



Disaster Resilience and Recovery

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Abstract: The COVID-19 issue has shown how crucial infrastructure is to the resilience of the supply chain, logistics, and delivery of important products and services. It has highlighted the necessity for nations to strengthen their infrastructure to withstand upcoming catastrophes and pandemics, and to ensure the ongoing functionality of telecommunications, transportation, and other vital networks. Plans for infrastructure resilience should evaluate the infrastructure that is necessary for societies and economies to function, as well as how interconnected the systems are and how they support resilient communities and economies. Green infrastructure development protects infrastructure assets and services against environmental impacts and climate change while ensuring that the infrastructure itself does not hinder environmental sustainability goals. Adapting to climate change, for instance, by using natural solutions, can assist nations in building infrastructure that is resistant to the hazards posed by sea level rise and other extreme climate events like storms, floods, and extreme temperatures. This paper emphasizes the use of a strategic and methodical approach to observe and prepare for disasters for lowering the risks and susceptibility to hazards.

Index Terms - Resilience; Green Infrastructure; Hazards; Sustainable Development Goals; Environmental Sustainability, Disaster Risk Reduction.

I. INTRODUCTION

Disasters are significant setbacks to a community's ability to function that go beyond what it can handle on its own. Natural, man-made, and technical risks, as well as several other variables that affect a community's exposure and vulnerability, can all result in disasters. Disaster losses are increasing, which has serious repercussions for the lives, dignity, and livelihood of people, especially the poor, as well as for long-achieved development benefits. Hazards combine with physical, social, economic, and environmental vulnerabilities to create disaster risk. The bulk of disasters is caused by hydro-meteorological events. Global concern over disaster risk is growing, and its effects and responses might have an impact on other hazards. Disasters, and in particular the management and reduction of risk, continue to represent a global challenge despite the increasing understanding and acceptance of the necessity of disaster risk reduction and greater disaster response capacities.

Communities are impacted by disasters in a variety of ways, including by exceeding individual and communal capacity to make sense of the events, destroying resources, upsetting significant attachments and relationships, endangering safety, and overwhelming community capacity to meet physical and emotional needs. Despite these factors, only a small percentage of traumatized individuals experience Post Traumatic Stress Disorder (PTSD); most traumatized individuals appear to be able to successfully navigate these initial adaptive phases without succumbing to the long-term progression of their acute stress reaction into PTSD. They no longer feel the event as anything more than a bad memory for them. Resilience is the ability of systems to withstand and adapt to shocks and surprises, and sustainability is the system's capacity to remain viable in the face of surprises and the unexpected. Over the past few decades, Critical Infrastructure Protection (CIP) has drawn more public and governmental attention, and the idea of resilience has been crucial to this growth. Aware of the risks that complex infrastructures and processes face from natural disasters, technological failures, human error, and terrorist attacks, agencies, governments, and intergovernmental organizations have launched programs and initiatives to safeguard vital societal functions. As our societies get more complicated and interconnected, this might be considered a natural progression.

DISASTER RESILIENCE

Disaster resilience is measured by how well people, communities, and public and private organizations can organize themselves to learn from previous catastrophes and lower their chances of experiencing similar ones in the future, at international, regional, national, and local levels. Reducing the effects of the crisis implies strengthening society's resilience. The best strategy to safeguard a community's future is to build disaster-resistant communities. Organizational, legal, and regulatory frameworks; Risk identification, assessment, monitoring, and early warning; Knowledge management and education; Reducing underlying risk factors; and Preparedness for an efficient reaction and recovery are the areas that include disaster resilience.

The essential components of disaster resilience (as shown in Figure 1.) are situation, trouble, response capacity, and reaction.

Situation: The social group, socioeconomic system, political structure, environmental situation, or institution whose resilience is being built.

Trouble: What shocks (sudden occurrences like violence or disasters) and/or pressures (long-term trends like resource degradation, urbanization, or climate change) the group seeks to be robust to?



Figure 1. Essential components of disaster resilience

Response capacity: The capacity of a system or process to respond to a shock or stress depends on exposure (the size of the shock or stress), sensitivity (the extent to which a system will be affected by, or will respond to, a given shock or stress), and adaptive capacity (how well it can adapt to a disturbance or moderate damage, take advantage of opportunities, and deal with the effects of a transformation).

