steps could help ensure adequate funding is available when disasters strike. Finally, a resilient recovery framework should be put in place to ensure that lessons from past disasters feed back into improved DRM policies, such as including build-back-better provisions in the existing construction norms. Moreover, in light of the ongoing COVID-19 developments, selected guiding principles are also laid out in this final chapter to emphasizing the importance of better linking crisis management necessities (including pandemic preparedness) with Moldova’s existing DRM system.*

**Although a broadly adequate institutional and legal DRM framework is in place in Moldova (see figure 7), especially on the response side, there is room for improved coordination on risk prevention and reduction and more in-depth contingency planning.** DRM functions are split

among several ministries and state departments, local public authorities, and economic entities. Although some overall management guidance and direction is provided by the Republican Commission for Emergency Situations, and vertical lines of authority within the system work adequately, there is a need to clarify roles and responsibilities for strategic oversight, planning, and coordination, and for implementation of risk identification, reduction, and response measures for all hazards. Institutional measures, including developing a legal and regulatory framework that addresses all hazards and promotes interagency coordination, are needed to ensure that the proposed investments in individual agency capacities are effectively linked.

**Such an improved DRM framework would also help Moldova better manage additional shocks and stresses, including public health crises such as the ongoing COVID-19.** It is essential to incorporate such crisis management aspects into Moldova’s existing DRM system which are otherwise primarily geared towards responding to natural and climate disasters. As seen with the COVID-19 crisis, Moldova’s existing DRM system could provide a good foundation to effectively respond to the urgent needs of cities and communities (see box 9 for more details). To better anticipate such shocks or stresses in the future, it will be essential to adapt and scale up existing DRM infrastructure including early warning systems, linking disaster preparedness and response systems to other types of crisis (health emergencies for example), prioritize health service provisions and risk communication tools for the poorest households living in informal settlements and other vulnerable

groups that are at-risk, generate education materials and public awareness programs, etc. For example, collecting, collating and analyzing DRM geospatial information, and making these analytics available to health stakeholders to help them to anticipate and mitigate future epidemics could facilitate crisis management measures.

**A National Disaster Risk Management Strategy would help Moldova achieve this goal.** It would provide an overarching vision and ensure that risk mitigation priorities are incorporated in appropriate national development programs. Given the limited resources available, risk mitigation should benefit as much as possible from mainstreaming into ongoing sector programs such as flood risk management and agriculture. A national DRM strategy should be developed by key institutions and stakeholders in a collaborative and participatory manner, with a view to establishing functional arrangements for coordination and defining critical areas where capacities need to be strengthened. Institutional mandates will need to be clearly defined to clarify responsibilities and avoid overlap and wastage of resources. International experience suggests that focal point responsibility for facilitating the process of strategy development and overseeing its implementation will be needed; the National Commission for Emergency Situations, for example, could serve this role.

**It would also be beneficial for Moldova to modify its current legal framework by introducing an overarching DRM law.** The law would introduce the key DRM terminology, and define the key roles and responsibilities for risk identification, assessment, mitigation, management, and finance at the national, regional, and local levels. This clarity would help manage potential overlap and assist with overall coordination of DRM activities.

**In addition, the existing risk information system should be improved, in part by creating a consolidated multi-hazard risk information platform.** This change would facilitate greater

coordination in data sharing and management and help meet priorities such as seismic risk mapping and the development of a national database of infrastructure and buildings and their vulnerabilities. Additionally, hydrological/flood forecasting needs to be modernized. A common shared platform making multi-hazard risk information available to all relevant ministries and agencies should be developed, and DRM risk assessments should be mainstreamed into sectoral development strategies.

**Moldova should promote risk-informed land use planning that draws on improved hydrological and seismic risk mapping.** This would help prevent settlement in floodplains and could inform urban planning processes and decisions regarding development planning, construction permitting, and seismic retrofitting and/or reconstruction of vulnerable key facilities and lifelines.

**There is an urgent need to conduct risk assessment (with a particular focus on seismic risks) and prioritize investments in disaster and climate risk reduction across key sectors** (residential, education, health, utilities, communication and infrastructure systems, and the public sector, including emergency service buildings, among others). Although Moldova has bolstered its capabilities in early warning, preparedness, and risk information, actual investments in risk reduction are limited, especially given the scale of climate and disaster risk in Moldova. As a matter of priority, the country should allocate funds for implementing the flood prevention investment program, at least the short-term program, developed with EIB assistance. Moldova should also start considering the development of an investment program to retrofit its public buildings and housing stock to resist earthquake tremors. This program would include (1) an in-depth assessment that could form the basis of a comprehensive national strategy to reduce the seismic risk to priority high-risk structures and networks, and (2) an investment plan articulating how these risk reduction efforts would be financed and overseen. At a minimum, buildings could be

categorized through this risk analysis into those that do not require structural intervention, those that need seismic retrofitting, and those that will require demolition and reconstruction.

