SOLIDARNA FOUNDATION

Recommendations on Croatian Post-Earthquake resilience building activities

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List of abbreviations

BCP – Business Continuity Plans
CCDRR – Child-Centered Disaster Risk Reduction
DRM – Disaster Risk Management
DRMMP – Disaster Risk Management Master Plan
DRR – Disaster Risk Reduction
EBRD – The European Bank for Reconstruction and Development
EMI – Earthquake and Megacities Initiative
GDP – gross domestic product
GEJE – Great East Japan Earthquake
HFA – Hyogo Framework for Action
ICT – Information and communication technology
JECT – Japanese-EBRD Economic Fund
KPI – Key performance indicator
SDG – Sustainable Development Goal
SFDRR – Sendai Framework for Disaster Risk Reduction 2015-2030
SMŽ – Sisak-Moslavina County (cro. Sisačko-moslavačka županija)
UN – United Nations
UNFCCC – United Nations Framework Convention on Climate Change
UNISDR – United Nations Office for Disaster Risk Reduction

Foreword

As we navigate the intricate challenges presented by the aftermath of the devastating earthquakes in the Sisak-Moslavina County, particularly in the beautiful city of Petrinja, this document stands as a testament to our collective commitment to rebuilding stronger, more resilient communities.

The Sisak-Moslavina County and its surrounding areas faced unprecedented trials following the earthquakes in 2020. Overcoming these adversities requires not only immediate relief efforts but a comprehensive, sustainable approach to disaster risk reduction and resilience building.

The Petrinja Post-Earthquake Urban Regeneration project, supported by the Japanese Government via the Japan-EBRD Cooperation Fund (JECF), supports the City Administration of Petrinja in implementing post-earthquake reconstruction, rehabilitation and preparedness measures. The European Bank for Reconstruction and Development (EBRD) recognizes the significance of investing in urban sectors and municipal engagement to bring about tangible long-term improvements in quality of life.

This document provides recommendations on post-earthquake disaster risk reduction and resilience building activities, grounded in international best practices, with the aim to guide the City of Petrinja in navigating the path toward a more resilient future. These recommendations can be transferred and scaled to other local communities throughout the Republic of Croatia.

As the Civil Society and Community Engagement Consultant for this project, our mission is to bridge local communities, international best practices, and valuable experiences to fortify Petrinja's journey toward recovery and its future resilience.

Introduction

"Our efforts must be people-centered and inclusive if we are to make progress on reducing disaster risk and disaster losses." Mami Mizutori, UN Special Representative of the Secretary-General for Disaster Risk Reduction

The recommendations in this document are focused on the local context of the City of Petrinja but can be transferred to other local communities as well. Hence, the recommendations will not take into consideration competencies on the national and international level but exclusively what can be implemented in the local context.

The introduction follows a context analysis of the City of Petrinja focusing on the impact of the 2020 earthquakes, the risks and vulnerabilities of the City and Sisak-Moslavina County, and the existing disaster risk reduction (DRR) and Resilience Frameworks and policies. The next chapter provides a set of recommendations for the City of Petrinja with potential activities based on Japan's and other international experiences that have a proven positive impact on DRR. The following chapter provides inputs on the importance and role of different stakeholders in DRR with specific suggestions on how to engage stakeholders. Finally, there is a set of addenda that should provide hands-on implementation matrixes and methodologies for DRR in the local community.

Although the small size of the countries make disaster risk reduction and disaster risk management a regional problem in Southeast Europe local communities can implement strategies and activities to substantially lower the impact of natural disasters, in the case of the City of Petrinja those made by earthquakes, floods or climate change.

Contemporary strategies for disaster risk management often exhibit distinct characteristics, namely, (a) a predominant focus on response and humanitarian perspectives, as opposed to a developmental outlook, (b) a deficiency in cross-disciplinary and cross-sectoral processes required for a more integrated mainstreaming approach that accommodates the specific risk parameters pertinent to each sector, and (c) a dearth of policy making processes founded on consensus building and effective engagement of relevant stakeholders. These interrelated factors underscore the need for a comprehensive approach to urban resilience —one that seamlessly incorporates disaster risk reduction (DRR) within the realms of developmental policy and planning, the provision of essential services, natural and environmental resource management, and poverty alleviation. [1]

Disaster risk reduction practices need to be multi-hazard and multi-sectoral, inclusive and accessible in order to be efficient and effective. There has to be a broader and a more people-centred preventive approach to disaster risk.

These recommendations will not consider activities during the relief and stabilization phase after a catastrophe such as rescue and evacuation or reconstruction. Also, activities for risk assessment, vulnerability analysis as well as legislative frameworks will not be considered as those are national competencies. The recommendations focus on the planning, awareness raising and readiness phase of the Resilience Wheel.

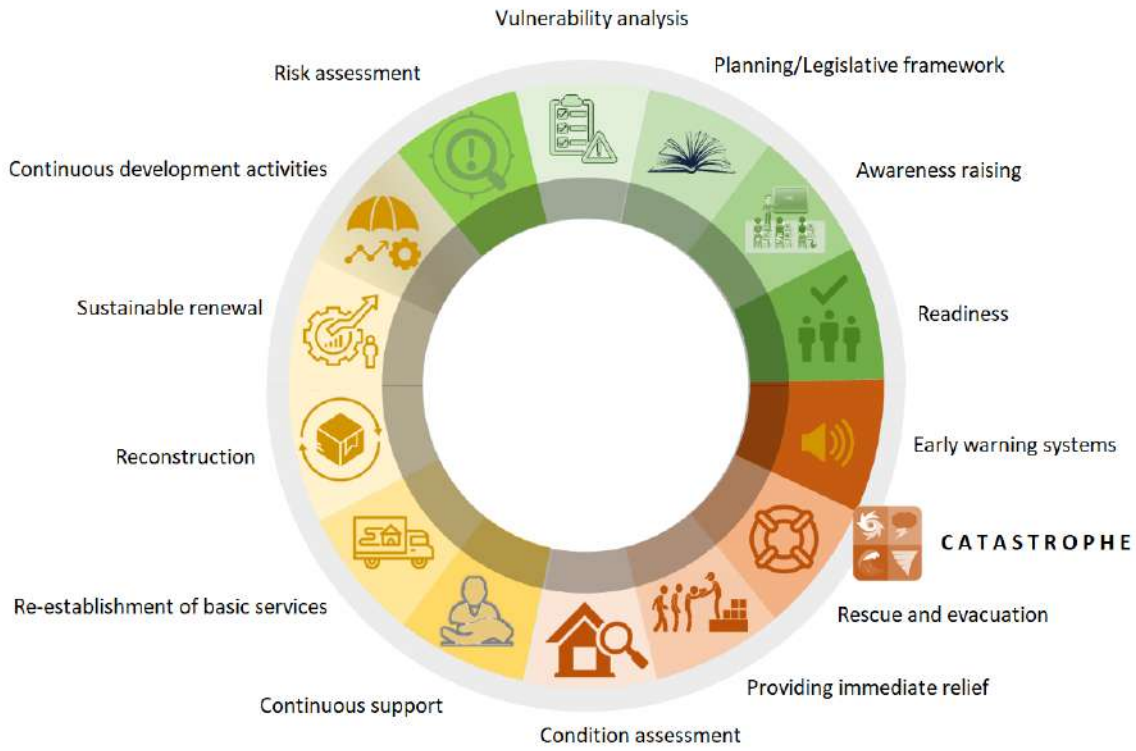
It is crucial to recognize the paramount importance of investing in disaster risk reduction, with a special emphasis on

earthquake disaster risk reduction. Earthquakes, as natural disasters, possess the potential to unleash widespread devastation, claiming lives and inflicting substantial damage upon communities and infrastructure. Investing in earthquake disaster risk reductions not merely a fiscal iconsideration; it is an investment in sustainable development. By adopting comprehensive risk reduction measures tailored to the unique vulnerabilities of the locality, we can not only prevent unnecessary suffering but also reap substantial long-term economic and social benefits.

In this document, we emphasize the value of earthquake preparedness in terms of human life and community resilience. Our recommendations are strategically designed to foster a holistic approach to disaster risk reduction, encompassing pre-event mitigation and preparedness.

Effective disaster risk reduction measures serve as a buffer against escalating costs associated with post-disaster response and recovery. By investing in earthquake risk reduction, the local government can secure a more stable and sustainable future, ensuring that your community remains resilient in the face of adversity.

The pivotal role of local governments in addressing DRR has been acknowledged as a critical factor in fostering resilient communities and nations. Empowering local authorities, non-governmental local entities, and communities involves providing them with the essential information, resources, and authority needed to effectively manage and mitigate disaster risks. Local governments assume a central role in horizontal and vertical planning and coordination at the local level.



Picture 1. The Resilience Wheel (source: Croatian Disaster Risk Management Strategy until 2030)

A dollar for DRR saves seven dollars in disaster response/recovery.[19]

The recommendations will be based on international best practices that are transferable to the Croatian/Petrinja context widely focused on Japanese experiences as the most developed nation in terms of DRR. The foundation of the Japanese "culture of disaster risk reduction" can be traced back to practices rooted in earthquake-resistant construction and other disaster risk reduction (DRR) activities.The Japanese population has coexisted with these natural disasters such as earthquakes, tsunamis, typhoons, floods, and landslides, fostering a resilient approach to disaster preparedness and mitigation and the City of Petrinja and other local governments have the opportunity to learn, adapt and implement measures and activities on local levels.

