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Review paper

EXPERIENCES AND LESSONS LEARNED IN THE IMPLEMENTATION OF THE SENDAI FRAMEWORK FOR DISASTER RISK REDUCTION – 10 YEARS SINCE ADOPTION

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Abstract

On March 18, 2015, the Member States of the United Nations (UN) adopted the Sendai Framework for Disaster Risk Reduction 2015–2030 in Sendai, Japan. As the first major global agreement of the post-2015 development agenda, the Sendai Framework provides a comprehensive set of principles, strategic priorities, and actionable measures designed to guide national and local efforts toward reducing disaster risks and enhancing disaster preparedness. It aims not only to mitigate the direct impacts of hazards but also to safeguard developmental gains, promote sustainability, and protect human lives and livelihoods from both existing and emerging risks. A key aspect of the Sendai Framework is its emphasis on building disaster-resilient communities and systems, particularly in urban settings where vulnerability is often strengthen by rapid population growth, aging infrastructure, and socio-economic inequalities. Resilience, in this context, refers to the capacity of individuals, communities, institutions, and infrastructure systems to anticipate, withstand, adapt to, and recover from the adverse effects of disasters. Enhancing resilience requires an integrated, multi-sectoral approach that aligns risk reduction strategies with sustainable development and climate adaptation efforts. This paper aims to critically examine the current status, progress, and challenges associated with the implementation of the Sendai Framework across diverse national contexts, ten years after its adoption. Particular emphasis is placed on Priority for Action D, which focuses on the substantial reduction of disaster-related damage to critical infrastructure and the minimization of disruption to essential services. These services including health care, education, water and electricity supply, sanitation, and transportation serve as the backbone of societal functioning and play a vital role in enabling swift recovery and continuity during and after disaster events. The resilience of such infrastructure is, therefore, a determining factor in the overall ability of communities to absorb shocks and maintain essential services, particularly in times of crisis. The paper further explores the extent to which countries have operationalized this priority and identifies emerging practices and policy innovations that contribute to enhanced systemic resilience.

Key words: *Sendai Framework, Disaster Risk Reduction, Resilience, Critical Infrastructure*

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1. INTRODUCTION

Disaster Risk Reduction (DRR) represents one of the key challenges of contemporary society, particularly in light of the increasing frequency and severity of both natural and anthropogenic hazards. Over the past few decades, the international community has developed a range of strategies and frameworks aimed at enhancing community resilience to various risks. However, despite clear guidelines and growing awareness of the importance of DRR, the number of recorded disasters has increased nearly fivefold over the past fifty years [1]. These trends indicate that risks continue to escalate globally, while people, their property, and critical infrastructure remain increasingly vulnerable and exposed to their impacts [2].

Over the past thirty years, the international community has established a number of key normative documents that form the foundation for action in the field of DRR. The first major milestone was reached in 1994 with the adoption of the Yokohama Strategy and Plan of Action for a Safer World, which laid out fundamental principles for building community resilience [3]. Building on this foundation, the Hyogo Framework for Action 2005–2015 marked a significant step forward by defining concrete priorities, including the institutional strengthening of DRR capacities and the integration of risk management into development policies [4]. A pivotal moment in the evolution of the international DRR approach occurred during the Third United Nations World Conference on Disaster Risk Reduction, with the adoption of the Sendai Framework for Disaster Risk Reduction 2015–2030 [5]. Unlike the Yokohama Strategy and the Hyogo Framework, the Sendai Framework introduces measurable targets (e.g., percentage reduction in losses) and shifts the focus from disaster management to risk management. It also places greater emphasis on resilient systems and proactive prevention, while recognizing the human, social, and economic dimensions of risk.

In parallel with the development of specific DRR frameworks, the international community has also adopted a series of broader global documents that incorporate disaster risk reduction as a key component of sustainable development and climate resilience. With the adoption of the 2030 Agenda for Sustainable Development and the Sustainable Development Goals (SDGs) in 2015, DRR was recognized as a prerequisite for achieving multiple goals, including the eradication of poverty (SDG 1), the development of sustainable cities (SDG 11), climate action (SDG 13), and the strengthening of institutions and capacities for crisis response (SDG 16) [6]. That same year, the Paris Agreement on Climate Change placed additional emphasis on adaptation and resilience, highlighting the importance of anticipatory approaches to climate-related risks [7]. Furthermore, the New Urban Agenda, adopted in 2016 at the Habitat III Conference, promotes the integration of DRR into urban development planning through strengthened infrastructure, participatory risk governance, and the reduction of vulnerabilities in urban areas [8]. These documents, together with the Sendai Framework, constitute a normative foundation for synergistic action at the global, national, and local levels.

In light of the tenth anniversary of the adoption of the Sendai Framework, now regarded as the most important global framework in the field of DRR, it is essential to assess the extent to which the aforementioned international and national strategies have contributed to reducing damage and losses, particularly in relation to critical infrastructure. At the same time, there is a growing need to identify the obstacles that have hindered more effective implementation, as well as to extract lessons learned that can inform the next phase of global efforts.

