

Risk-informed Governance and Innovative Technology for Disaster Risk Reduction and Resilience

Module 1.1: Risk-Informed Governance for Disaster Risk Reduction and Resilience

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Learning Outcomes

At the conclusion of this Session, Participants will be able to:

- Understand the concept of governance, risk-informed governance and how it applies to DRR
- Explain how and why an adverse event progresses from emergency to catastrophe.
- List and define the major components of a comprehensive system of DRM.
- Understanding of the range and diversity of functions of government that support DRM and how technologies can streamline risk information across government.
- Explain how innovative technologies improve the disaster management planning process, and how official (governmental) and citizen disaster preparedness efforts might be improved as a result of new technology applications.

1. Governance and the 2030 Agenda for Sustainable Development

■ Introduction

- Understanding Governance
- The terminologies of **disaster risk management**
- Sources of **vulnerability**
- Comprehensive emergency management
- Disaster management data requirements
- Applying Science Technology and Innovations (STI) to DRM



Image: Aerial view of the damages in Port-au-Prince, Haiti.
Image credit: Nikos Niotis, 2013.

1. Governance and the 2030 Agenda for Sustainable Development

■ Concept of Governance

- The way that public sector organizations and other stakeholders develop solutions and create opportunities to address societal challenges.
- Past definitions do not reflect current thinking. Examples include:
 - Being efficient and accountable (neglects to account for effectiveness focus)
 - Governing without government (neglects to account for whole-of-society)

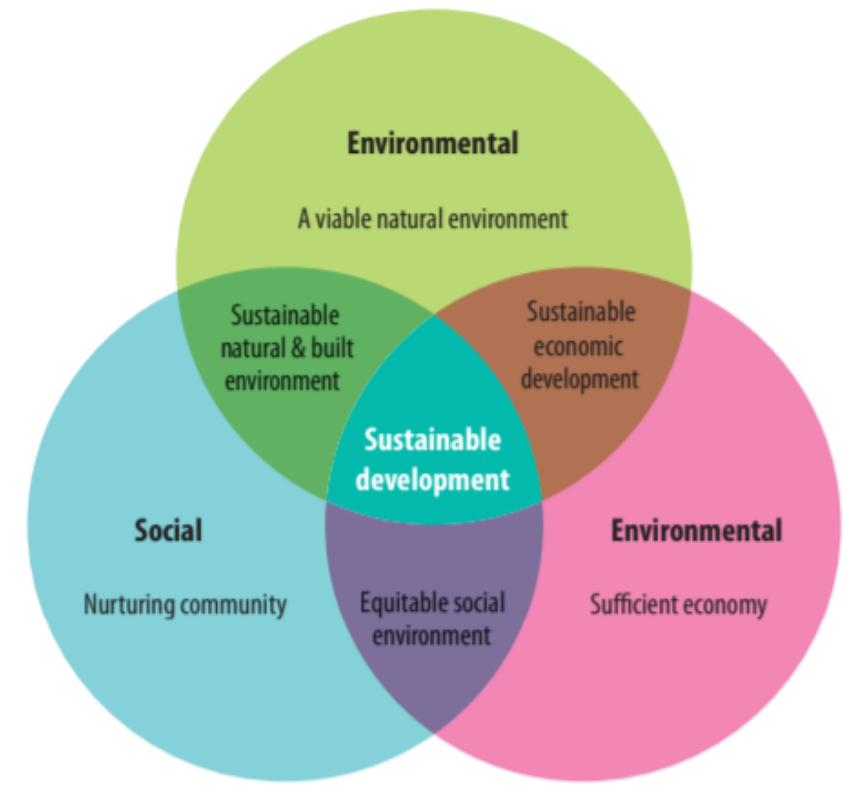


1. Governance and the 2030 Agenda for Sustainable Development

SUSTAINABLE DEVELOPMENT GOALS



Three Circles of Sustainable Development



https://www.unescap.org/sites/default/files/publication_WEBdrr02_Mainstreaming.pdf

2030 Agenda for Sustainable Development

- **Governance** play a defining role in supporting the pillars of ‘**Transforming our world: the 2030 Agenda for Sustainable Development**’
- At the heart of the 2030 Agenda are **five critical dimensions**:
 - ✓ **people**,
 - ✓ **prosperity**,
 - ✓ **planet**,
 - ✓ **partnership** and
 - ✓ **peace**, also known as the **5P’s**.
- Realizing the SDGs depends on the **Eleven Principles of Effective Governance for Sustainable Development**.



Image source: <http://www.oneworldcentre.org.au/global-goals/agenda-2030-and-the-sdgs/>

1. Governance and the 2030 Agenda for Sustainable Development

- **11 Principles of effective governance for sustainable development:** proposed by the UN Committee of Experts on Public Administration (CEPA) and endorsed by UN ECOSOC Council in July 2018

Image: <https://publicadministration.un.org/Portals/1/Images/CEPA/booklet.pdf>



Principles of Effective Governance for Sustainable Development

- Effectiveness**
 - » Competence
 - » Sound policymaking
 - » Collaboration
- Accountability**
 - » Integrity
 - » Transparency
 - » Independent oversight
- Inclusiveness**
 - » Leaving no one behind
 - » Non-discrimination
 - » Participation
 - » Subsidiarity
 - » Intergenerational equity



1. Governance and the 2030 Agenda for Sustainable Development

Eleven Principles of Effective Governance for SDG Implementation

Effectiveness	Competence	To perform their functions effectively, institutions are to have sufficient expertise, resources and tools to deal adequately with the mandates under their authority. Commonly used strategies include promotion of a professional public sector workforce, strategic human resources management, leadership development and training of civil servants, performance management, results-based management, financial management and control, efficient and fair revenue administration, and investment in e-government.
	Sound policymaking	To achieve their intended results, public policies are to be coherent with one another and founded on true or well-established grounds, in full accordance with fact, reason and good sense. This regards strategic planning and foresight, regulatory impact analysis, promotion of coherent policymaking, strengthening national statistical systems, monitoring and evaluation systems, science-policy interface, risk management frameworks, and data sharing.
	Collaboration	To address problems of common interest, institutions at all levels of government and in all sectors should work together and jointly with non-State actors towards the same end, purpose and effect. This includes centre of government coordination under the Head of State or Government, and collaboration, coordination, integration and dialogue across levels of government and functional areas.
Accountability	Integrity	To serve in the public interest, civil servants are to discharge their official duties honestly, fairly and in a manner consistent with soundness of moral principle. This is about promotion of anti-corruption policies, practices and bodies, codes of conduct for public officials, competitive public procurement, elimination of bribery and trading in influence, conflict of interest policies, whistle-blower protection, and provision of adequate remuneration and equitable pay scales for public servants.
	Transparency	To ensure accountability and enable public scrutiny, institutions are to be open and candid in the execution of their functions and promote access to information, subject only to the specific and limited exceptions as are provided by law. Examples are proactive disclosure of information, budget transparency, open government data, registries of beneficial ownership, and lobby registries.
	Independent oversight	To retain trust in government, oversight agencies are to act according to strictly professional considerations and apart from and unaffected by others. This covers promotion of the independence of regulatory agencies, arrangements for review of administrative decisions by courts or other bodies, independent audit, and respect for legality.
Inclusiveness	Leaving no one behind	To ensure that all human beings can fulfil their potential in dignity and equality, public policies are to take into account the needs and aspirations of all segments of society, including the poorest and most vulnerable and those subject to discrimination. This includes promotion of equitable fiscal and monetary policy, promotion of social equity, data disaggregation, and systematic follow-up and review.
	Non-discrimination	To respect, protect and promote human rights and fundamental freedoms for all, access to public service is to be provided on general terms of equality, without distinction of any kind as to race, colour, sex, language, religion, political or other opinion, national or social origin, property, birth, disability or other status. Strategies include promotion of public sector workforce diversity, prohibition of discrimination in public service delivery, multilingual service delivery, accessibility standards, cultural audit of institutions, universal birth registration, and gender-responsive budgeting.
	Participation	To have an effective State, all significant political groups should be actively involved in matters that directly affect them and have a chance to influence policy. Examples are free and fair election, regulatory process of public consultation, multi-stakeholder forums, participatory budgeting, and community-driven development.
	Subsidiarity	To promote government that is responsive to the needs and aspirations of all people, central authorities should perform only those tasks which cannot be performed effectively at a more intermediate or local level. Examples include fiscal federalism, strengthening urban governance, strengthening municipal finance and local finance systems, enhancement of local capacity for prevention, adaptation and mitigation of external shocks, and multilevel governance.
	Intergenerational equity	To promote prosperity and quality of life for all, institutions should construct administrative acts that balance the short-term needs of today's generation with the longer-term needs of future generations. This includes sustainable development impact assessment, long-term public debt management, long-term territorial planning and spatial development, and ecosystem management.

1. Governance and the 2030 Agenda for Sustainable Development

■ Governance

Public Governance refers to "The exercise of **economic, political** and **administrative** authority to manage a country's affairs at all levels."

- *World Public Sector Report, 2015*

Governance: generally refers to actions, processes, traditions and institutions (formal and informal) by which collective decisions are reached and implemented.

- *UNDRR, GAR, 2019*



1. Governance and the 2030 Agenda for Sustainable Development

■ Governance

- The principal elements of good governance calls for *accountability, transparency, efficiency, effectiveness, responsiveness and rule of law.*
- Complexity of the 2030 Agenda calls for an integrated level of coordination by different stakeholders and among the stakeholder groups.
- Where institutions should move away from silo-based operations to holistic and engaging actions.

1. Governance and the 2030 Agenda for Sustainable Development

■ Governance Styles

Hierarchical

- Top-down
- Centralized
- Singular power at top
- Every organization a subordinate to a single entity
- Most common form of governance within organizations, including government

Network

- Focuses on partnerships and collaboration
- Public-private partnerships often within this style
- Nodes are autonomous
- Outcomes the result of interactions
- Decision-making the result of negotiation, compliance a matter of trust / obligation

Market

- Focuses on financial intervention/incentive
- Formal and informal rules of behavior
- Legal agreements guide participant action
- Relationships generally adaptable
- Actions driven by incentives and compliance
- Regulatory mechanisms

2. Governance and Risk-Informed Governance for DRR and Resilience

Government Innovation in the Context of DRR and Resilience

- The Global Sustainable Development Report 2019** mentions **governance** as the **1st** of 4 **‘levers’** to enable and steer transformation & innovation

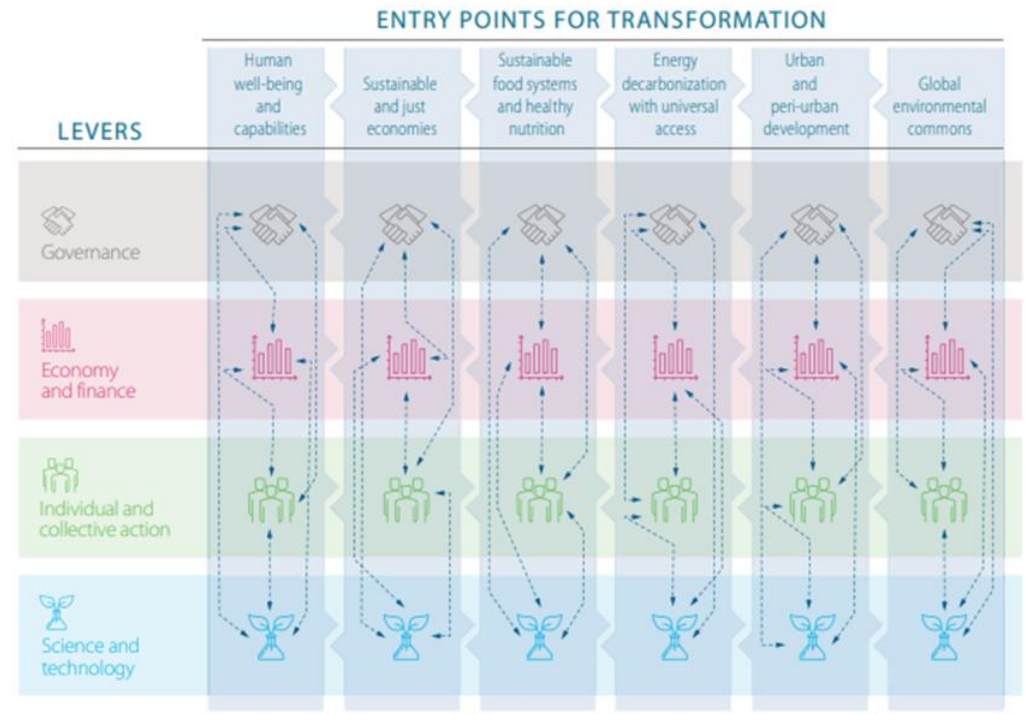


Image 1 and 2: https://sustainabledevelopment.un.org/content/documents/24797GSDR_report_2019.pdf

2. Governance and Risk-Informed Governance for DRR and Resilience

- **Government Innovation refers to:**
 - the use of new approaches to create **public value**
 - novel rules, and regulations that seek to effectively address a public problem
 - finding new ways to impact the lives of citizens, and activating them as partners
- **Engaging with citizens** is one of the **most critical steps to innovating government**
- Governments are using **transparency to build trust** in these service innovations
- Governments through innovation are **re-inventing their operations to meet citizens needs** making them more **inclusive, transparent and accountable.**

2. Governance and Risk-Informed Governance for DRR and Resilience

■ Governance Innovation Types

- **Institutional innovations**

Focus on the renewal of established institutions and the establishment of new institutions

- **Organizational innovation**

Including the introduction of new working procedures or management techniques in public administration

- **Process innovation**

Focuses on the improvement of the quality of public service delivery

- **Conceptual innovation**

Focuses on the introduction of new forms of governance (e.g., interactive policymaking, people's budget reforms, horizontal networks)



