**Forum:** The General Assembly 1

**Issue:** Strengthening Safeguarding of Critical Infrastructure in Disaster-Prone Regions to Enhance National and Regional Security

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**Introduction**

Critical infrastructure includes systems, networks, and assets that are integrally functional to the operation of society, such as energy grids, communication networks, transport systems, chains of water supply, and healthcare facilities. Their disruption could lead to economic, social, and political disaster, hence being crucial for national and regional stability.

Critical infrastructure has become much more vulnerable to disasters in the last decades. Earthquakes, hurricanes, floods, and other causes of disasters have often become the most prone to disaster incidents increased by climate change. Increased sea levels, more violent storms, and changes in climatic patterns have multiplied the risks for infrastructures in already high-frequency disaster areas.

For example, Hurricane Maria in 2017 razed Puerto Rico's power grid, plunging the entire island into darkness for months. The Tohoku Earthquake and Tsunami of 2011 brought down major transport and energy networks in Japan, and even precipitated a nuclear accident at Fukushima. Events like this have demonstrated just how far-reaching the consequences can be when a key piece of infrastructure fails.

The global interconnectedness of modern infrastructure adds another layer of complexity. A disruption to supply chains due to one isolated failure in its infrastructure in one region ripples through the world. For instance, the recent blockage of the Suez Canal in 2021 has shown how a single point of failure in transportation infrastructure can disrupt international trade and cause multibillion-dollar losses.

While disasters strike more frequently and with greater intensity, the protection of critical infrastructure has ceased to be solely a national concern but an international imperative that calls for cooperation, innovation in technology, and far-reaching policy frameworks. The report gives in-depth analysis on the issue, an assessment of the current measures in place, and actionable solutions for improving resilience and security.

**Definition of Key Terms**

* **Critical Infrastructure:** Critical infrastructure consists of the systems and assets that a society needs in order to function. Examples of critical infrastructure include energy production and distribution systems, communication networks, water supply and sanitation systems, healthcare facilities, and transportation networks. For instance, it is on airports and ports that much of trade relies, whereas power plants are at the heart of all economic activities, not to mention public welfare.
* **Natural Hazard-Prone Areas:** Disaster-prone regions refer to places that have potentials for being seriously affected by certain natural calamities. These may be earthquakes, hurricanes, floods, and drought. For example, Southeast Asia, due to its geographical location, is highly susceptible to typhoons while areas surrounding the Pacific Ring of Fire are highly prone to earthquakes and volcanic eruptions.
* **Resilience:** The ability of systems and communities to resist, absorb, adapt to, and recover from an event. Infrastructure resilience would include those constructed or natural measures that mitigate the impacts of disasters: for example flood defenses, earthquake-resistant buildings, and duplicate/ redundant power supplies.
* **Risk Mitigation:** The term describes strategies and measures adopted in order to limit the potential impacts of disasters on critical infrastructure. These include developing and implementing updated building codes, developing warning systems, and risk assessment on a routine basis.
* **Cascading Failures:** Cascading failures are failures that occur in interdependent systems as a result of the failure of one infrastructure system. For instance, an outage of electricity might cause failure of communication, cessation of transportation, and disruption of health services. A very good example of cascading failure is the 2003 Northeast Blackout in the United States, wherein a single malfunctioning grid resulted in an outage across eight states.

**Background Information**

Critical infrastructure represents those core services that modern societies cannot function without and at the same time underpin economic development and welfare. Yet it is increasingly at risk from natural disasters in general, and within countries with recurrent hazards more particularly. These threats are increasing globally due to climate change, urbanization, and insufficient preparedness.

**Disaster Frequency On The Rise**

Over the last couple of decades, the frequency and intensity of disasters have increased tremendously. According to the United Nations Office for Disaster Risk Reduction, it was approximately increasing from about 200 cases a year during the 1980s to more than 400 during the 2020s. Such an upward scale in incidents is vastly because of climate change, which, together with heating the atmosphere, shifted and intensified the extremity in weather events.

For instance, warming sea surface temperatures have led to an increase in the intensity of hurricanes in the Atlantic Ocean. The 2017 Hurricane Harvey in Texas had caused record flooding, displacing over 30,000 people after its water infrastructure was overwhelmed. So too, wildfires, fanned by longer droughts and higher temperatures, devastated communities in California and destroyed power lines and communication networks.