**Moldova's early warning and communication systems should be improved.** Emergency communication and DRM information systems are deficient in Moldova, and emergency response equipment is currently absent or outdated. While SHS can improve the lead time and resolution of its forecasts through technical measures, making use of those data sets to achieve better outcomes requires improving current information dissemination and response measures. Moldova should develop an integrated concept as part of a comprehensive upgrade of the warning systems for various types of hazards; earthquakes should be the priority, given their potentially devastating effects and the lack of existing mitigation/retrofitting programs. Technical rescue operational capacities within Moldova's existing DRM framework should be strengthened by improving the management, logistics, and communication protocols between response teams at the local, regional, and national levels.

**Financial constraints already faced by agencies involved in DRM should be urgently addressed.** Nearly all these agencies lack the financial resources to procure and properly maintain relevant equipment and to develop and implement programs and plans for risk prevention, mitigation, and response. The Government of Moldova should develop and implement a methodology for tracking and recording DRR/DRM budget allocation across the national system, and should replicate this at the local level. Disaster risk insurance mechanisms for non-agriculture-related disaster risk events, such as flood and earthquake, should be considered, and the existing agriculture-related insurance for farmers should be overhauled to protect against slow-onset disasters such as droughts. Ex post disaster risk financing mechanisms should be improved, in part by reforming the existing emergency funds or by developing new approaches, such as a Development

Policy Loan with Catastrophe Deferred Drawdown Option (CAT-DDO), that would also reinforce the country's level of financial protection.

**Moldova should develop a coherent resilient recovery framework.** The country's diverse community of disaster recovery stakeholders should establish a common all-hazards disaster recovery framework to better manage pre- and post-disaster planning and operations. This framework's performance would depend on the ability of stakeholders to collectively identify, analyze, and document the parameters within which recovery effectiveness and efficiency are maximized at all government levels and by all stakeholder groups (including businesses, nonprofit organizations, communities, households, and individuals). The framework should enable pre-disaster recovery planning among all stakeholders and formalize processes and systems that enable effective assessment of post-disaster damages and needs in order to more accurately quantify and characterize recovery needs and formulate broad recovery strategies. Once developed, the framework should be embedded into policies, legislation, and programs that promote (incentivize), guide (ensure), and support a build-back-better approach in recovery, rehabilitation, and reconstruction.

## Box 9. Considerations to strengthen existing DRM systems in light of ongoing COVID-19 health crisis

Similar to other affected countries, local governments in Moldova are at the frontline of combating the COVID-19 pandemic, jointly with DRM agencies both at national and subnational levels as well as different sectoral actors. In general, the strength and duration of impacts of shocks such as COVID-19 are not solely determined by a country's population density, but also by local capacity and level of preparedness to manage such crises, as well as by the level of functional responsibilities and resources available through decentralization systems. Moldova's ability to respond to crises such as COVID-19 is therefore not only determined by its level of preparedness and readiness to cope with such complex crises, but also by the level of effectiveness of its governance systems (particularly in urban areas), as well as its existing service delivery and infrastructure systems. Based on global best practices (including recent public health crises), the following considerations could be examined to enhance Moldova's preparedness in the overall DRM context.

- Integrating public health with existing DRM systems. Additional support to frontline response personnel, strengthening and expanding emergency operations, development of awareness campaigns and public awareness communications and development of public – private partnerships. Also recognizing that disasters can, and will, still occur during ongoing crises such as COVID-19 and that these disasters will further strain emergency management capacity as well as potentially amplifying spread and impact of ongoing crises such as COVID-19.
- Enhancing the capacity of municipal authorities to deliver basic services during the crisis. Development of business continuity plans for municipal services and advising on appropriate adaptation of municipal services can minimize impact of shocks and ensure public order and calm.
- Prioritizing delivery of services and communication with the urban poor living in marginalized areas, including vulnerable groups (e.g. Roma, refugees, the homeless, informal sector workers, women and children) who are more likely to lack access to such services and information flows.
- Assisting DRM agencies and local governments in providing available geospatial tools and developing related analytics. This includes risk modelling, rapid impact and losses assessments, geospatial tools for real time analytics, expanding Urban and DRM data systems to all stakeholders in the crisis and relief/recovery stage. Mobilization of multi-sector advisory services to support ad-hoc needs.
- Conducting multi-sectoral impact assessments for future risk-informed decisions, by helping local governments and DRM agencies in measuring the spatial and urban economic impacts of shocks such as COVID-19 by leveraging the existing DRM experience and methodologies for post-disaster damage and loss assessments/post-disaster needs assessment and recovery plans.
- Improving financial solutions to maximize efficient response. Prior to disaster, development of ex-ante solutions to ensure adequate financial resources are available for all disaster types, including immediate emergency funding through fiscal transfers and conditional grants.
- Establishing territorial coordination plans aiming to developing incorporating disaster resilience dimensions into integrated territorial plans, engaging private sector and communities, and strengthening local government's capacity to lead local coordination efforts as well as liaise with national and subnational governments.

