IRDR
Integrated Research on Disaster Risk

Promoting DRR Capacity Building for SIDS

Dr. Prof. Saini Yang

Executive Director

Toward inclusive, safe and sustainable development

0 ABOUT IRDR

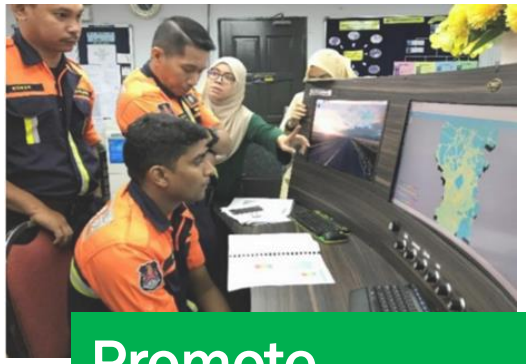
International Science Council

UNDRR
UN Office for Disaster Risk Reduction

IRDR
Integrated Research on Disaste

Mobilze science and technology to support inclusive, safe and sustainable development

Improve knowledge and understanding of risk and uncertainty



Promote innovation in research and action, and explore effective solutions in DRR

Build institutional capacity required for risk-informed development

SENDAI FRAMEWORK
FOR DISASTER RISK REDUCTION 2015-2030

SUSTAINABLE DEVELOPMENT GOALS

IRDR Functions and Deliverables

Coordinating international research

Working at the science-policy-practice interface

As an international hub of centres of excellence for risk research and capacity building

IRDR Main Deliverables will contribute to Open Science and Open Access

IRDR Special Reports

IRDR Working Paper Series

IRDR Lectures

IRDR Trainings and Courses

Service in organising DRR Science and Policy Forums

Promotion of risk science development and best examples

IRDR: a science community for research and actions

13 National Committees , 1 Regional Committee

IRDR Australia	Bushfire & Natural Hazards Cooperative Research Centre (BNH CRC)	**IRDR New Zealand**	Natural Hazards Research Platform (NHRP)
IRDR Canada	Science and Technology Working Group, Canada's Platform for Disaster Risk Reduction	**IRDR USA**	Natural Hazards Center (NHC), Institute of Behavioral Science, University of Colorado at Boulder
IRDR China	China Association for Science and Technology (CAST)	**IRDR Iran**	A group of eight Iranian research institutes and scientific associations
IRDR Colombia	National Committee of Disaster Risk Knowledge, National Unit for Disaster Risk Management of the Presidency of the Republic of Colombia	**IRDR Indonesia**	Indonesia Institute of Sciences (LIPI)
		IRDR Japan	Science Council of Japan (SCJ)
IRDR France	Scientific Council, Association Française Pour la Prevention des Catastrophes Naturelles (AFPCN)	**IRDR Republic of Korea**	National Disaster Management Research Institute (NDMI) in Ministry of the Interior and Safety
IRDR Germany	German Committee for Disaster Reduction	**IRDR Nepal**	National Reconstruction Authority of Nepal

IRDR Regional Committee **ISC Regional Office for Latin America and the Caribbean**

18 International Centres of Excellence

Community-based Resilience, New Zealand	ICoE- CR	Risk Education and Learning, South Africa	ICoE- REaL
Risk Interpretation and Action, UK	ICoE- RIA	Capacity building, research, Taipei	ICoE- Taipei
Understanding Risk & Safety, Colombia	ICoE- UR&S	Vulnerability & Resilience Metrics, USA	ICoE- VaRM
Critical Infrastructure & Strategic Planning, Germany	ICoE- CI&SP	Disaster Resilient Homes, Buildings, and Public Infrastructure, Canada	ICoE- DRHBPI
National Society for Earthquake Technology, Nepal	ICoE- NEST	Disaster and Medical Humanitarian Response, Hong Kong	ICoE-CCOUC
Disaster Risk and Climate Extremes, Malaysia	ICoE-SEADPRI-UKM	Spatial Decision Support for Integrated Disaster Risk Reduction, the Netherlands	ICoE-SDS IDRR
Transforming Development and Disaster Risk	ICoE-TDDR	Integrated Research on Disaster Risk Science, Australia	ICoE-IRDRS
Resilient Communities & Settlements, India	ICoE-RCS	Disaster and Climatic Extremes, Pakistan	ICoE-DCE
Risk Interconnectivity and Governance on WEather/Climate Extremes Impact and Public Health， Shanghai	ICoE-RIG-WECEIPHE	Coherence among Disaster Risk Reduction, Climate Change Adaptation, and Sustainable Development, Tokyo	ICoE - Coherence

IRDR'S GROWING PARTNERSHIP

WORLD METEOROLOGICAL ORGANIZATION

CBAS

COMMITTEE ON DATA CODATA INTERNATIONAL SCIENCE COUNCIL

RISKKAN Knowledge Action Network

WCRP World Climate Research Programme

URBAN HEALTH AND WELLBEING A SYSTEMS APPROACH

ISC GeoUnions Standing Committee on Disaster Risk Reduction

WWRP WORLD WEATHER RESEARCH PROGRAMME

WORLD BANK GROUP

ADB ASIAN DEVELOPMENT BANK

unesco

Culture Sector, Science Sector, MAB China, UNESCO Chairs, UNESCO Category II Centres (IKCEST, HIST,)...

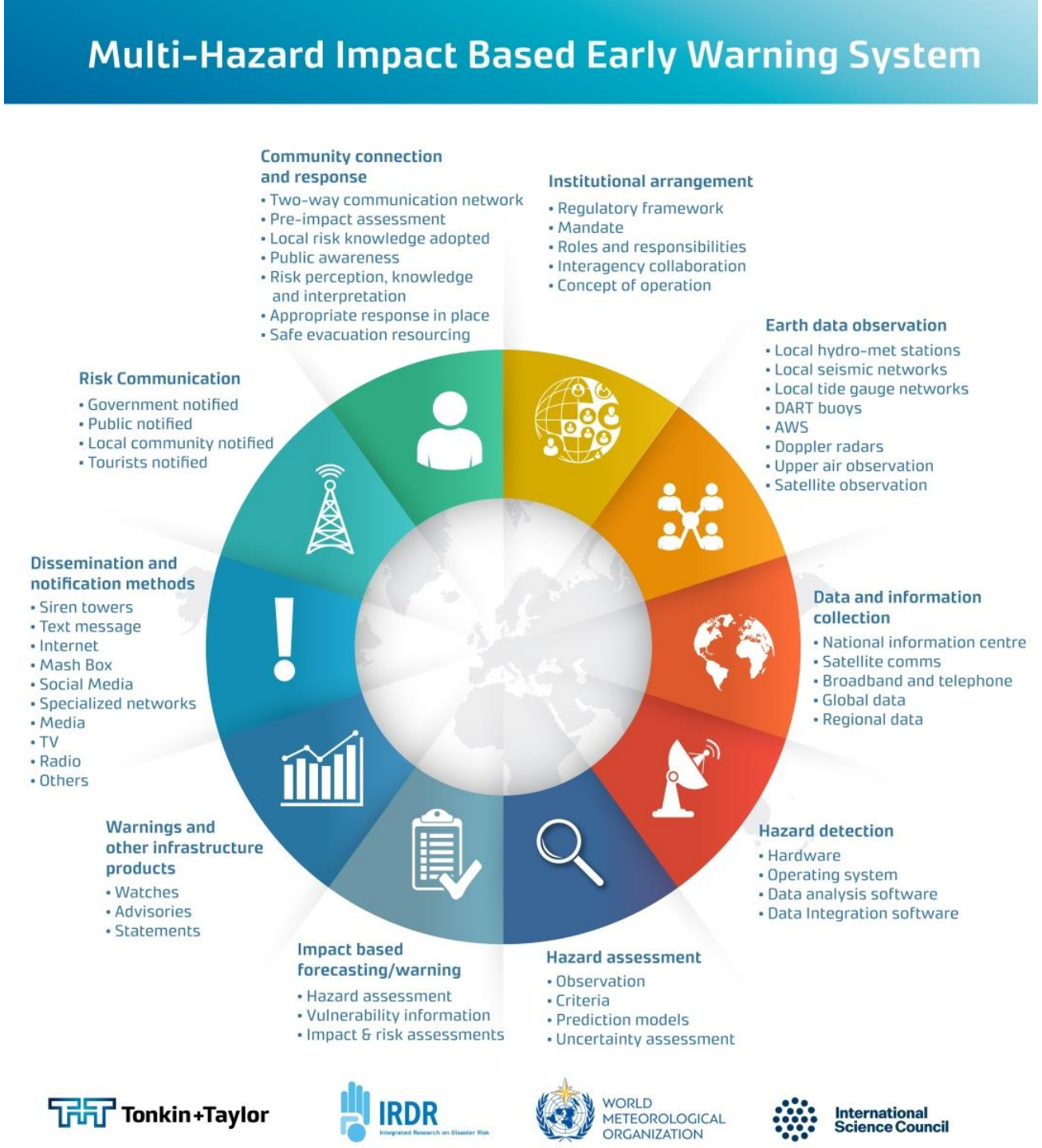
Technologies and database, Open Science and knowledge service, MHEWS, culture and Climate Change, UNESCO Sites, Youth,...