Reaction: A variety of reactions are possible, including rebound better, where capacities are improved, exposures are decreased, and the system is better able to handle upcoming shocks and stresses; rebound, where pre-existing conditions prevail; or rebound, but worse than before, where capacities are diminished. In the worst-case scenario, the system fails, drastically reducing our ability to handle the future.

DISASTER RISK MANAGEMENT

Disaster risk management is the use of policies and techniques for reducing disaster risk to prevent new disaster risks, lower current disaster risks, and manage residual risks. This helps to increase disaster resilience and cut down on disaster losses. The core principles of disaster risk management are to actively participate and take a proactive approach to reducing vulnerability, enhancing capacity, and improving catastrophe resilience as shown in **Figure 2**. The idea of a risk society is a crucial topic within the context of disaster risk reduction and disaster resilience. Eliminating vulnerabilities and managing risk are inextricably tied to resilience, especially in the context of calamity training. The approach to disaster risk management used by local and indigenous peoples involves acknowledging and utilizing traditional, indigenous, and local knowledge and practices as a supplement to scientific knowledge in disaster risk assessments and for the planning and execution of local disaster risk management.

Future disaster risk management initiatives deal with and try to prevent the emergence of new or elevated disaster risks. They concentrate on resolving potential disaster hazards that could arise later if disaster risk reduction strategies are not implemented. Better land use planning or water supply systems that can withstand disasters are two examples. Corrective disaster risk management initiatives target existing catastrophe risks that need to be managed and diminished right now and aim to eliminate or minimize them. Examples are the retrofitting of critical infrastructure or the relocation of exposed populations or assets.

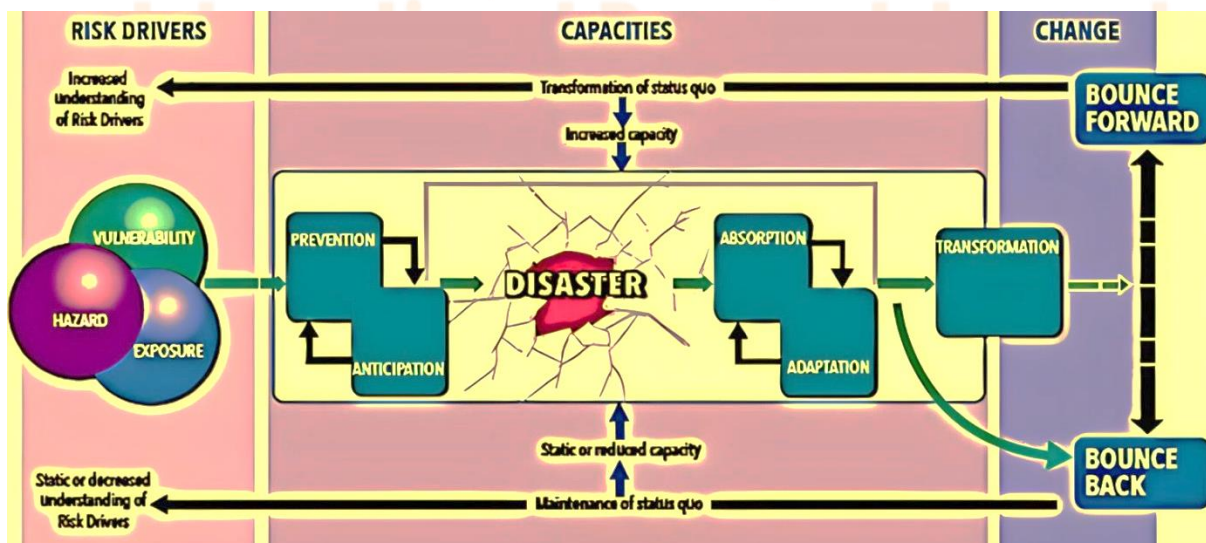


Figure 2. Core Principles of Disaster Risk Management

Disaster risk management plans set out the goals and specific targets for decreasing catastrophe risks coupled with relevant measures to fulfill these objectives. They should be guided by the Sendai Framework for Disaster Risk Reduction 2015-2030 and considered and coordinated within relevant development plans, resource allocations, and program activities. Plans at the national level must be tailored to each level of administrative responsibility as well as the various social and geographic conditions that exist. The implementation schedule, roles, and sources of funding should all be laid out in the plan. Linkages to sustainable development and climate change adaptation plans should be made where possible. The inclusion of potentially affected communities in local disaster risk management is encouraged by community-based disaster risk management. This comprises assessments of risks, weaknesses, and capacities made by the local community, as well as their participation in local disaster risk reduction planning, implementation, monitoring, and evaluation.