Source: Bhardwaj et al. 2020., World Bank 2020.

# ANNEX 1

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# ANNEX 2

## NATIONAL DRM-RELATED LAWS AND REGULATIONS IN MOLDOVA

Most of Moldova's laws and regulations<sup>41</sup> cover the response aspect of the disaster risk management framework—but some aspects go beyond that:

- **Law 267/1994** on Fire Protection identifies the framework, principles, and duties concerning fire protection in the Republic of Moldova.
- **Law 271/1994** on Civil Protection establishes the Civil Protection System of the Republic of Moldova with the objective to protect people and property from the consequences of disasters caused by a wide range of natural and man-made hazards. It defines the fundamental principles of civil protection organizations at all levels and establishes the tasks for public authorities (at national, regional, and local levels), institutions, enterprises, organizations, and citizens.
- **Law 1384/2002** on Requisitions defines the circumstances (emergency and state of war) under which state institutions are authorized to temporarily seize ownership of goods and equipment from citizens and public and private institutions, or oblige them to provide services or carry out works in the national interest or for national defense.
- **Law 1491/2002** on Humanitarian Assistance defines the institutions (Agency for Material Reserves and the Ministry of Health, Labor and Social Protection), the type of eligible goods, and the procedures involved in receiving and distributing humanitarian assistance on the territory of Moldova.

**Law 212/2004** on Declaring the State of Emergency and War regulates the conditions under which a state of emergency or war is declared and how the declaration affects citizens' rights and obligations as well as the enforcement of other laws. It establishes a common methodology for assessing emergency situations, delineates emergency situation zones, calls for the timely notification of the population and an adequate response, and establishes how information will be collected and presented to the population in the event of emergencies. The

state of war and emergency is declared through a parliamentary resolution/decision. The government (i.e., the Prime Minister) and the president have the right to propose the institution of an emergency, which cannot exceed 60 days. Depending on the circumstances, they can request extensions (<http://www.presedinte.md/eng/titulul3>).

- **Government Decision 282** as of 14.03.2005 on the Civil Protection Training defines the categories of population that should have mandatory civil protection training. It also defines the tasks and training methodology for emergency response preparedness.
- **Law 93/2007** on the General Inspectorate for Emergency Situations (GIES) establishes the legal framework, principles, functions, duties, and rights of the personnel of the GIES, as well as the conditions under which GIES services and work are carried out.
- **Government Decision 1076** as of 16.11.2010 on Types of Emergencies and Information Collection classifies emergencies by type into climatological, meteorological, hydrological, biological, chemical, and man-made emergencies. Depending on the scope and extent of the people affected and the number of casualties, it classifies the emergencies as site, local, regional, national, or trans-border emergencies. Finally, it defines the authorities responsible for collecting the information that could trigger the state of emergency and the communication protocol with the General Inspectorate for Emergency Situations.
- **Government Resolution 408/2017** establishes the approval of the framework regulation on host nation support in emergency situations.
- **Government Resolution 803/2018** establishes the Emergency Situations Management Center of the Emergency Situations Commission of the Republic of Moldova and the structures for ensuring the work of other commissions for emergency situations.
- **Government Resolution 137/2019** regulates the organization and functioning of the General Inspectorate for Emergency Situations.