This paper aims to provide an overview of the experiences gained thus far in the implementation of the Sendai Framework, with a particular focus on the achievement of Target D, through the analysis of available documents, reports, and examples of good practice. The focus is placed on identifying key challenges and opportunities for strengthening the resilience of critical systems, as well as exploring potential pathways for enhancing global and local cooperation in the coming period.

2. METODOLOGY

For the purposes of this study, a qualitative content analysis was conducted on key international documents related to DRR, with a particular focus on the Sendai Framework for Disaster Risk Reduction 2015–2030. This approach enables a deeper understanding of the normative and implementation aspects of global DRR policies through the systematic interpretation of document content [9].

The analysis included primary sources, such as reports and databases of the United Nations Office for Disaster Risk Reduction (UNDRR), as well as secondary sources, such as relevant academic literature, evaluation reports, thematic analyses, and official statistical data at both global and national levels. Special attention was given to the implementation of Target D of the Sendai Framework, which focuses on reducing damage to critical infrastructure and minimizing disruption to essential services such as health, education, water supply, and electricity.

The criteria for analysis included explicit references to Target D, identification of barriers and challenges in its implementation, documented examples of good practice and availability of quantitative data enabling comparison across different national and regional contexts.

The analytical framework was based on thematic analysis [10], which allowed for the identification and categorization of key themes and patterns within the collected documentation. This approach makes it possible to observe broader trends in the implementation of the Sendai Framework, as well as specific regional differences.

The results of the analysis are presented in the following section, structured around key obstacles and examples of good practice in the implementation of the Sendai Framework, with an emphasis on progress toward achieving Target D.

3. RESULTS AND DISCUSSION

According to official data from the UNDRR monitoring system on the implementation of the Sendai Framework, published in October 2024, a total of 163 countries, representing approximately 84% of all United Nations Member States, have submitted national progress reports on the implementation of the Sendai Framework's objectives [11].

However, despite the growing number of reports and formal national strategies, countries working on the implementation of the Sendai Framework face a range of structural and systemic barriers that significantly limit the effectiveness of implementation. Based on the analysis of reports, evaluations, and available literature, several key challenges have been identified, which are recurring across different geographical and institutional contexts.

The main challenges in the implementation of the Sendai Framework are as follows:

1. Insufficient political commitment and weak coordination among levels of government often hinder the effective implementation of DRR strategies. While many countries adopt formal strategies, political will for their implementation varies. Moreover, the lack of alignment between national, regional, and local institutions results in a fragmented approach that diminishes the effectiveness of measures [12].
2. Limited financial resources – the lack of funding is one of the most serious challenges, particularly in low- and middle-income countries. Instead of investing in prevention and risk reduction, budgets are still predominantly focused on emergency response and post-disaster recovery. This imbalance further exacerbates long-term vulnerability [13].
3. Lack of data and knowledge on risks – effective risk management requires reliable, up-to-date, and spatially disaggregated data. In many regions, both basic data and the capacity to analyze them are lacking, making it impossible to plan and prioritize interventions accurately [12].
4. Inadequate integration into development planning – DRR is often viewed as an isolated activity rather than as an integral part of the development agenda. Consequently, plans for urban development, infrastructure, and land use rarely include resilience elements, missing the opportunity for long-term prevention and adaptation [8, 12, 14].
5. Capacity limitations – many local governments, especially in rural and less developed areas, lack sufficient technical and institutional capacities to implement DRR measures. Additionally, community-level capacity-building programs are often underdeveloped or neglected [15, 16].
6. Weak engagement of the private sector – although the private sector can play a key role in building resilient infrastructure, its involvement in DRR strategies is often limited and unstrategic. The lack of regulatory incentives and partnerships between the public and private sectors further reduces the scope of collaboration [17, 18].
7. Climate change and emerging risks – the increasingly severe consequences of climate change, such as extreme weather events, droughts, and floods, complicate risk management. Additionally, new forms of risk, such as pandemics and cyber threats, were insufficiently addressed in the initial Sendai Framework, necessitating its update and expansion [19, 20].
8. Underdeveloped monitoring and accountability systems – countries face challenges in reporting on Sendai Framework indicators due to weak monitoring and evaluation systems. Responsibility for DRR outcomes is often dispersed among various stakeholders, making it difficult to identify weak points and respond in a timely manner [21, 22].

Although the challenges mentioned above pertain to the implementation of the Sendai Framework as a whole, their cumulative impact is particularly evident in the context of Target D. Protecting critical infrastructure and ensuring the continuity of essential services require a high level of coordination, capacity, funding, and data, all of which, as the analysis has shown, are often limited or fragmented. Therefore, the achievement of Target D can be seen as a mirror of the overall system's ability to shift from a reactive to an anticipatory risk management model.

The degree of achievement of Target D of the Sendai Framework varies significantly among countries and regions, but a common denominator remains the high level of exposure

and vulnerability of critical infrastructure to the consequences of disasters. According to data from UNDRR published in 2024, between 2015 and 2023, an average of more than 94,000 damaged critical infrastructure assets were recorded annually, while over 1.6 million disruptions in the provision of essential services, including healthcare, education, water supply, and electricity, were documented [23]. The most affected are low- and middle-income countries, particularly those classified as least developed countries and landlocked states, where institutional and technical capacities for prevention remain limited.