Case Study: United Arab Emirates Extreme Weather App

■ Government Redefining boundaries with Citizens through Innovation

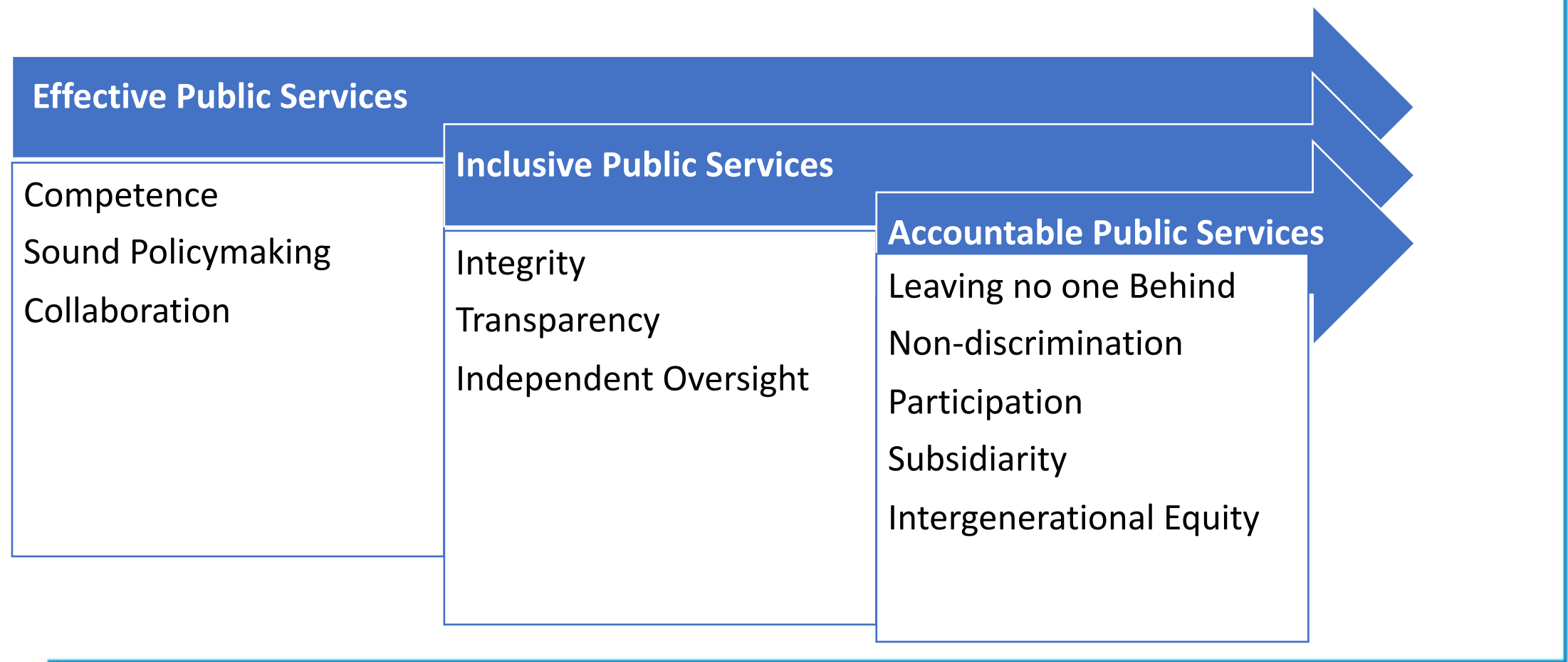
- **The Extreme Weather App¹⁴** is a **freely accessible application**
- **Launched in 2016** by the UAE's by Masdar Institute of Science & Technology, the app is powered by a series of algorithms
- **Alerts citizens** about current and future weather conditions
- On their current location **using a smartphone or web browser.**
- Using **real-time satellite data and weather forecasting models.**
- Specialized in **detecting and predicting sandstorms**



<https://www.oecd.org/gov/innovative-government/embracing-innovation-in-government-uae.pdf>

2. Governance and Risk-Informed Governance for DRR and Resilience

■ Pillars of People-Centered Reform



2. Governance and Risk-Informed Governance for DRR and Resilience

■ Risk Governance

- **Risk governance** provides the enabling environment for risk-informed decision making and implementation for achieving resilient development outcomes.
- **Risk governance** is the foundation for mainstreaming risk into development policy and practice for more effective management of climate change and disaster risks.

2. Governance and Risk-Informed Governance for DRR and Resilience

■ Risk Governance

Risk governance is defined as “the totality of actors, rules conventions, processes and mechanisms concerned with how relevant risk information is collected, analysed and communicated and management decisions are taken”.

- *UNDRR, GAR, 2019*

Disaster Risk Governance refers to “the system of institutions, mechanisms, policy and legal frameworks and other arrangements to guide, coordinate and oversee disaster risk reduction and related areas of policy”.

Disaster Risk Governance: <https://www.preventionweb.net/terminology/view/51755>

2. Governance and Risk-Informed Governance for DRR and Resilience

■ Strengthening Risk Governance

Strengthening risk governance is recommended around **three governance** components:

- **People** (the actors of development) – leadership, capacity and knowledge.
- **Institutional Capacities – Mechanism** (the underlying architecture for development) – institutional arrangements, partnerships, coordination networks, and the legal and policy framework.
- **Processes** (the procedures and products for development) – budgeting processes, planning processes, tools, and products (e.g., plans).



2. Governance and Risk-Informed Governance for DRR and Resilience

- ## Risk Governance Building Blocks



<https://www.preventionweb.net/publications/view/50833>

2. Governance and Risk-Informed Governance for DRR and Resilience

■ Risk-Informed Governance

Risk-informed approach to governance – requires extensive collaboration and ownership from many partners, including multiple agencies within governments. It calls for long-term and in-depth engagement to connect national/local plans and legislation to real-world impacts. It also requires capacity development beyond the traditional training; need to strengthen local institutions so that they are eventually able to coordinate, solve problems, involve communities, share information and train others.



2. Governance and Risk-Informed Governance for DRR and Resilience

■ Risk-Informed Governance

- Risk-based decision-making process
- Understanding of threats
- Development becomes a vehicle to reduce risk
- Vital to:
 - Agenda 2030
 - Sendai Framework
 - Paris Agreement
 - Addis Ababa Action Agenda
 - Others
- Requires investment in the data, tools, and methods that support risk assessment and management



2. Governance and Risk-Informed Governance for DRR and Resilience

■ Risk-Informed Decision-Making (RIDM)

- **Risk-Based Decision-Making (RBDM)**

Decisions based on a narrow set of model-based risk metrics that are devoid of cost, feasibility and stakeholder concerns; decisions are typically made by technical experts, without public consultation or stakeholder involvement.

- **Risk-Informed Decision-Making (RIDM)**

The product of deliberation, using a variety of considerations of which risk data is but one factor; recognizes and incorporates subjective reasoning, ensuring that the technical aspects of a decision are balanced with the human ones.

2. Governance and Risk-Informed Governance for DRR and Resilience

■ The Sendai Framework and Risk-Informed Governance

The Sendai Framework calls on governments to move towards risk-informed governance arrangements that include a broader hazard and risk scope, and incorporate the concept of systemic risk. This requires **integration across different sectors and levels of government, working with scientists, civil society and the private sector to address current and emerging risks.**

PRIORITY 2 of the Sendai Framework Calls for:

Strengthening disaster risk governance to manage disaster risk

2. Governance and Risk-Informed Governance for DRR and Resilience

■ **Governance Approaches to Resilience Building**

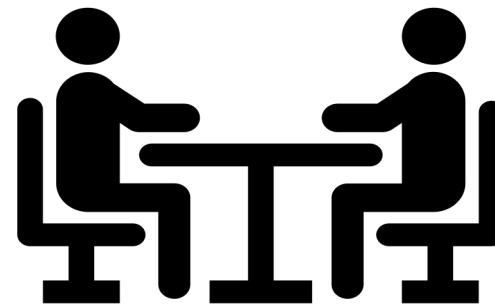
- **Decentralised governance:** the transfer of political power and fiscal and/or administrative functions from central government to lower or local levels
- **Multi-stakeholder governance:** governance structure that brings together different partners across scales and/or sectors in decision-making and implementation of solutions in a coordinated manner.
- **Participatory governance:** governance that includes citizens, or representatives of a particular group of citizens, in decision-making
- **Community-based governance:** governance that often focuses on building resilience for the most vulnerable and lowest-income groups in society
- **Adaptive governance:** governance conditions for adaptive management. This is a structured, iterative process of continual innovation, testing, learning and adjustment

2. Governance and Risk-Informed Governance for DRR and Resilience

■ Challenges of Risk-informed Governance

- **People** (actors)
 - Unclear risk ownership, unknown unknowns, miscommunication due to the lack of an open and transparent culture, and risk-awareness culture
- **Mechanisms** (the underlying architecture for development)
 - Lack of risk oversight and governance structure e.g., lack of crisis preparedness and response institutional arrangements, addressing the sources of risk in isolation and silos, and lack of risk assessment
- **Processes** (the procedures and products for development)
 - Insufficient actions in golden hour, lack of data-driven decision-making, lack of digital government tools, neglect to care for victims and the vulnerable group

Group Work and Activities



- **Discussion 1: Visioning Exercise**

The Facilitator can lead a discussion on:

- What does risk-governance for DRR look like in their own country?
- What would it take in terms of the key building blocks of risk governance (***People, Processes*** and ***Mechanism***) to ensure resilience?

3. Public Governance and Innovative Solutions for DRR and Resilience

■ ① People

I. Leadership in Disaster Risk Management (DRM)

- Integrated leadership and ownership
- Allocating responsibility at different levels
- Central coordination involving experts and technocrats
- Leading agency at the core coordinating DRM
- Help mobilize human and material resources



Leadership and Professionalism

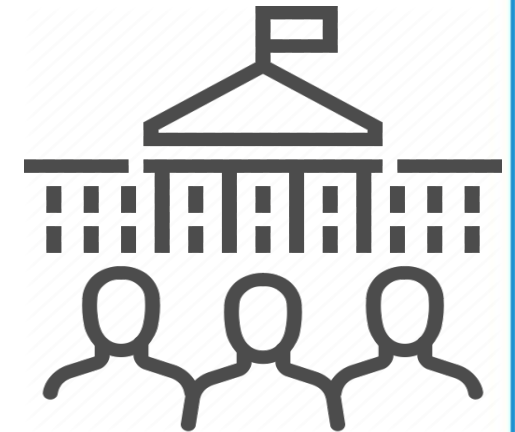
II. Effective Communication Strategy

- Established channels for effective and timely risk communication
 - Personal data protection by Laws and regulations
- Measures to prevent the spread of misinformation

■ 2 Institutional Capacities

III. Crisis Preparedness and Response Arrangements

- Established manuals, laws and regulations, and institutional settings
- Infrastructure and systems
- Equipped competent skills and capabilities
- Established response plans/mechanisms



IV. National to Local Government Coordination

- **Whole-of-government** coordination is fundamental
- Multi-sectoral approach in resolving divergences across sectors
- Enhance coherence across levels of governments
- Fully empowered local governments
- National and local governments collaborating

V. Stakeholder Engagement for the Whole-of-Society Response

- Government engages and collaborates with key stakeholders (private sector, civil society, academia etc.)
- Local communities and volunteers are actively engaged
- Engagement of and care for the vulnerable at various phases of DRM

VI. Regional and International Partnerships in DRM

- Private and Public partnership for sharing technology & innovative solutions
- Disasters in most cases are trans-boundary or “boundary blind”
- Helps to share information (early warning), expertise, and best practices
- Mobilize/pooling resources for DRM
- Promote multi-country and international cooperation

3. Public Governance and Innovative Solutions for DRR and Resilience

■ 3 Processes

VII. Responses in “Golden Hour”

- The first hour (i.e., 60mns) following an emergency or disaster is the *Golden Hour*
- Many lives are lost when disaster strikes
- This require rescue within the shortest possible time
- Leaders must build confidence and guide others in a concerted effort

VIII. Leveraging Science, Technology and Innovation

- Helps anticipate, respond to, and recover from disasters effectively
- Promotes access to critical and innovative public services during disasters

IX. Data-Driven Decision-making

- Quality data sharing and data analytics is an enabler for DRR and Resilience
- Effective and timely data is key for risk-informed decision-making

3. Public Governance and Innovative Solutions for DRR and Resilience

Policy Suggestions on Risk-informed Governance

- Disaster risk signals require an agile governance structure that quickly recognizes and responds to disasters
- Governments should actively and proactively identify disaster risk factors and intensively manage disaster on vulnerable targets.
- To identify unknown disaster risk factors, experts should be involved and empowered to cope with disaster risks
- Data-driven governance should be able to determine and respond to immediate risks
- Risk-informed governance should diagnose current overall practices and traditions, prepare countermeasures

4. Disaster Risk Management (DRM), Vulnerability and Development

21st Century Disaster Deaths

Year	Fatalities	Major Events (5000 or more fatalities)
2000	9,609	
2001	30,844	Gujarat Earthquake
2002	12,124	
2003	109,827	Bam Earthquake, European Heatwave
2004	242,765	Indian Ocean Earthquake
2005	88,673	Kashmir Earthquake
2006	24,239	Java Earthquake
2007	16,960	
2008	235,256	Cyclone Nargis, Sichuan Earthquake
2009	10,672	
2010	297,140	Haiti Earthquake, Russian Heatwave, Somalia Drought
2011	51,434	Japan Earthquake
2012	10,319	
2013	21,859	North India Floods, Typhoon Haiyan
2014	7,993	
2015	22,774	Nepal Earthquake
2016	8,512	
2017	9,734	
2018	10,733	
Total	1,221,465	

Source: EM-DAT (International Disaster Database), as cited in UNISDR, 2019.

4. Disaster Risk Management (DRM), Vulnerability and Development

■ Disasters and Development

- Disasters strain development
- Exacerbated by:
 - Climate Change
 - Urbanization
 - Conflict
 - Other factors
- DRM a comprehensive effort to reduce disaster likelihood before they strike, and limit their impact when they do



Image: Damaged cars and houses in West Palu, Central Sulawesi, Indonesia, after the September 28, 2018 earthquake.

Image credit: Arimacs Wilander, UNICEF, 2018.

4. Disaster Risk Management (DRM), Vulnerability and Development

■ Technology Role in DRM

- **Science, technology, and innovation** support:
 - Sustainable Development
 - Disaster Risk Reduction
- Potential to increase effectiveness of current practices
- Applicable to all DRM phases
- Remarkable increase in stakeholders and options
- Increasing trend in STI use in disaster management

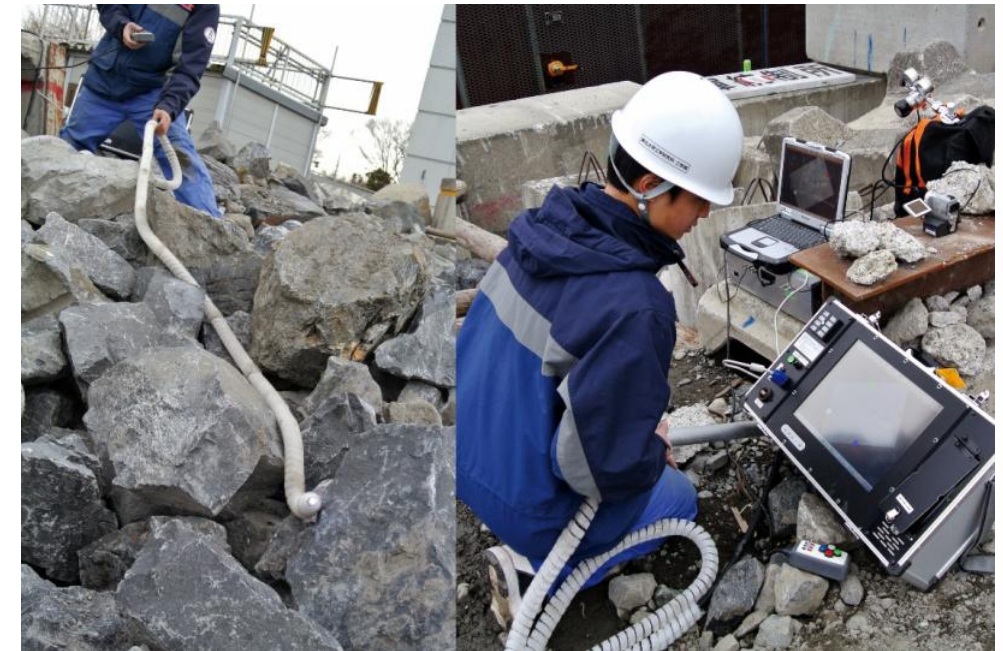


Image: Researchers developing a special camera that will be able to help rescuers explore collapsed structures.
Image credit: Human Robot Informatics Laboratory, 2015.