# ANNEX 3

## OVERVIEW OF KEY INSTITUTIONS INVOLVED IN DRM IN MOLDOVA

Aside from GIES, several other key institutions are concerned with DRM in areas beyond core response functions:

- **The Ministry of Agriculture, Regional Development and Environment**, recently created following the merger of three different ministries, has multiple DRM-related responsibilities, especially for risk reduction and mitigation. It also oversees several agencies that have important DRM-related mandates, such as the State Hydrometeorological Service (SHS), the Climate Adaptation Office, Apele Moldovei (Republican Water Management Agency), and the Agency Moldsilva for forestry.
- **The State Hydrometeorological Service** monitors, forecasts, and issues warnings related to meteorological, hydrological, agrometeorological, and some environmental hazards. SHS is responsible for hydrological and meteorological monitoring through a network of automatic and manual weather and hydrological stations as well as a weather radar; SHS further utilizes observations from satellites and outputs from internationally operated global and regional numerical weather models. It also receives and interprets observations and numerical forecasts from the Romanian National Meteorological Administration.<sup>42</sup> SHS is required to inform the GIES about potential and actual dangerous hydrometeorological and air/water quality events. With support from Austria, UNDP, and the World Bank/Global Facility for Disaster Reduction and Recovery (GFDRR), SHS has been able to join EUMETNET's Meteoalarm, thereby producing early warnings in line with European standards and benefiting from enhanced regional integration.<sup>43</sup>
- **The Climate Adaptation Office** serves as the technical support unit to the National Commission on Climate Change, a permanent, formalized, and independent body that advises the government and that developed the National Climate Adaptation Strategy 2014–2020, which identified adaptation measures in six priority sectors: agriculture, health, water resources, energy, forestry, and transport.<sup>44</sup>
- **Apele Moldovei** is responsible for developing water basin management plans; maintaining the national water registry; developing and implementing flood and drought risk management plans; maintaining the national flood protection infrastructure; and providing irrigation and drainage services.
- **The Agency Moldsilva** carries out afforestation works to stabilize landslides and prevent erosion.
- **The Institute of Geology and Seismology of the Moldovan Academy** is the main body for monitoring seismic events in Moldova. It is responsible for hazard and risk assessment, as well as earthquake warnings. Its seismic monitoring capability has been recently enhanced.<sup>45</sup> Although the institute can produce seismic hazard maps, it does so on demand and not as part of its regular legally mandated output.
- **The Agency for Geology and Mineral Resources** is responsible for exploration, monitoring, and mapping of mineral wealth, landslides, and groundwater levels. One of its main tasks is developing Moldova's geodesic information system to keep track of dangerous geological processes, both in order to protect the population and the environment and to inform the development of urban, spatial, and zoning plans.
- **The Ministry of Economy and Infrastructure** is responsible for developing urban, spatial, and zoning legislation and regulations as well as construction norms and standards.
- **The Agency of Land Relations and Cadaster of Moldova** is the main agency responsible for coordinating the National Spatial Data Infrastructure.
- The Ministry of Health and Social Protection is responsible for health care planning and regulation. However, most health care providers are directly accountable to their rayon (local) administration. The Rayon Health Authority, led by a chief doctor, is composed of the primary and secondary providers.

# ANNEX 4

## OVERVIEW OF WORLD BANK ENGAGEMENT IN MOLDOVA

Natural disasters do not respect national borders, and Moldova's small geographical size makes regional cooperation essential for any activity related to disaster preparedness and risk mitigation. Regional strategies in collaboration with international partners to reduce disaster risk across Moldova and its neighbors have therefore been crucial over the past years. For example, the Government of Moldova has pursued regional cooperation activities through the Disaster Preparedness and Prevention Initiative for South Eastern Europe and through NATO. The World Bank, in collaboration with other development partners in the region (UN, European Commission, etc.) has also supported the Government of Moldova to strengthen the country's disaster preparedness and climate resilience capacity.

- In **2008**, the South Eastern Europe Disaster Risk Mitigation and Adaptation Program (SEE DRMAP), a joint initiative comprising analytical and advisory activities of the World Bank and the United Nations Office for Disaster Risk Reduction (UNISDR), identified areas that are essential for reducing disaster risk in the region. Some of these areas are the focus of country-level activities detailed in this report.
- Since **2010**, the World Bank—with GFDRR support—has supported the Government of Moldova in developing a national DRM system for extreme weather events. Following the devastating 2010 floods, the World Bank supported the Government of Moldova in conducting a PDNA and in planning recovery actions. The PDNA identified strengthening of hydromet services, data sharing, and early warning as critical areas. The PDNA also informed recovery efforts financed by other donors and set the stage for future investment programs.
- Also in **2010**, the World Bank began supporting activities in Moldova to reduce natural hazard risk, particularly in agriculture and related sectors, and to reduce economic vulnerability to natural shocks. These activities helped inform a US\$10 million IDA (International Development Association) Disaster and Climate Risk Management Project that supported the development of hydromet services, civil protection, and climate-smart agriculture. Additional financing of US\$2 million for this project helped to establish the Emergency Command Center for disaster response,

to create a mobile weather and market information alert system, and to operationalize a modern weather monitoring and visualization system that supports improved accuracy and lead times in forecasting severe weather events.