According to the UN Office for Disaster Risk Reduction [3] the benefits of investing in disaster risk reduction and resilience also include:

a) A legacy of leadership
- strengthened trust in and legitimacy of local political structures and authority
- opportunities for decentralized competencies and optimisation of resources
- conformity to international standards and practices

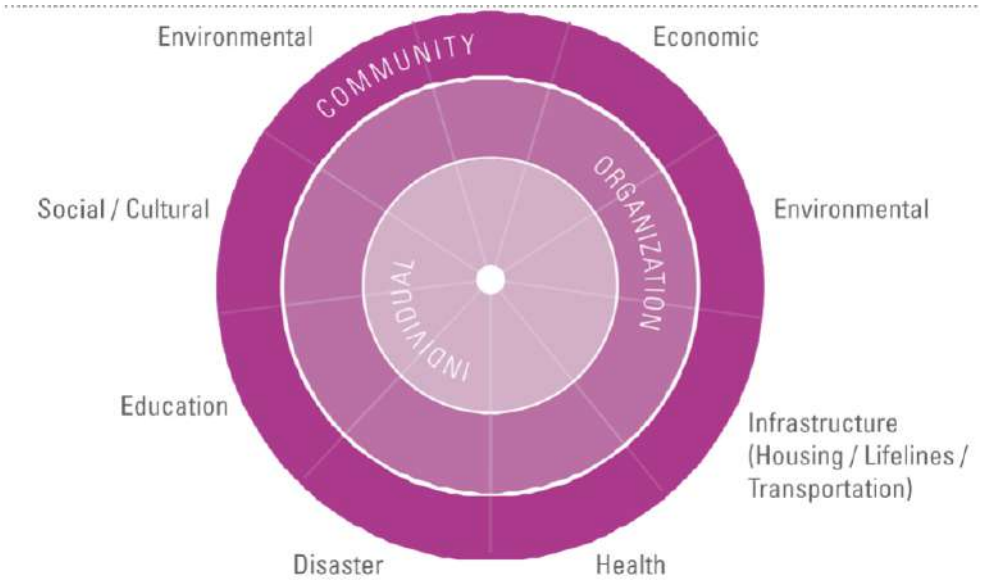
b) Social and human gains
- lives and property saved in disaster or emergency situations, with a dramatic reduction in fatalities and serious injuries
- active citizen participation and a platform for local development
- protected community assets and cultural heritage, with less diversion of city resources to disaster response and recovery

c) Economic growth and job creation
- assurance for investors in anticipation of fewer disaster losses, leading to increased private investment in homes, buildings and other properties that comply with safety standards
- increased capital investment in infrastructure, including retrofitting, renovation and renewal
- increased tax base, business opportunities, economic growth and employment are safer, better-governed cities attract more investment

d) More liveable communities
- balances ecosystem that foster services such as fresh water and recreation and that reduce pollution
- improved education in safer schools and improved health and well-being

e) Inter-connected organizations with national and international expertise and resources
- access to an expanding network of organizations and partners committed to disaster resilience to share good practices, tools and expertise
- an expanded knowledge base and better-informed citizens

Picture 2. Japan's former Prime Minister Shinzo Abe taking part in a disaster drill exercise (source: Prime Minister of Japan and His Cabinet, 2018)



Picture 3. Making cities resilient wheel (source: United Nations Office for Disaster Risk Reduction, 2010)

“There is no such thing as “natural disasters.” Natural hazards—floods, earthquakes, landslides and storms—become disasters as a result of human and societal vulnerability and exposure, which can be addressed by decisive policies, actions and active participation of local stakeholders. Disaster risk reduction is a no-regret investment that protects lives, property, livelihoods, schools, businesses and employment.” [4]

The government of the Republic of Croatia took the initiative to provide funds for the reconstruction and development of infrastructure and to adopt measures for the reconstruction of damaged infrastructure and basic services. On December 30, 2021, the Program for the Social and Economic Revitalization of the Assisted Areas of the Sisak-Moslavina County affected by the earthquake was adopted with the goal of implementing incentive measures and activities, securing the necessary funds, and a methodology for monitoring and reporting on the implementation was determined. This Program, as a strategic document, set clear goals for mitigating the demographic and material consequences caused by the earthquake, and at the same time, a systematic approach was taken to ensure social economic revitalization and balanced development in the medium and long term. [5]

Recurrent disasters disproportionately affect vulnerable regions, inflicting substantial repercussions on the local economy. The adverse consequences of disaster-induced damage are notably borne by individuals in lower income brackets, eroding their livelihoods and perpetuating the cycle of poverty. In light of this, disaster risk reduction assumes paramount importance for fostering sustainable economic growth. Proactively engaging in Disaster Risk Reduction (DRR) mitigates the severity of disaster-related damage, presenting a more cost-effective alternative compared to the financial outlays required for post-disaster recovery and reconstruction. This strategic approach not only curtails economic losses but also cultivates sustainable economic growth. The concept of "investment in Disaster Risk Reduction," underpinned past disaster experiences by local communities around the world with Japan’s communities as frontrunners in DRR who can be a source of knowledge for the City of Petrinja and other local communities.

Picture 4. Disaster education in Japan (source: Ministry of Foreign Affairs of Japan, Photos provided by Sona Area Tokyo (top left); Honjo Life Safety Learning Center (bottom left / top right); and Motoshiro Elementary School, Toyota City (bottom right))

International experience: Santa Tecla, El Salvador

In the aftermath of the January 13, 2001 earthquake, the municipality of Santa Tecla, El Salvador, faced severe repercussions, with approximately 700 out of the 1,200 recorded deaths in El Salvador occurring in Santa Tecla due to a landslide that engulfed more than half of the homes in the Las Colinas neighborhood. Responding proactively, the municipal government has since implemented strategic adjustments to land use regulations, environmental protection measures, norms, and response plans. These efforts aim to fortify both institutional and human capacities, making disaster risk reduction a central focus of environment-related policies and plans in Santa Tecla.

At the core of these initiatives is Santa Tecla's Strategic Policy for Disaster Risk Management, seamlessly integrated into the municipality's sustainable development strategy. This policy strategically restricts land use in flood-prone areas and addresses mass population movements. The impact of these changes was evident during subsequent events such as the tropical depression associated with Hurricanes Ida in 2009 and 12-E in 2011, where no fatalities or damage to public infrastructure and housing were recorded. To sustain these efforts, the municipal ordinance mandates that 1.5% of municipal revenue be allocated to disaster risk management. Importantly, this allocation does not diminish funding already designated for disaster preparedness, response, and recovery.

Picture 5. Assessment of earthquake-triggered landslide in Las Colinas, Santa Tecla (El Salvador, 13 January 2001), where 585 people died (source: Wikipedia)

Context Analysis

Impact of the 2020 earthquake

City of Petrinja is located in Croatia in the central part of Sisak-Moslavina County, south of the river Kupa, before its entrance into the river Sava. It is 60 km from Zagreb, the capital of Croatia. The administrative area of the City of Petrinja is 380.65 km2 and covers a total of 55 settlements. According to the Population Census of 2021, 19,950 persons lived in the City of Petrinja. Geographically, the area of the city lies in the zone between the mountain hinterland and the Kupa's lowlands. [6]

On December 29, 2020, a powerful earthquake, measuring 6.2 on the scale, hit Sisak-Moslavina County, specifically close to Petrinja. Just the day before, on December 28, 2020, there was another quake with a magnitude of 5.0. Following the main earthquake on December 29, 2020, there were several aftershocks, including another magnitude 5.0 earthquake on January 6, 2021.