4. Disaster Risk Management (DRM), Vulnerability and Development

■ Key DRM Terms

- Hazard
- Exposure
- Vulnerability
- Resilience
- Risk
- Disaster

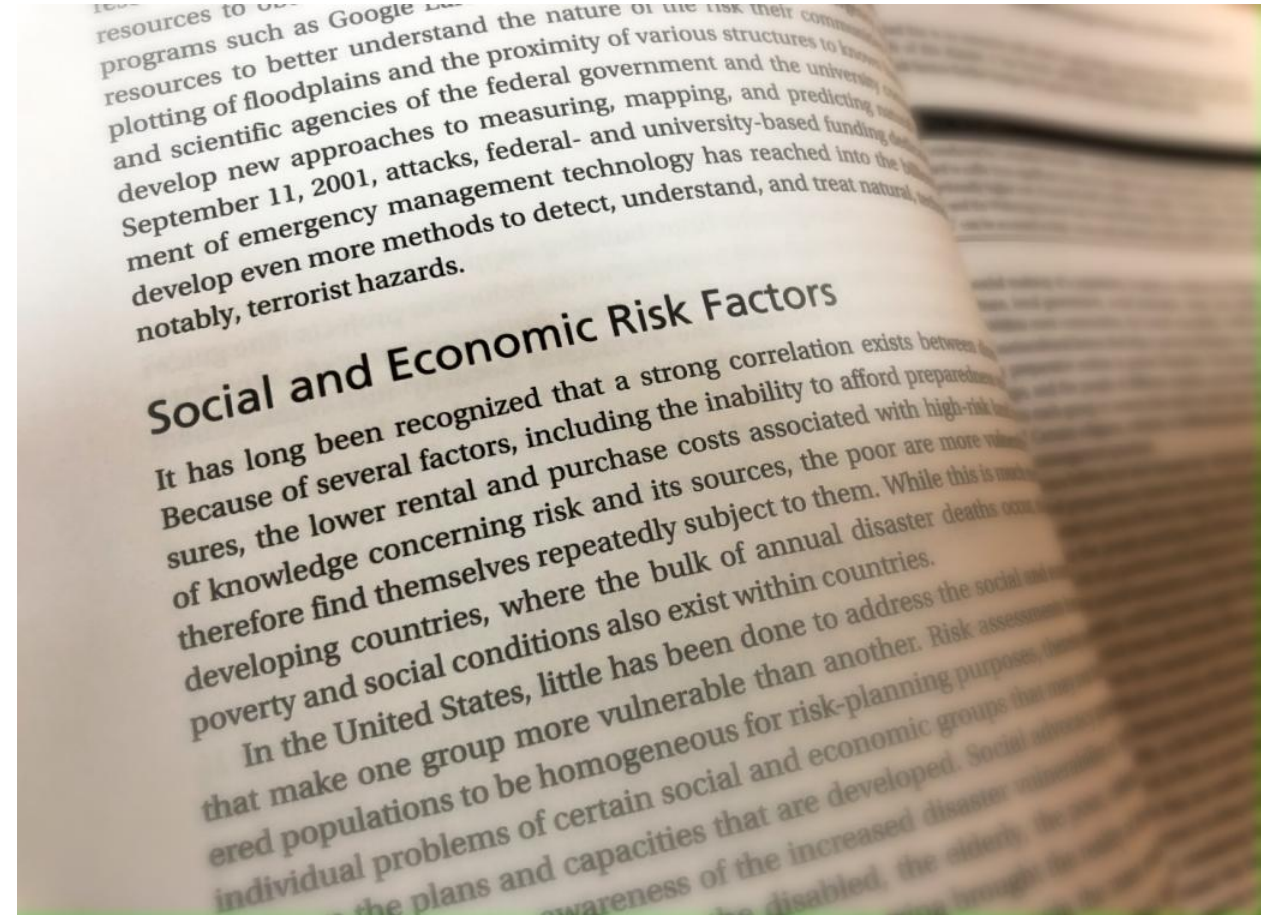


Image credit: Haddow, Bullock, and Coppola, 2016.

4. Disaster Risk Management (DRM), Vulnerability and Development

1: Hazard

- “Process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation.”
- Three types:
 - Natural
 - Human Induced
 - Socionatural



Image: Tornado, USA, April 3, 2012.
Image credit: Nick Maroulis, 2012.

4. Disaster Risk Management (DRM), Vulnerability and Development

2: Exposure

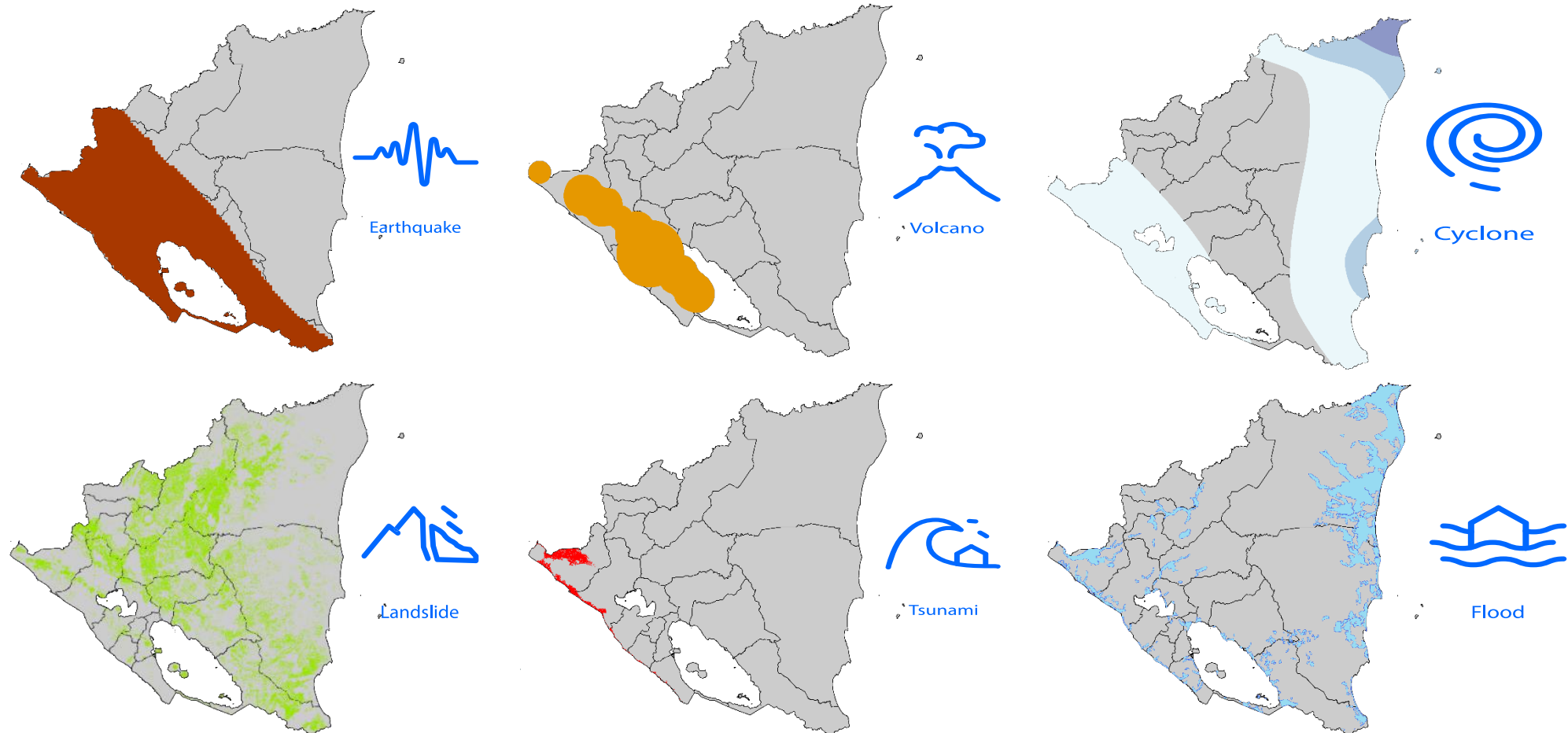
- Measure of what lies within the area that a hazard has the potential to affect
- Includes land, buildings, infrastructure, resources, agriculture, people, and more
- Differs significantly between hazards
- Exposure is not vulnerability



Image: 'Floating' lake community in Shan State, Myanmar.
Image credit: Damon Coppola, 2016.

4. Disaster Risk Management (DRM), Vulnerability and Development

Case Study: Nicaragua Hazard Exposure



3: Vulnerability

- Propensity to incur loss
- **Four vulnerability profiles**
 - Physical
 - Social
 - Economic
 - Environmental



Image: Traditional earth-brick homes that are highly vulnerable to seismic risk were ultimately to blame for the majority of deaths that occurred during the Bam Earthquake in 2004.
Image credit: Shehzad Noorani, UNICEF Iran.

4: Resilience

- The ability of individuals, households, communities, cities, institutions, systems and societies to prevent, resist, absorb, adapt, respond and recover positively, efficiently and effectively when faced with a wide range of risks, while maintaining an acceptable level of functioning and without compromising long-term prospects for sustainable development, peace and security, human rights and well-being for all.”
- The opposite of vulnerability



Image: The Singapore Marina Barrage is a freshwater catchment system that has, over time, created a vast freshwater reservoir that helps increase national resilience by reducing dependence on other countries for potable water. Image credit: Bernard Yeo, 2011.

4. Disaster Risk Management (DRM), Vulnerability and Development

5: Risk

- **Private sector:** Risk is the effect of uncertainty on objectives
- **Disaster management community:**
 - Risk = likelihood X consequences
 - Likelihood can be:
 - Probability
 - Frequency
 - Consequences
 - Effect on people
 - Effect on property
 - Effect on environment
 - Effect on economy

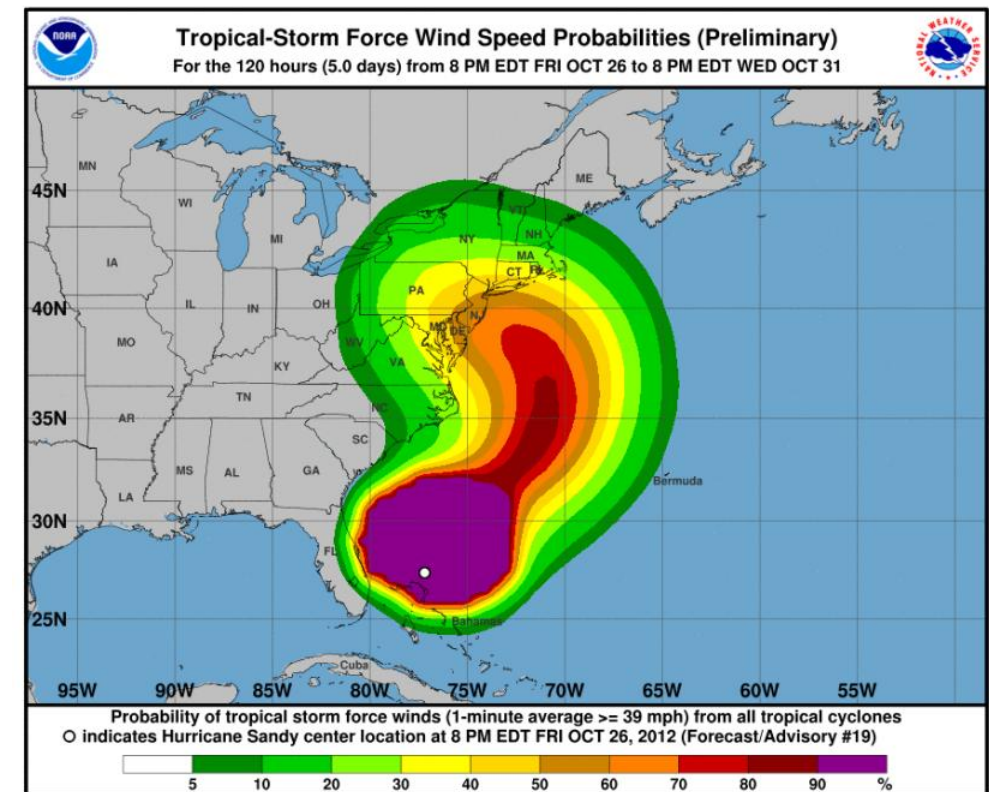


Image: US Government hurricane track probability chart.
Image credit: US National Weather Service, 2012.

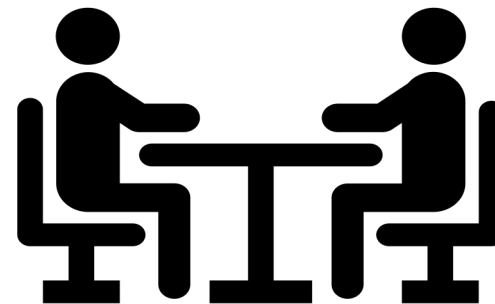
6: Disaster

- A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts.
- Determined by response/recovery requirements, and the capacity to address them.
- **Emergency** becomes disaster when one or more requirements goes unmet by all stakeholders.
- **Disasters** are not the inevitable result of hazards



Image: Spanish Air Force plane dropping fire retardant.
Image credit: Ignacio Ferre Perez, 2017.

Group Work and Activities



■ Discussion 2: Event Versus Disaster

- What is the defining threshold for a disaster in your country?
- Is this threshold easily defined?
- What are the characteristic differences between an event that is adequately managed, and one that the public or the media would deem to be disastrous?

4. Disaster Risk Management (DRM), Vulnerability and Development

■ Disaster Impacts on Poor Countries

- Development efforts stunted, erased, or even reversed.
- GDP diverted away from development, social programs, or debt repayment
- Infrastructure is damaged or destroyed.
- Students left without adequate education for months or even years
- Increase in disease vulnerability
- Surges in unemployment and decreased economic stability and strength
- Shortages of materials and labor / increased construction costs / poached workers
- Loss of institutional knowledge, cultural and social identity, and economic viability
- Rapid upsurge in crime and insecurity
- Increased rates of depression and a lack of motivation

4. Disaster Risk Management (DRM), Vulnerability and Development

■ Physical Vulnerability

Geography



Infrastructure



Populations



4. Disaster Risk Management (DRM), Vulnerability and Development

- Religion
- Age
- Gender
- Literacy
- Language
- Health
- Politics
- Security
- Human rights
- Government and governance
- Social equality and equity
- Traditional values
- Culture

■ Social Vulnerability



Image: Russian Orthodox Pilgrims.
Image credit: Partriarchia.Ru. 2019.

