UCLouvain
Institut de Recherche
Santé et Société (IRSS)

Centre for Research on the
Epidemiology of Disasters
CRED

USAID
FROM THE AMERICAN PEOPLE

Classification of Hazards & Disasters

The EM-DAT Perspective

Scientific & Technical Advisory Group Meeting

Damien Delforge (UCLouvain, CRED)

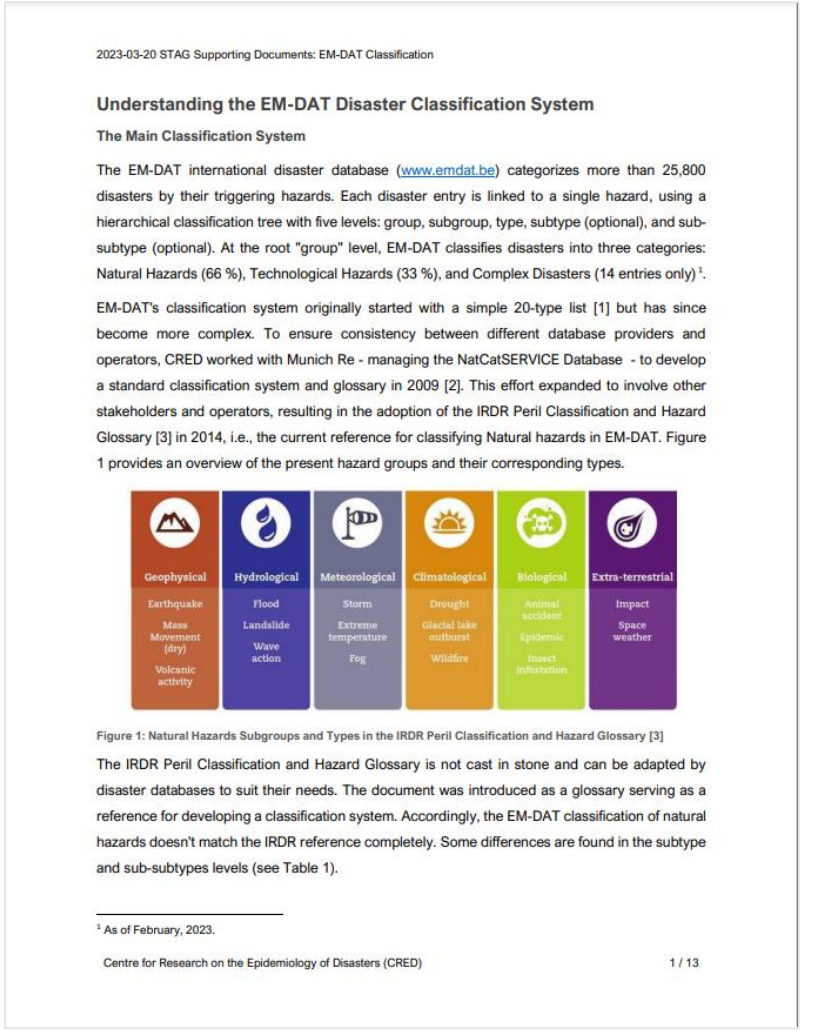
Brussels, Belgium
March 20th, 2023

GOAL

Understand EM-DAT Classification of Disasters

- What Disasters?
- History
- **Classification**
- Evaluation Criteria
- Perspectives

Supporting Information



2023-03-20 STAG Supporting Documents: EM-DAT Classification

Understanding the EM-DAT Disaster Classification System

The Main Classification System

The EM-DAT international disaster database (www.emdat.be) categorizes more than 25,800 disasters by their triggering hazards. Each disaster entry is linked to a single hazard, using a hierarchical classification tree with five levels: group, subgroup, type, subtype (optional), and sub-subtype (optional). At the root "group" level, EM-DAT classifies disasters into three categories: Natural Hazards (66 %), Technological Hazards (33 %), and Complex Disasters (14 entries only) [1].