**Economic and Social Consequences**

The economic costs of infrastructure failure due to disasters are huge. According to World Bank estimates, annual economic losses caused by natural disasters amount to US$300 billion every year the world over. These costs fall squarely on the low- and middle-income countries that actually do not have the financial resources to put into building resilient infrastructures. In fact:

The 2010 earthquake in Haiti caused estimated damage as high as 120% of the country's GDP, thus crippling it for years. In India, the 2018 Kerala floods caused $5 billion in damages, with all roads, bridges, and dams destroyed, and millions of people finding their lives disrupted.

Besides the economic losses, infrastructure failures are adding to humanitarian crises. Damaged water supply systems might lead to outbreaks of waterborne diseases, while disruptions in transport hamper the delivery of emergency assistance. In the 2020 flooding in Indonesia's Jakarta, faulty drainage systems stranded thousands. Climate Change as a Multiplier

Moreover, the vulnerability of infrastructure is critically dependent on climate change. Cities located at coasts face a great risk due to sea-level rise, while fluctuating weather conditions raise the chances of extreme events like hurricanes, floods, and droughts. According to the Intergovernmental Panel on Climate Change, these events are set to increase in frequency and intensity without any evident decline unless strongly counterbalanced.

Consider, for example, the case of sea-facing Miami in the United States, which is one of the highly vulnerable cities because of sea-level rise and storm surges. A look at the seawalls under construction or the improvement of the drainage system gives an idea of the investments required to protect such cities. Embankments and cyclone shelters have so far been erected in Bangladesh, one of the world's most flood-prone countries, to reduce the cycle of disasters hitting year after year.

**Major Countries and Organizations Involved**

**United States**

The United States has been in the lead in addressing the issue of security of critical infrastructure, particularly with a multi-faceted program undertaken by the Department of Homeland Security, among other federal agencies. The National Infrastructure Protection Plan has a roadmap based on public-private partnerships, risk assessment, and technological innovation. Some of the key initiatives are as follows:

Smart Grids: "The investment in smart grid technology has surely made the energy systems resilient, and restorative processes during any outage of electricity happens in no time."

Cybersecurity Measures: Infrastructures are getting digitized, and this has raised concerns over protecting systems against cyber-attacks. "The US has established the Cybersecurity and Infrastructure Security Agency, an agency that tackles cybersecurity threats to the country's infrastructure."

**Japan**

Due to the high chances of earthquakes, tsunamis, and typhoons, Japan has gone a step ahead to engineer the methods of protection from these events that will help protect infrastructures such as:

Earthquake-resistant buildings: Earthquake-resistant designs under Japanese building codes reduce levels of destruction during earthquakes

Tsunami barriers: Barricading along coastlines defends against storm surges and tsunamis.

Early Warning Systems: In Japan, sophisticated warning mechanisms provide precious time for people to run to higher altitudes or to a place of safety thus minimizing casualties.

**European Union**

The EU has adopted a collective approach to protect its critical infrastructure. It has forced the member states, through the Critical Infrastructure Protection Directive, to identify the key systems and develop measures to protect them. In addition, the EU encourages cross-border collaboration as a means of controlling interdependent risks. For instance, energy grids and transport networks crossing many countries are jointly analyzed for risk and planned for responses.

**United Nations Office for Disaster Risk Reduction (UNDRR)**

UNDRR is a leading driver of disaster resilience around the world. Through the Sendai Framework for Disaster Risk Reduction 2015–2030, UNDRR supports technical assistance, knowledge sharing, and monitoring efforts to reduce disaster risks via resilient infrastructure. In so doing, it cooperates with its member states, other international organizations, and private stakeholders in the implementation of best practices.

**World Bank**

So far, the World Bank has been very instrumental in financing disaster-resilient infrastructure in developing countries. Under its umbrella is the GFDRR-Global Facility for Disaster Reduction and Recovery-which mainly focuses on the assessment of risks, building capacities, and post-disaster recovery. Some of them include:

Flood management in Vietnam: World bank financed the building of flood resilient infrastructure in Mekong Delta to protect several millions of its residents.