1 MHEWS

IRDR Working Group on Risk Interpretation and Action (RIA) proposed a framework of multi-hazard impact based early warning system(2019), which has been utilized by countries especially in the SIDS due to its **low cost**. This system aligns with the four pillars of the Early Warning for All initiative (2022).

Case of application: The Ministry of Humanitarian Affairs and Disaster Management (MoHADM) established a National Multi-Hazard Early Warning Centre (NMHEWC) to facilitate disaster preparedness and establish linkages between early warning and early action to reduce the impact of disasters in Somalia.

UNDRR filmed this case and will be promoting it in the lead up to International Day for Disaster Risk Reduction 2022.



Some examples about the EWS projects (IRDR and IRDR engaged)

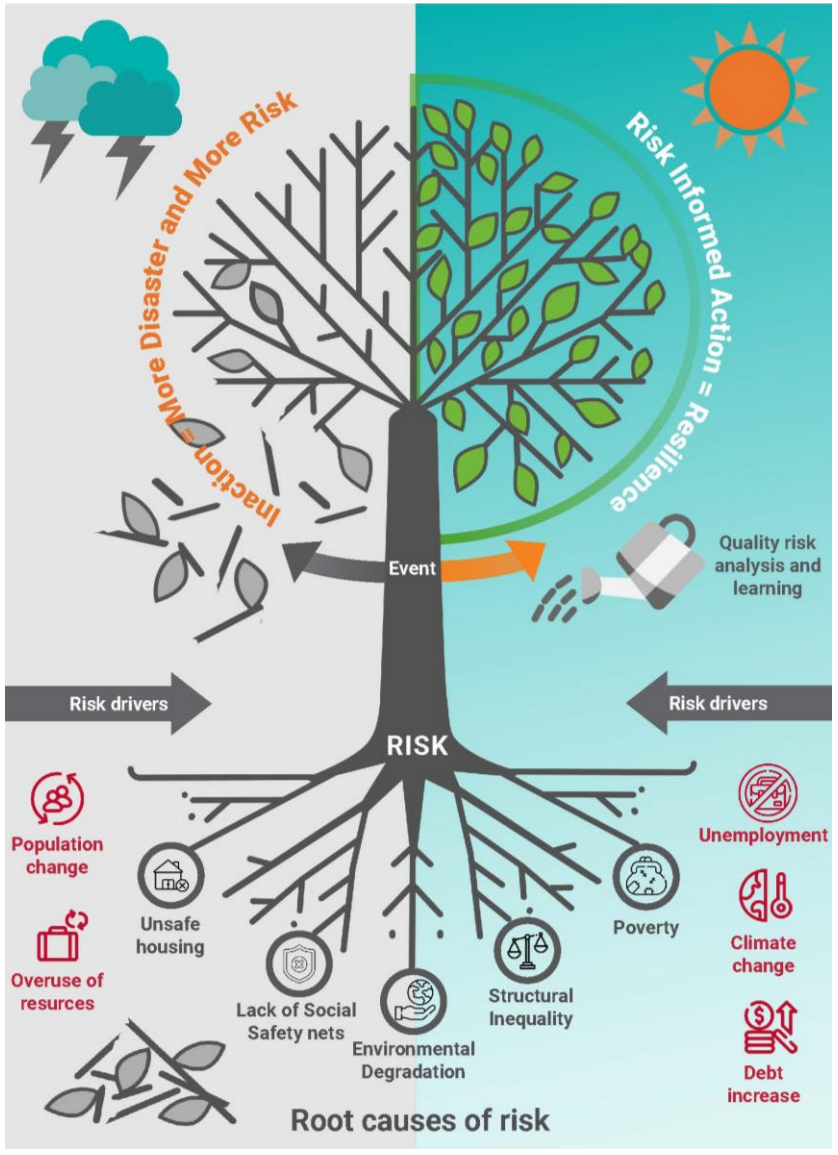
Countries	Projects (IRDR and IRDR engaged)
The Pacific Region Tonga, Samoa, Fiji, Cook Islands, Kiribati Niue and Tuvalu, Palau, Nauru, Marshall Islands Tokelau, Honiara, Papua New Guinea	The Pacific Resilience Program– Multi Hazard Early Warning System in Tonga and Samoa Risk Interpretation and Application Program of IRDR Climate Risk and Early Warning System Initiative (CREWS) Coastal Inundation Forecasting Demonstration Project (CIFDP-Fiji) United National Development Project
Caribbean Antigua, Barbuda, Dominica, Dominica Republic, Saint Lucia, Saint Vincent and the Grenadines	Strengthen Integrated Early Warning Systems for more effective disaster risk reduction in the Caribbean though knowledge and tool transfer

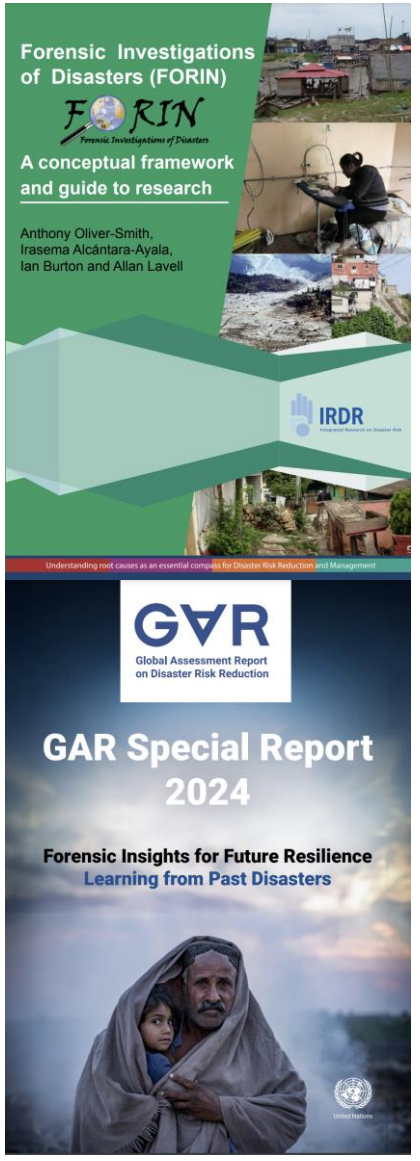
2 Forensic Investigations of Disasters– FORIN