EM-DAT's classification system originally started with a simple 20-type list [1] but has since become more complex. To ensure consistency between different database providers and operators, CRED worked with Munich Re - managing the NatCatSERVICE Database - to develop a standard classification system and glossary in 2009 [2]. This effort expanded to involve other stakeholders and operators, resulting in the adoption of the IRDR Peril Classification and Hazard Glossary [3] in 2014, i.e., the current reference for classifying Natural hazards in EM-DAT. Figure 1 provides an overview of the present hazard groups and their corresponding types.

Figure 1: Natural Hazards Subgroups and Types in the IRDR Peril Classification and Hazard Glossary [3]

The IRDR Peril Classification and Hazard Glossary is not cast in stone and can be adapted by disaster databases to suit their needs. The document was introduced as a glossary serving as a reference for developing a classification system. Accordingly, the EM-DAT classification of natural hazards doesn't match the IRDR reference completely. Some differences are found in the subtype and sub-subtypes levels (see Table 1).

[1] As of February, 2023.

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Table 1

→ Type list

→ Occurence

Table A-X

→ Definitions

Icons from www.flaticon.com

Only Mass Disasters with a Certain Impact Are Classified

What Disasters?

- ✓ Unintentional
- ✓ Unforeseen

- ✗ No conflict
- ✗ No terrorist attack

EM-DAT Inclusion Criteria

1. 10 or more persons reported killed
2. 100 or more persons reported affected
3. A call for international assistance
4. A declaration of a state of emergency

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Disasters Are Classified According to their Trigger: Hazards

Triggering event

Natural or Technological Hazard

Extreme physical phenomenon

Influencing factors

- Exposure
- Vulnerability
- Capacity

Resulting event

Disaster (impact)

- Killed people
- Affected people
- Economic damage
- …

Icons from www.flaticon.com

1 EM-DAT Classification Has Changed since 1992 (1)

List of Disaster Types recorded in EM-DAT

1

Accident	Earthquake	Insect Infestation
Avalanche	Epidemic	Landslide
Chemical accident	Famine ✖	Storm
Civil Strife ✖	Fire	Tsunami
Cyclone	Flood	Typhoon
Displaced persons ✖	Heat/cold wave	20 Volcano
Drought	Hurricane	

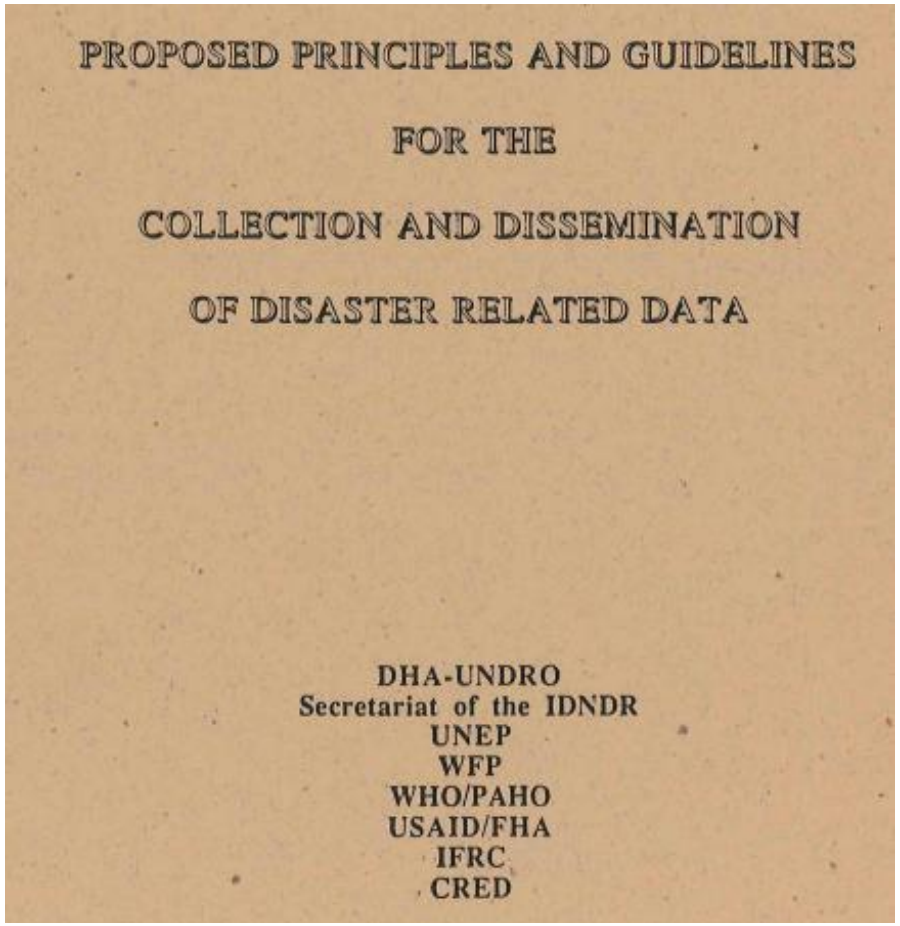
✖ **Not in EM-DAT anymore** ✖ **Now associated disasters**