4. Disaster Risk Management (DRM), Vulnerability and Development

■ Environmental Vulnerability

- Environment affected by disasters
- Environment as a natural buffer
- Practices, laws, and processes



Image: Barrier islands.
Image credit: Science Source. 2013.

4. Disaster Risk Management (DRM), Vulnerability and Development

Economic Vulnerability

- Gross domestic product
- Debt
- Access to credit
- Insurance coverage
- Sources of national income
- Availability of disaster reserve funds
- Social distribution of wealth
- Prevalence of business continuity planning
- Economic diversity (the range of products and resources that drive the economy)
- Philanthropic giving

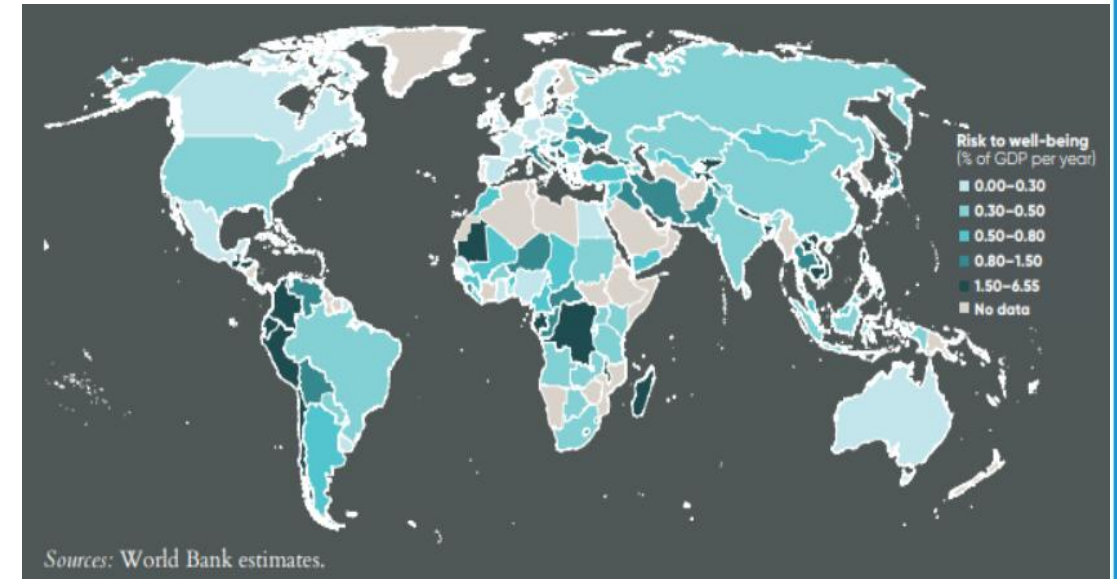
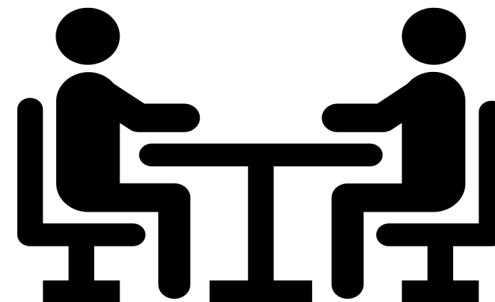


Image: Risk as a percent of GDP per year.
Image credit: World Bank. 2014.

Group Work and Activities



■ Discussion 3: Economic Vulnerability

- It is often stated that poor countries experience more disasters than wealthy ones.
- **The Facilitator** can lead a discussion about whether Participants believe this statement to be true, and why or why not.
- The Facilitator can ask Participants what role GDP may play in determining what is a disaster, and what relative impact disasters have on society.

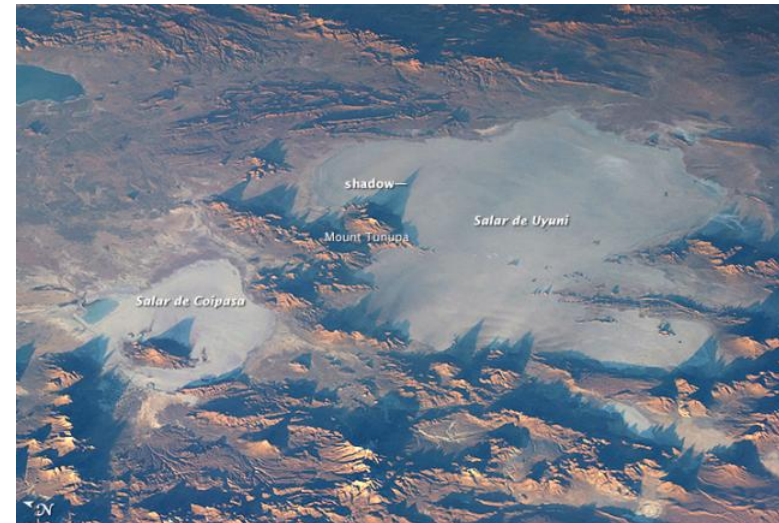
4. Disaster Risk Management (DRM), Vulnerability and Development

Unique Vulnerability

SIDS

LLDCs

LDCs



4. Disaster Risk Management (DRM), Vulnerability and Development

■ Small Island Developing States (SIDS)

- Small size
- Remote locations
- Limited resources / investments
- Limited exports
- Small/undiversified economies
- High debt-burden
- Poor infrastructure
- Exposure to global environmental challenges and external economic shocks, including to a large range of impacts from climate change and potentially more frequent and intense natural disasters

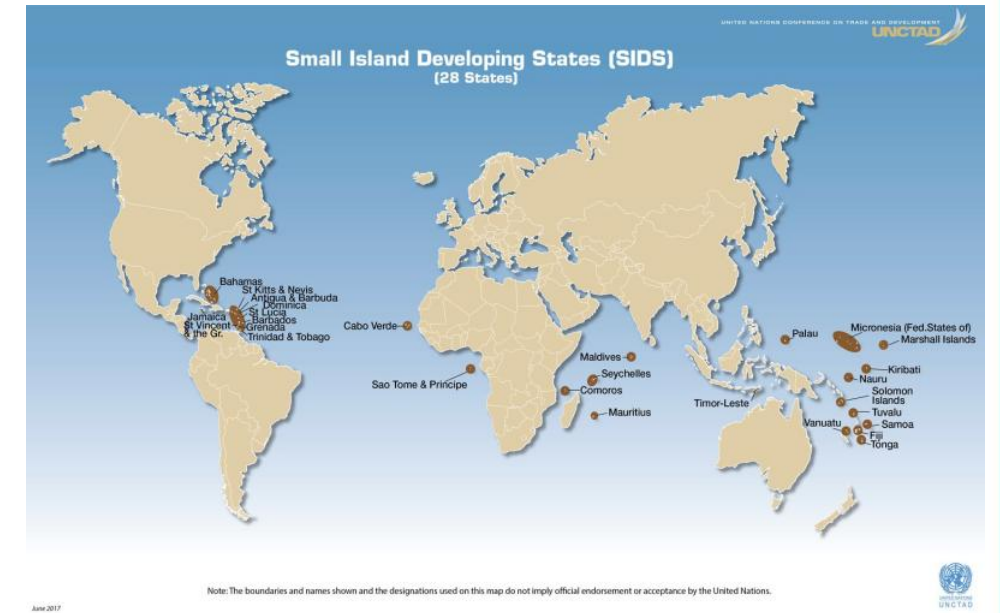


Image: Map of SIDS.
Image credit: UNCTAD. 2019.

4. Disaster Risk Management (DRM), Vulnerability and Development

■ Landlocked Developing Countries (LLDCs)

- No access to major navigable waters
- Special trade and development challenges
- Weak transit infrastructure
- Unpredictable rainfall
- Land degradation
- Rapid urbanization

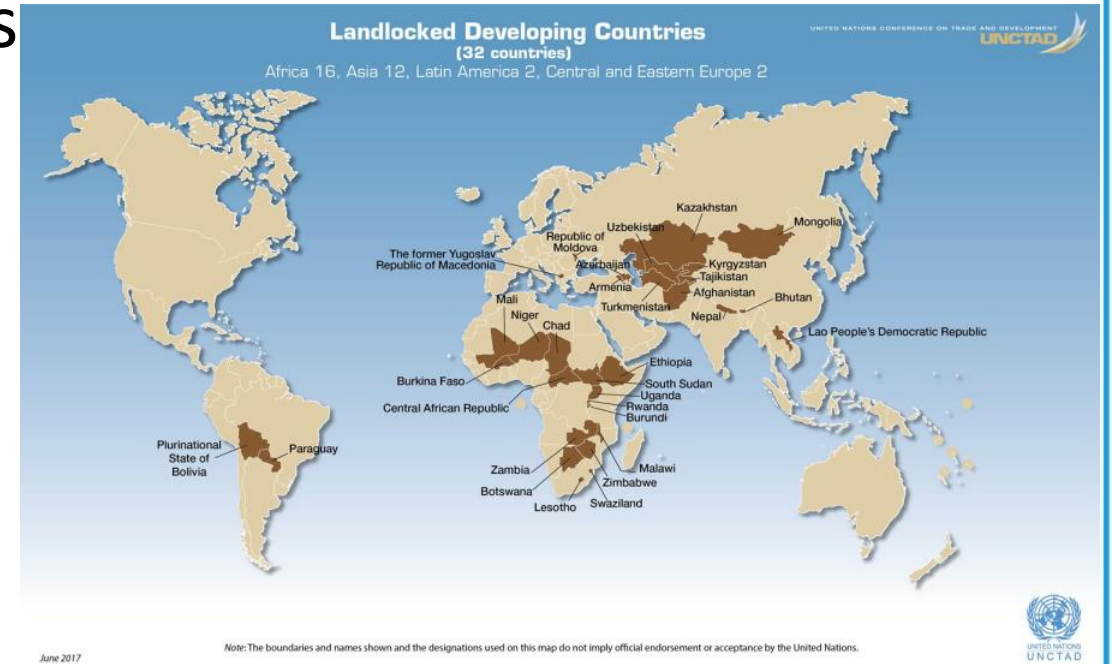


Image: Map of LLDCs, worldwide.
Image credit: UNCTAD, 2019.

4. Disaster Risk Management (DRM), Vulnerability and Development

- **Least Developed Countries (LDCs)**

- Three identification criteria:
 - Gross national income (GNI) per capita (US\$1,025 or less)
 - Human assets index (HAI)
 - Economic vulnerability index (EVI)

- Development hampered by may challenges

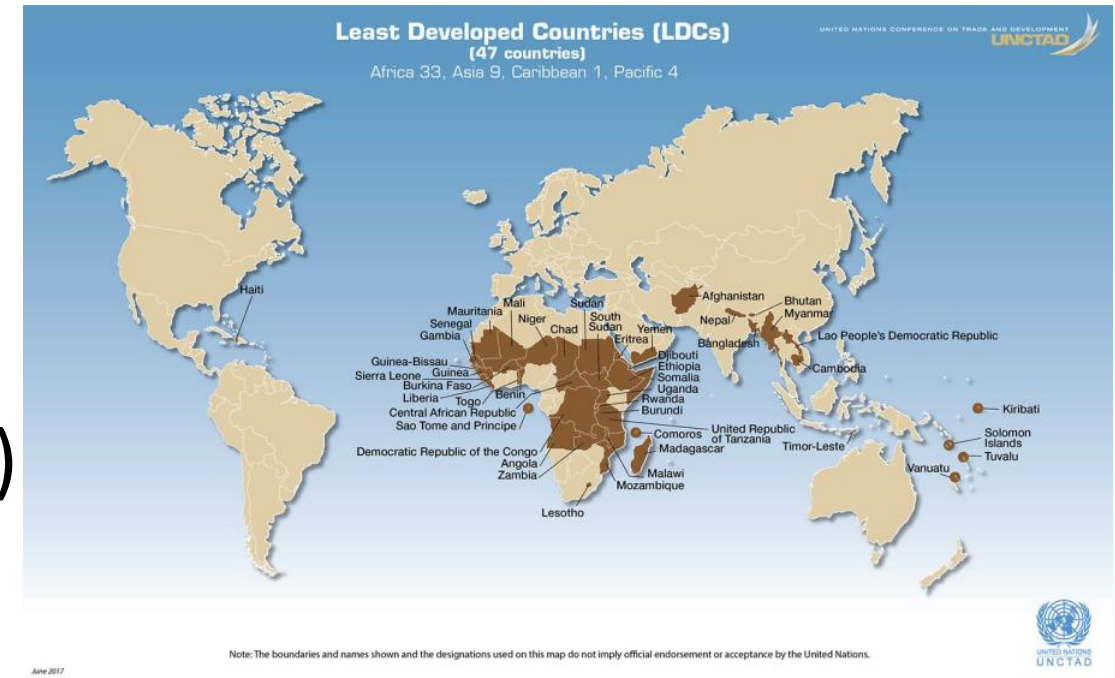
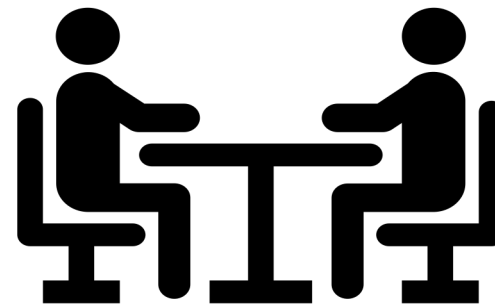


Image: Map of LDCs, worldwide. Image credit: UNCTAD, 2019.