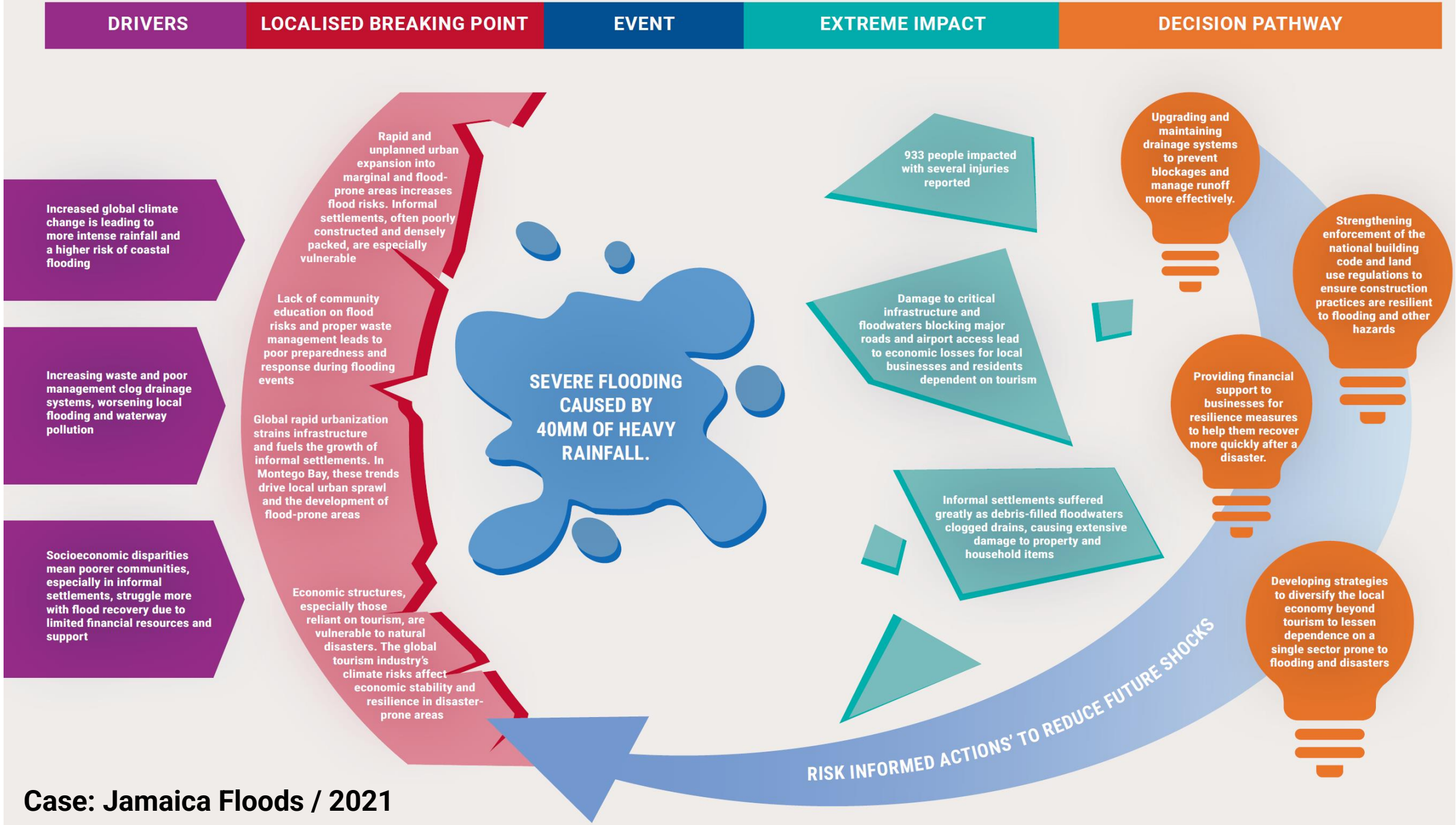
The FORIN methodology, proposed in 2014, helps to **simplify** the process of studying disasters. It has several features which help to improve the understanding of disaster risk, offering policy options and other evidence-based recommendations that can be integrated with development policy and processes to reduce the risk of disaster. This methodology has been applied in catastrophes analyses in many developing countries, including the Haiti Earthquake 2010 and Jamaica Flood 2021.

Innovations of the methodology

- Holistic root-cause analysis with emphasis on the social-cultural dimension
- "Disaster DNA" Framework
- Future-oriented thinking with a focus on resilience
- Avoiding blame and fostering collaboration







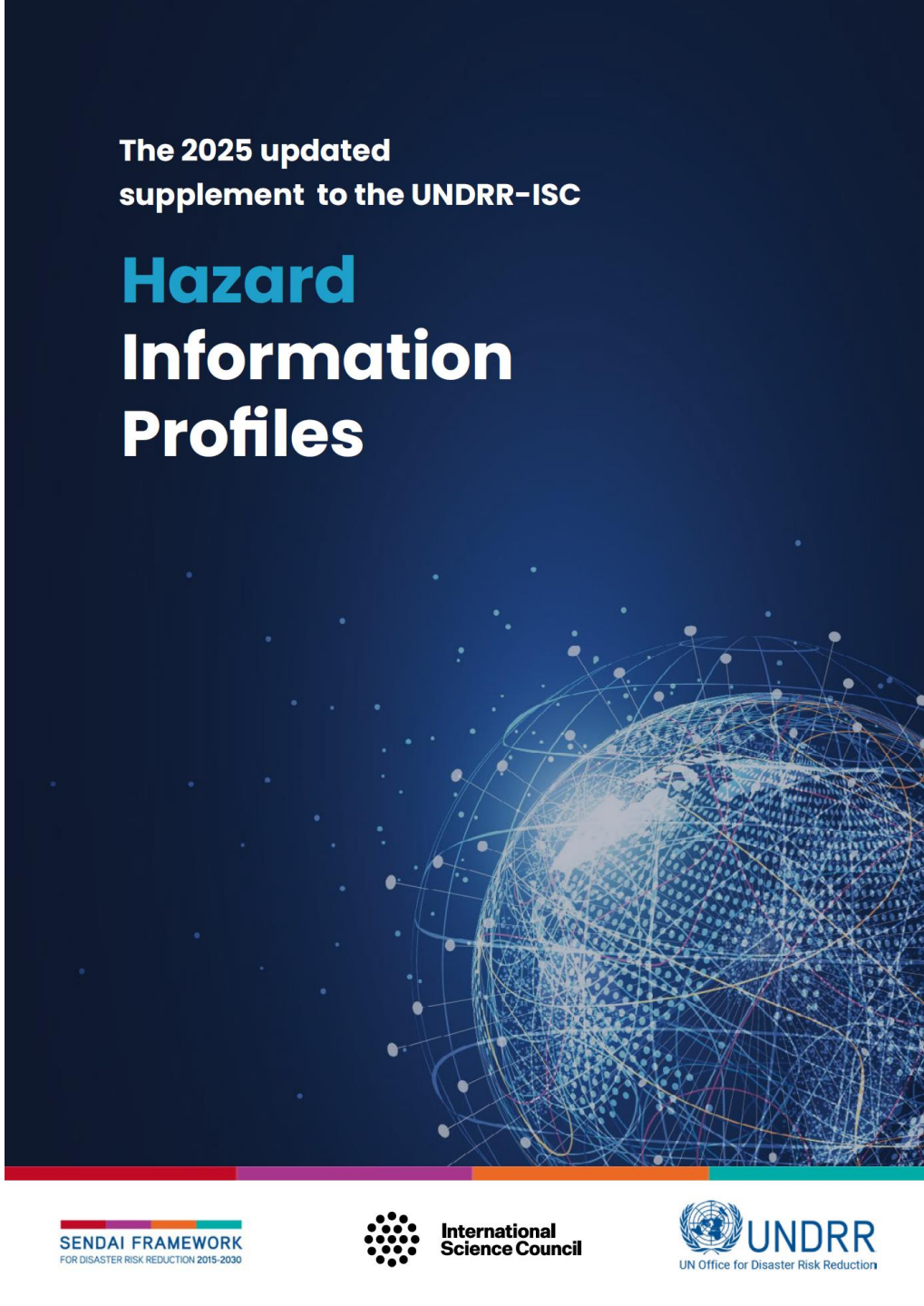
Case: Jamaica Floods / 2021

Understanding hazards and risks

IRDR launched the Hazard Classification in 2014. In 2021, IRDR and UNDRR, ISC together review the classification and launched the new Hazard Information Profiles. In 2025, HIPs were reviewed and the new edition reflects the complex and interconnected nature of today's global risk landscape. Hazards increasingly occur together, cascade across systems, and amplify one another. In response, the updated profiles emphasize a *multi-hazard approach*—critical for effective early warning systems, emergency planning, and disaster resilience.