Guha-Sapir, D. and Misson, C.: The Development of a Database on Disasters, Disasters, 16, 74–80, https://doi.org/10.1111/j.1467-7717.1992.tb00378.x, March 1992.

Icons from www.flaticon.com

EM-DAT in 1992 (2)

Report on the IERRIS Workshop
Brussels, September 1992


PROPOSED PRINCIPLES AND GUIDELINES

FOR THE

COLLECTION AND DISSEMINATION

OF DISASTER RELATED DATA

DHA-UNDRO
Secretariat of the IDNDR
UNEP
WFP
WHO/PAHO
USAID/FHA
IFRC
CRED

CLASSIFICATION OF DISASTERS

1. NATURAL DISASTERS
1.1. Sudden
- Avalanche
- Cold Wave
- Earthquake
- Floods
- Heat Wave
- High Wind: . Cyclone
(includes Hurricane and Typhoon)
. Storm
. Tornado
- Insect Infestation
- Landslide
- Power Shortage
- Tsunami
- Volcanic Eruption

1.2. Long Term
- Epidemic
- Drought
- Famine
- Food Shortage

2. MAN MADE DISASTERS
2.1. Sudden
- Transport or Structural Accident
- Industrial/Technological Accident
- Fire*

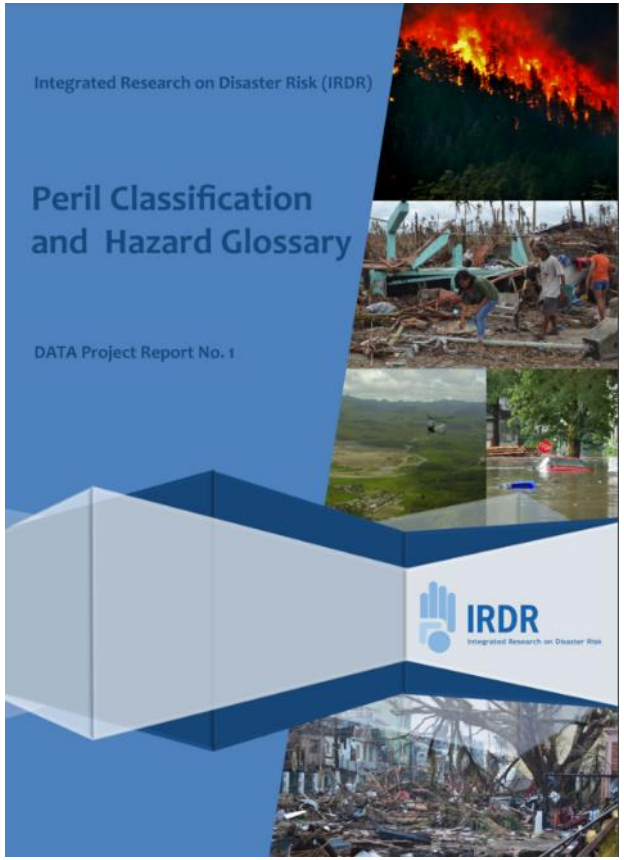
2.2. Long Term
- Conflict
- Displaced Population
(includes: Displaced Persons & Refugees)