Earthquake Reconstruction in Nepal: After the 2015 earthquake, World Bank provided support for reconstruction works so that structures rebuilt will be per resilient design standards.

**Timeline of Events**

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| **Date** | **Description of Event** |
| January 18–22 2005 | The Hyogo Framework was the first global plan to outline actions for disaster risk reduction. It was built on resilience in disaster-prone areas and identified critical infrastructure as a priority for protection. It emphasizes the role of risk assessment, early warning, and community preparedness. |
| March 11 2011 | On March 11, 2011, an offshore 9.0-magnitude earthquake-generated massive tsunami caused widespread devastation to transportation and energy systems, in addition to damage to the Fukushima Daiichi nuclear plant-a very important case that illustrates cascading failures in infrastructures, hence demanding a very strong need for effective mitigation strategies. |
| March 14–18 2015 | It then set the new important international plan in reducing disaster risk-the Sendai Framework-replacing the Hyogo Framework. The document had introduced some targets: reduction of disaster-related economic losses, including on critical infrastructure. The framework's focus is to build resilience through international cooperation to integrate disaster risk management for development planning. |
| September 16–October 2, 2017 | Hurricane Maria plunged Puerto Rico into darkness, establishing one of the longest blackouts on record to hit the United States. The disaster underlined how important older parts of the infrastructure remain vulnerable and squarely pointed to how investments in resilient systems were seriously needed. |
| June 2020 | With the increasing disaster risks, various regional bodies formed task forces that would facilitate better coordination and sharing of resources in the event of any disaster. For instance, the African Union came up with a disaster risk reduction program that focused on protecting infrastructure in Africa. |
| February 19–21 2024 | The Global Infrastructure Resilience Summit brings together, for the first time, governments, international organizations, and the private sector through a comprehensive strategy against growing threats to critical infrastructure. It covers technological innovation, financing mechanisms, and cross-border cooperation in system building. |

**Relevant UN Treaties and Events**

* Declaration on the Critical Economic Situation in Africa, 3 December 1984 (**A/RES/39/29**)
* Sendai Framework for Disaster Risk Reduction, 18 March 2015 (**UNDRR/2015**)
* Resolution on Strengthening of the Coordination of Emergency Humanitarian Assistance of the United Nations, 19 December 1991 (**A/RES/46/182**)
* International Strategy for Disaster Reduction (ISDR), 9 December 1999 **(A/RES/54/219)**
* United Nations Plan of Action on Disaster Risk Reduction for Resilience, 25 March 2013 **(UNPOA/2013)**

**Previous Attempts to solve the Issue**

In the last two decades, there has been significant growth in the protection of critical infrastructure that could be based in disaster-prone areas. Governments, organizations around the world, and private stakeholders have embraced different approaches to reduce risks and build resilience. Success stories have been mixed characterized by successes and lingering challenges.

**Improved Early Warning Systems**

Japan and the United States are leading countries in developing a number of early warning technologies. Japan's earthquake early warning system provides from seconds to minutes of warning time for people to seek protection. Advanced forecast models have been installed by the U.S. National Weather Service to provide reasonably accurate hurricane, tornado, and flood warnings.

**Resilient Engineering and Building Codes**

For example, countries like New Zealand and Chile are prone to earthquakes; for this reason, building codes are strict to limit the damage to infrastructure. These types of building codes introduce the need for the inclusion of earthquake-resistant designs in buildings so that when disasters occur, essential facilities such as hospitals and electrical plants remain functional.

**Initiatives towards Regional Collaboration**

The regional organizations have facilitated cross-border cooperation towards addressing some of the shared weaknesses. For example, the European Union has provided a Critical Infrastructure Protection Directive that has enhanced the cooperation between states to the extent of even allowing joint risk assessment and planning of responses.

**Disaster-Resilient Infrastructure Projects**

International financial institutions like the World Bank have helped developing nations build resilient infrastructure investments in their various countries. The Green Climate Fund was well placed to finance flood protection in Bangladesh and its millions of citizens.

**Difficulties and challenges**

*Lack of Finance*

Arguably, the biggest obstacle to resilience measures is lack of funding. A majority of developing countries are constrained by lack of funds toward implementing resilient infrastructure. Donor fatigue and competing priorities for development aggravate this constraint.