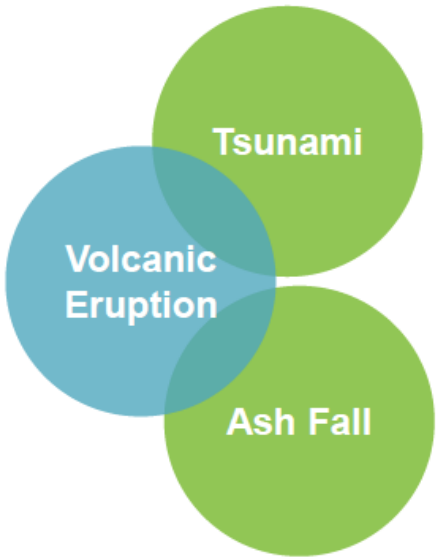
This updated edition builds on that foundation with:

- 282 reviewed hazards across 8 types and 39 clusters
- Improved, machine-readable format to support their use across digital tools and systems
- Clearer articulation of hazard interactions and multi-hazard scenarios
- User-informed revisions and new content to support real-world planning and response

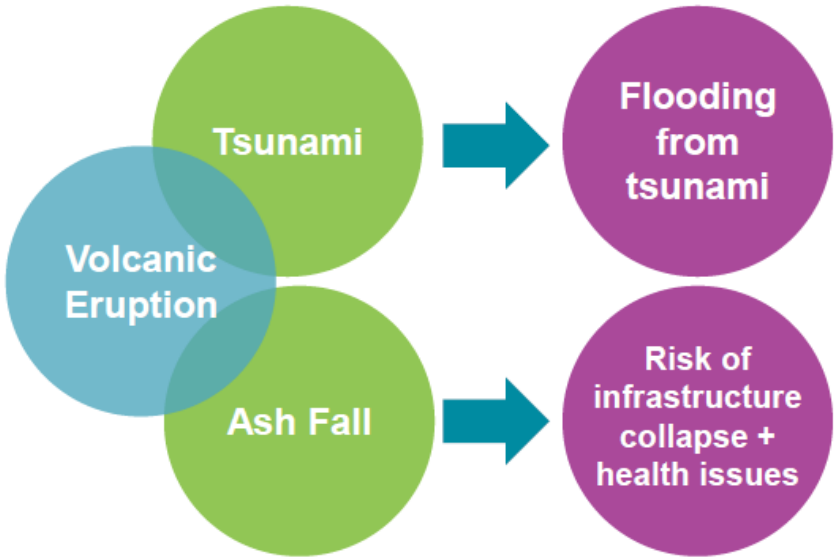


Understanding Hazards | Tonga Eruption + Tsunami 2022

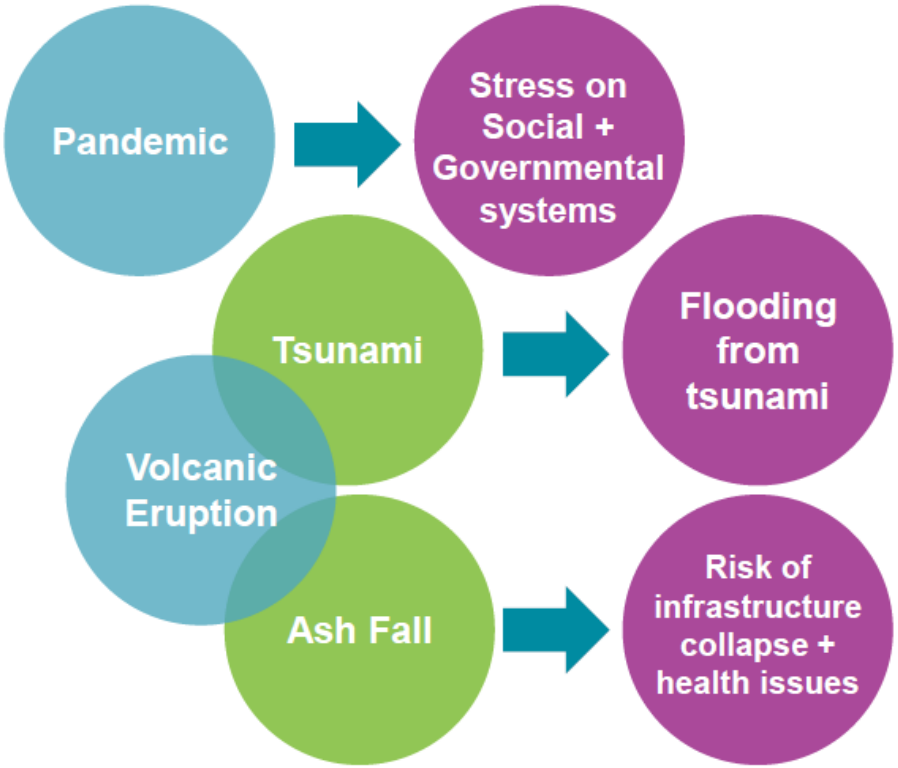
Compound hazard



Cascading hazard

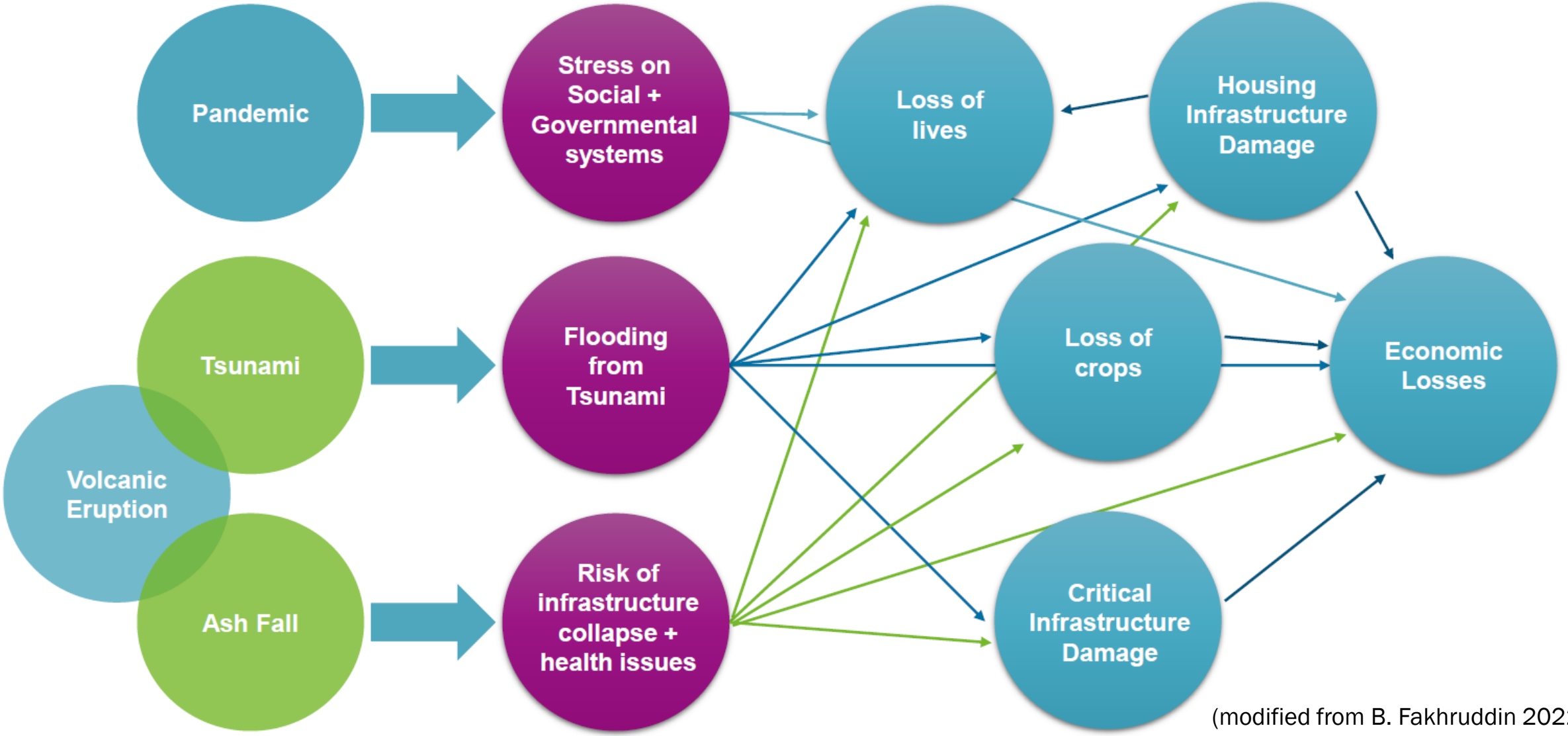


Complex hazards



(modified from B. Fakhruddin 2022)