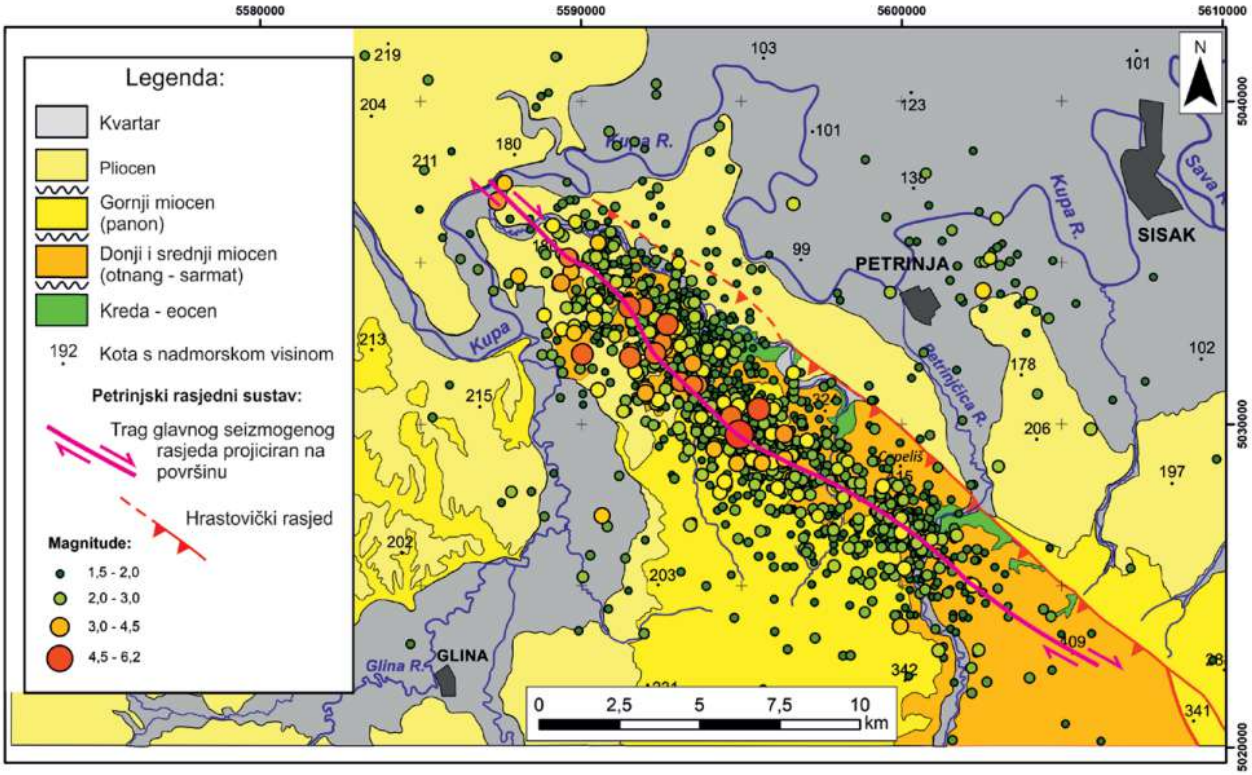
Unfortunately, the December 29, 2020 earthquake had severe consequences. Seven people lost their lives, 15 were seriously injured and had to be hospitalized, and many others suffered minor injuries.

The earthquake also caused significant damage to buildings, infrastructure, and the overall community, impacting both the local economy and society as a whole. Just the physical damage in the Sisak-Moslavina County is estimated to be 5,5 Billion EUR, out of which 4,8 Billion EUR are related to devastated buildings and other material goods while 714 Million EUR are related to losses. By the end of 2021 more than 40 000 damaged buildings were reported and the earthquake affected economic activities, social service provision, and the damage and loss of property and livelihood left a strong impact on the lives of thousands of people living in the affected areas. [7]

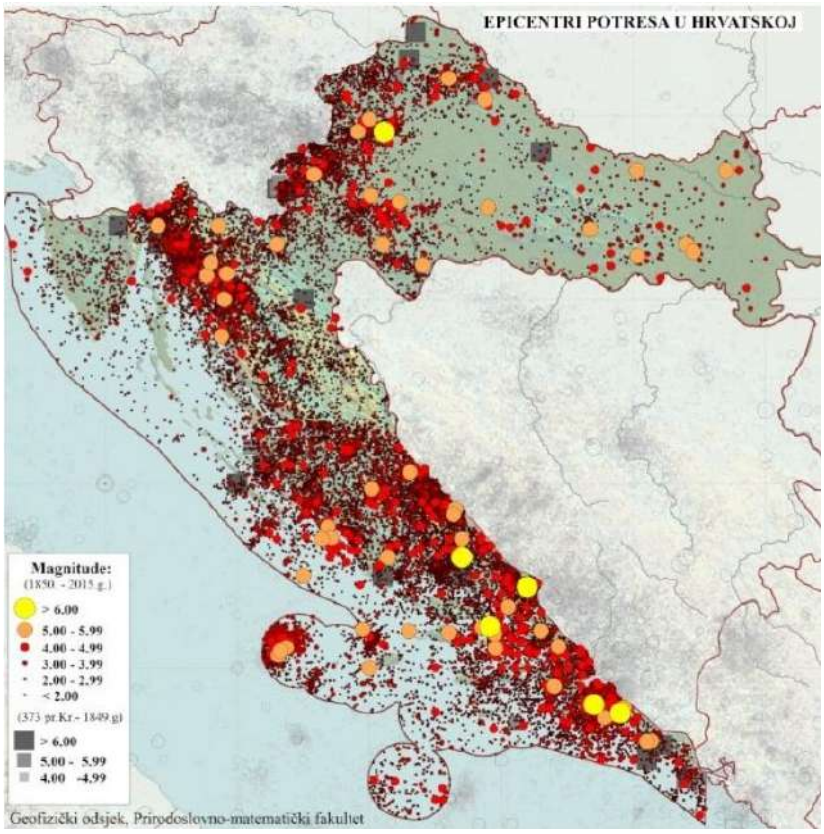
Almost 74% of the total estimated damage and losses were recorded in the social sectors (housing, education, health, culture), which significantly damaged the living conditions and quality of life of the population. As many as 139 health care buildings (health centres, hospitals/clinics) were damaged in the earthquake, and in the education sector a total of 271 buildings were damaged, while the consequences were most pronounced in Sisak-Moslavina County (109 buildings), especially in the towns of Petrinja, Glina and Sisak, where the largest number of schools unusable in the medium and long term. [8]

In the entire area of the Sisak-Moslavina County, 825 craftsman trades, 700 companies and about 3000 small family agriculture businesses were heavily damaged in the earthquake. In addition, animals were also injured and killed in the earthquake. Grain silos and containers were destroyed or collapsed, and a considerable amount of fodder was destroyed and got wet and unusable. Sisak-Moslavina County was the only one to report damages in agriculture.

In the rest of all damages, the economic sector suffered the most damage, followed by agriculture, trade, infrastructure and horizontal sectors. Damage to buildings and equipment in the trade and service provision is around EUR 145 million, and in industry EUR 176 million, while the total losses due to the removal of construction waste/demolition and business interruption are estimated at EUR 157 million for the trade and service sector and EUR 200 million in industry sector. In the County of Sisak-Moslavina, more than 2,000 commercial buildings and storage areas on agricultural farms were damaged in the earthquake, and the total damage was estimated at EUR 68.91 million, and the additionally reported damage to machinery was over EUR 4 million. [9]



Picture 6. Earthquake epicenter before and after December 29, 2020 (source: The geological map is simplified and partly modified according to the data from Piki, M. (1987): Basic geological map of SFRJ 1:100,000, list Sisak, L 33-93. Geological Institute, Zagreb; Federal Geological Institute, Belgrade. Data on earthquake epicenters were taken from the Croatian Earthquake Catalog of the Seismological Service at the Geophysical Department of the University of Zagreb)



Picture 7. Map of earthquake epicenters in Croatia from 373 BC. K. until 2015 (source: Catalog of earthquakes in Croatia and neighboring areas, Archives of the Department of Geophysics, Natural Sciences and Mathematics faculty, University of Zagreb, 2015)

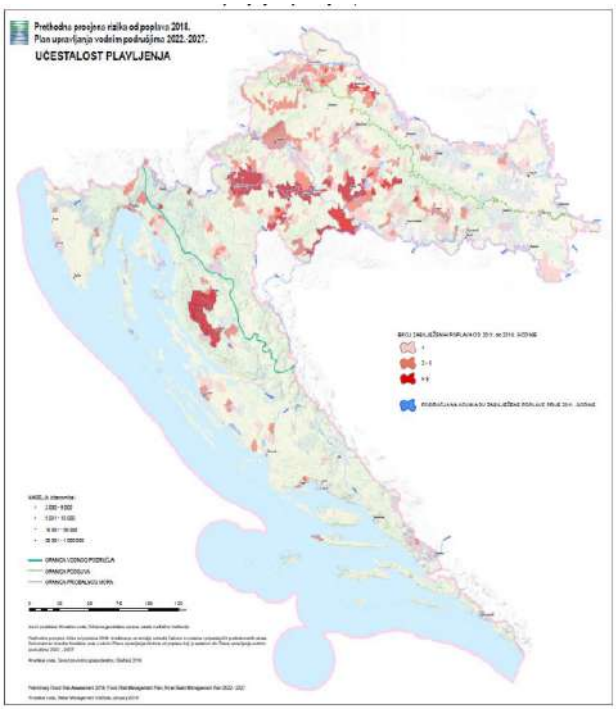
Risks and vulnerable communities

Specific disaster risks for the City of Petrinja that were recognized in the Assessment of the risk of major accidents for the area of Sisak-Moslavina County from 2019 are earthquakes as a medium risk, pandemics, extreme temperatures and industrial accidents as high risks, floods caused by the overflow of terrestrial water bodies and open fires as very high risks. [10] Other natural risks and influences on needs were also identified in the 2021 Humanitarian Intervention Plan for the Sisak-Moslavina County, such as: landslides, liquefactions, water quality uncertainty, and climate change.

Given that Croatia has a high rate of poverty and that at the national level 18.3% of the citizens of the Republic of Croatia are at risk of poverty, where the risk of single-member households (45%), especially those made up of elderly people (50%) [11] and that Sisak-Moslavina County has the fourth highest unemployment rate in the Republic of Croatia [12], the impact on vulnerable groups should be taken into account. When it comes to particularly vulnerable groups (children up to 14 years old, people over 65 years old, women and people with disabilities), more than 159,000 people are affected in Sisak-Moslavina County. Just the perceived effect of the 2020 earthquake on upper secondary school children was for 51.6% of children negative or extremely negative. [13] Low living standards and low accessibility to healthcare institutions presents a great risk for vulnerable groups, especially the elderly population living in rural areas and persons with disability.