- In **2016**, the World Bank developed a quantitative country risk profile for Moldova (and other countries in Europe and Central Asia) to equip government decision makers with more information about how floods and earthquakes are likely to impact at-risk communities and the economy.
- In **2017**, the World Bank approved a US\$27.2 million IDA Climate Adaptation Project to reduce the vulnerability of rural households—who represent a disproportionately high share of the poor—to the impacts of climate change, and to enhance the capacity of government institutions, key stakeholders, communities, and the public to manage climate change risks. (This lending operation was canceled in 2018.)
- In **2017**, building on work to strengthen hydromet services, the World Bank began supporting the government's technical and service delivery capacity for hydromet services and its ability to utilize weather forecasts and climate observations.
- In **2018**, the Government of Moldova requested technical assistance to enhance at national and local levels its technical rescue operational capacities, specifically for Urban Search and Rescue, within Moldova's existing DRM framework and in line with INSARAG guidelines.

**The World Bank anticipates continued demand from the Government of Moldova in these areas:**

1. **Integrating public health into existing DRM systems (including strengthening the implementation of pandemic preparedness plans through cross-sector/multi-agency collaboration)**
2. **Building resilience and adaptation to climate impacts, especially in the agricultural sector**
3. **Identifying flexible disaster risk financing instruments**
4. **Leveraging regional collaboration and existing European meteorological infrastructure to improve local forecasting of trans-boundary weather phenomena.**

# ANNEX 5

## OVERVIEW OF MAIN DONOR ENGAGEMENTS IN DRM AND CCA

Several development partners are active in the area of climate change adaptation (CCA) and disaster risk management in Moldova, including the European Union, European Bank for Reconstruction and Development,

European Investment Bank, Austrian Development Cooperation, Swiss Development Agency, UNDP, USAID, and International Fund for Agricultural Development (IFAD).

Development partner	Area of focus (or hazard)	Risk identification	Risk reduction	Preparedness	Financial protection	Resilient recovery	Government counterpart
Austrian Development Cooperation (ADA)	Climate-smart agriculture						
European Commission	Energy efficiency, urban water management, civil protection, EU Floods Directive, Eurocode building code, INSPIRE	✓	✓	✓			GIES, Ministry of Construction, Apele Moldovei
European Investment Bank	Flood risk management	✓	✓				Apele Moldovei
GIZ	Solid waste management, energy efficiency, climate policy, water management						
IFAD	Climate-smart agriculture						Ministry of Agriculture, Regional Development and Environment
Swiss Development Cooperation	Disaster risk reduction, emergency relief and reconstruction		✓	✓		✓	
UNDP	Civil protection, climate change adaptation, urban regeneration, disaster risk assessment	✓	✓	✓		✓	Ministry of Agriculture, Regional Development and Environment; Municipality of Chisinau; Energy Efficiency Agency; Energy Efficiency Fund; licensed urban design companies; Technical University of Moldova; Agency for Innovation and Technology Transfer
USAID/MCC	Climate-smart agriculture						
WMO/Finnish Meteorological Institute/UNISDR	Hydromet improvement			✓			State Hydrometeorological Service
WHO	Seismic risk identification and retrofitting for hospital buildings	✓	✓				Ministry of Health

Note: GIZ = German Agency for International Cooperation; MCC = Millennium Challenge Corporation; WMO = World Meteorological Organization.