* *Could also be a natural disaster*

Figure 3: Proposed list of disaster type specifications

Icons from www.flaticon.com

1 The Current EM-DAT Reference for Classification (2014)



The 6 Natural Hazards Groups and their types

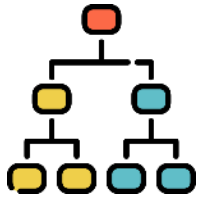
Geophysical	Hydrological	Meteorological	Climatological	Biological	Extra-terrestrial
Earthquake	Flood	Storm	Drought	Animal accident	Impact
Mass Movement (dry)	Landslide	Extreme temperature	Glacial lake outburst	Epidemic	Space weather
Volcanic activity	Wave action	Fog	Wildfire	Insect infestation	

Working Group: 16 stakeholders from Universities, National and International Research centers, Governmental and UN institutions, Reinsurance companies, Humanitarian agencies

IRDR = Integrated Research on Disaster Risk

Icons from www.flaticon.com, disaster icons from CRED/IRDR

The Two EM-DAT Classification Systems



Main classification

Triggering hazard

Associated disasters

Co-occurring or cascading hazards

STAG version

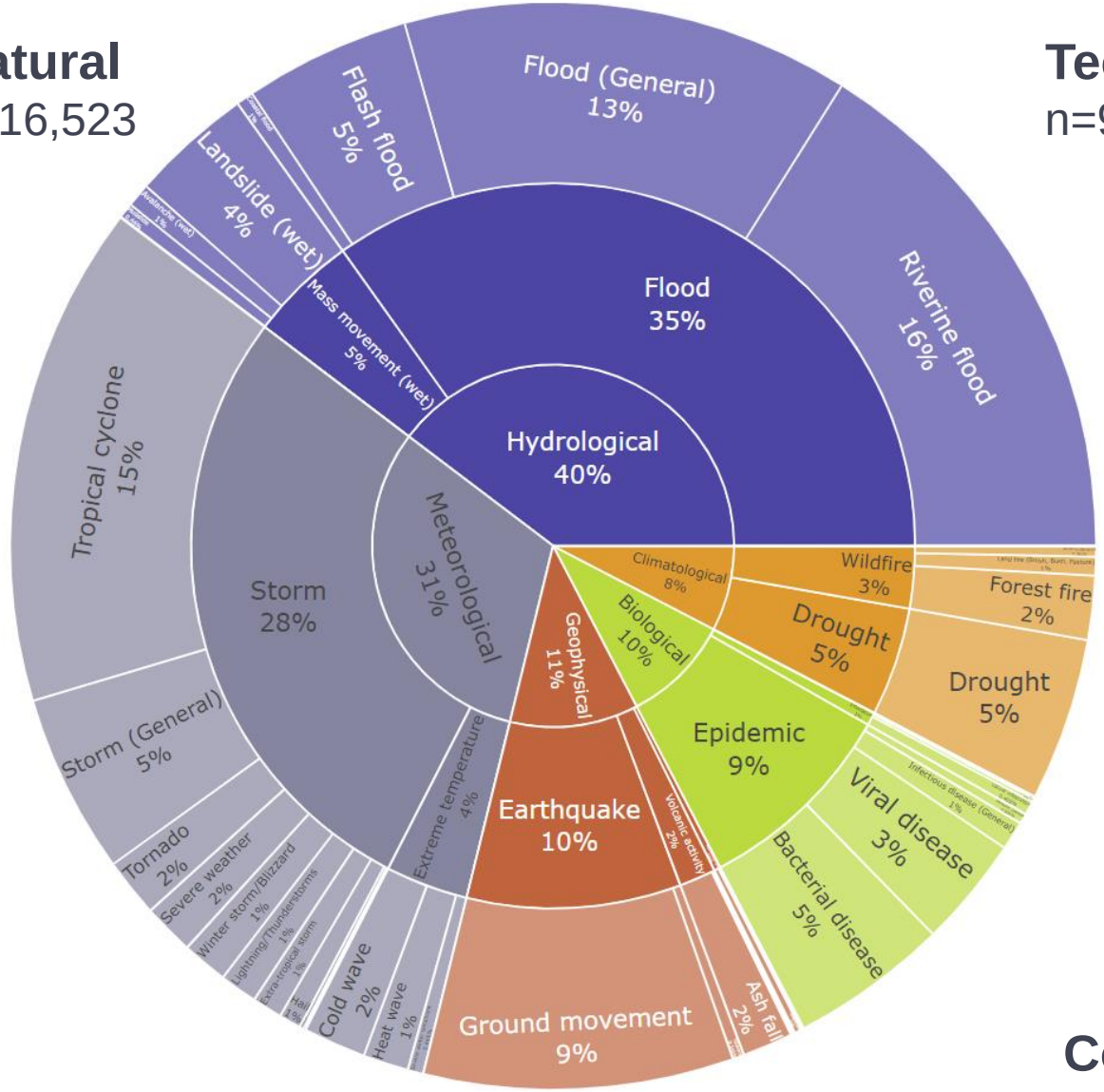
- One disaster, one class
- Hierarchical structure (4 levels)
- Reference glossary