Cascading Compounding + Complex Impacts



(modified from B. Fakhruddin 2022)

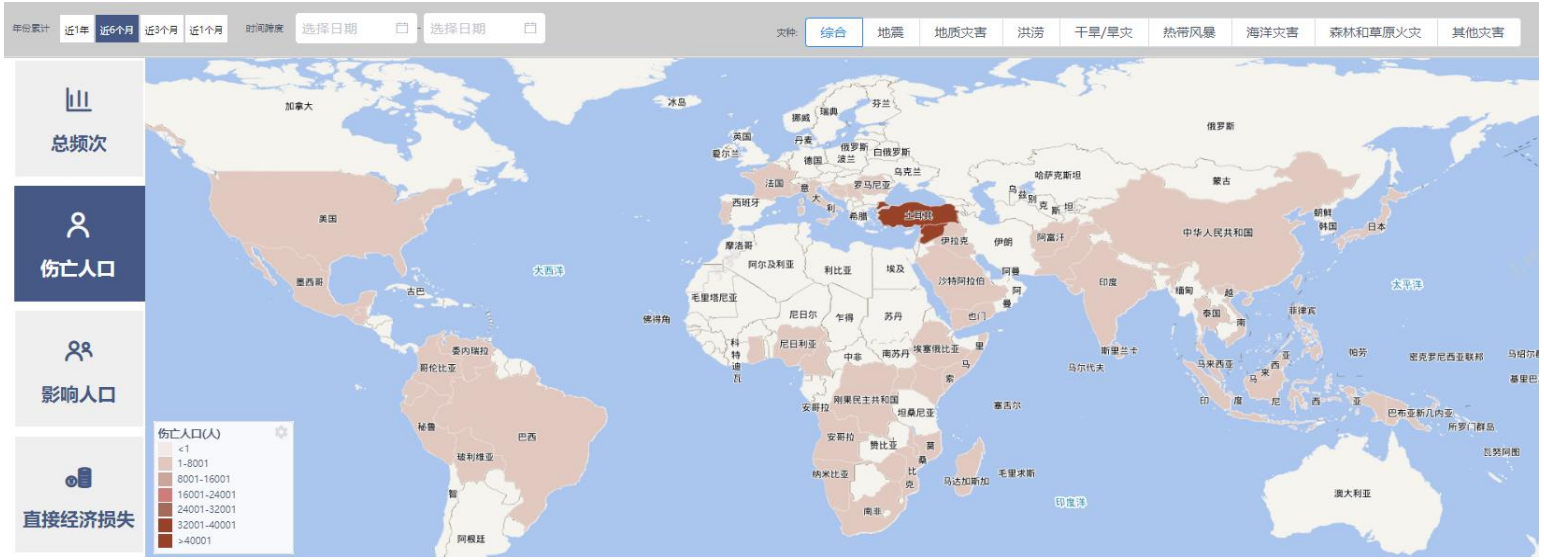
3 Global Disaster Data Platform (www.gddat.cn)

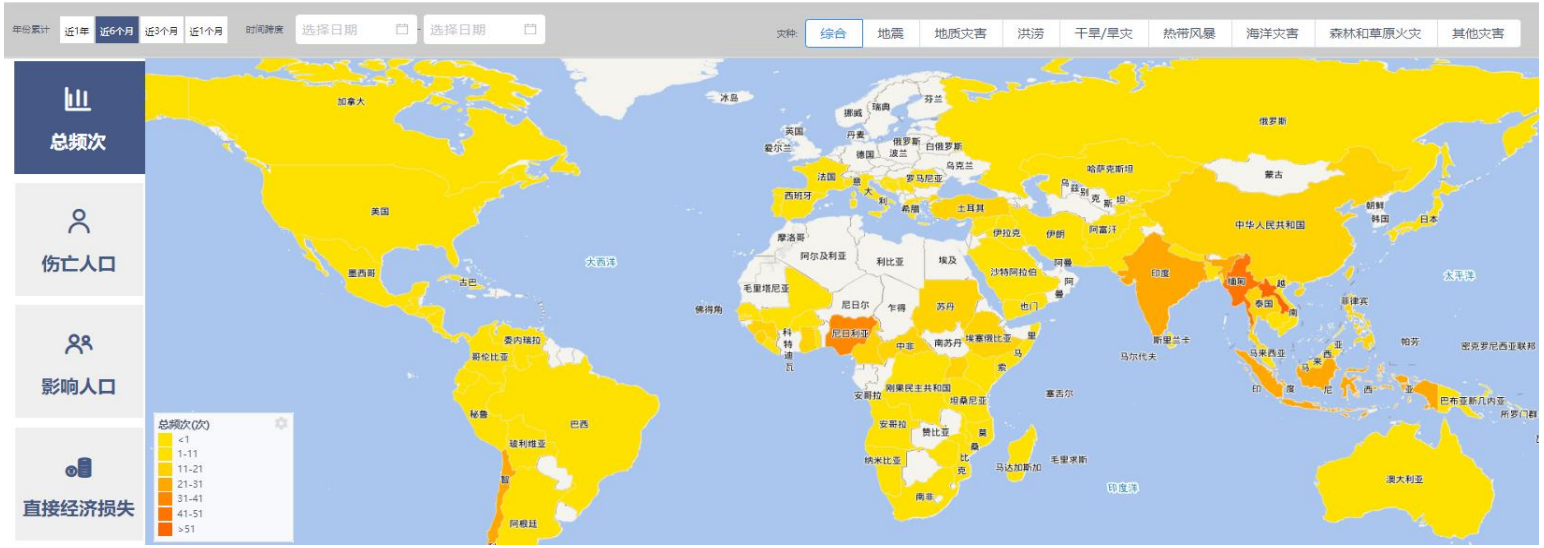
The The Global Disaster Data Platform (GDDAT) can achieve real-time global disaster data monitoring and analysis.