## NOTES

1. In February 2020, Moldova launched the review of the unfinished strategy, with support from UNDP and UNDRR, to: a) assess its alignment to a modern DRM framework and the Sendai Framework commitments; and b) subsequently finalize the document.
2. According to the World Bank, the economy of Moldova has grown rapidly in the past decade, and growth has been accompanied by significant progress in reducing poverty and boosting the welfare of the bottom 40 percent. For example, between 2000 and 2015, Moldova was also able to eliminate extreme poverty (defined as living on less than \$1.90 per day in 2011 purchasing power parities), which decreased from 36 percent (2000) to 0 percent (2015). Poverty remains a significant rural phenomenon in Moldova, however. Defined according to the national poverty line, poverty levels in Moldova declined substantially and stood at 11 percent in 2014, compared with 26 percent in 2007 and much higher levels earlier in the decade. However, further reductions in poverty due to pensions and remittances are unlikely to be realized in light of the current coronavirus crisis as economic activity in sender countries declines and as public finances become strained. Additionally, the adverse effects of the crisis on the labor income and health of earners could lead to increases in poverty. Individuals at the bottom of the consumption distribution are particularly vulnerable to these health and income shocks as they often lack adequate coping strategies and insurance mechanisms. In order to mitigate the effect of the crisis on these vulnerable individuals, adequate health and social security provisions will need to be implemented.
3. During the 2011–2016 period, all disasters reported by the Civil Protection and Emergency Situations Service (CPESS)—now replaced by the General Inspectorate for Emergency Situations (GIES)—were weather and climate related. The 2007 drought caused estimated losses of about US\$1 billion, while the 2008 and 2010 floods cost the country about US\$120 million and US\$42 million respectively.
4. The latest Moldova Economic Update (World Bank 2019a) indicates that extreme weather constitutes one of the main challenges to growth and poverty alleviation efforts, given that it directly disrupts agricultural production and affects vulnerable rural communities.
5. Earthquakes with a 6.0–6.9 magnitude (Richter scale) are categorized as “strong.” The typical average effects from such events include damage to a moderate number of well-built structures in populated areas. Earthquake-resistant structures survive with slight to moderate damage. Poorly designed structures are likely to receive moderate to severe damage. This type of earthquake can also be felt in wider areas (up to hundreds of miles/kilometers from the epicenter) and cause strong to violent shaking in the epicentral area. Such indications should be taken with extreme caution, since intensity and thus ground effects depend not only on the magnitude, but also on the distance to the epicenter, the depth of the earthquake’s focus beneath the epicenter, the location of the epicenter, and geological conditions (certain terrains can amplify seismic signals).
6. Moment magnitude ( $M_w$ ) is considered the authoritative magnitude scale for ranking earthquakes by size. It has become the standard scale used by seismological authorities like the U.S. Geological Survey for reporting large earthquakes (typically  $M_w > 4$ ). The moment magnitude scale (MMS; denoted explicitly with  $M_w$  or  $M_w$ , and generally implied with use of a single  $M$  for magnitude) is a measure of an earthquake’s magnitude (“size” or strength) based on its seismic moment (Bormann et al. 2013).
7. Assuming that damages of the 1986 earthquake are representative of the most important seismic event of the past 200 years, the average annual damages are calculated at US\$40.8 million (including direct and indirect losses).
8. After the disastrous effects of the January 23, 1838, Vrancea earthquake in Chisinau, a limit of two stories was imposed on building construction, restrictions that were still in effect at the time of the 1940 earthquake (Stepanenco and Cardanet 2016).
9. The highest salaries are paid in Chisinau, while the lowest salaries are paid in the southern region (UNDP 2017).
10. The wine industry is especially vulnerable to earthquakes due to the high risk of steel tank failure and wine bottle breakage. Currently, Moldova has the highest GDP share derived from the wine industry of any country, and around 200,000 people (20 percent of the economically active population) earn a living from the wine industry in Moldova. DW.com, “The Increasingly Acquired Taste of Moldovan Wine,” October 11, 2018, <https://www.dw.com/en/the-increasingly-acquired-taste-of-moldovan-wine/a-45796665>. In addition, the region of Cahul was identified by the Wine Risk index as having the third highest risk from natural perils (earthquake, hail, frost, and floods) among all the world’s wine regions. KIT.edu, “Winemakers Lose Billions of Dollars Every Year due to Natural Disasters,” April 26, 2017, <https://www.kit.edu>.

kit.edu/kit/english/pi\_2017\_051\_winemakers-lose-billions-of-dollars-every-year-due-to-natural-disasters.php.