- Any n° of associated disasters
- Flat structure (1 level)
- Possibly different from main class

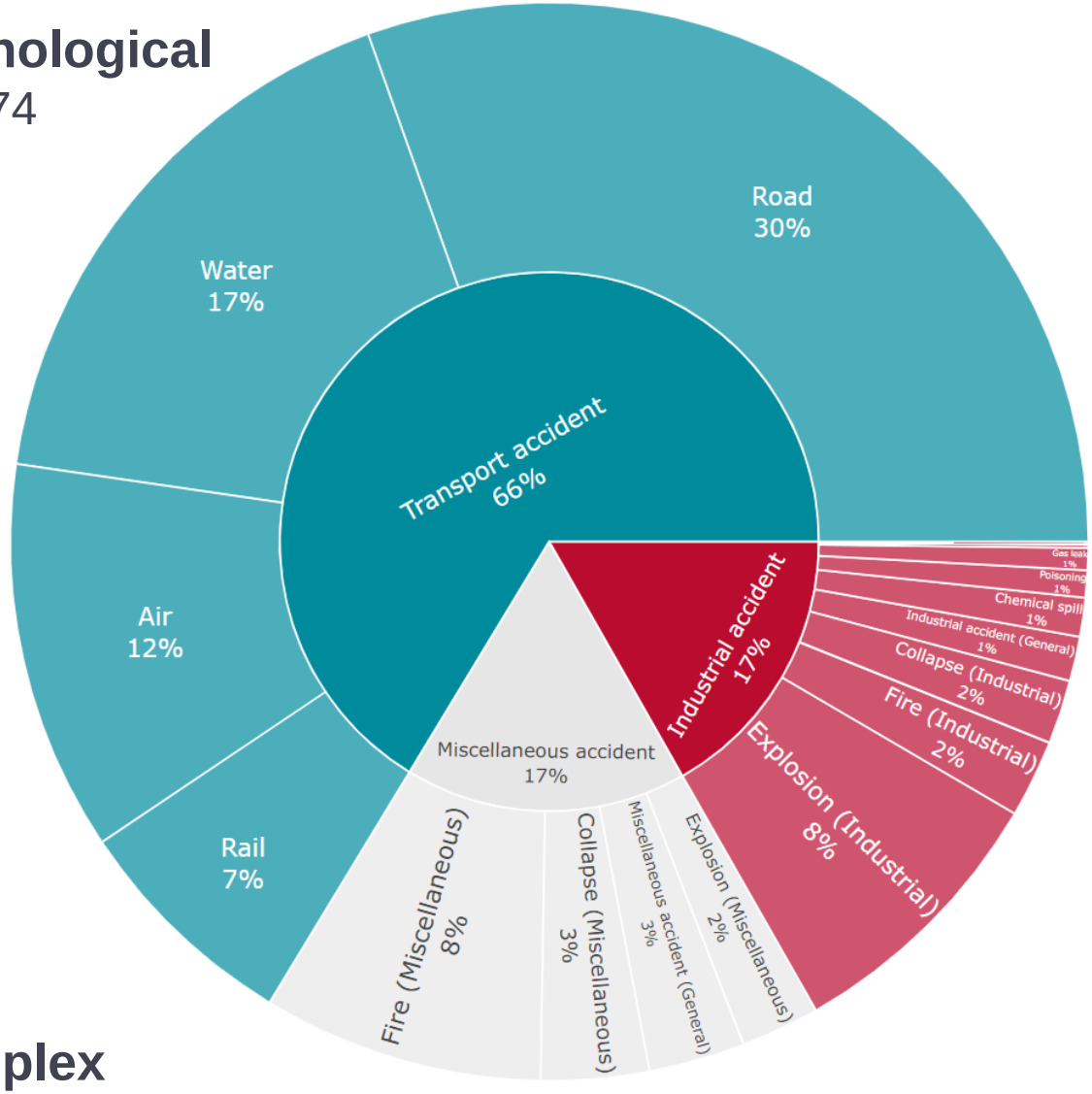
Icons from www.flaticon.com

Disaster Occurrence per Groups

Natural
n=16,523



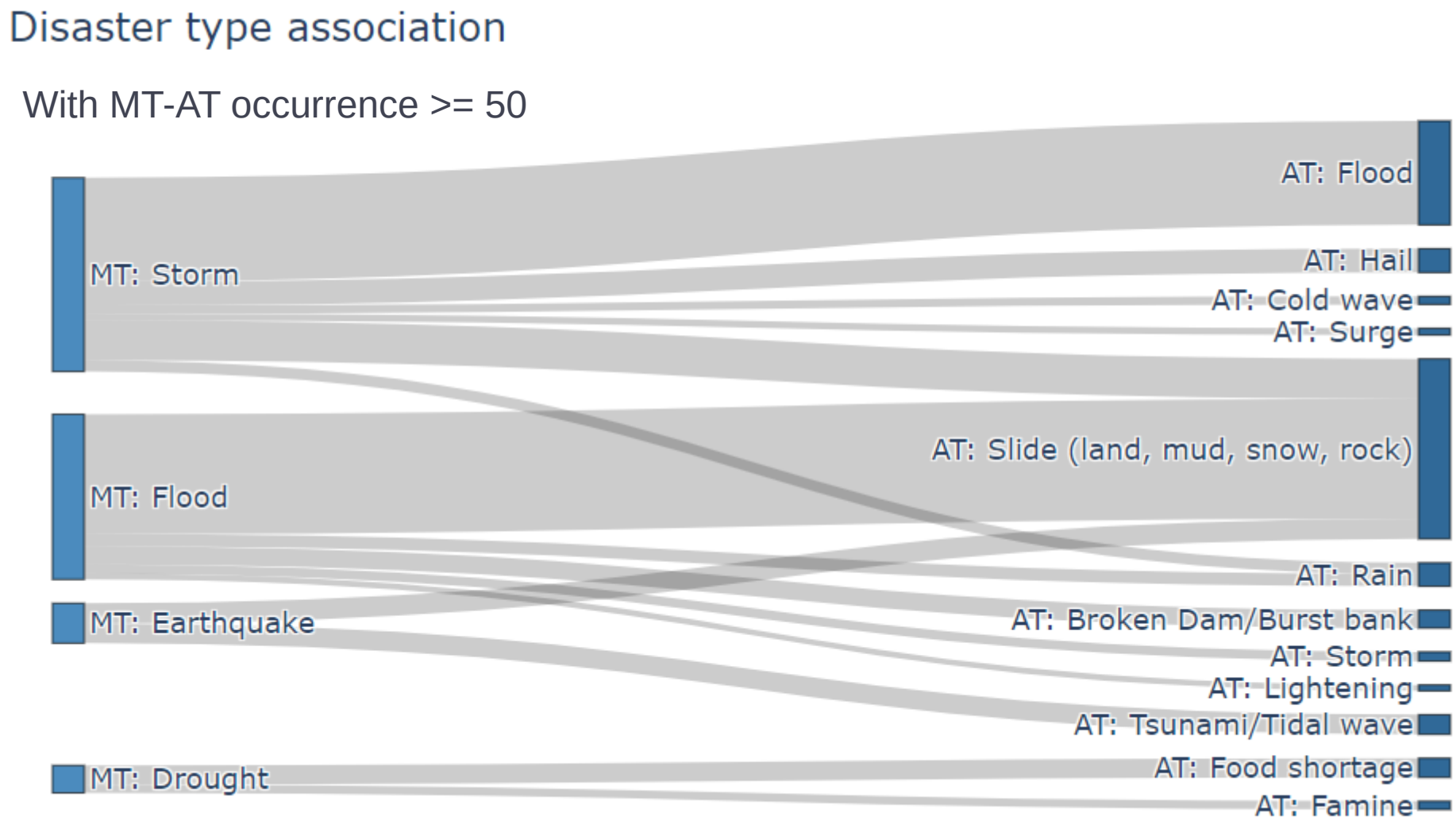
Technological
n=9,274



Complex
n=14

Icons from www.flaticon.com