The analysis of national reports shows that the challenges in achieving Target D are multilayered and deeply rooted in the broader context of risk management systems. The most commonly identified barriers include insufficient integration of DRR principles into spatial and infrastructure planning, outdated or non-resilient buildings, lack of investment in preventive measures such as seismic reinforcement, early detection systems, and decentralized energy sources, as well as weak coordination among sectors responsible for infrastructure and risk management [24].

Despite these challenges, there are examples of countries that have made visible progress in infrastructure protection. Notably, Japan stands out, having developed robust technical standards, pre-defined protocols, and continuous investment in prevention based on lessons learned from past disasters. As a result of these measures, Japan experiences a relatively low number of disruptions in the provision of essential services, even during major natural disasters, making it a model of good practice in achieving Target D [25].

These global trends find both parallels and contrasts in the regional context of the Western Balkans, where DRR efforts are still evolving. In recent years, Serbia has made significant progress in aligning its disaster risk reduction strategies with international frameworks, particularly the Sendai Framework for Disaster Risk Reduction 2015–2030. The adoption of the Law on Disaster Risk Reduction and Emergency Management marked a key step toward institutionalizing DRR at the national level [26]. This legal framework introduced obligations for local-level risk assessment and planning, as well as mechanisms for cross-sectoral coordination and the inclusion of vulnerable groups in risk governance processes.

One of the critical challenges facing Serbia's DRR and emergency management system is the fragmentation of its institutional framework and procedures, along with limited capacities at both central and local levels [27]. As a result, practical implementation remains uneven, with substantial differences in technical capacity, financial resources, and access to up-to-date risk data. While some local authorities have developed DRR action plans and early warning systems, others continue to operate with outdated emergency protocols and limited integration of climate risks into development planning. Additional challenges include insufficient investment in the resilience of critical infrastructure and gaps in monitoring and evaluation mechanisms for DRR targets, particularly Target D.

In the broader context of the Western Balkans, DRR remains a growing priority, but countries vary considerably in terms of institutional maturity and political coherence. Countries such as North Macedonia, Montenegro, and Albania have also adopted DRR strategies aligned with the Sendai Framework, often with support from European Union projects and regional initiatives, such as the Disaster Preparedness and Prevention Initiative for South Eastern Europe (DPPI-SEE) [28]. However, regional cooperation is still limited, and the exchange of good practices tends to be informal and project-based rather than institutionalized.

Compared to broader European and global DRR trends [29], Western Balkan countries are largely in a transitional phase, shifting from a reactive to a more preventive and risk-informed approach. Although policy-level alignment with the Sendai Framework is evident, full implementation, particularly in areas such as infrastructure protection, community resilience, and data transparency, remains under development. Unlike many EU Member States, countries in the Western Balkans often lack the financial and technical resources needed for the consistent operationalization of DRR goals.

Therefore, incorporating the regional context into DRR assessments is essential for understanding both the progress and the existing gaps in the implementation of Target D. It also highlights the need for stronger regional cooperation, capacity building, and sustainable investment in critical systems to ensure that national efforts are not only aligned with global strategies, but also adaptable to local realities.

4. CONCLUSION

A decade after the adoption of the Sendai Framework for Disaster Risk Reduction 2015–2030, the achievement of its targets particularly Target D remains a significant global challenge. Evidence indicates that, despite increasing formal commitments and the integration of DRR principles into policy discourse, the practical implementation of measures aimed at safeguarding critical infrastructure and ensuring the continuity of essential services continues to be impeded by a range of systemic obstacles. These include institutional fragmentation, inadequate financial and technical resources, and limited risk-informed planning. As a result, many countries continue to report substantial damage to infrastructure systems and recurring disruptions in service delivery during disaster events, which, in turn, prolong recovery periods and amplify the long-term vulnerability and exposure of affected communities.

In the context of the Republic of Serbia, notable progress has been achieved in terms of regulatory development and the establishment of institutional frameworks. However, the national approach to critical infrastructure protection remains largely fragmented. Preventive investment remains insufficient, and inter-institutional coordination mechanisms are underdeveloped, limiting the effectiveness of DRR initiatives.

This issue acquires additional significance in light of Serbia's ongoing European integration process. Strengthening the resilience of infrastructure systems and harmonizing national policies with EU DRR standards is increasingly recognized as a vital component of the EU accession agenda. In particular, this agenda is reflected in Cluster 4 – Green Agenda and Sustainable Connectivity, which encompasses key policy areas such as energy, environmental protection, and climate change mitigation. Within this context, Target D of the Sendai Framework assumes heightened strategic relevance, functioning as a vital linkage between Serbia’s international obligations and its European aspirations. It also presents an opportunity to advance policy and institutional reforms that simultaneously contribute to enhanced societal security, systemic resilience, and sustainable development.

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