Around one quarter (25%) of the population, mostly in rural parts, depends on drinking water from their private wells, being in constant risk of their collapse, pollution or draining. The extent of the long-term impact of the earthquake on the population can be seen especially when taking into account the particularly negative aspect of the low development index, considering that Sisak-Moslavina County is in the lowest development group (1 out of 4), while the City of Petrinja is in the last quarter of above-average ranked local units self-government [14].

Specific societal risks that were identified in the 2021 Humanitarian Intervention Plan are poor local economic conditions, unfavorable regional political and economic development, declining purchasing power of the population, increase in members of vulnerable groups, increase in the number of people with physical and mental health problems, lack of basic public infrastructure. Regarding the question of national minorities living in the area of Sisak-Moslavina County, the majority are Serbian, followed by Bosniak, Czech and Roma, which are at the biggest risk of poverty.



Picture 8. Frequency of flooding in the Republic of Croatia (source: Assessment of the risk of major accidents for the area of Sisak-Moslavina County)

	Total residents	Children 0-14 years	People with 65+ years	Women	Persons with Disabilities*
SMŽ	193.603	18.238	34.501	71.618	35.186
Petrinja	19.950	2.584	4.657	10.182	5.182

Table 1: Statistic data on vulnerable groups (source: Census 2021 and Census 2011), Croatian Bureau of Statistics

Considering all of the above, a focus is needed on ensuring the reconstruction and resilience of poor and vulnerable groups from earthquakes and disasters. Primarily, this refers to the possibility of access to basic services, adequate provision of social and health services, education, but also investment in development in order to ensure the perspective and future of the population, especially young people. It is necessary to invest specifically in the mental health support system in order to solve the trauma that citizens have suffered, but also to achieve resilience for possible future disasters.

Disaster Risk Reduction and Resilience Frameworks and Policies

All of the recommendations set in this document are based on and in accordance with the international and national legal and institutional framework for disaster risk reduction and resilience building.

The disaster risk reduction legal framework in the Republic of Croatia is established on the basis of the Law on the Civil Protection System upon which the Government adopted the Disaster Risk Management Strategy until 2030. According to the strategy it is based on all the principles of strategic planning and development management, the principles of accuracy, integrity, efficiency, effectiveness, responsibility and focus on results, sustainability, partnership and transparency.

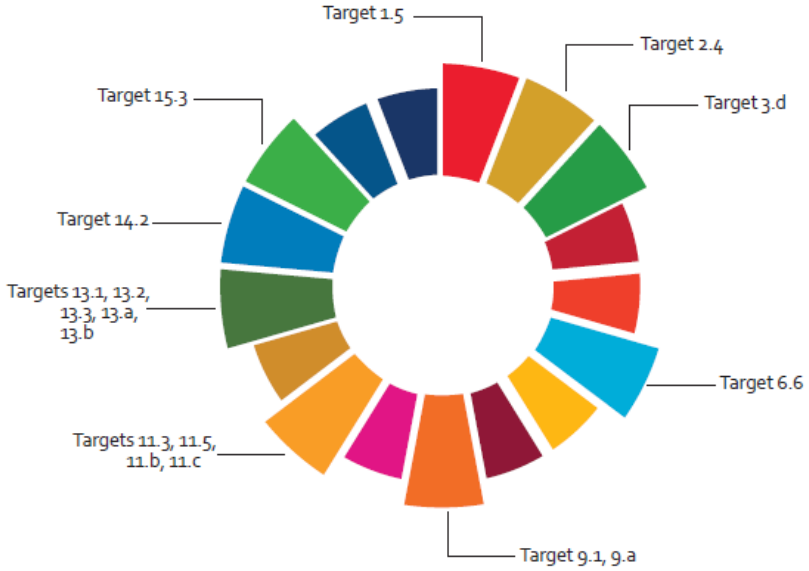
The institutional framework for disaster risk reduction was established primarily through the Croatian platform for disaster risk reduction, established in 2009 and coordinated by the Ministry of the Interior. Local municipalities, including the City of Petrinja, form the local level of bearers of disaster risk management. The Platform of Croatian Counties and Cities for Disaster Risk Reduction was established with the aim of better connection and exchange of knowledge.

All of the national disaster risk reduction strategies and plans are developed in accordance to the 2030 Agenda for Sustainable Development, the 2015 Paris climate agreement and the 2021 Glasgow Pact as well as the Sendai Framework on Disaster Risk Reduction 2015-2030 (SFDRR) as the main international framework that sets out objectives to “substantially reduce disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries.” [15]

The 2030 Agenda for Sustainable Development underscores the significant role of disaster risk reduction (DRR) in the realization of the Sustainable Development Goals (SDGs). It explicitly acknowledges the intricate connections between disasters and critical aspects such as poverty, food security, healthcare accessibility, water supply, infrastructure, urban development, climate change, and ecosystem preservation. Within the framework of the 2030 Agenda, concrete commitments are proposed to mitigate vulnerability, enhance capacity, and foster resilience to disasters.

The impact of disaster risk extends across various dimensions of development, as emphasized by the 2030 Agenda. Nine out of the 17 SDGs incorporate targets directly linked to Disaster Risk Management (DRM), and numerous other targets implicitly underscore the pivotal role of disaster management in the broader context of development. This recognition highlights the interconnected nature of disaster risk and sustainable development.

Targets of the 2030 Agenda for Sustainable Development and their linkage to disaster risk management



Target	Subject
1.5	Build resilience and reduce vulnerability to extreme events
3.d	Strengthen capacity for early warnings of national and global health risks
9.1	Develop resilient infrastructure
11.3	Enhance inclusive and sustainable urbanization and planning
11.b	Develop and implement DRM measures in cities and human settlements
13.1	Strengthen resilience and adaptive capacity to climate-related hazards and disasters
13.3	Improve education on climate change and the associated risks
13.b	Raise capacity for climate-change-related planning and management
15.3	Restore degraded land and soil affected by desertification, drought and floods

Target	Subject
2.4	Ensure sustainable food production systems that strengthen capacity for adaptation to climate change and disasters
6.6	Protect water-related ecosystems
9.a	Facilitate financial, technological and technical support for the development of resilient infrastructure
11.5	Reduce the deaths and economic losses caused by disasters
11.c	Provide technical and financial assistance for sustainable and resilient construction
13.2	Integrate climate change measures into national policies, strategies and planning
13.a	Mobilize funds for climate change mitigation and adaptation
14.2	Manage and protect marine ecosystems to avoid significant adverse impacts

Picture 9. Targets of the 2030 Agenda for Sustainable Development (source: Bello O., Bustamante A., Pizarro P., Planning for disaster risk reduction within the framework of the 2030 Agenda for Sustainable Development, United Nations, 2021)

THE SENDAI FRAMEWORK ON DISASTER RISK REDUCTION

The Sendai Framework for Disaster Risk Reduction 2015-2030 was adopted at the Third UN World Conference in Sendai, Japan, on March 18, 2015. It is the outcome of stakeholder consultations initiated in March 2012 and intergovernmental negotiations from July 2014 to March 2015, supported by the United Nations Office for Disaster Risk Reduction at the request of the UN General Assembly. The Sendai Framework is the successor instrument to the Hyogo Framework for Action (HFA) 2005-2015: Building the Resilience of Nations and Communities to Disasters. The Sendai Framework is built on elements which ensure continuity with the work done by States and other stakeholders under the HFA and introduces a number of innovations as called for during the consultations and negotiations.

The Sendai Framework sets seven global targets that will contribute to the achievement of the outcome and goal of the Framework:

(a) Substantially reduce global disaster mortality by 2030, aiming to lower the average per 100,000 global mortality rate in the decade 2020–2030 compared to the period 2005–2015;

(b) Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100,000 in the decade 2020–2030 compared to the period 2005–2015;

(c) Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030;

(d) Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030;

(e) Substantially increase the number of countries with national and local disaster risk reduction strategies by 2030;

(f) Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of the present Framework by 2030;

(g) Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030.

The Sendai Framework also articulates the following four priorities:

1. Understanding disaster risk
2. Strengthening disaster risk governance to manage disaster risk
3. Investing in disaster risk reduction for resilience
4. Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction

The Sendai Framework also emphasizes the need for recognition of stakeholders and their roles; mobilization of risk-sensitive investment to avoid the creation of new risk; resilience of health infrastructure, cultural heritage and work-places; strengthening of international cooperation and global partnership, and risk-informed donor policies and programs.

Current approaches to managing disaster risk are often characterized by (a) the prevalence of a response or humanitarian perspective rather than a development perspective, (b) the lack of cross-disciplinary and cross-sectoral processes demanded by a more integrated mainstreaming approach that

captures the parameters of risk that are relevant to each sector, and (c) the absence of policy making processes based on consensus building and effective engagement of the concerned stakeholders. These factors are correlated, calling for a holistic approach to urban resilience, one that integrates DRR with developmental policy and planning, delivery of core services, natural and environmental resource management, and poverty reduction. [13]

Picture 10. Integrated monitoring of the global targets of the Sendai Framework and the Sustainable Development Goals, UNDRR

Recommendations for DRR and resilience building

In response to the pressing need for bolstering disaster resilience in the City of Petrinja the following set of recommendations has been developed. This comprehensive guide aims to strategically address the multifaceted dimensions of disaster risk reduction and resilience building within the local context. The anticipated outcome of implementing these recommendations at the grassroots level is poised to significantly mitigate disaster risk and curtail potential losses in lives, livelihoods, health, and across economic, physical, social, cultural, and environmental domains.