11. The worst flood in Moldova since its independence in 1991 occurred in 1994; it killed close to 50 people and caused almost US\$500 million in damage. In 1997, floods occurred in 28 of 40 provinces, causing nine deaths and about US\$70 million in damage. Further flooding occurred in 1999, 2002, and 2005 with smaller impacts, ranging from US\$1 million to about US\$10 million in damage.
12. For example, in 2016, intense rain flooded the insides of buildings after their roofs were destroyed by hail. Summer rainfall is generally unpredictable and often dangerous. Moldova's central zone (Codru) is at greater risk than the northern zone.
13. In Moldova, most farm households are smallholders, who tend to be poorer and less buffered against shocks than larger farmers. More than one-third of all farm households reported difficulties in paying for decent nutrition for household members over the previous year. The numbers are higher among subsistence farm households, who consume more than 99 percent of their farm production (compared to around 80 percent for smallholders), leaving little for income generation (World Bank 2016b).
14. For more information, see PPRD East 2, "Moldova," <http://pprdeast2.eu/en/strany-partnery/moldova/>.
15. Moldova is developing its national civil emergency and disaster management capabilities through participation in activities organized by NATO's Euro-Atlantic Disaster Response Coordination Centre.
16. This INSARAG-related activity corresponds to the Enhancing Technical Rescue Capacities in Moldova technical assistance, funded by a Global Facility for Disaster Reduction and Recovery (GFDRR) grant and which closed in November 30, 2019.
17. In February 2020, Moldova launched the review of the unfinished strategy with support from UNDP and UNDRR with the expectation to finalize it. The recommendations that follow from the preliminary assessment are broadly in line with the observations and recommendations made in the present note.
18. These include, for example, the Environmental Strategy for 2014–2023; the Program for the Conservation and Increase of Soil Fertility (2011–2020), and a national afforestation plan (2014–2018) designed to extend forest vegetation on 13,050 ha of degraded lands.
19. The seismic zonation consists of mapping and dividing with isolines the region where the earthquake can be felt more or less with the same intensity.
20. The geoportal would act as an interface to a national or sectoral metadata catalog that enables users—state bodies, private companies, and citizens—to search for spatial data that they can use for their purposes.
21. The Agency of Land Relations and Cadaster carries out execution, control, supervision, and other functions in land relations, geodesy, mapping, cadaster, and Geographic Information System activities, as well as (to some extent) Land Information System activities. The goal is to build up the structure of the country's National Spatial Data Infrastructure.
22. The following factors may be considered for potential scalability: safety benefits, minimal disruption, potential to integrate with existing government programs, cost-effectiveness, and appropriateness to local context.
23. Current needs are articulated in Law no. 835-XIII, On the Principles of Urban Planning and Territorial Development (May 1996). See UNECE (2015).
24. The EU–Moldova relationship enhancement policy has allowed Moldova to benefit from the experience of EU states at central and local level in regional development, spatial planning, energy efficiency, and construction technical standards. The principles and approaches promoted by the EU directives are followed by the Moldovan authorities in the process of improving the legislation on housing and basic services.
25. The Urban and Construction Code was approved in the first reading by the outgoing Parliament. The approval of the code in the final reading is still pending as of February 2020.
26. According to a United Nations Development Programme survey cited in UNECE (2015), 7 percent of Moldova's population currently lives in dilapidated or poor-quality housing.
27. For example, any buildings in high-flood areas should consider safety of citizens accessing the building and make sure expensive internal fittings (e.g., medical equipment) are kept on higher levels and/or can be moved if flood threatens.
28. Over the last century, Romania has experienced 13 major earthquakes, which claimed the lives of over 2,600 people and affected more than 400,000 others. In 1977, more than 35,000 families were left homeless in a catastrophic earthquake that caused over EUR 1.8 billion in losses in 55 seconds.
29. The "Bucharest Prepared" program, managed by the Bucharest Community Foundation and backed by ING, IKEA and LIDL, is a new grant funding mechanism that aims to support CSOs in raising awareness on earthquake risks, create support systems in local communities, and promote life-saving behavior among citizens.
30. For more information: <https://practicalaction.org/news-media/2018/07/11/reaching-the-last-mile-challenges-and-lessons-from-early-warning-systems/>
31. For example, one of the key lessons from the 2005 Highly Pathogenic Avian Influenza (HPAI) is that speed of response is important in public health emergencies, where prevention is more humane and cost-effective than ex-post treatment and mitigation. In countries such as Vietnam, the level of