14% of Disasters Have at Least 1 Associated Disaster



MT: Main Type; AT: Associated Type

Icons from www.flaticon.com

2 Classifying Disasters: From What Sources?

Authoritative Sources - examples

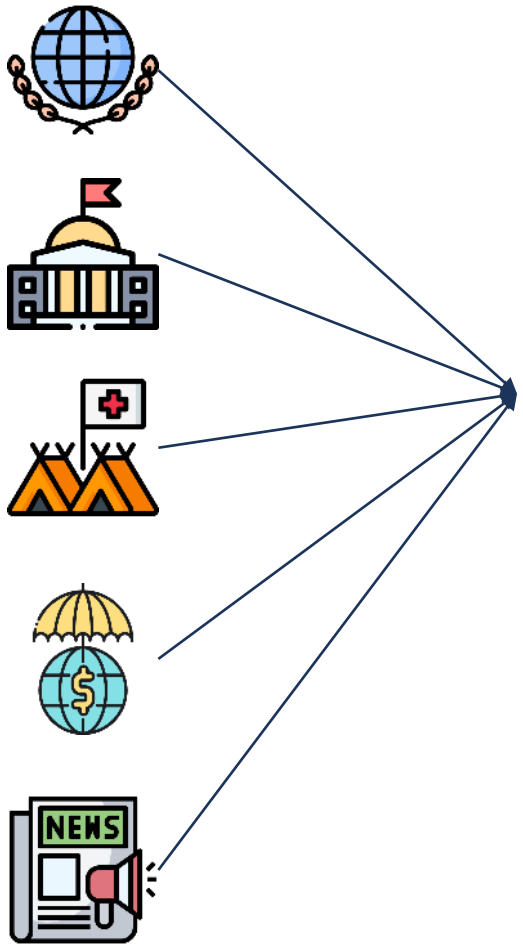
United Nations Agencies, World Bank

National governments, US, EU

Humanitarian agencies (e.g., IFRC)

Re-insurance companies (e.g., AON)

Press Agencies (e.g., AFP)



Manual Classification

EM-DAT

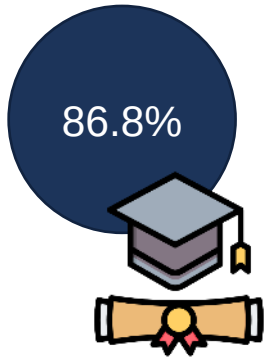
- Event date
- **Disaster type (4 lvl)**
- **Associated disasters**
- Country / location
- Impact variables

Icons from www.flaticon.com

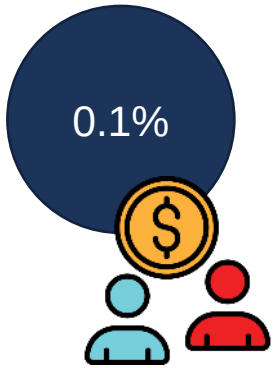
Classifying Disasters: For Which Users?