全球灾害实况 2022-05-12 12:10:24-2023-05-12 12:10:24

总频次	受影响人数	累计经济损失
943 次、	260120.79 万人	47150000 千美元

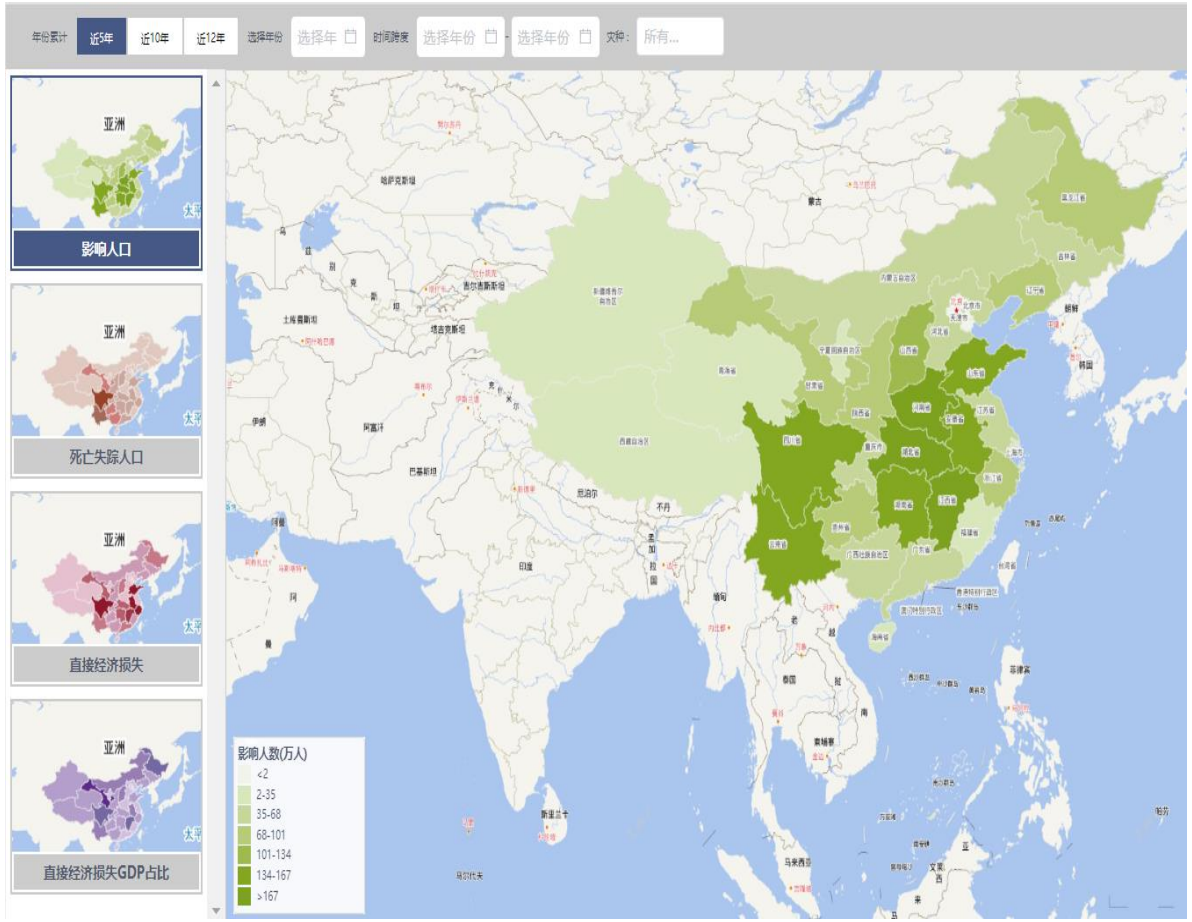
野火	507 次、起		老挝	88 次、起
洪涝	244 次、起		缅甸	46 次、起
地震	142 次、起		尼日利亚	44 次、起
火山	18 次、起		印度	41 次、起
干旱	14 次、起		印度尼西亚	39 次、起
风暴	13 次、起		智利	25 次、起
其他气象灾害	4 次、起		中国	25 次、起
地质灾害	1 次、起		菲律宾	24 次、起
			美国	23 次、起
			几内亚	22 次、起

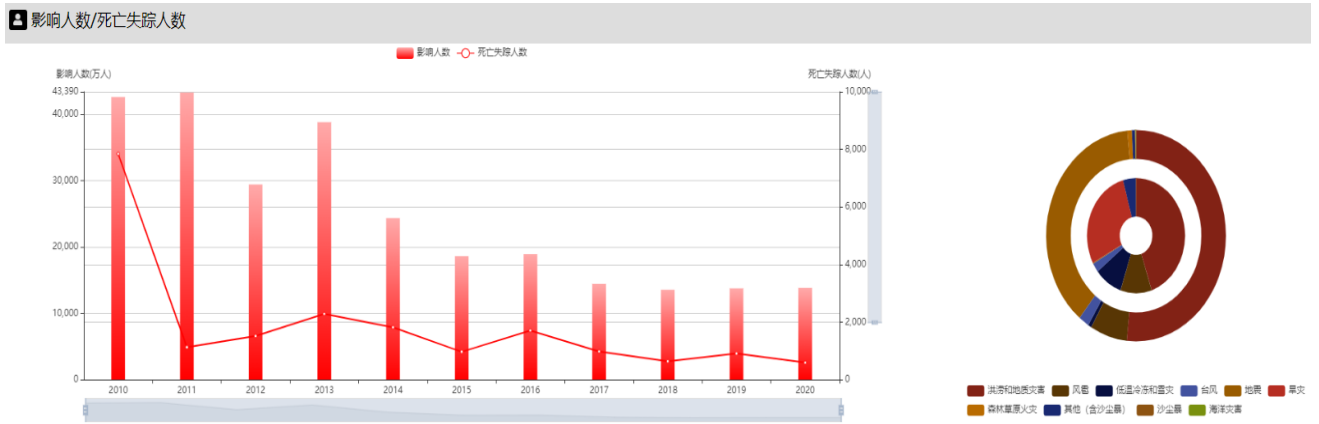


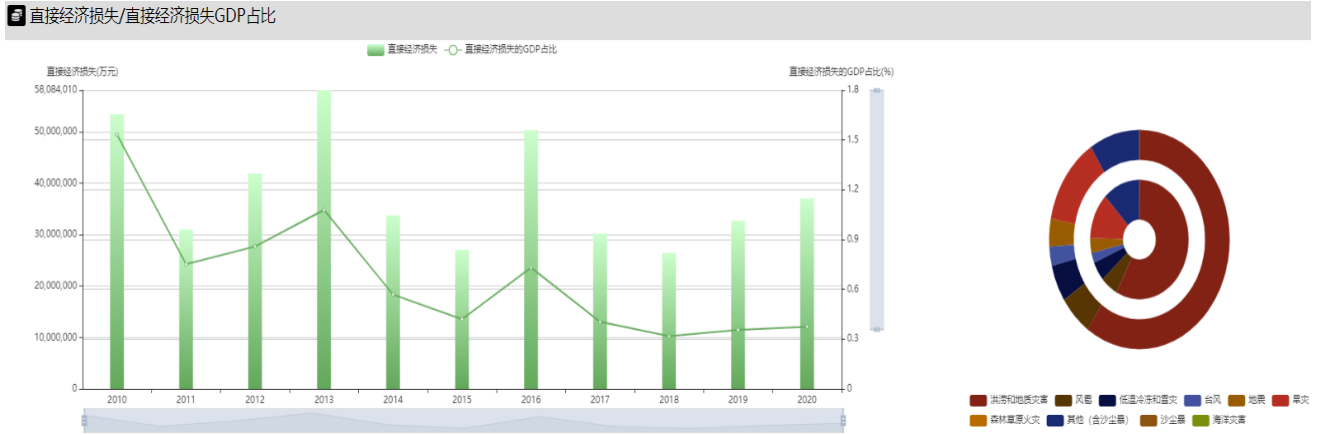


Disaster Database for China

The The Global Disaster Data Platform (GDDAT) provides global disaster assessment products from different organizations.







Assessment Products

The The Global Disaster Data Platform (GDDAT) provides global disaster assessment products from different organizations.

- 北京师范大学
  - 报告
  - 年度国际十大自然灾害
- 中国科学院
- 联合国减灾办公室
- 世界经济论坛
- 联合国大学
- 红十字与红新月会国际联合会

2021 Global Natural Disaster Assessment Report-EN

数据来源：北京师范大学

Compared to the average over the last 30 years (1991-2020), the total frequency of global natural disasters in 2021 was 13% higher, with 81% lower in deaths, 48% less in the affected population, and 82% more in direct economic losses. Global flood disasters in 2021 were the most frequent, 48% more than the historic levels, causing 4,393 deaths, which was more than the death toll from other natural disasters but 35% less than the historical average of flood-related deaths; the direct...

发布日期：2022.10.13 20:01 | 浏览量: 1078

2021 Global Natural Disaster Assessment Report-CH

数据来源：北京师范大学

与过去30年（1991-2020年）均值相比，2021年全球自然灾害总频次偏多13%，死亡人口偏少81%，影响人口偏少48%，直接经济损失偏多82%。其中，2021年全球洪水灾害最为频繁，比历史偏多48%，造成的死亡人口最多，达4393人，与历史平均相比偏少35%；风暴灾害造成的直接经济损失最大，约1377亿美元，较历史偏多133%；地震等活动偏少，灾害损失较轻；野火灾害死亡人口减少，但影响人口增加219%，直接经济损失增加109%。区域上，2021年亚洲自然灾害的频次最高，其次为北美洲；同时，亚洲也是因灾死亡人...