Group Work and Activities



■ Activity 4: National Disaster Risk Brief

■ For this activity, Participants will use the listed resources below and their own knowledge and experience to generate a brief risk profile for their country. Participants from the same country can work in teams. The risk profile should include the following:

- List of top five hazards (ranked by potential to cause a disaster)
 - Rough map of exposure to those five hazards
 - Top 3 drivers of vulnerability
 - Top 3 priorities for disaster risk reduction
- PreventionWeb Collection of Country Risk and DRR Governance Profiles:
<https://www.preventionweb.net/collections/country-profiles>
 - Index for Risk Management (INFORM):
<https://drmkc.jrc.ec.europa.eu/inform-index>
 - Caribbean Catastrophe Risk Insurance Facility Country Risk Profiles:
https://www.ccrif.org/content/publications/risk_profiles
 - World Bank Country Risk Profiles of ECA Region for Flood and Earthquake:
<https://www.worldbank.org/en/region/eca/publication/europe-and-central-asia-country-risk-profiles-for-floods-and-earthquakes>
 - World Bank Global Facility for Disaster Reduction and Recovery (GFDRR) Country Risk Profiles:
<https://www.gfdr.org/en/disaster-risk-country-profiles>

4. Disaster Risk Management (DRM), Vulnerability and Development

■ Disaster Risk Management (DRM)

Three forms of DRM:

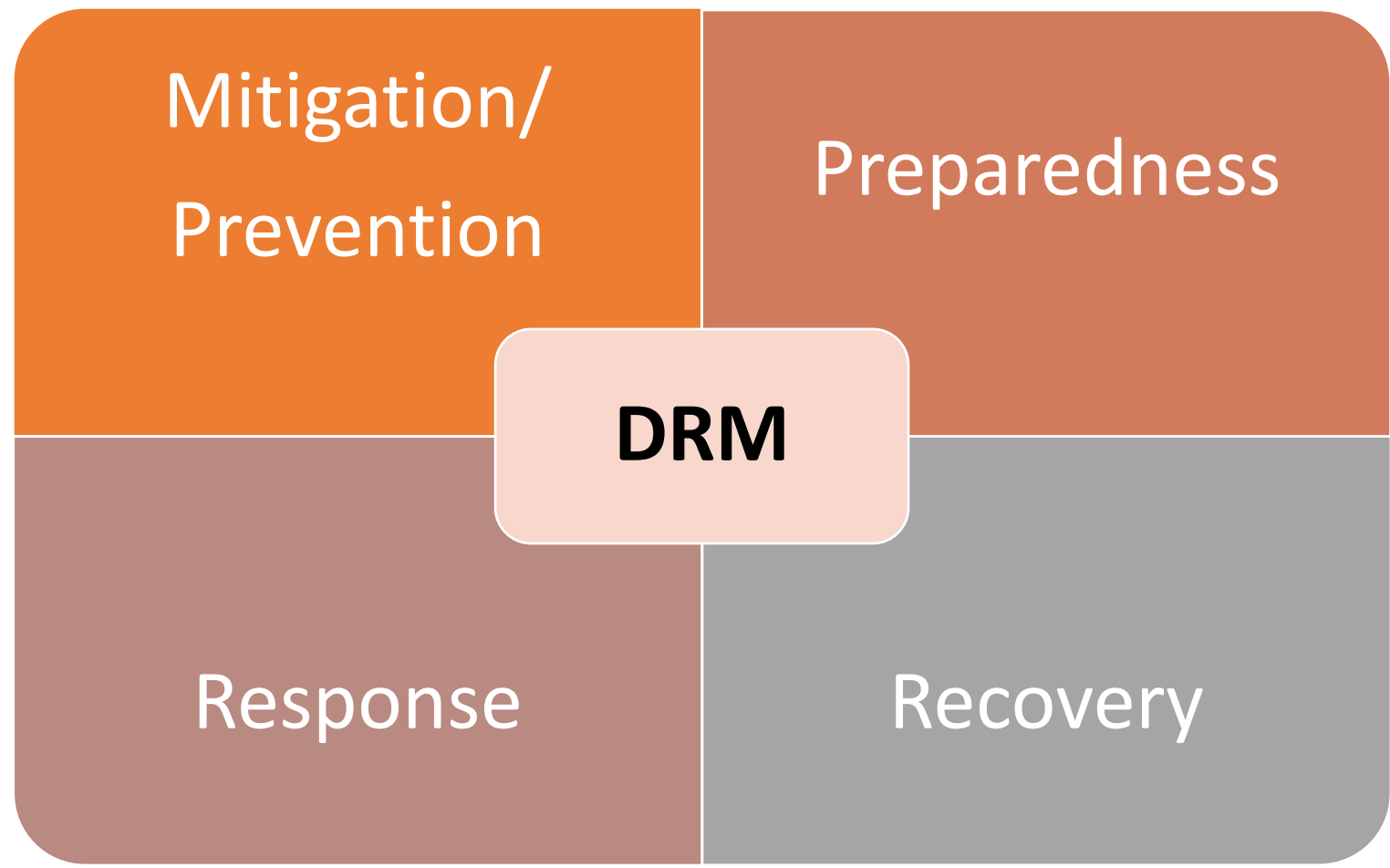
1. Prospective
2. Corrective
3. Compensatory

“The application of disaster risk reduction policies and strategies to prevent new disaster risk, reduce existing disaster risk and manage residual risk, contributing to the strengthening of resilience and reduction of disaster losses.”

Quotation Source: UNDRR, 2017.

4. Disaster Risk Management (DRM), Vulnerability and Development

■ DRM Functions



4. Disaster Risk Management (DRM), Vulnerability and Development

■ Linking DRM and Sustainable Development Functions



Image: <https://images.app.goo.gl/cZ9wEC79nRoqZb1W8>

Image: <https://images.app.goo.gl/o2wuSc5u3cm55UEi7>

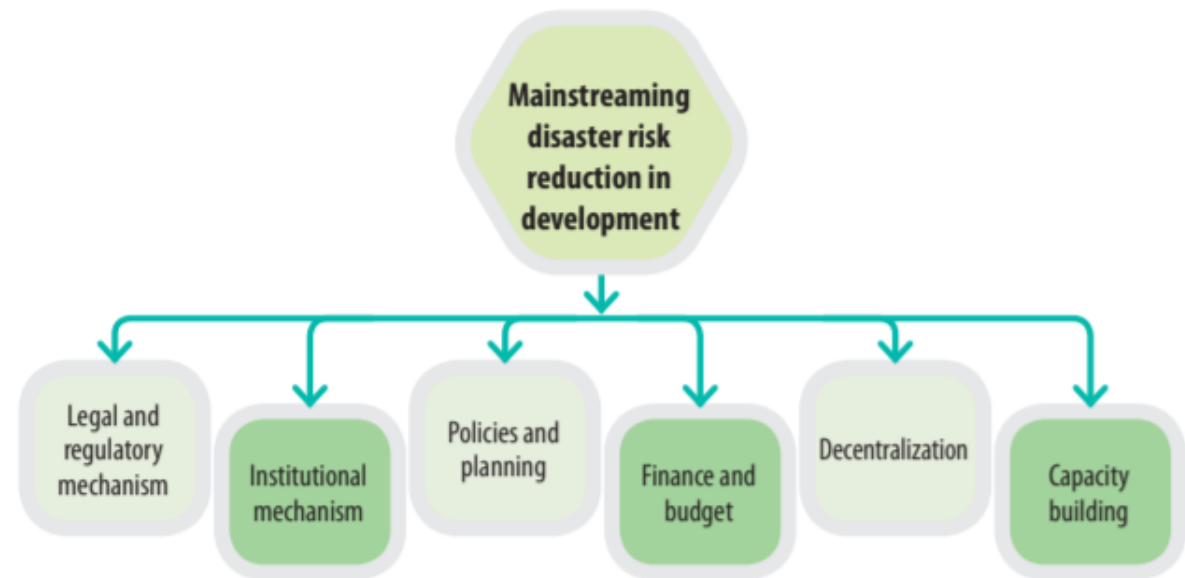
4. Disaster Risk Management (DRM), Vulnerability and Development

Principles for integrating disaster risk reduction into development

Strategic Principles	Targets
A. Legal and regulatory mechanisms	Adopt, or modify where necessary, legislation to support disaster risk reduction, including regulations and mechanisms that encourage compliance and promote incentives for undertaking risk reduction and mitigation activities.
B. Institutional mechanisms	Support the creation and strengthening of national integrated disaster risk reduction mechanisms, such as multisectoral national platforms, with designated responsibilities at the national through the local levels to facilitate coordination across sectors.
C. Policies and planning	Integrate risk reduction, as appropriate, into development policies and planning at all levels of government, including in poverty reduction strategies and sectors and multisector policies and plans.
D. Finance and budgeting	Allocate resources for the development and the implementation of disaster risk management policies, programmes, laws and regulations on disaster risk reduction in all relevant sectors and authorities at all levels of administrative and budgets on the basis of clearly prioritized actions.
E. Decentralization	Recognize the importance and specificity of local risk patterns and trends; decentralize responsibilities and resources for disaster risk reduction to relevant subnational or local authorities, as appropriate.
F. Capacity building	Assess existing human resource capacities for disaster risk reduction at all levels and develop capacity-building plans and programmes for meeting on-going and future requirements.

<https://www.unescap.org/sites/default/files/apdr2015-ch5.pdf>

- Principles of mainstreaming disaster risk reduction in development.



https://www.unescap.org/sites/default/files/publication_WEBdrr02_Mainstreaming.pdf

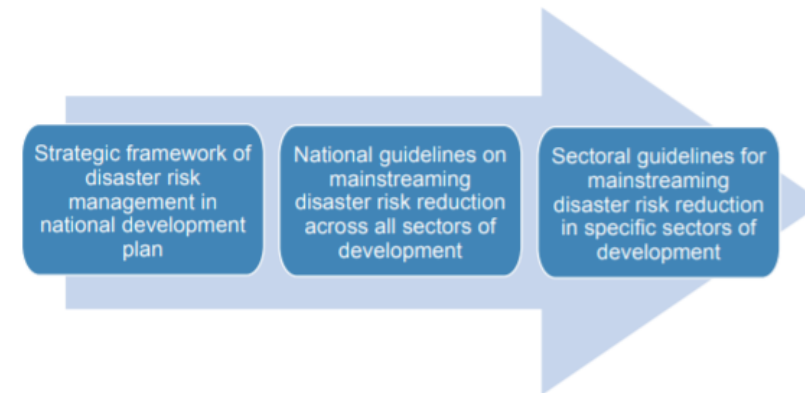
4. Disaster Risk Management (DRM), Vulnerability and Development

- Three-dimensional view of the disaster - development nexus



- Disaster risk reduction is an essential component of sustainable development.

Interconnected processes for integrating disaster risk reduction into sustainable development



https://www.unescap.org/sites/default/files/publication_WEBdrr02_Mainstreaming.pdf

<https://www.unescap.org/sites/default/files/apdr2015-ch5.pdf>

4. Disaster Risk Management (DRM), Vulnerability and Development

- Pillars of Disaster Risk Management



<https://www.rmsi.com/blog/wp-content/uploads/2018/08/four-pillars-of-disaster-management.jpg>

4. Disaster Risk Management (DRM), Vulnerability and Development

Mainstreaming DRR within the Sustainable Development Goals

SDG	Target
Goal 1: Ending poverty in all its forms	target 1.5: Reduce exposure of the poor to climate related extreme events and disasters
Goal 2: Ending hunger, achieving food security and promoting sustainable agriculture	target 2.4: Strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters
Goal 3: Ensuring healthy lives	target 3.6: Develop early warning and reduce risk of national and global health
Goal 4: Ensuring inclusive and equitable quality education	target 4a: Build and upgrade educational facilities that are safe
Goal 9: Building resilient infrastructure	target 9.1: Develop quality, reliable, sustainable and resilient infrastructure
Goal 11: Making cities and human settlements safe, resilient and sustainable	target 11.5: Significantly reduce the number of deaths, affected and economic losses by disasters
Goal 13: Combating climate change and its impacts	target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters
Goal 15: Reversing land degradation	target 15.3: Restore land affected by drought and floods

https://www.unescap.org/sites/default/files/publication_WEBdrr02_Mainstreaming.pdf

4. Disaster Risk Management (DRM), Vulnerability and Development

■ Mitigation

Structural Mitigation:

- Resistant construction
- Building codes and regulatory measures
- Relocation
- Structural modification
- Construction of community shelters
- Construction of barrier, deflection, and retention systems
- Detection systems
- Physical modification
- Treatment systems
- Redundancy in life safety infrastructure

Non-structural Mitigation:

- Regulatory measures
- Community awareness and education programs
- Nonstructural physical modifications
- Environmental control
- Behavioral modification

Source: Coppola, Damon P. 2014. Introduction to International Disaster Management. Elsevier. Burlington.

4. Disaster Risk Management (DRM), Vulnerability and Development

■ Preparedness

- Assumes the occurrence of a hazard event (as opposed to mitigation)
- Components include:
 - Planning
 - Equipment and supply acquisitions
 - Training, education, and exercises
 - Public education
 - Pre-positioning
 - Partnership building
 - Monitoring



Image: Civil Defense volunteers in India participate in a disaster exercise.
Source: The Telegraph. 2019.

4. Disaster Risk Management (DRM), Vulnerability and Development

■ Response

Common response functions:

- Notification and Warning
- Disaster Assessment
- Emergency Communications
- Command, Control, and Coordination
- Transportation
- Public Works and Engineering
- Firefighting
- Mass Care
- Shelter
- Psychosocial Services
- Logistics
- Public Health and Medical Services
- Search and Rescue
- Hazardous Materials Response
- Agriculture and Natural Resources
- Energy
- Public Safety and Security
- Long-Term Recovery

The taking of action to reduce or eliminate the impact of disasters that are imminent, that are currently occurring, or that have recently occurred, in order to prevent further suffering, financial loss, environmental damages, economic impacts, or other negative consequences.

4. Disaster Risk Management (DRM), Vulnerability and Development

- **UN Clusters**

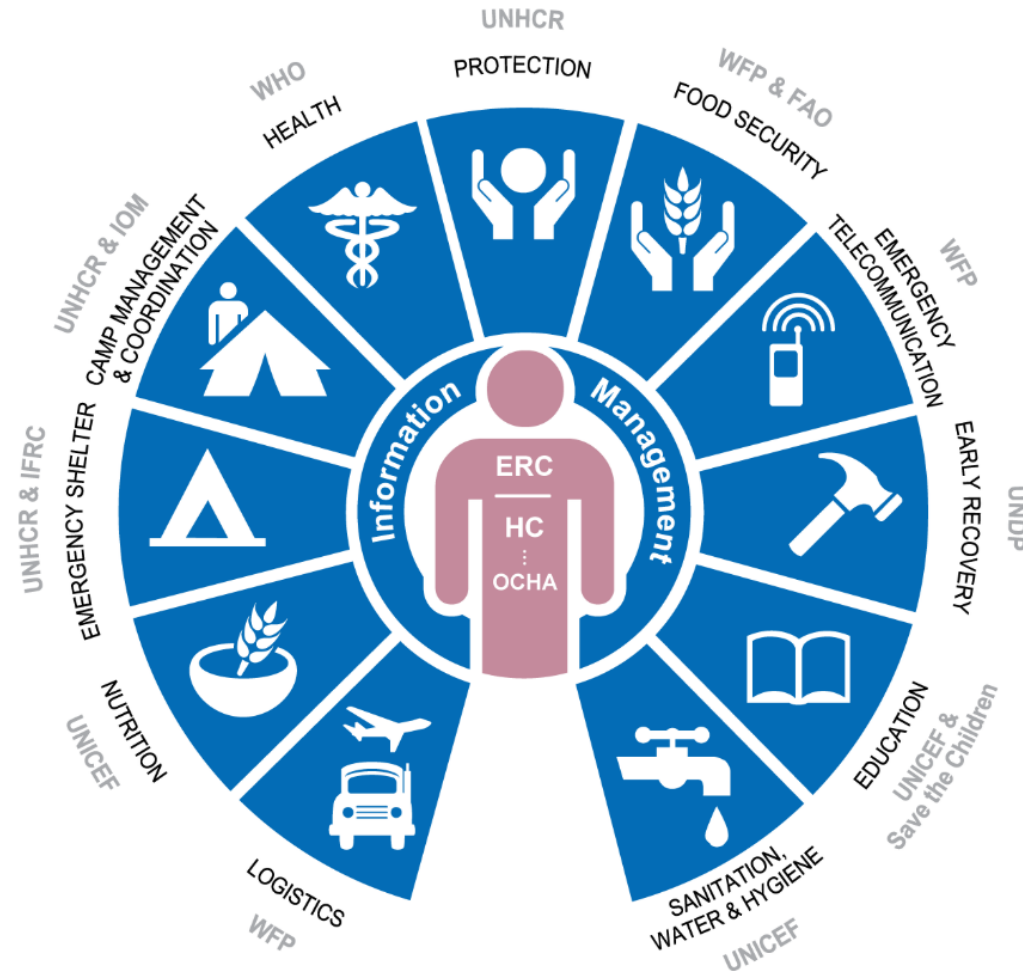


Image Source: <https://www.buildingabetterresponse.org/course/view.php?id=43§ion=3&lang=ar>

4. Disaster Risk Management (DRM), Vulnerability and Development

■ Recovery

- Recovery involves returning disaster-impacted communities and the people affected by disasters to a functional state (ideally back on a positive development trajectory).
- Components of recovery begin as soon as the direst aspects of relief and response have concluded, and can persist for months, years, and in the most extreme cases, decades thereafter.