EM-DAT Data Portal: Four User Groups (since 2020)

International Public Organization



Academics & Research Institution



Commercial

Media*

\+ **High Visibility on the Web**

HDX Humanitarian Data Exchange

Our World in Data

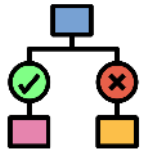
*Added in July 2021

Icons from www.flaticon.com

3 The Ideal Classification System

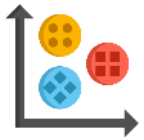
Evaluation Criteria for a Good **Design**

1. Comprehensiveness



2. Clarity

Intelligibility, Accuracy, Distinctiveness



3. Homogeneity

4. Suitability

For Users and Managers

5. Stability

For Users and Managers

6. Flexibility

Design = Logic + Structure + Classes + Glossary

Icons from www.flaticon.com

3 Classification Logic: the Tsunami Exception

Earthquake

Triggering hazard

Main EM-DAT type

Tsunami

Cascading hazard

~~Associated disaster~~

Main EM-DAT type

Clarity

Suitability

Icons from www.flaticon.com

3 General Categories in EM-DAT

1. Infectious diseases (General)
2. Infestation (General)
3. Wildfire (General)
4. Volcanic activity (General)
5. Flood (General)
6. Storm (General)
7. Industrial accident (General)
8. Miscellaneous accident (General)

Clarity

Homogeneity

Stability

Flexibility

Icons from www.flaticon.com

3 Empty Categories in EM-DAT

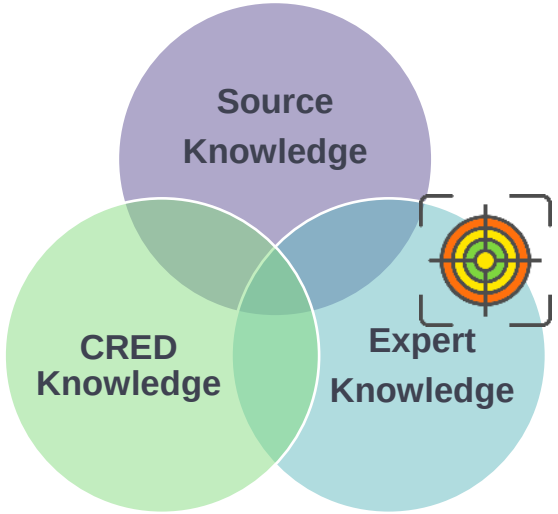
1. Fungal disease
2. Prion disease
3. Airburst
4. Energetic particles
5. Geomagnetic storms
6. Shockwave
7. Radio disturbance
8. Lahar
9. Ice Jam Flood
10. Rogue wave
11. Seiche

Why empty?

➔ Event rarity or lack of data?

Comprehensiveness
Stability

➔ Not intelligible enough?



Suitability
Clarity

Icons from www.flaticon.com

Main Challenges for EM-DAT Classification

Finding the best trade-offs (Comprehensiveness, Clarity, …)

… considering **CRED limited capacity** and **classification effort**

Small team size

Limited expert knowledge

Manual classification and update

Data model vs Data collection efforts

Icons from www.flaticon.com

Perspectives from EM-DAT Viewpoint

Small team size

Limited expert knowledge

Manual classification and update

Data model vs Data collection efforts

Connect with experts

Leverage existing work

Build partnership and projects

Artificial Intelligence

STAG Meeting 2023

Thank you!

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