发布日期：2022.10.13 20:01 | 浏览量: 1404

2020 Global Natural Disaster Assessment Report-EN

数据来源：北京师范大学

Compared to the average over the last 30 years (1990-2019), the occurrence and intensity of global natural disasters were generally at a lower level in 2020. Major natural disasters in 2020 were 4% less in frequency, 73% lower in deaths, 50% less in the population affected and 29% more in direct economic losses. In 2020, the frequency of extreme temperatures around the world was low, but the number of deaths from such events was the most, reaching 6343; flood disasters were the mo...

发布日期：2021.10.20 13:21 | 浏览量: 2286

- 联合国减灾办公室
  - 报告
  - 数据
- 世界经济论坛
- 联合国大学
- 红十字与红新月会国际联合会

Global Assessment Report on Disaster Risk Reduction 2022

数据来源：联合国减灾办公室

Nothing undermines sustainable development like disasters. They can destroy decades of progress in an instant. Understanding and managing disaster risk is essential to achieving the Sustainable Development Goals.

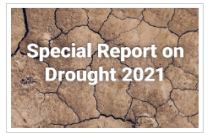
发布日期：2022.08.13 11:10 | 浏览量: 24

Special Report on Drought 2021

数据来源：联合国减灾办公室

The risks that drought poses to communities, ecosystems and economies are much larger and more profound than can be measured. The impacts are borne disproportionately by the most vulnerable people. Drought impacts are extensive across societies – they interconnect across large areas, cascade through socioecological and technical systems at different scales, and linger through time. A lack of awareness of such characteristics, including the consistent...

发布日期：2021.08.13 11:10 | 浏览量: 273



Global Assessment Report on Disaster Risk Reduction 2019

数据来源：联合国减灾办公室

At no point in human history have we faced such an array of both familiar and unfamiliar risks, interacting in a hyperconnected, rapidly changing world. New risks and correlations are emerging. Decades-old projections about climate change have come true much sooner than expected. With that come changes in the intensity and frequency of hazards. Risk really is systemic, and requires concerted and urgent effort to reduce it in integrated and innovative ways.

发布日期：2019.12.01 00:00 | 浏览量: 252

- 联合国减灾办公室
- 世界经济论坛
  - 报告
- 联合国大学
- 红十字与红新月会国际联合会

The Global Risks Report 2023

数据来源：世界经济论坛

The first years of this decade have heralded a particularly disruptive period in human history. The return to a "new normal" following the COVID-19 pandemic was quickly disrupted by the outbreak of war in Ukraine, ushering in a fresh series of crises in food and energy – triggering problems that decades of progress had sought to solve.

发布日期：2023.04.11 17:24 | 浏览量: 18

The Global Risks Report 2022

数据来源：世界经济论坛

As 2022 begins, COVID-19 and its economic and societal consequences continue to pose a critical threat to the world. Vaccine inequality and a resultant uneven economic recovery risk compounding social fractures and geopolitical tensions. In the poorest 52 countries— home to 20% of the world's people—only 6% of the population had been vaccinated at the time of writing. By 2024, developing economies (excluding China) will have fallen 5.5% below their pre-pandemic expected...

发布日期：2022.09.02 17:23 | 浏览量: 1

The Global Risks Report 2021

数据来源：世界经济论坛

The immediate human and economic cost of COVID-19 is severe. It threatens to scale back years of progress on reducing poverty and inequality and to further weaken social cohesion and global cooperation. Job losses, a widening digital divide, disrupted social interactions, and abrupt shifts in markets could lead to dire consequences and lost opportunities for large parts of the global population. The ramifications—in the form of social unrest, political fragmentation and geopolitical...

发布日期：2021.09.02 17:23 | 浏览量: 181

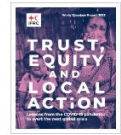
- 联合国减灾办公室
- 世界经济论坛
- 联合国大学
  - 报告
- 红十字与红新月会国际联合会

World Risk Report 2022

数据来源：联合国大学

Der bewaffnete Konflikt in der Ukraine prägt das Jahr 2022 wie keine andere Krise. Millio- nen Menschen verloren ihr Leben oder sind auf der Flucht. Die langfristigen Folgen des Kon- fliktes für das internationale System weit über die Ukraine hinaus sind gravierend; überall auf der Welt leiden Menschen unter explodieren- den Nahrungsmittel- und Energiepreisen. Vor allem in den Ländern am Horn von Afrika über- lagern sich derzeit multiple Krisen zu einem toxischen Gemisch, das vor...

发布日期：2022.12.31 00:00 | 浏览量: 10



World Risk Report 2021

数据来源：联合国大学

The year 2021 has again been strongly marked by the Covid-19 pandemic. In addition, cli- mate-related extreme weather events, includ- ing heat waves, forest fires, and floods, have preoccupied us in many parts of the world. This year, also Germany was severely hit by floods in the West and South. This disaster has shaken many people and made us painfully aware that climate change – which makes such floods more likely in many places – affects us all and can have devastating effects even...

发布日期：2021.12.31 00:00 | 浏览量: 0

World Risk Report 2020

数据来源：联合国大学

Nothing is shaping the year 2020 as strong- ly as the Covid-19 pandemic. It determines our everyday life, our actions and our social interactions. Its long-term consequences are as yet unforeseeable. The news is dominated by it, while other no less important issues are receding into the background. These include the main topic of this year's WorldRiskReport, "Forced Displacement and Migration". The figures published this summer by the UN Refugee Agency are alarming: almost 8...

发布日期：2020.12.31 00:00 | 浏览量: 1

2020
Global Natural Disaster Assessment Report

Academy of Disaster Reduction and Emergency Management,
Ministry of Emergency Management - Ministry of Education

National Disaster Reduction Center of China,
Ministry of Emergency Management

International Federation of Red Cross
and Red Crescent Societies

October 2021

GLOBAL NATURAL
DISASTER
ASSESSI

2022 GLO

October 202

Academy of Disaster
Ministry of Emergency

School of National Sa
Normal University

National Disaster Redu
Management

International Federati

2023 GLOBAL NATURAL DISASTER ASSESSMENT REPORT

October 2024

Academy of Disaster Reduction and Emergency Management,
Ministry of Emergency Management - Ministry of Education