EMERGENCY PREPAREDNESS

Prevention, mitigation, preparedness, response, and recovery are the major steps of emergency preparedness as shown in **Figure 3**. Pre-disaster prevention, mitigation, and readiness, followed by post-disaster response, rehabilitation, and reconstruction. The “Prevention/Mitigation” phase involves taking steps to stop or lessen damage (such as building flood-protective dams and dikes). The term “Preparedness” refers to activities and actions that are not intended to prevent a disaster from occurring but rather to ensure an effective reaction to the effects of hazards. Examples include emergency exercises and public awareness campaigns. Preparedness activities improve a community's capacity to react in the event of a disaster. The creation of mutual aid agreements and memorandums of understanding, training for emergency responders and concerned people, holding catastrophe drills to refresh training and test capabilities, and launching all-hazards education campaigns are typical preparedness steps.

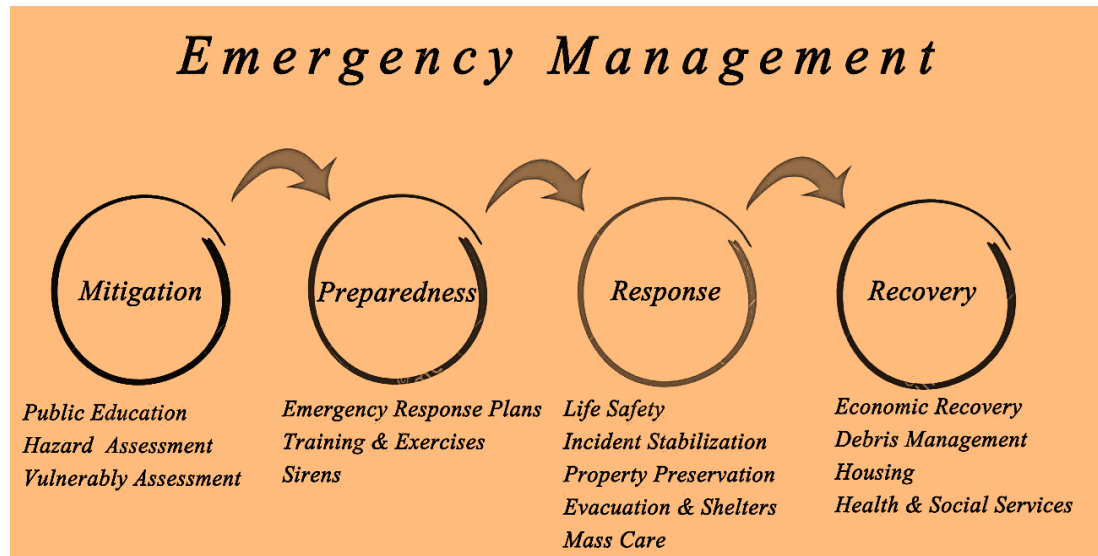


Figure 3. Core Steps of Emergency Preparedness

The term “Response” refers to actions like rescue missions, first aid, putting out fires, and evacuation. It will be easier to execute plans in an emergency case if they are shared in advance. Actions were taken immediately before, during, and after a hazardous impact to preserve lives, minimize financial losses, and ease suffering. The emergency operations center may be activated, threatened people may be evacuated, mass shelters and care may be provided, emergency rescue and medical care may be provided, firefighting may be conducted, and urban search and rescue may be conducted. Disaster risk reduction considerations should be the cornerstone of all actions throughout the “Rehabilitation/Reconstruction” phase. actions made to restore basic services and fix physical, social, and economic damages to get a community back to normal or almost normal conditions. Rebuilding roads, bridges, and important facilities are typical recovery measures, as well as debris clean-up and continued mass care for displaced people and animal populations. With regards to emergency relief (food, water, medication, household items), shelter (construction supplies, new homes), and livelihood support (microcredit, cropping seeds, livestock, fishing boats, and nets), NGOs offer significant aid.