This aligns closely with the objectives outlined in the Sendai Framework, emphasizing the imperative to foster a resilient community that is well-prepared to confront and withstand diverse hazards. The overarching goal of these recommendations is to cultivate a robust and sustainable urban landscape in Petrinja that is resilient to the challenges posed by natural disasters, thereby safeguarding the well-being and prosperity of its residents, businesses, and communities.

Lessons learned from GEJE:

Over the past years of post-Great East Japan Earthquake (GEJE) reconstruction [16] , several crucial lessons have been gleaned, emphasizing the significance of planning, shared resilience, and the iterative nature of the whole recovery process. Firstly, planning for disasters, despite their unpredictable nature, proves beneficial both before and after they occur. Secondly, resilience is most potent when it is a collaborative effort, involving national and local governments, infrastructure developers, businesses, communities, and households in building better systems. Thirdly, resilience is an ongoing, adaptive process, requiring adjustments and sustained efforts.

Additionally, a comprehensive study of the GEJE disaster and recovery process has highlighted four central lessons. Firstly, adopting a holistic approach to Disaster Risk Management (DRM) enhances preparedness for complex disasters. Secondly, while investing in prevention is vital, it doesn't substitute the need for preparedness. Thirdly, each disaster serves as an opportunity for learning and adaptation. Lastly, effective DRM necessitates the collaboration of diverse stakeholders, including various levels of government, community and nonprofit actors, and the private sector.

As a synthesis of a decade of research on the GEJE, three key strategies are underscored: the importance of proactive disaster planning, the shared responsibility of DRM among stakeholders, and the institutionalization of a culture of continuous resilience enhancement. Practical measures, such as business continuity plans (BCPs) and pre-arranged agreements among organizations, are highlighted as valuable tools for minimizing damages and disruptions. [17]

The recommendations follow the four priority areas of the Sendai Framework for Disaster Risk Reduction 2015-2030. and emphasize a number of activities set out in the SFDRR. Also, the recommendations are in line with the national Disaster Risk Management Strategy, specifically the strategic goal “Disaster Risk Reduction” and its specific goals 2 and 4 as well as the strategic goal “Increasing Preparedness for Disaster Management" and its specific goal 1. The implementation of these recommendations would contribute to the KPIs 1.2., 1.4., and 2.1. and both outcomes set in the national strategy.

1. Passing Down Memories and Records

In order to preserve the community's knowledge and awareness a specific recommendation for the City of Petrinja is based on the Japanese experience with the goal of passing memories, experiences and good practices to future generations. A set of activities [18] that have been proven to ensure their impact:

a) **Preservation of Earthquake Records:** Implementing a systematic archival system for documents, photographs, and videos pertaining to earthquakes. The emphasis is on distilling invaluable insights from the processes of emergency response, recovery, and reconstruction, ensuring a rich repository of knowledge.

b) **Preservation of Disaster Heritage Sites:** Identifying and safeguarding sites endowed with historical significance in the realm of disasters. Concurrently, the establishment of dedicated disaster legacy centers becomes pivotal, serving as focal hubs for preserving and disseminating critical information.

c) **Creation of Educational Programs**: Developing robust and multifaceted educational programs designed to transmit experiences from prior disasters. The focus extends beyond mere transmission to actively building upon these experiences, fostering a sense of responsibility and continuity in the next generation. Integration of post-disaster management and education within school curricula becomes imperative for ensuring a sustained transfer of knowledge.

This holistic approach, shaped by a decade of hands-on consultancy, not only addresses the immediate needs of preserving invaluable insights but also lays the foundation for a resilient and informed future for the City of Petrinja.

2. Implementation of community-based disaster risk reduction approach

From the standpoint of local communities, the conventional notion that disaster response, recovery, and risk reduction solely fall under the purview of governments is undergoing a significant shift. It is becoming increasingly evident that relying solely on government support and intervention is insufficient to effectively address the escalating global challenges posed by disasters. Moreover, the imperative to confront small- and medium-scale hazards that routinely impact local residents is gaining prominence. Embracing a Community-Based Disaster Risk Reduction (CBDRR) approach becomes crucial in this context. This people-centric methodology emphasizes the active involvement of local stakeholders who possess a nuanced understanding of the major challenges and resources at the community level. By placing communities at the forefront, this approach seeks to empower local residents to proactively tackle and mitigate the impact of disasters that affect them annually.

By increasing participation of local communities and stakeholders and creating local ownership the impact on the number of affected people, economic loss is significant and it can be expected to reduce the negative impact on the environment. This approach places emphasis on fostering the capacity development of communities, serving as a cornerstone for the success of enduring and sustainable DRR initiatives. By prioritizing community engagement and knowledge transfer, CBDRR establishes a solid foundation to instill a culture of resilience within local communities, contributing to the lasting effectiveness of DRR endeavors.

Kamaishi City, located in Iwate Prefecture, has established a comprehensive destination in close proximity to Unosumai Station that was destroyed in the 2011 Tohoku earthquake and tsunami. This destination comprises the Tsunami Memorial Hall, a facility dedicated to preserving the legacy of the disaster and fostering education on earthquake disaster prevention; the Kamaishi Memorial Park, a commemorative facility; and a central facility designed to facilitate storytelling, guided tours, and personal interactions for tourists.

Picture 11. The Kamaishi Memorial Park in Kamaishi City (source: Unosumai Tomosu)

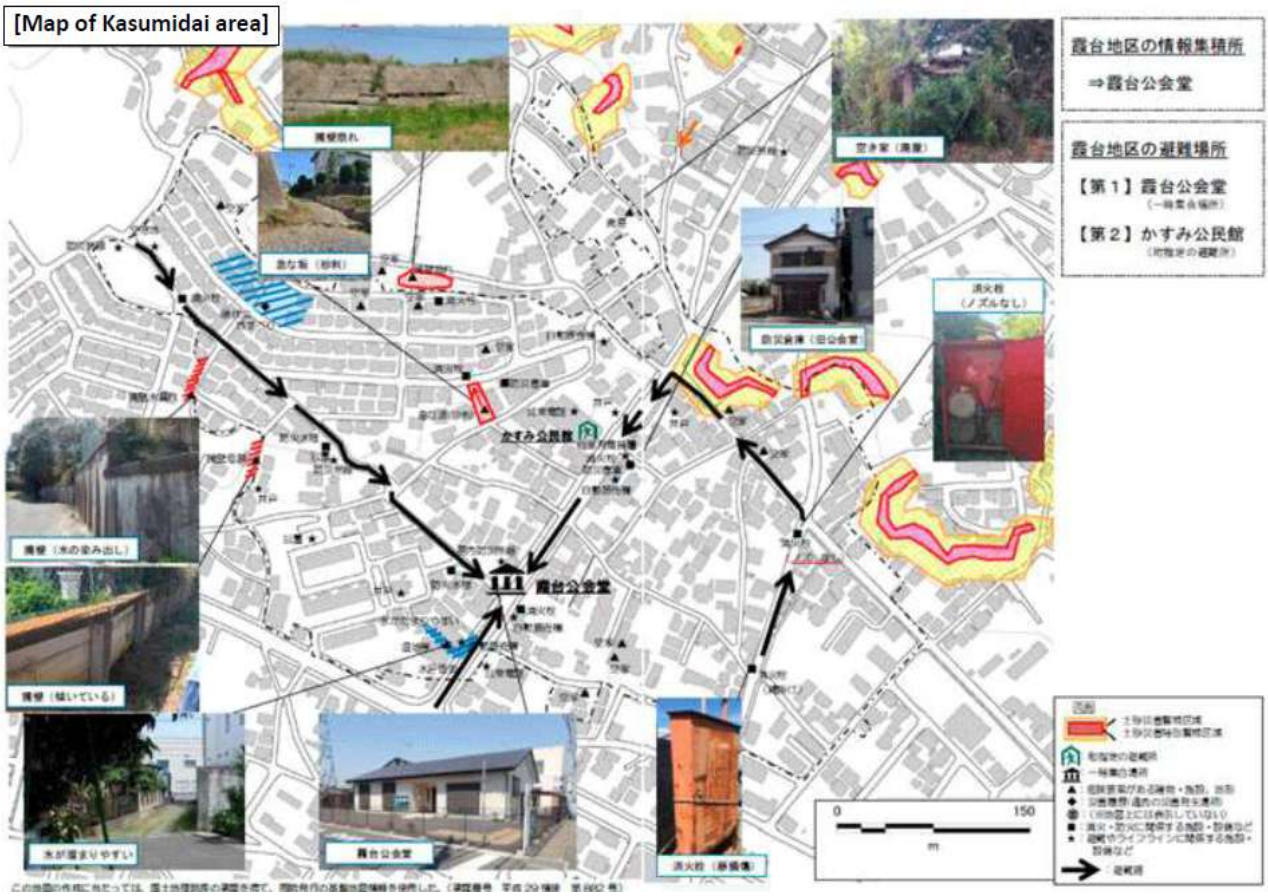
Picture 12. The Tsunami Memorial Hall in Kamaishi City (source: Unosumai Tomosu)

3. Hazard mapping

Hazard maps serve as essential tools in conveying graphic information pertaining to the risks associated with various disasters, including but not limited to earthquakes, floods, landslides, tsunamis, and volcanic eruptions. Their utility extends to serving as a foundational resource for the formulation of pertinent policies and effective countermeasures for disaster risk reduction. In the context of Japanese hazard maps, their comprehensive scope goes beyond the depiction of hazard-prone areas; they also incorporate crucial details such as evacuation routes, shelter locations, and available response resources. This comprehensive information not only aids in risk assessment but also facilitates the strategic planning and execution of emergency response measures by local authorities.