School of National Safety and Emergency Management, Beijing Normal University

National Disaster Reduction Center of China - Ministry of Emergency Management

International Federation of Red Cross and Red Crescent Societies

Integrated Research on Disaster Risk

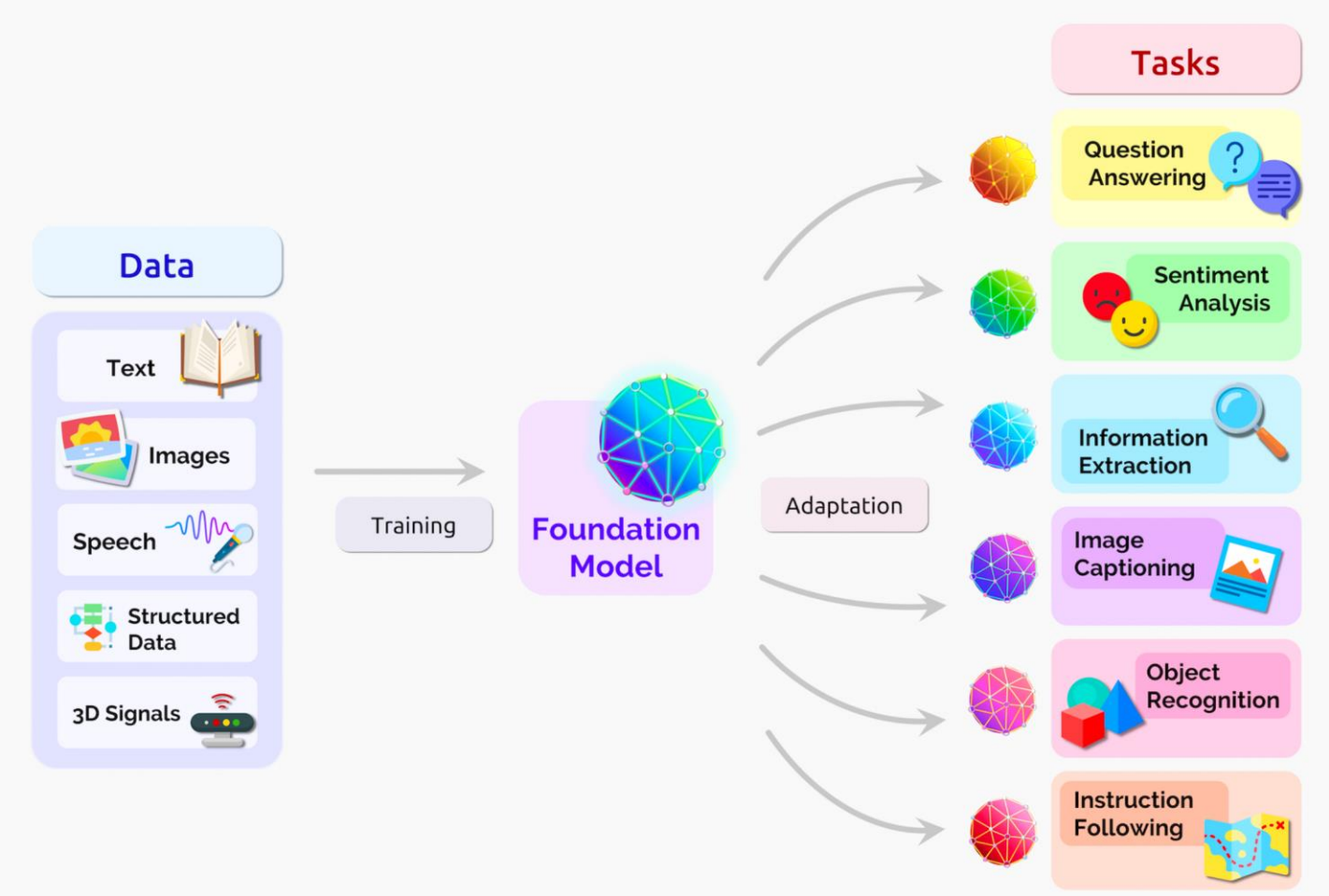
2023

4 Ongoing Work

IRDR
Integrated Research on Disaster Risk

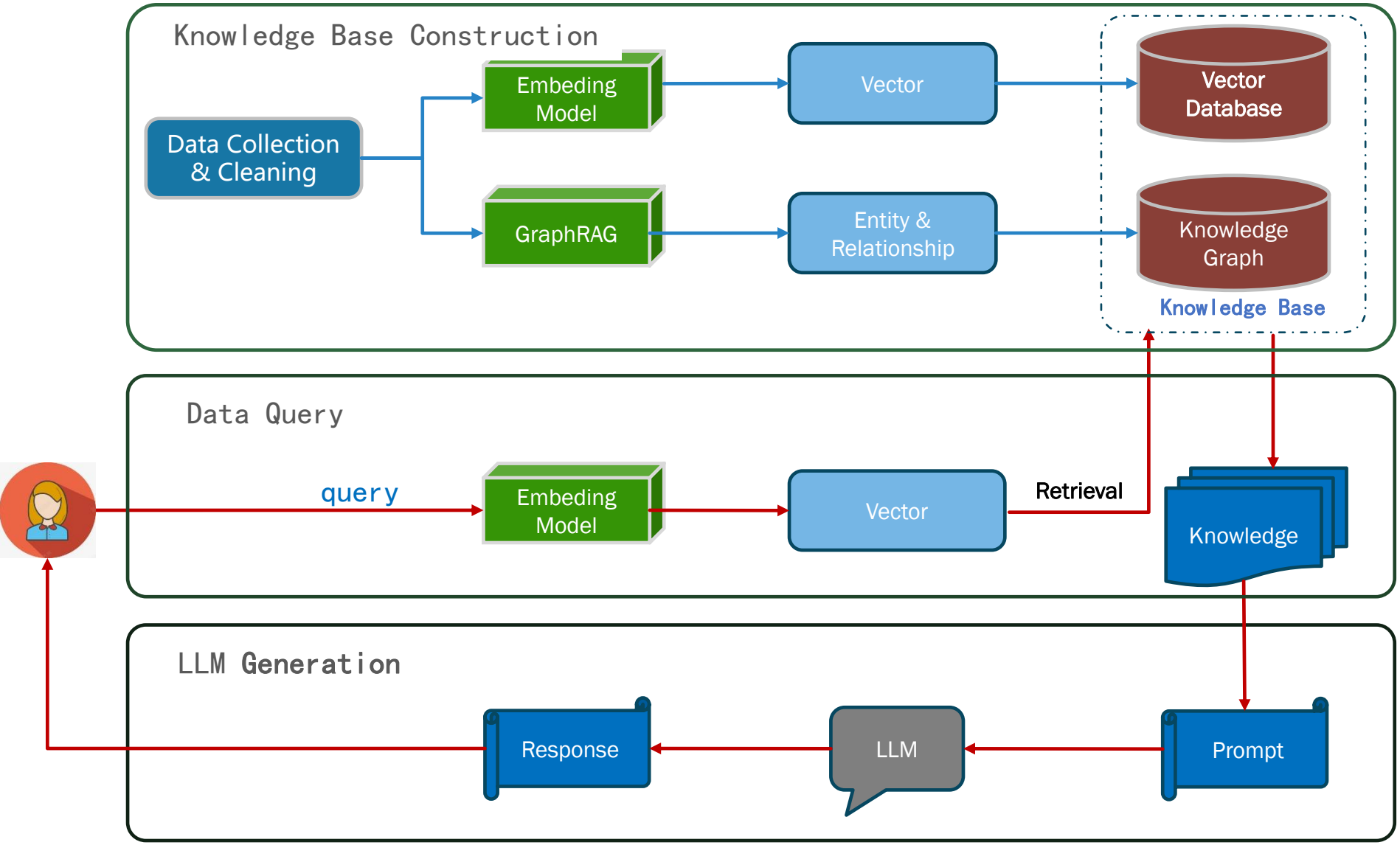
LLM on DRR

1. Open Access Publications
2. Open Model
3. Research Toolbox
4. Capacity Building



Source：AI Thailand

System Design



- The Embedding Model converts documents into vector representations and injects them into the vector database.
- GraphRAG extracts entities and relationships from text to construct a knowledge graph.

- Encode the query into a vector using the Embedding Model.
- Perform matching and retrieval based on the vector database and knowledge graph to obtain relevant knowledge content.

Construct a Prompt based on the retrieval results and the user query, and feed it into the large language model to generate a response.

DATA COLLECTION & CLEANING

- **disaster early warning**
- **emergency response**
- **loss assessment**
- **risk assessment**
- **capacity building for disaster risk reduction**

IRDR
Integrated Research on Disaster Risk

- **Raw data collection:** Relevant literature data were collected based on keywords related to 5 core disaster scenarios. So far, more than 11,000 documents have been accumulated.

- Data processing:

Data Preprocessing	Data Cleaning	Metadata Extraction	Knowledge Extraction & Organization
• **Format Conversion:** Convert PDF documents into more easily processable formats (e.g., Markdown), facilitating subsequent text extraction and analysis. • **Text Extraction:** Accurately extract textual content from the converted files, avoiding interference from non-text elements such as images and tables.	• **Text Processing:** Remove headers, footers, annotations, formulas, images, and irrelevant characters. • **Table Conversion:** Locate table positions, convert identified tables into structured data (e.g., CSV, JSON), and perform semantic parsing of table contents.	• **Metadata Recognition:** Automatically identify and extract key metadata from each scientific paper, including title, authors, keywords, journal/conference name, etc. • **Metadata Structuring:** Transform the metadata into structured formats (e.g., JSON) to support efficient retrieval, deduplication, citation analysis, and knowledge provenance.	• **Entity Recognition:** Utilize NER techniques to extract key entities from the literature, such as concepts, persons, locations, and dates. • **Relationship Establishment:** Based on the identified entities, mine implicit relationships to construct a knowledge graph, enhancing the question-answering system's comprehension capability.

IRDR
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Thank you

Toward inclusive, safe and sustainable development