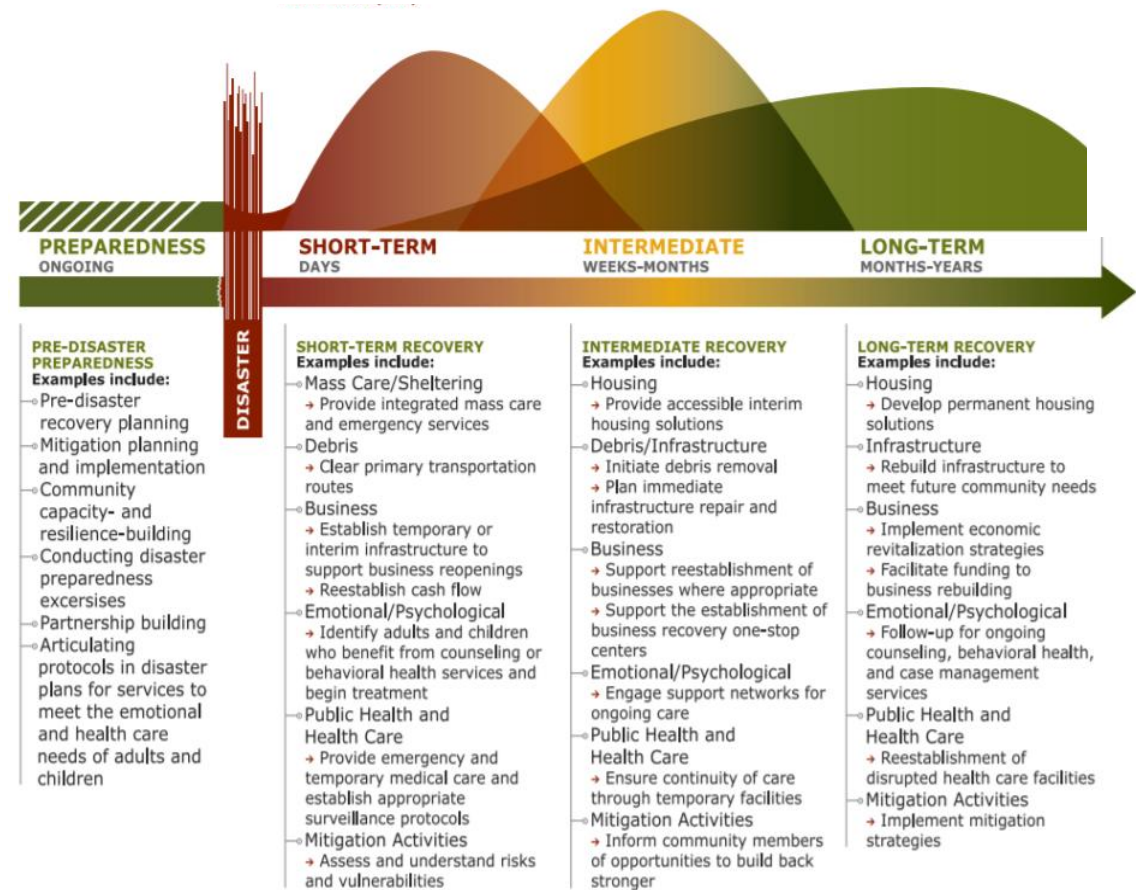


Image: The Recovery Continuum from the US National Disaster Recovery Framework.
 Source: US Federal Emergency Management Agency, 2011.

5. Disaster Risk Management Data Requirements

■ DRM Data Requirements

- **Data** generally refers to unprocessed numbers, figures, facts or images
- Robust and accurate information is key to decision making
- Big data for instance can help in all phases of DRM
- Information will almost always be imperfect and incomplete
- Goal – reduce uncertainty associated with decisions
- Pre-existing data sources
 - Demographics
 - Land use patterns / surveys
 - Infrastructure plans / prints
 - Historical impact maps
- New data sources
 - Seismic shake maps
 - Flood gauge readings
 - Meteorological data
 - Damage assessment



Image: Computer monitors and display screens in the Florida, US, Emergency Operations Center in advance of Hurricane Irma.
Source: Gina Jordan, 2017..

5. Disaster Risk Management Data Requirements

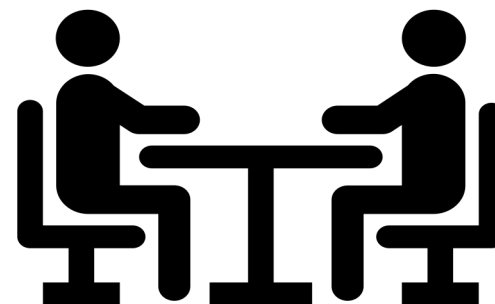
Mitigation Planning Data Requirements

- Hazard exposure data
- Hazard likelihood data
- Anticipated consequence data

LDF Hazard Risk Assessment Tool	PROBABILITY	TREND	Health and Public Safety	Home and Property Damage	Livelihood Impacts	Cultural Wellbeing	Environmental Harm	Damage to Infrastructure	Recovery Costs	Services	Government	Damage to Facilities / Agriculture	Risk Acceptability	Mitigation Potential	Relative Risk Ranking
All Hazards															
Plant and Animal Epidemic / Invasive Species / Species Loss	5	3	1	2	2	3	3	0	3	0	3	3	1		0.98
Illegal Drug Crisis	5	2	2	1	2	3	0	0	2	1	0	3	2		0.89
Severe Thunderstorms / Lightning / Hail	5	3	1	3	0	2	2	3	3	1	2	3	1		0.88
Epidemic / Pandemic / Vector-Borne Disease	2	3	3	0	3	3	0	0	2	2	2	3	2		0.84
Flood (flash flood, lake, river, stormwater)	4	3	0	2	1	3	3	1	3	1	2	2	2		0.83
Severe Winter Storms / Ice Storms	5	3	1	1	0	1	1	3	3	2	3	2	2		0.76
Forest / Wildland Fire	5	2	1	3	2	2	1	2	3	1	2	1	2		0.72
Hazardous Materials Release / Contamination / Run-off	4	3	1	0	0	3	3	0	3	0	0	3	2		0.66
Tornado / High Wind	2	2	2	2	2	2	2	2	3	1	3	2	2		0.44
Extreme Heat	5	3	1	0	0	1	2	1	0	2	0	2	2		0.44
Extreme Cold	4	1	2	2	1	0	0	3	1	2	1	1	2		0.35
School Violence / Armed Attack / Workplace Violence	2	2	3	0	0	1	0	0	1	2	0	2	2		0.31
Dam Failure	1	2	2	3	0	3	3	3	3	1	3	1	1		0.15

Image: Risk assessment data from a hazard mitigation planning effort.
 Source: Lac du Flambeau Tribe, 2019.

Group Work and Activities



■ Discussion 5: Data Sources

- **The Facilitator** can lead a discussion about where communities and countries may acquire the data required to conduct a mitigation planning effort.
 - Participants should consider the different hazards that exist in their countries
 - Data sources for hazard exposure might include?
 - Sources of data for hazard likelihood might include?
 - Sources of data for anticipated consequences include?
- The Facilitator can discuss with Participants where STI stands to enhance these efforts, and where such enhancements using technology do not make sense.

5. Disaster Risk Management Data Requirements

■ Hazard Monitoring and Warning Data

- Dynamic, real time
- May be automated or require human surveys
- Aerial imagery
- Citizen reporting

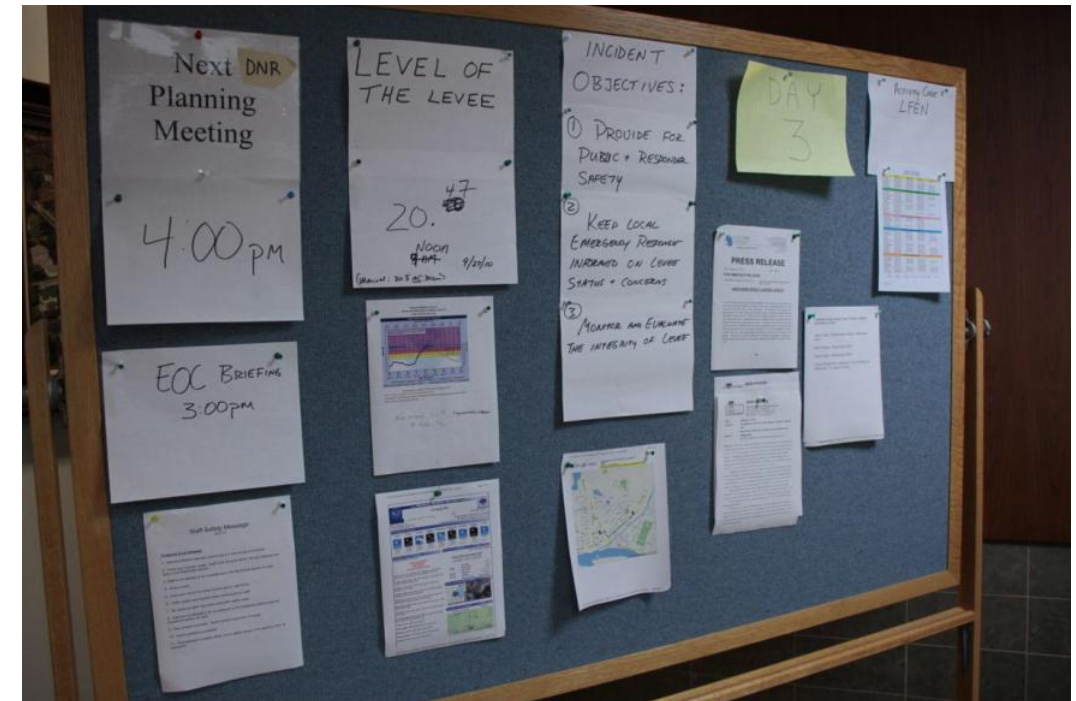


Top Image: Stream gauge on the Big Wood River, Idaho, USA. Bottom image: Mobile emergency alert message. Top Image Source: Lac du Flambeau Tribe, 2019.

5. Disaster Risk Management Data Requirements

■ Response and Recovery Data Requirements

- Current and detailed data and information
- Diverse stakeholders (end users)
- Situation Assessments
- Needs Assessments
- Reliability, Relevance, and Timeliness

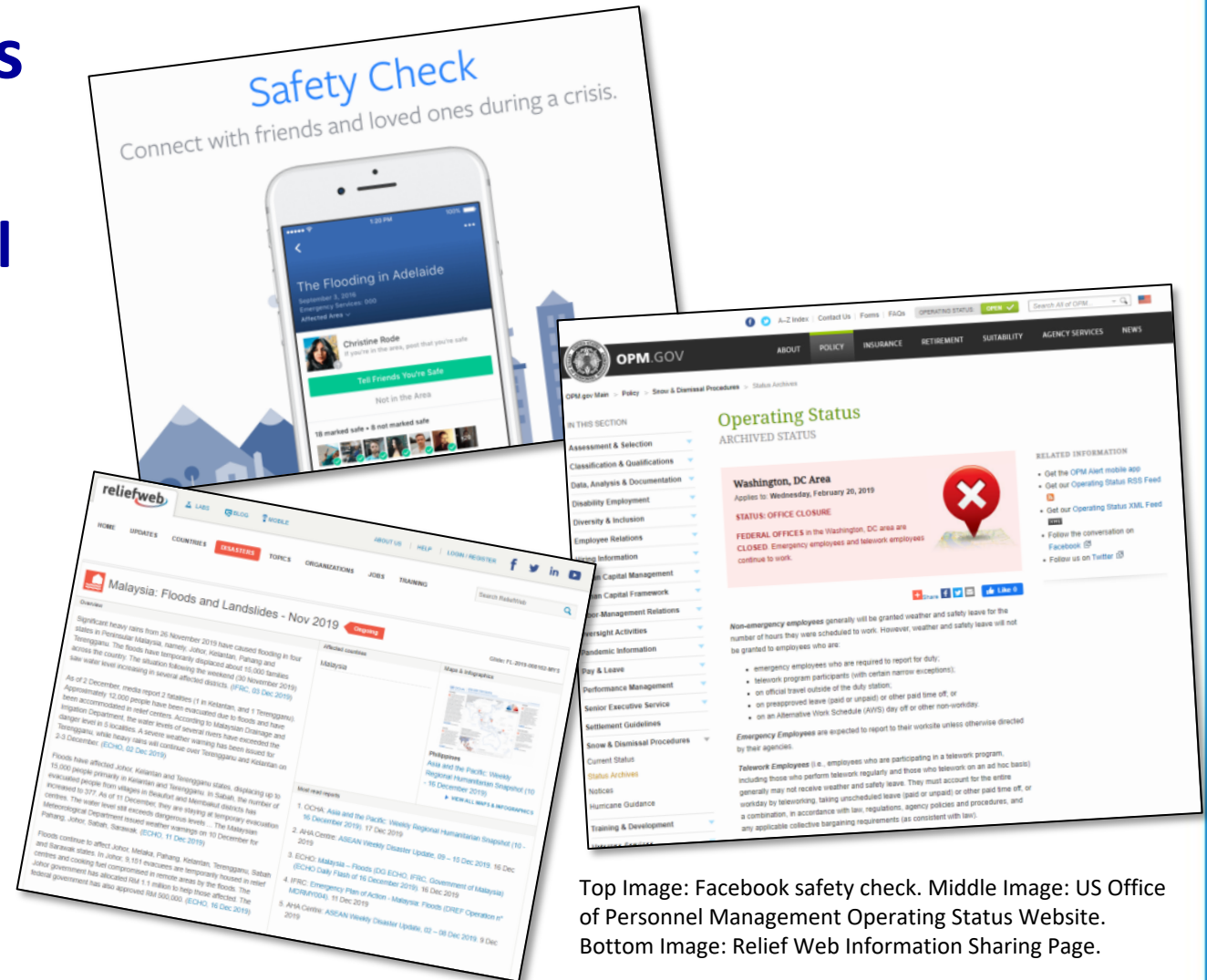


Top Image: Bulletin board in an active EOC.
Image Source: Portage Daily Register, 2010.