The word “Resilience” has recently gained popularity in the disaster community. Building and strengthening resilience to all types of hazard events is currently a top priority for designers, engineers, community planners, emergency managers, bureaucrats, legislators, and a wide range of researchers in many fields. Whatever the threat—a wildfire, a storm surge, or a terrorist attack—a resilient building, network, or community will survive less harmed and resume normal operations more quickly. How the system responds to either, or both, transient and permanent shocks greatly influence both the nature of system resilience and our ability to influence that resilience. storms are a short-term shock, whereas global warming is a long-term shock, even though it increases the likelihood of storms. A system's effects may be both short-term and long-term. The magnitude of the shock may also affect a system's capacity to withstand it and live.

The overall disaster risk can be decreased by adopting appropriate measures based on the disaster risk management concept in each phase of the disaster risk management cycle, as shown in **Table 1**.

Disaster Type	Prevention/ Mitigation	Preparedness	Response
Tornadoes and Storms	Seismic design Retrofitting of Vulnerable buildings Installation of seismic isolation/seismic response control systems	Preparation of hazard maps Food & material stockpiling Emergency drills	Rescue efforts First aid treatment Fire fighting
Hurricanes	Construction of dike	Construction of early warning systems	Monitoring of secondary disaster
Floods	Building of dam	Preparation of emergency kits Ensure sufficient water supply	Construction of temporary housing
Wildfires	Forestation	Know the risks.	Establishment of tent villages
Earthquakes	Construction of flood control basins/reservoirs	Get an emergency kit.	
Drought	Construction of sidewall	Learn about agencies and roles	
Mass Violence	Establishment of forests to protect against storms	Find mitigation funding	Rehabilitation/ Reconstruction
Residential fires	Construction of erosion control dams	Understand continuity of operations (COOP)	
Chemical spills	Construction of retaining walls	Research Non-governmental organizations (NGOs) that can help in emergencies	Disaster resistant reconstruction
Power outages to animal-related businesses	Construction and operation of earthquake observation systems		Appropriate land use planning
	Construction and operation of meteorological observation systems		Livelihood support
Terrorist Attack	Construction of shelter		Industrial rehabilitation planning
	Construction of meteorological observation systems		

IMPORTANCE OF REDUCING THE RISK OF DISASTER

Disaster risks have an impact on people's lives, livelihoods, and health as well as on the physical, mental, cultural, and environmental health of people, groups, and nations. Disasters significantly impede progress toward sustainable development, many of which are exacerbated by climate change and are increasing in frequency and intensity. Therefore, disaster risk reduction not only saves lives but also promotes the well-being of people and communities. To work with communities at risk of catastrophe to create DRR practices and lessen the risks posed by upcoming disasters, using the criteria provided by the United Nations International Strategy for Catastrophe Response (UNISDR). The process of reorientation highlights the crucial value of location, not only as a framework for recovery but also as the foundation for the development of social capital and community disaster resilience. Community psychologists and other service providers working to support disaster survivors should consider the implications of this method of comprehending and addressing the disorientation caused by disasters.

CONCLUSION

Policies, strategies, and programs for sustainable development and poverty reduction must systematically incorporate measures to mitigate catastrophe risks. These efforts must also be supported through partnerships and other forms of bilateral, regional, and global collaboration. To confront the challenges ahead, increased efforts must be made to build essential capacities at the community and national levels to manage and decrease risk. Sustainable development, poverty reduction, good governance, and catastrophe risk reduction are mutually supporting objectives. The burden of catastrophes will consequently need to be reduced over the coming decades through general development, the reduction of poverty, and the exchange of knowledge about how to become more resilient to natural disasters. When individuals, the local community, the state, and the federal government agencies carry out their emergency management responsibilities, emergency management is effective. The availability of resilience skills in communities can significantly improve equitable and successful response and recovery tactics. The CDC's community preparedness recommendations and the Federal Emergency Management Agency's "Whole of Community Planning" mandate are examples of federal policy directives that must be translated into operational public health practice activities. To do this, health departments must revise their internal procedures and create a structure for community-level collaboration that is anchored to clearly defined and quantifiable programmatic outcomes.

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