The information presented in hazard maps serves as a valuable resource for the general populace, enabling them to enhance their preparedness and facilitate efficient evacuation procedures. Additionally, this information holds significance in the formulation of urban plans and land use plans, ensuring the integration of disaster risk reduction principles in infrastructure development initiatives. Leveraging hazard maps aids in raising public awareness about potential risks and serves as a strategic tool for proactive evacuation preparedness. By incorporating this data into planning processes, local governments can foster a resilient and well-informed community, better equipped to respond to and mitigate the impact of potential disasters.

Photo 13. Disaster Risk Reduction exercise in the Philippines (source: Humanitarian Practice Network 2007, Horacio Marcos C. Mordeno, MindaNews)



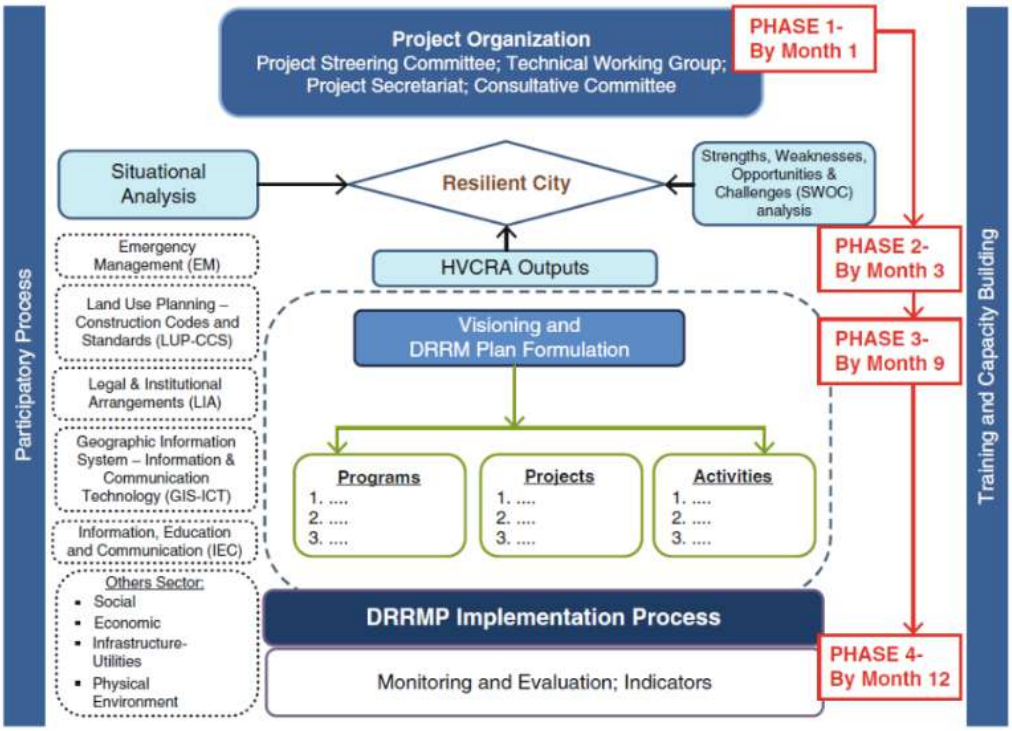
Picture 14. Map of hazardous areas created by the neighborhood association (source: Kasumidai Area Disaster Management Plan, Ami Town, Ibaraki Prefecture)

4. Development of a community based Disaster Risk Management Master Plan (DRMMP)

The DRMMP was developed by the Earthquake and Megacities Initiative (EMI) and it was adopted by the International Standards Organization as ISO31000 for risk management. The Disaster Risk Management and Mitigation Plan (DRMMP) offers local authorities a systematic and rigorous framework to identify programs, projects, and activities focused on mitigating risks arising from natural and man-made hazards. It also establishes defined processes for the implementation of these projects and activities, serving as the foundation for budgeting and investment decisions. This plan serves also as a tool for local residents, fostering the creation of a secure neighborhood grounded in the principles of self-help and mutual support, tailored to the specific local disaster risks and population characteristics. The DRMMP is intentionally structured to afford stakeholders an opportunity to acquire an understanding of the concepts of hazard, vulnerability, and risk, and their significance in the planning process. It fosters consensus among stakeholders regarding the trade-offs and justifications for investing in urban resilience. Through active participation in the plan's development, stakeholders not only contribute vital knowledge to the plan but also recognize and accept their roles and responsibilities in the plan's implementation, thereby assuming ownership.

The delineated mutual support initiatives aim to ensure the enduring safety and well-being of both current residents and future generations. Proactive planning and execution by the adult and minor community members not only contribute to heightened community safety but also function as a valuable disaster education tool for subsequent generations, empowering them to safeguard and contribute to the resilience of the community. Stakeholders that should be involved in the preparation of the plan include public bodies, community associations, voluntary organizations, schools and school children, and private enterprises.

The planning process should be viewed as an ongoing procedure rather than a conclusive endpoint. In reality, the process of planning often holds more significance than the resulting emergency plan itself, serving to pinpoint and emphasize challenges that require resolution.



Picture 15. The DRMMP workflow (source: Urban Resilience Master Planning: A Guidebook for Practitioners and Policy Makers, March 2015)

5. Information and communication technology (ICT) utilization

Information and Communication Technology (ICT) serves a pivotal role in enhancing risk identification and facilitating evidence-based decision-making for disaster risk reduction and preparedness. Effectively communicating these risks to communities, enabling individuals to undertake appropriate mitigation measures, is of paramount importance.

The inclusivity of these processes is essential, necessitating the active engagement and empowerment of diverse stakeholders, encompassing women, elders, and the private sector. This comprehensive involvement is crucial for fostering understanding, reducing vulnerabilities, and preparing communities for the challenges posed by disasters.

Also, the widespread adoption of mobile technologies has facilitated the practice of crowdsourcing, enabling the real-time acquisition of local information. This innovative technology facilitates the aggregation of contributions from the public, covering aspects such as the identification of evacuee locations, the needs of disaster-affected communities, the mapping of contaminated water sources, and the identification of areas at risk for future disasters. Crowdsourcing, citizen science, and participatory mapping are gaining recognition within the disaster risk reduction community for their capacity to harness diverse perspectives and real-time, local data.

Investing and using available crowdsourcing tools by the local government creates multiple benefits. The primary advantage of crowdsourcing lies in its ability to tap into a broad spectrum of real-time, local information from the wider public. Analyzing disaster risk information solely from macro-level data can limit the understanding of impacts at the local level. Integration of crowdsourced local data into risk reduction analyses and plans holds immense potential to inform and prompt localized actions based on specific risks.

Furthermore, the process of crowdsourcing itself becomes a valuable avenue for participating communities to learn about their risks, serving as a dynamic form of disaster risk communication. By investing in crowdsourcing tools there stands an opportunity to establish community level emergency communication mechanisms, traditional and technology based alike.

6. Joining the “Making Cities Resilient” campaign

The joining of the "Making Cities Resilient" campaign is recommended to the local government of the City of Petrinja. This campaign adeptly addresses local governance and urban risks by drawing upon the insights garnered from previous UNISDR campaigns focused on safer schools and hospitals. It also aligns with the sustainable urbanization principles articulated in the UN-Habitat World Urban Campaign 2009-2013. Participating in this campaign offers the City of Petrinja a platform to share experiences and insights with other cities, fostering a collaborative learning environment. Moreover, it serves to enhance the policy relevance and advocacy of the city on the international stage. Recognizing cities as pivotal stakeholders in the related meetings of UN-Habitat, UNFCCC, and UNISDR this campaign enables Petrinja to target urban issues, promoting integrated actions and generating win-win solutions. By addressing urban disasters, urban poverty, and climate-related concerns at the city level, the campaign facilitates a comprehensive approach encompassing both mitigation and adaptation strategies.

Picture 16. The Making Cities Resilient campaign logo (source: UNDRR)

7. Local societal capacity enhancement

A recommended strategy to enhance disaster preparedness in the City of Petrinja involves the systematic strengthening of local capacity for resilience. Drawing from the Japanese experience, a pivotal initiative involves conducting a series of disaster management drills at various institutions regularly, aligning them with Disaster Risk Management (DRM)-related plans and manuals. The effectiveness of training is heightened when it specifically targets key stakeholders and aligns with relevant topics within established frameworks. This approach ensures a nuanced enhancement of capacity and preparedness.

Also, activities should include linking disaster risk reduction strategies with poverty reduction efforts, promote social inclusion, gender equality and community participation, support a culture of DRR in the local private sector or support local organisation working on resilience building. The strategic integration of these interconnected systems facilitates swift coordination and support to devastated areas in the event of a disaster, showcasing the importance of proactive and interconnected measures in disaster management.