- preparedness was a key factor. Similarly, Moldova has also prepared national strategy documents and action plans. Another lesson from Vietnam that has been applied in Moldova is the success of a two-pronged strategy: first, the control of influenza in high-risk regions, and second, simultaneous actions to minimize risks to humans and to rapidly prepare for a pandemic. Source: <http://documents.worldbank.org/curated/en/968771468322474039/pdf/Project0Inform110Stage1final1Mar-29.pdf>
32. Recent progress in mapping transportation networks, including semi-formal urban transit, and in the geo-location of jobs, people and important infrastructure, such as health centers, are providing an opportunity to understand the impacts of disasters on the ability to reach key destinations. As argued in the Lifelines report, beyond the destruction of infrastructure, disasters have large costs for firms and households because they disrupt the functioning of the economy. People are unable to get to work, schools, or hospitals, and key supplies are cut off from firms that depend on consumers and suppliers to maintain commercial operations. Until recently, it was difficult to explore how disasters impacted these flows, but a series of technological advances are now helping experts overcome this data scarcity. Local communities can now relatively easily indicate the existence of a road and its condition, on platform called OpenStreetMap, and indicate the location of service infrastructure such as health centers.
  33. Most of the material in this paragraph and the next originally appeared in the EU PPRD Moldova country profile report (PPRD East 2 2015), which the World Bank gratefully acknowledges.
  34. Other funds, such as the Environmental Fund, the Regional Development Fund, and the National Fund for Agricultural and Rural Development, have financed mitigation and prevention efforts but are not contingency funds per se. For example, the Rural Development Fund provides subsidies to eligible farmers for anti-hail equipment/nets, while the Environmental Fund funded Apele Moldovei's strengthening of the Ghidicici Reservoir dam to prevent flooding of Chisinau and parts of Anenii-Noi district.
  35. The subsidies for agricultural insurance account for roughly 1 percent of total agricultural subsidies. The premium rates are quite high: 5–6 percent for hail, 1.5–3 percent for frost, and 7–9 percent for drought, if the perils are insured separately. Moreover, the two (out of 33) insurance companies that offer agricultural risk insurance (namely Klassika Asigurari and ASITO) only insure high-value crops against hail and frost; they do not cover natural hazards such as drought.
  36. Direct damages include replacement of damaged building and infrastructure, whereas indirect losses may include costs associated with loss of transport activities or with business interruption, etc.
  37. The current practice is based on simple common sense; it estimates the minimum market price of a damaged unit (e.g., an infrastructure asset, an orchard, crops, etc.) and the level of damage (in percentage).
  38. ECLAC is a pioneer in the field of disaster assessment and in the development and dissemination of the Damage and Loss Assessment (DaLA) methodology and PDNA methodology.
  39. This approach represents Priority 4 of the Sendai Framework for Disaster Risk Reduction and is based on a three-pillar approach to recovery efforts: (1) building back stronger to ensure that the affected infrastructure is more resilient to future shocks; (2) building back faster (under streamlined legislation) through such measures as contingent reconstruction plans, preapproved contracts, and financial arrangements; and (3) building back more inclusively to ensure that low-income households receive adequate support.
  40. The financial assistance mechanisms could include (but not be not limited to) individual and household disaster subsidies, low-interest reconstruction loans, and tax subsidies. A post-disaster assistance program should include standardized application and approval processes, definition of eligibility, maximum payouts, and clear time frames.
  41. Note that some of the regulations are currently being redrafted as the government adapts to its major administrative reorganization. For example, the Regulations for the Organization and Operation of the GIES are being amended to reflect the transfer of the compliance and control function to the Agency for Technical Supervision.
  42. SHS provides short-term (up to one week) weather forecasts for the entire country and hydrological forecasts for the main river basins. Flood forecasts on the timing of expected peak river levels and flows are provided for the two major rivers of Moldova, the Dniester and Prut. For smaller watercourses at risk of rapid-onset flash floods, only general weather forecasts are available. SHS provides 10-day forecasts for precipitation, soil moisture, snow depth, and ice thickness on rivers and reservoirs, supporting preparedness.
  43. Meteoalarm is the official website of Europe's national weather services that provides advice on exceptional weather. Meteoalarm is developed by EUMETNET, the network of public European weather services that are members of the World Meteorological Organization. It is further expanding to the east to ensure that 30 European countries can collaborate to enhance Meteoalarm.
  44. The National Commission for Climate Change is responsible for implementing commitments under the United Nations Framework Convention on Climate Change and the Kyoto Protocol mechanisms.
  45. Data recorded by the monitoring stations are sent to the National Data Center, where they are processed for real-time data analysis to provide automatic event detection, event location, and magnitude calculation. Moldova also collaborates with the Romanian National Institute for Earth Physics, and regularly exchanges data through the monitoring stations.



This disaster risk management country note for Moldova provides an overview of the way its government currently manages risks created by disasters and climate change. It takes stocks of existing measures and mechanisms used to manage disaster risk management (including emergency response) and lays the foundation for the development of a comprehensive disaster risk management strategy. Because of the growing frequency and severity of disasters, the government has faced the rising costs of responding to disasters as well as the challenges of financing risk reduction efforts, emergency response activities, and recovery and reconstruction costs. Having adequate regulatory frameworks alongside sufficient access to financial instruments and resources to respond to disasters is critical for building the disaster resilience of the country and minimizing the negative impact of disasters and climate change on Moldova's economic growth and poverty reduction efforts.

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### **About GFDRR**

The Global Facility for Disaster Reduction and Recovery (GFDRR) is a global partnership that helps developing countries better understand and reduce their vulnerabilities to natural hazards and adapt to climate change. Working with over 400 local, national, regional, and international partners, GFDRR provides grant financing, technical assistance, training, and knowledge sharing activities to mainstream disaster and climate risk management in policies and strategies. Managed by the World Bank, GFDRR is supported by 33 countries and 11 international organizations.