5. Disaster Risk Management Data Requirements

Information Sharing Systems

- Sharing at the **individual level**
- Sharing at the **organizational level**
- Sharing at the **inter-organizational level**



Top Image: Facebook safety check. Middle Image: US Office of Personnel Management Operating Status Website. Bottom Image: Relief Web Information Sharing Page.

5. Disaster Risk Management Data Requirements

■ Case Study: European-Mediterranean Seismological Centre (EMSC)

- Collects real-time information from over 70 seismological networks
- Earthquake events displayed on an easy-to-use, open access website
- Services supported by “LASTQUAKE” mobile phone app
 - Site-specific notifications
 - Citizen-science capabilities

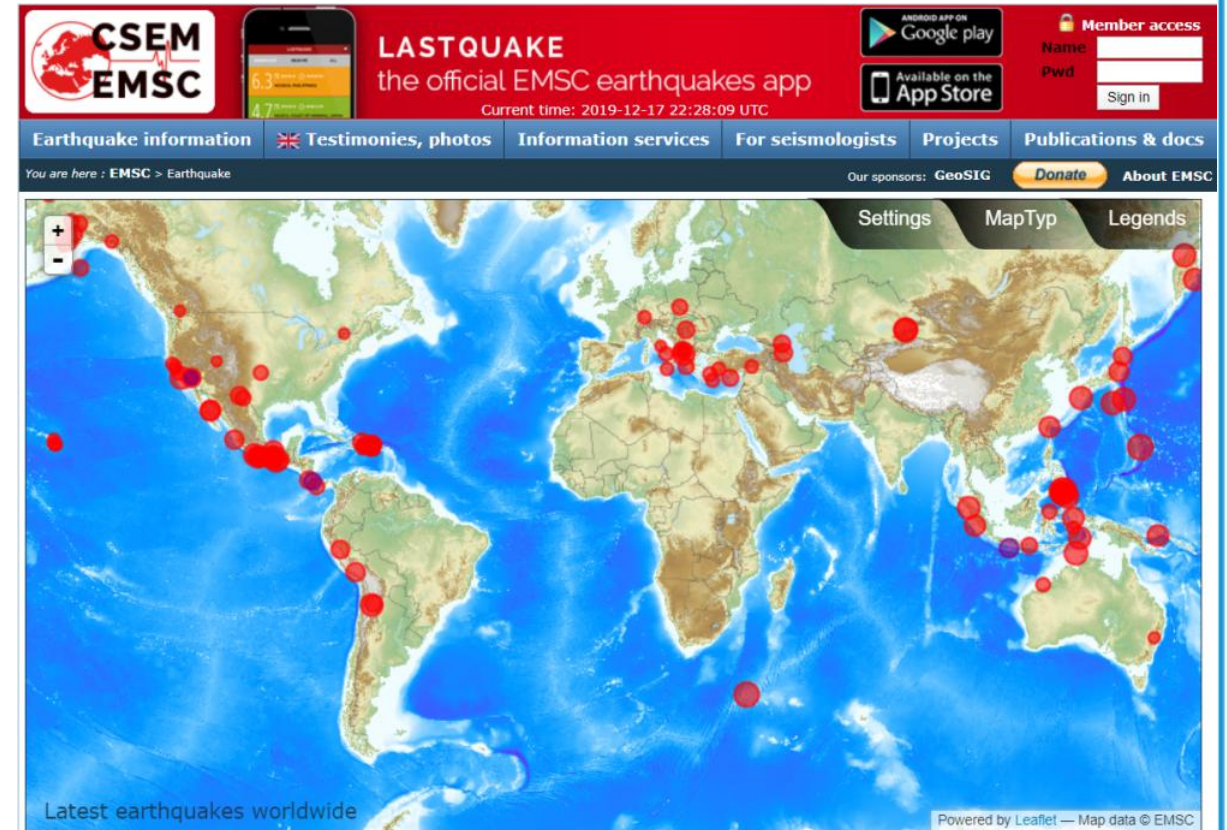


Image: Screenshot of the EMSC Website, December 17, 2019.
Source: EMSC, 2019.

6. Enhancing DRM and Resilience with STI

- Enhanced capacity
- New Capacity
- STI may:
 - Empower and give a voice to people of diverse backgrounds and classes
 - Increase inclusion of otherwise marginalized groups
 - Extend access to education and healthcare
 - Increase government accountability and transparency
 - Connect disparate social groups and community stakeholders
 - Expand economic diversification
 - Strengthen infrastructure networks and nodes
 - Reduce environmental degradation
 - Improve compliance with regulations (e.g., land use)

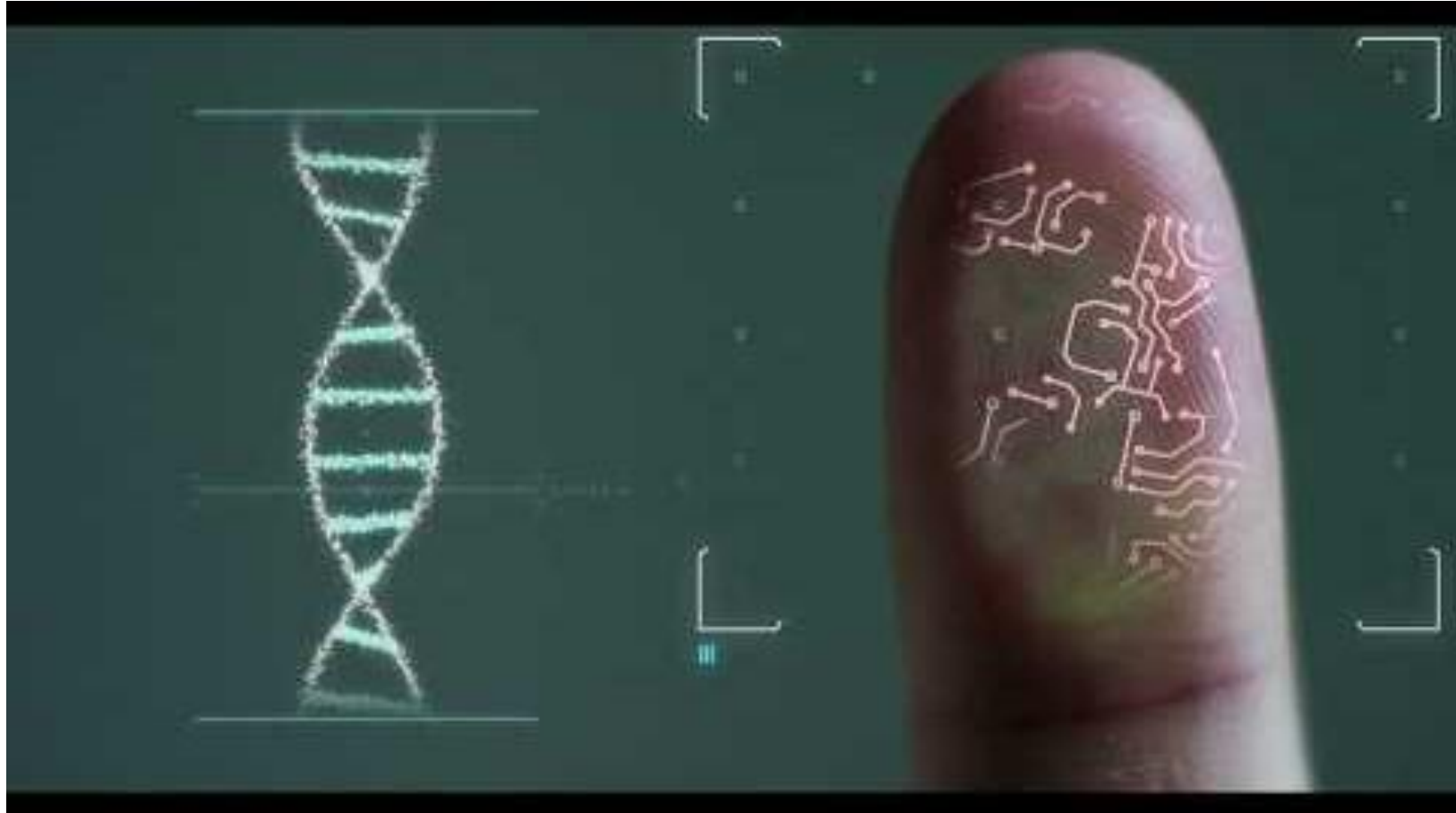
6. Enhancing DRM and Resilience with STI

“Science, technology and innovation play a critical role in building community resilience. Diverse fields of science generate new knowledge that improve understanding of the mechanisms and drivers of community resilience. New market-ready technologies create innovative opportunities for increasing economic, social and environmental resilience, and new approaches to innovation can bring together non-traditional innovation actors to unite their efforts and pool their resources towards community resilience.”

Source: UN Economic and Social Council. 2019. The role of science, technology and innovation in building resilient communities, including through the contribution of citizen science. Commission on Science and Technology for Development. March 4. <http://bit.ly/2lCq48U>.EMSC, 2019.

6. Enhancing DRM and Resilience with STI

- **Frontier Technologies for a Sustainable Future**

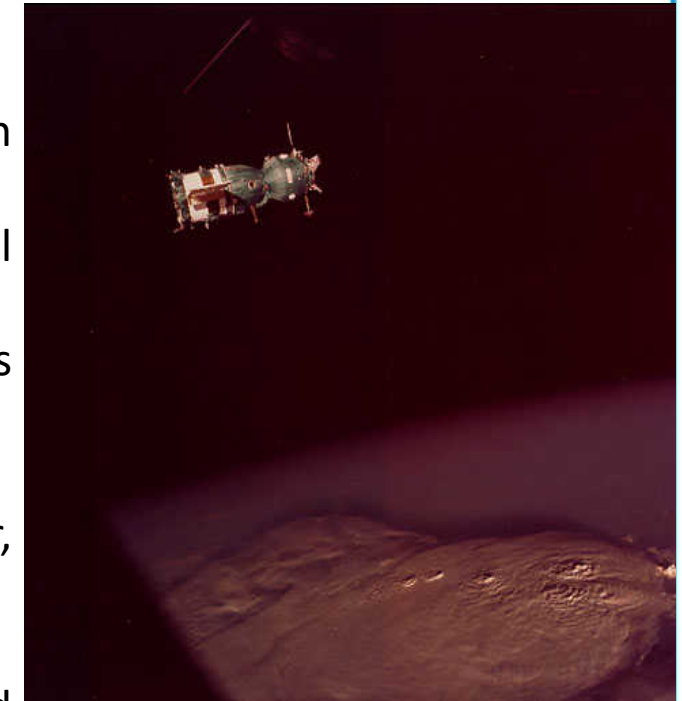


6. Enhancing DRM and Resilience with STI

■ Action-Specific Enhancements

STI may:

- Make possible the monitoring of otherwise poorly understood environmental risks
- Accurately map geographic areas associated with high risk from distinct hazards
- Elevate risk and hazard awareness among exposed and other populations (with forecasting, detection, and sensing)
- Elevate operational awareness before and during actualized events (situational awareness / common operating picture)
- Increase or improve capabilities and capacities to conduct damage and needs assessments
- Reduce the health and life safety risk of exposed individuals and responders
- Reduce personal and property vulnerability to hazard forces like heat, wind, water, and seismicity
- Increase the speed, range, and access of warning information
- Enable citizen participation in hazard mitigation and post-disaster response and recovery data and information generation

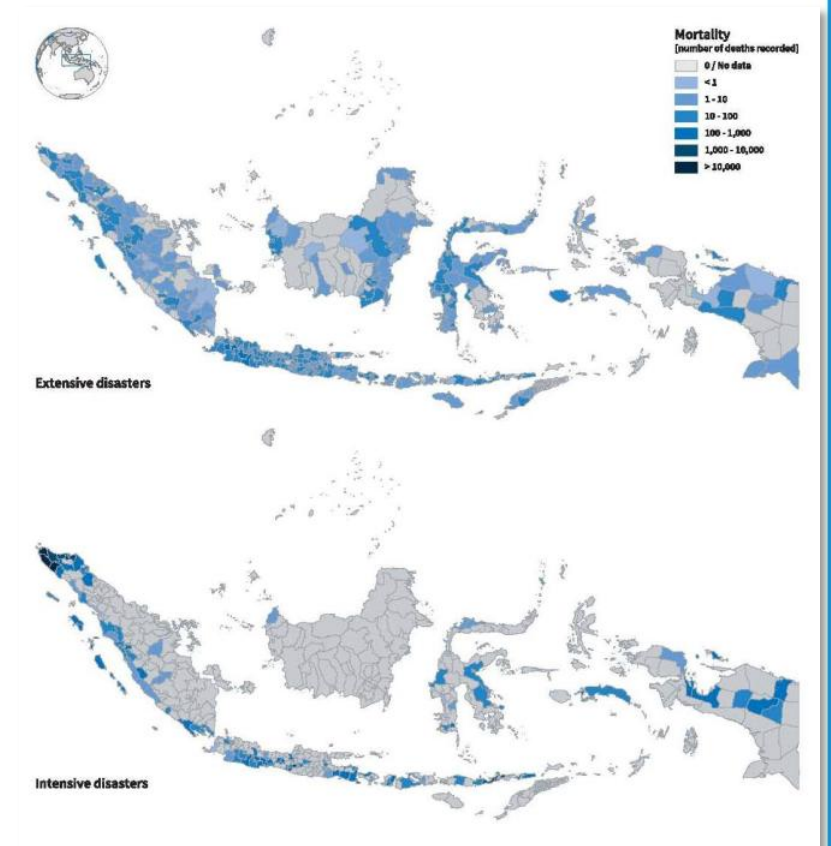


Source: US and Russian Space Stations viewing a storm over the Soviet Union, 1975. Source: NASA, 1975.

6. Enhancing DRM and Resilience with STI

Resilience Enhancements for Intensive, Extensive, and Emerging Risk

- Intensive Risk:** Medium to high likelihood and high consequence events
- Extensive Risk:** Very high likelihood and moderate consequence events; primarily weather-related
- Emerging Risk:** Lower yet increasing frequency with high potential consequences



Source: Maps of Intensive and Extensive Risk in Indonesia, 1990-2013. Source: UNDRR, 2015.