8. Enhancing self-help and mutual support by awareness raising

Fostering public awareness of disaster risk reduction is crucial, especially in anticipation of disasters. While the government is instrumental in fostering public support through infrastructural development and non-structural measures, there are concerns regarding the limitations of public support in the face of significant disasters. Japan's experience after the Great Hanshin-Awaji Earthquake has shown that approximately 80% of individuals were rescued through self-help or mutual support, emphasizing the crucial role of community members in disaster mitigation. With challenges such as the widening of municipal areas and a decreasing number of civil servants, proactive community involvement becomes increasingly essential. Self-help and mutual support was a cornerstone after the Petrinja earthquake in 2020 where hundreds of citizens rushed to the City and its surrounding villages to provide help to citizens in need.

In order to maximize the impact of self-help and mutual support, concrete actions for disaster prevention and mitigation include raising the understanding of local disaster risks, confirming evacuation routes, and stockpiling essentials. Hazard maps play a pivotal role in this process, providing information on local disaster risks and aiding in evacuation decisions. Fostering comprehensive awareness and understanding among the public regarding disaster risks, hazard maps, and alert levels is imperative. Addressing existing challenges and promoting proactive community engagement will significantly contribute to Petrinja's resilience and preparedness in the face of potential disasters.

Picture 17. People clear debris from shops damaged by flooding in Hitoyoshi, Kumamoto Prefecture (source: Reuters)

Picture 18. Football fans and local citizens providing immediate support (source: Slavko Midzor/PIXSELL)

9. Addressing Drivers of Inequality for Enhanced Disaster Risk Reduction

In the pursuit of effective DRR strategies, it is imperative for the local government of Petrinja to address the root causes of inequalities within the community. Inequality serves as a significant contributor to poverty and vulnerability, with marginalized groups often bearing the brunt of these disparities. Such groups may include women, children, the disabled, the elderly, and specific ethnic or social segments.
For optimal DRR outcomes, it is crucial to acknowledge that certain communities may have limited access to DRR benefits, and the voices of marginalized groups are at times excluded from local DRR committees. To rectify this imbalance, Concern's DRR approach emphasizes several key measures:

1. **Inclusive Representation:** Ensure that the most vulnerable individuals, often marginalized or economically disadvantaged, are appropriately represented in disaster management committees.
2. **Differentiated Analysis:** Understand and address the distinct needs of various groups in DRR analyses and plans, recognizing that a one-size-fits-all approach may not be effective.
3. **Priority Focus:** Prioritize the needs of the most vulnerable, recognizing them as high-priority concerns in disaster management strategies.
4. **Root Cause Examination:** Delve into the underlying causes of inequality, which frequently stem from differences in access to social or political assets.

By incorporating these principles into the local DRR framework, Petrinja can foster a more inclusive and equitable approach to disaster resilience. Addressing drivers of inequality will not only fortify the overall effectiveness of DRR initiatives but also contribute to building a more resilient and cohesive community that can withstand and recover from potential disasters.

10. Establish a local Community Disaster Risk Reduction Unit

Establishing a Local Disaster Risk Reduction Unit for the City of Petrinja is a step toward enhancing resilience in the face of potential disasters. Establishing an effective organizational structure, coupled with streamlined processes, strong leadership, and clear coordination, is crucial for the successful implementation of DRR and resilience-building initiatives at the local level. Drawing inspiration from successful initiatives, such as Batticaloa's (Sri Lanka) participation in the 'Making Cities Resilient: "My city is getting ready!" Campaign, the establishment of a Disaster Risk Reduction Unit proved to be instrumental in bolstering the city's disaster preparedness and resilience.

Modeling after the Batticaloa experience, where the creation of such a unit was a key milestone in resilience-building, it is recommended that Petrinja initiates a similar approach. This would involve the formation of a dedicated unit tasked with implementing the City's Community Disaster Management and Risk Reduction Plan, supervising and monitoring project implementation in collaboration with relevant stakeholders, raising community awareness, and facilitating access to information.

Additionally, the unit would provide essential experience and information on DRR good practices to be embraced by national institutions and other local governments. This recommendation aligns with global efforts to create sustainable, disaster-resilient urban areas, contributing to the overall well-being and safety of the community. Anticipated benefits include heightened disaster risk reduction capabilities, increased stakeholder ownership, enhanced disaster knowledge, and leadership of the City in the field of DRR.

11. Develop the City's Development Plans with Concepts of DRR and Resilience

For cities that have a risk for disasters the integration of DRR and Resilience as a fundamental consideration within the city's vision and strategic plan, ensures the protection of development objectives.

This strategic action recognizes that local governments possess a significant level of capacity and legal authority to formulate the city's vision or strategic plan, making it an ideal platform for embedding resilience concepts. By infusing DRR principles into the development plan, the city can aim to proactively address and mitigate potential risks, thereby fostering sustainable and resilient urban growth.

This approach empowers local authorities to leverage their planning capabilities to create a vision that not only promotes development but also systematically incorporates measures to enhance resilience against various hazards and challenges. This also becomes the foundation for the Disaster Risk Management Master Plan as well as future investments and potential funding mechanisms.

"Risk reduction and resilience education focuses on those measures aimed at creating content, processes and learning opportunities for children, staff and school communities (including parents) to develop individual and community level resilience in relation to the risks they face." Comprehensive School Safety Framework 2022-2030

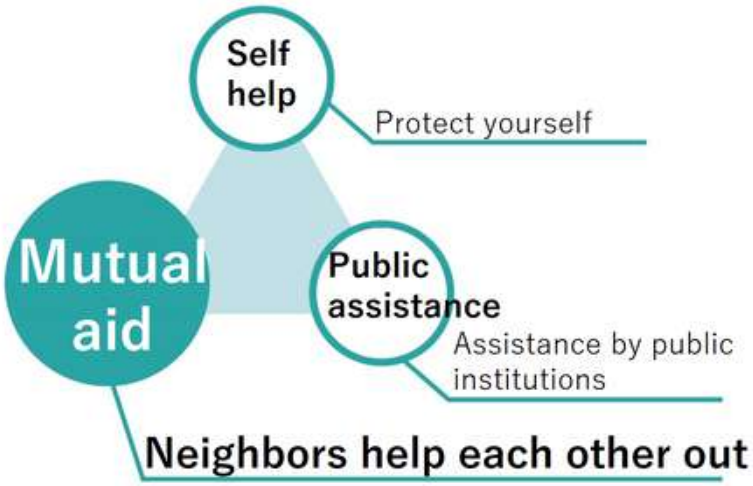
12. DRR education

The significance of ensuring the safety and resilience of school buildings cannot be overstated, particularly when considering their role as shelters during disasters. Rather than focusing on structural aspects, in this chapter the focus is on integrating non-structural DRR education measures which also represents a fundamental pillar of the Comprehensive School Safety Framework 2022-2030. [19]

Education has played an integral and cross-cutting role in disaster reduction efforts since the inception of the International Decade for Natural Disaster Reduction in the 1990s. The 2015-2030 Sendai Framework seamlessly integrates education into the entire disaster management cycle, emphasizing its critical role in prevention, mitigation, preparedness, response, recovery, and rehabilitation.

Some of the purposes of DRR education include the cultivation of human values and attitudes; development of awareness and understanding of disaster risk; improvement of knowledge and skills in DRR, improvement of disaster preparedness knowledge and skills as well as disaster response skills; and the improvement of the ability to adapt to major and sudden changes.

Within the realm of disaster education, the Child-Centered Disaster Risk Reduction (CCDRR) [20] approach recognizes the unique perspectives of children in identifying risks, vulnerabilities, and capacities, thereby contributing significantly to overall community resilience which makes it important to engage children in all the phases of DRR. Education, encompassing formal, informal, non-formal, and continuing forms, emerges as a crucial force in building a culture of safety.



At its core, the goal of disaster education revolves around the "three helps" concept—self-help, mutual help, and public help. Individuals are empowered not only to protect their lives but also to collaborate with neighbours, particularly during the crucial post-disaster period when public assistance may be limited. [21]

Key actors in the domain of disaster education include
a) School principals, teacher trainers, teachers, youth movement leaders, learning activity facilitators and volunteers.
b) Community organisations, student clubs & youth-led organisations, peer educators, persons with disabilities organisations, and others

Recommended activities within this framework include:

- Strengthening Capacities: Enhance the capabilities of teachers and other education personnel to effectively deliver content related to risk reduction and resilience education.
- Non-Formal Learning Pathways: Utilize non-formal learning pathways, such as school assemblies, clubs, youth movements, sports, and community programming, to actively engage children, youth, and staff in various school and community activities.
- Accessibility and Equity: Ensure that learning materials and key messages are accessible to overcome inequities and barriers for vulnerable groups, including those with minority languages and children with disabilities.
- Quality Teaching Materials: Develop high-quality teaching and learning materials encompassing life skills, risk reduction, safety, climate change action, health and hygiene, and social cohesion.
- Peer-to-Peer Support: Support peer-to-peer awareness-building initiatives aimed at fostering leadership, cultural expression, and psychosocial support within the educational context.
- Technology Integration: Develop and scale up strategies, including the use of digital technology, to build the capacities of educators in delivering resilience-building learning content.
- Disability Compliant Content: Ensure that all curricular content is disability compliant, incorporating clear info-graphics, fonts/typefaces, alternative text for graphics within digital documents, and providing additional disability support materials where feasible (e.g., sign language, braille, etc.).