*Inadequate Maintenance*

Even when constructed, resilient infrastructure may fail due to inadequate maintenance. For example, inadequately designed and/or maintained levees and flood drainage systems have often failed in their job of protecting against floods in Southeast Asia.

*Limited Data and Risk Assessments*

To be able to prioritize investments in infrastructure resilience, proper risk assessments have to be conducted. A large number of countries, however, lack reliable data and modeling tools to make this course possible.

*Planning with Inclusivity*

This has meant that measures put in place have not been able to meet grassroots needs. One very important ingredient in making infrastructure projects work and sustainable is involving the affected populations.

**Possible Solutions**

The problems besetting CIP are a set of complex challenges that are going to require creative and multi-faceted solutions. The following are some proposed solutions ranging from policy reforms, technological advancement, and capacity building initiatives.

**Regional Disaster Response Centers**

These regional hubs can be the centers of coordination in responding and recovering from disasters. In this regard, such centers should be fitted with the following:

* Real-time data on weather patterns and risks of disasters.
* Resources include emergency supplies, personnel, and communication systems.
* Protocols for cross-border collaboration during emergencies.

For instance, the AHA Centre of ASEAN has served quite effectively for disaster response in Southeast Asia. Scaling up those models to other regions would increase preparedness and resilience.

**International Financing Mechanism**

Some major determinants of resilient infrastructure involve access to finance. International institutions should, therefore, create funds allocated for projects in disaster-prone areas. This may be accomplished through mechanisms such as:

* Grants to poor countries for systems upgrade.
* Concessional loans to middle-income countries for taking risk mitigation measures
* Incentives for the private sector investments towards resilient infrastructure.

This is so amply demonstrated by CIF, which has been a mechanism that works, which has supported various renewables and resilience projects the world over.

**Public-Private Partnerships**

The private sector brings a lot to the table: technical capacity, financial resources, innovation. The government could enable the frameworks through tax incentives for companies that invest in resilient systems, clear regulations to enable accountability and transparency.

There are quite a few examples available about Japan in respect to public-private knowledge sharing, which contracted construction firms for the design and construction of its earthquake-resistant infrastructure, similar to India for private firms dealing with the question of smart city development.

**Technologies Advanced to Your Rescue**

Advanced technologies are your friends in guaranteeing the security of critical infrastructures. The key technologies include: Artificial Intelligence: AI-based tools study a heap of data on identifying vulnerabilities and predict disaster impacts.

Sensors connected to IoT networks can monitor the infrastructure in real time for early signs of damage or stress. Geospatial Technologies: Satellite imagery and GIS can be employed in building risk maps that could help in disaster planning. In Rwanda, during flooding, the use of drone technology allowed access to far-out communities with medical supplies to ensure continuity in health services.

**Integration of Disaster Risk Reduction into Planning**

As much as urbanization might have increased exposure to disaster risk, the integration of DRR into planning could reduce exposure through:

* Legislation and enforcement of zoning regulations which bar construction in high hazards.
* Designation of green infrastructures like wetlands and parks as areas to absorb floodwaters.
* A better transportation infrastructure system that promotes accessibility in case of emergencies.

Examples include Singapore's integrated flood management system and water plazas in Rotterdam that double as recreational spaces during non-flood periods.

**Enhance Community-Based Disaster Preparedness**

The level of disaster preparedness at the local community level can go a long way in enhancing resilience. This includes:

* Routine drills and disaster training.
* Local response teams equipped with appropriate equipment and knowledge.
* Public awareness through education campaigns and media.

Community-based approaches have been proved effective in countries like the Philippines, where the barangays or local councils play a very important role in disaster response.

**Guiding Questions**

1. How is your delegation affected by this?
2. What is critical infrastructure, and why is it important in disaster-prone regions?
3. What challenges do countries face in protecting critical infrastructure during disasters?
4. How can international frameworks like the Sendai Framework help improve disaster resilience?
5. What technologies can help protect critical infrastructure in disasters?
6. How can low-income countries get the support they need to safeguard infrastructure?

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**Appendix or Appendices**

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II. [https://www.oecd.org/gov/resilient-critical-infrastructure.htm](https://www.oecd.org/gov/resilient-critical-infrastructure.htm%20) (*OECD Policy Paper on Resilience*)

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