6. Enhancing DRM and Resilience with STI

■ Methods of Support

- Conducting or informing original research
- Conducting or informing hazard assessment and analysis
- Conducting or informing consequences analyses, including forecasting and assessment of cascading risks
- Developing, validating, and utilizing applied tools and standards to support the risk reduction mission
- Designing, developing, and utilizing technologies that support pre- and post-disaster risk reduction activities
- Using new methods and technologies to conducting risk reduction education and communication

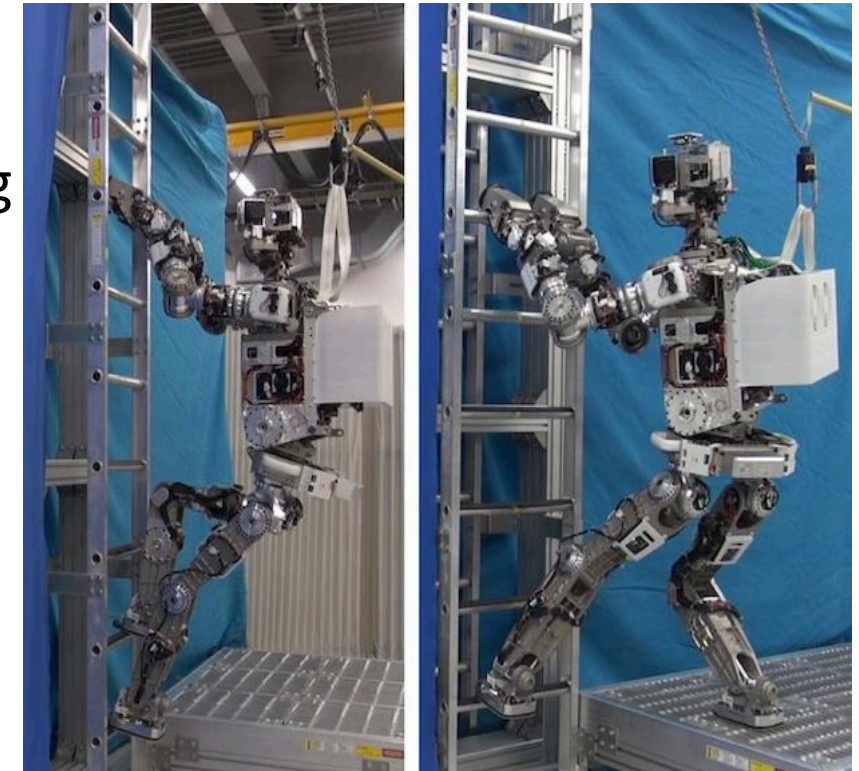


Image: Robot testing conducted by Honda to support disaster response.
Source: Honda, 2015.

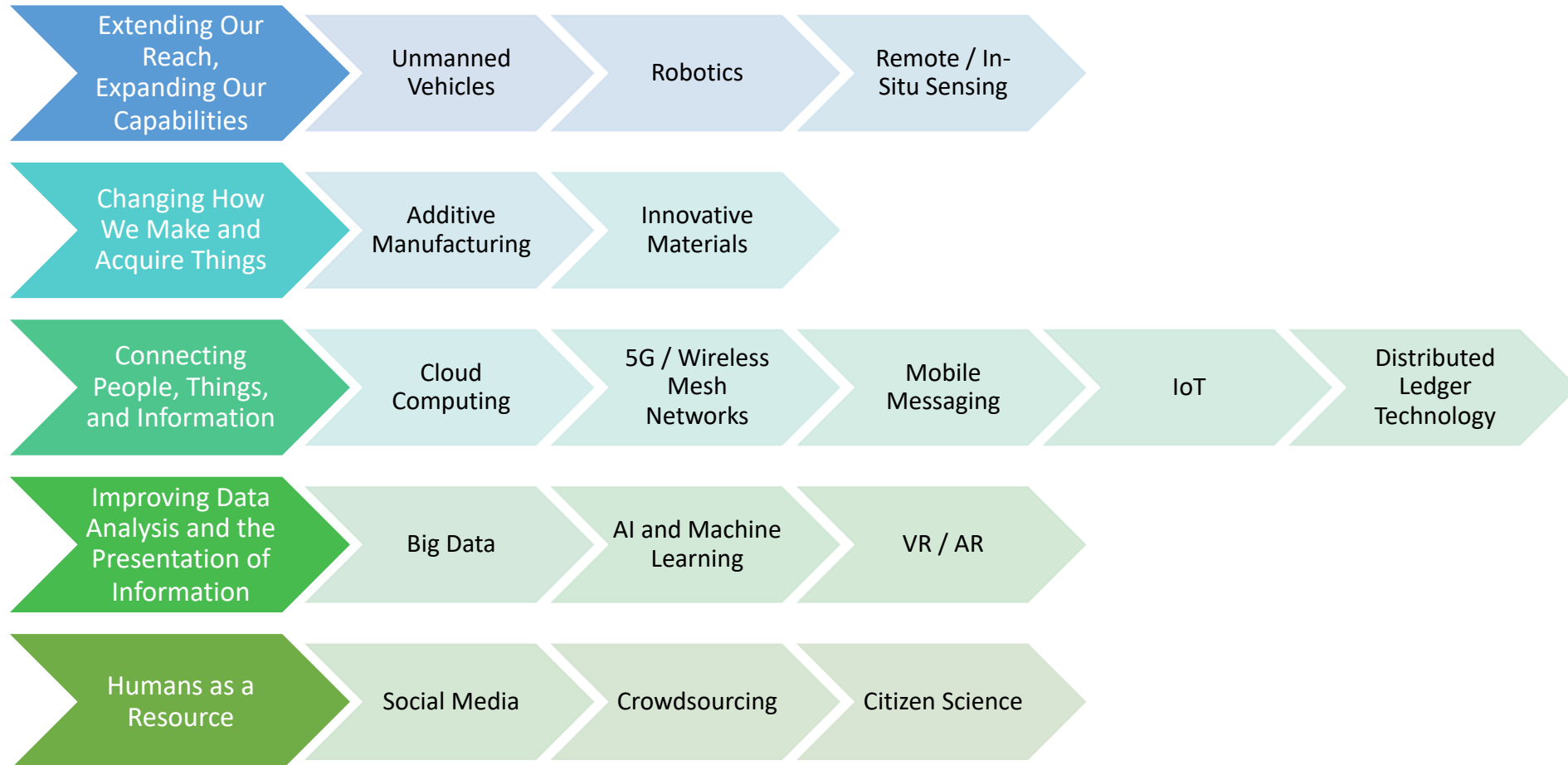
6. Enhancing DRM and Resilience with STI

■ ICTs in all DRM Phases

Mission Area	Description	Core Capabilities	
Preparedness	The capabilities necessary to secure the country against acts of terrorism and manmade or natural disasters	<ul style="list-style-type: none"> • Planning • Public Information and Warning • Operational Coordination • Access Control and Identity Verification 	<ul style="list-style-type: none"> • Cybersecurity • Intelligence and Information Sharing • Physical Protective Measures • Supply Chain Integrity and Security
Mitigation and Prevention	The capabilities necessary to reduce risk and loss of life and property by lessening the impact of disasters.	<ul style="list-style-type: none"> • Planning • Public Information and Warning • Operational Coordination • Community Resilience 	<ul style="list-style-type: none"> • Long-term Vulnerability Reduction • Risk and Disaster Resilience Assessment • Threats and Hazards Identification • Integrated Risk Governance
Response	The capabilities necessary to save lives, protect property and the environment, and meet basic human needs after an incident has occurred	<ul style="list-style-type: none"> • Environmental Response/Health and Safety • Fatality Management Services • Fire Management and Suppression • Infrastructure Systems • Logistics and Supply Chain Management • Mass Care Services 	<ul style="list-style-type: none"> • Mass Search and Rescue Operations • On-scene Security, Protection, and Law Enforcement • Operational Communications • Public Health, Healthcare, and Emergency Medical Services • Situational Assessment
Recovery	The capabilities necessary to assist communities affected by an incident to recover effectively	<ul style="list-style-type: none"> • Planning • Public Information and Warning • Operational Coordination • Economic Recovery 	<ul style="list-style-type: none"> • Health and Social Services • Housing • Infrastructure Systems • Natural and Cultural Resources

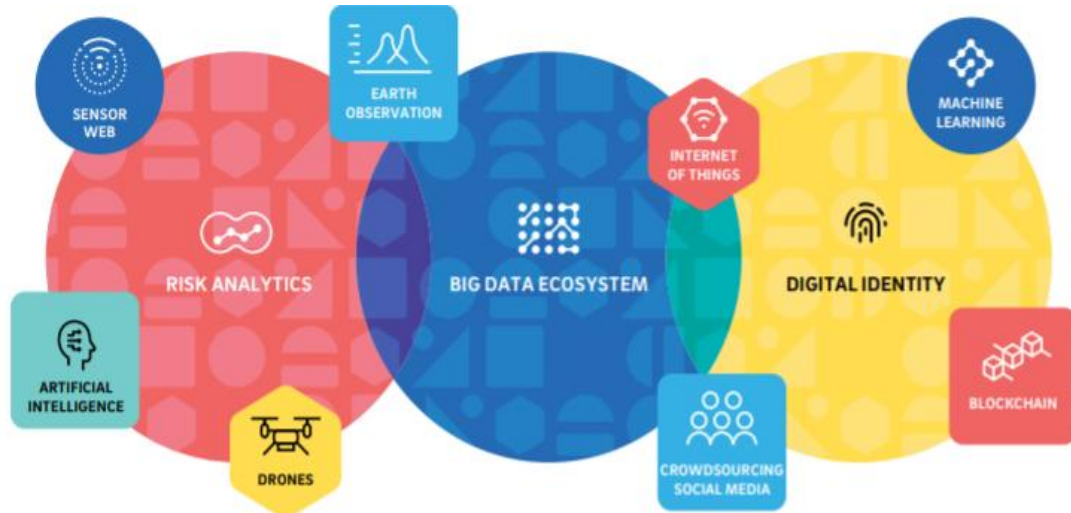
6. Enhancing DRM and Resilience with STI

Technologies and Innovations for DRR and Resilience

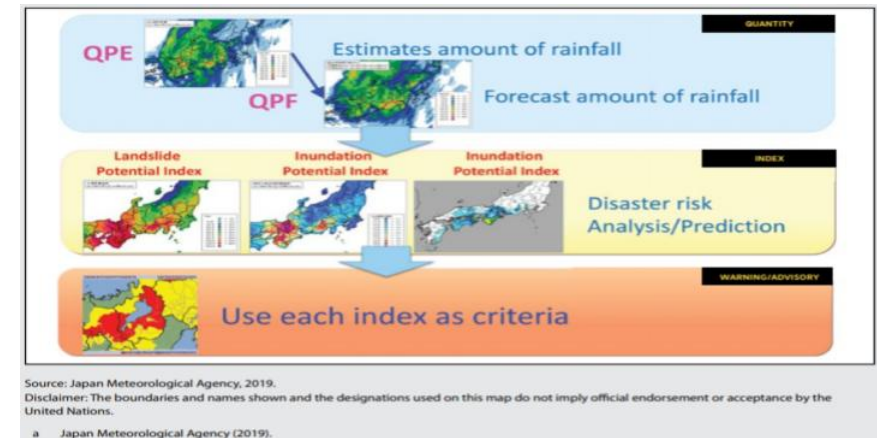


6. Enhancing DRM and Resilience with STI

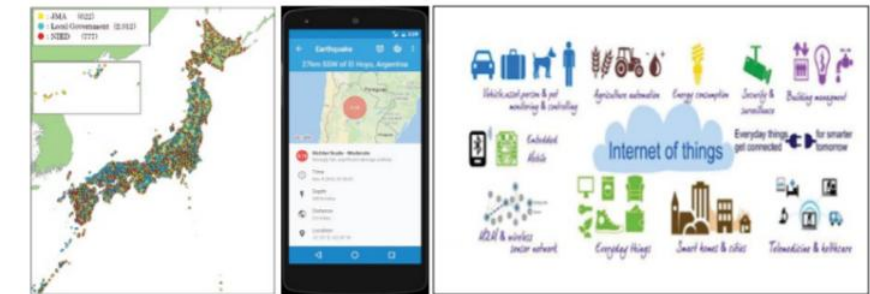
- New technologies for resilience, inclusion and empowerment



Big data used for flood forecasting in Japan

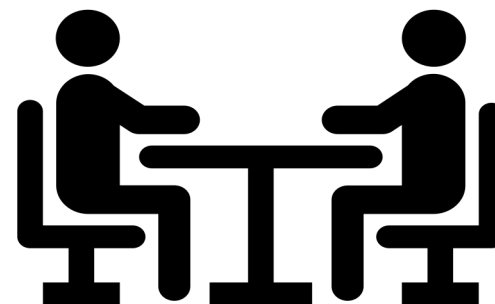


IoT provides affordable earthquake early warning to communities in Japan



<https://www.unescap.org/sites/default/files/APDR%202019%20Chapter%204.pdf>

Group Work and Activities



■ Discussion 6: Motivation for adopting new technologies for DRR and resilience building

Although the technologies described in this course are interesting, they are not solutions unto themselves and are rather a means to an end. As such, and more so than any other stakeholder in their use (including end-users), must understand the link between the technology and the mission or goal being targeted.

- The Facilitator can lead a discussion that emphasizes this point but asking Participants to explain why a government would consider pursuing new technologies to address their disaster risk reduction and resilience goals.
 - o **The Facilitator** can encourage Participants to identify the top-level goals that are sought.
- For instance, these goals may include:
 - o To build social resilience
 - o To build economic resilience
 - o To building environmental resilience
- Ultimately, the motivation should be to address the seven Sendai Framework Global Targets, and the 17 Sustainable Development Goals. The Facilitator can ask Participants whether the technologies that will be covered address these, and which have an obvious connection to one or more of the Targets / SDGs.

<p>Key Readings</p>	<ul style="list-style-type: none"> • Izumi, T., Shaw, R., Ishiwatari, M., Djalante, R., Komino, T. 2019. 30 Innovations for Disaster Risk Reduction. IRIDeS, Keio University, the University of Tokyo, UNU-IAS, and CWS Japan, Japan, http://bit.ly/2OkCMWg. • Center for Sustainable Community Design. n/d. Types of Mitigation Actions. Beyond the Basics. http://bit.ly/2H7LGSn. • International Telecommunications Union (ITU). 2019. Disruptive Technologies and Their Use in Disaster Risk Reduction and Management. ITUGET 2019 Background Document. http://bit.ly/2Lu3j2G • Inform. 2019. Inform Global Risk Index: Results 2019. http://bit.ly/38lztQn.
<p>Further Readings</p>	<ul style="list-style-type: none"> • Eastern Kentucky University. n/d. When Disaster Strikes: Technology’s Role in Disaster Aid Relief. Blog. http://bit.ly/2OSoGgy. Offline Document: http://bit.ly/32ACmjb • Asia-Pacific Disaster Report 2019 – specific chapter - Technological innovations for smart resilience (https://www.unescap.org/sites/default/files/APDR%202019%20Chapter%204.pdf) • Disaster Risk Reduction at the heart of sustainable development (https://www.unescap.org/sites/default/files/apdr2015-ch5.pdf) • Mainstreaming DRR for Sustainable Development – A Guide Book]https://www.unescap.org/sites/default/files/publication WEBdrr02_Mainstreaming.pdf



Thank you