To support local schools and teachers in the City of Petrinja the SOLIDARNA Foundation has developed a methodology for preparation of a school workshop on disaster risk reduction and disaster preparedness. The document can be found in the addendum of this document.

“Risk reduction and resilience education focuses on those measures aimed at creating content, processes and learning opportunities for children, staff and school communities (including parents) to develop individual and community level resilience in relation to the risks they face.” Comprehensive School Safety Framework 2022-2030

Picture 19. People evacuating from tsunami on March 11, 2011 (source: Embassy of Japan in the Netherlands)

Japan’s experience -
The 'Miracle of Kamaishi': How 3,000 Students Survived March 11
Source: Japan for Sustainability, 2013

“In the aftermath of the March 11, 2011, catastrophe, which claimed more than 15,800 lives and have left some 2,660 people still missing, the fact that almost all the nearly 3,000 elementary and junior high school students of Kamaishi, Iwate Prefecture, miraculously survived has brought hope to many people.
A prime example was the children in Unosumai, the hardest-hit district in the city. Immediately after the magnitude 9.0 earthquake struck that afternoon, the students of Kamaishi East Junior High School ran out of the school to higher ground. Their quick response prompted the children and teachers of the neighbouring Unosumai Elementary School to follow, and consequently drew in many local residents.
As they continued to run, older students supported the younger school children, and together they reached a safe location while behind them the mega-tsunami swallowed their schools and the town.
The city lost more than 1,000 lives to the disasters, but only five of them were school-age children, and they weren't at school when the quake hit. The story of the successful evacuation came to be known as "the miracle of Kamaishi”." [22]

Role of Stakeholders

An established approach in development endeavors involves stakeholder participation characterized by equal involvement across all phases of disaster risk management (DRM) planning. This entails a collaborative development process where stakeholders influence decisions and share control. The establishment of stakeholder ownership is pivotal, as it tends to evoke commitment.

The involvement of the community in the DRR process cultivates collaboration among diverse stakeholders, fostering consensus and dedication to actionable strategies. This participatory approach facilitates the exchange of information and knowledge, laying the groundwork for trust and transparency. Additionally, it ensures a clear and direct commitment to community priorities.

Conclusions and lessons to be learned from coordinating with others [23]:

- The scale of activities required for effective community resilience building, often associated with DRR, exceeds the capacity of any single agency.
- Collaboration with other organizations possessing complementary skills not only adds value but also brings diverse capacities to the forefront.
- Integrated interventions, involving multiple institutions, prove beneficial for many DRR and community resilience programs.
- Coordination is essential to address gaps in resilience building, enhance lesson-sharing, and prevent unnecessary duplication of efforts.
- The establishment of thresholds on surveillance indicators and response initiation involves a political process necessitating engagement from all stakeholders.
- Coordinated approaches mandate the integration of short- and long-term interventions across various sectors.
- Engagement with the community and linkage to all stakeholders, including the government, are crucial steps requiring adequate time, which should be factored into program design and development stages.
- Consortia and unified approaches facilitate scaling initiatives and possess the potential to amplify advocacy influence significantly.
- Exploring effective means to involve the private sector in community resilience building is imperative.

Picture 20. Disaster education in Anan City Tachibana Elementary School (source: Bousai Koushien)

Suggestions on stakeholders planning and preparedness:

a. **Review and update policies:** The local government should review and revise existing policies related to earthquake preparedness, building codes, and land-use regulations to enhance resilience and mitigate future risks. Social and health services should collaborate with emergency management agencies and community organizations to develop plans addressing the needs of vulnerable populations, including the elderly, people with disabilities, low-income individuals, and marginalized communities. This includes identifying evacuation plans, establishing communication channels, and coordinating knowing "safe" places in each room that can serve as shelter in the event of an earthquake.

b. **Training and drills:** Stakeholders should organize training sessions and drills to educate the community about earthquake preparedness, response measures, and safe practices. They contribute to public awareness campaigns by disseminating information about earthquake risks, safety measures, and preparedness strategies. This helps individuals and families to understand potential hazards and take necessary precautions.

c. **Partnerships and collaborations:** The local government should establish partnerships and collaborations with non-governmental organizations, private sectors, and educational institutions to jointly work towards enhancing earthquake resilience and developing long-term plans. By fulfilling these responsibilities, local government structures play a vital role in managing the immediate aftermath of an earthquake and facilitating the recovery and rebuilding process for the affected community.

d**. Communications:** Update list of emergency contacts, protocoles and information and make it widely known.

When determining specific roles and responsibilities for stakeholders the Sendai Framework points out a number of proposed activities where a number of them are feasible in the local context of the City of Petrinja:

(a) Engaging civil society, volunteers, and community-based organizations in collaboration with public institutions to provide specific knowledge, pragmatic guidance, and support for disaster risk reduction plans. It is crucial to emphasize the critical role of women, youth, persons with disabilities, older persons, and migrants in disaster risk management. Ensuring their empowerment through capacity-building measures.

(b) Encouraging academia, scientific entities, and research networks to to focus on long-term disaster risk factors, support community action, and bridge the gap between policy and science. Increasing research for regional, national, and local application.

(c) Urging businesses, professional associations, and financial institutions to integrate disaster risk management into their business models. Encouraging awareness-raising, supporting research and innovation, and actively participating in the development of normative frameworks. Especially emphasizing disaster-risk-informed investments in micro, small, and medium-sized enterprises.

(d) Calling upon the media to play an active and inclusive role in raising public awareness, disseminating accurate disaster information, and supporting early warning systems. Adopting specific disaster risk reduction communications policies and fostering a culture of prevention through sustained public education campaigns and public consultations at all levels of society, in accordance with national practices.

Addendum - Ten Essentials for Making Cities Resilient Checklist [24]

1. **Organize for disaster resilience** - establish a resilient organizational structure with strong leadership, clear coordination, and defined responsibilities, integrating DRR into the City Vision or Strategic Plan.

2. **Future risk scenarios** - Maintain current and future risk scenarios by identifying, understanding, and utilizing up-to-date data on hazards and vulnerabilities. Conduct participatory risk assessments to inform urban development and long-term goals.

3. **Financial capacity resilience** - strengthen financial capacity for resilience by preparing a comprehensive financial plan that assesses the significant economic impacts of disasters. Identify and develop financial mechanisms to support resilience activities such as social impact bonds.

4. **Implement resilient urban development and design through risk**-informed urban planning, focusing on vulnerable populations. Enforce realistic, risk-compliant building regulations.

5. **Enhance the protective functions** of natural ecosystems by identifying, protecting, and monitoring them within and outside the city. Utilize these ecosystems for effective risk reduction.

6. **Strengthen institutional capacity for resilience** by understanding the capacity of governmental organizations, private sector, academia, and civil society. Identify and address gaps in resilience capacity.

7. **Identify and enhance societal capacity** for resilience by strengthening social connectedness and fostering a culture of mutual help through community, government, and multimedia initiatives.

8. **Increase infrastructure resilience** by developing a strategy for protecting and maintaining critical infrastructure. Implement risk-mitigating infrastructure where necessary.

9. **Ensure effective preparedness and disaster response** by creating and regularly updating preparedness plans, connecting with early warning systems, and enhancing emergency and management capacities.

10. **Expedite recovery and build back better** by establishing post-disaster recovery, rehabilitation, and reconstruction strategies aligned with long-term planning, ultimately enhancing the city environment.

Conclusion on Recommendations on Croatian Post-Earthquake Resilience

In the wake of the devastating earthquakes that shook the foundations of the Sisak-Moslavina County, especially impacting the resilient city of Petrinja, this document outlines a set of feasible recommendations aimed at fostering post-earthquake resilience and sustainable development. Rooted in international best practices, particularly drawing from Japan's rich experience in disaster risk reduction (DRR), these recommendations provide a strategic framework for the City of Petrinja to navigate the path towards a more resilient future.

The recommendations presented here focus on the local context of Petrinja but are adaptable to other communities throughout the Republic of Croatia. Our approach is centered on a people-centric and inclusive perspective, echoing the words of Mami Mizutori, UN Special Representative of the Secretary-General for Disaster Risk Reduction. It is crucial to recognize that disaster risk reduction practices need to be multi-hazard, multisectoral, inclusive, and accessible to be truly efficient and effective.

Our emphasis on earthquake preparedness underscores the need for a holistic approach that spans pre-event mitigation and preparedness, acknowledging the pivotal role of local governments and its stakeholders in fostering resilient communities. The benefits of investing in disaster risk reduction and resilience, as highlighted by the UN Office for Disaster Risk Reduction, are far-reaching. From social and human gains, economic growth, and job creation to more liveable communities and less human and financial loss in case of a disaster, the returns on such investments are both immediate and long-lasting. Furthermore, it is crucial to recognize the role of local communities, especially those in vulnerable regions.

In conclusion, the journey toward post-earthquake resilience is a collective one, demanding cooperation, inclusivity, and the steadfast commitment of local governments, communities, and stakeholders. The recommendations outlined in this document provide a roadmap for Petrinja and beyond, urging stakeholders to unite in building a future that is not only safer in the face of adversity but also sustainable and prosperous.

The time to act is now, and by implementing these recommendations, we can pave the way for a more resilient and secure future for all the citizens of Petrinja.

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