

Which Types of Natural Disasters Cost the Most Human Life in the last 120 years?

Python / Data Analysis Personal Project

1. Introduction

This project explores the impact of natural disasters on human life from 1900 to 2024.

Using global data from *Our World in Data*, the goal is to find out which disasters caused the highest number of deaths, how these numbers changed over time, and whether some disaster types have become more or less frequent.

Understanding these long-term patterns helps us see not only how vulnerable humanity has been to natural forces, but also how progress in technology, communication, and preparedness may have changed the outcomes.

2. Research Questions

This project aims to investigate the human impact of natural disasters using global historical data from 1900 to 2024.

The analysis focuses on the following key questions:

- Which type of natural disaster has caused the highest number of deaths globally?
- How have disaster-related deaths changed over time?
- What do these numbers represent when adjusted for the global population?

3. Data Cleaning and Preparation

The dataset used in this analysis comes from *Our World in Data* and contains global records of deaths caused by various types of natural disasters between **1900 and 2024**.

It includes **7,517 rows** and **13 columns**, covering different disaster categories such as droughts, floods, earthquakes, volcanic activity, and others.

In this dataset, missing values in disaster-specific columns indicate no recorded deaths.

Therefore, the `NaN` values were replaced with `0` to reflect this meaning and to make the dataset easier to interpret.

Additionally, the columns representing human deaths were converted from *float* to *integer* type to reflect the fact that deaths are whole numbers, which also reduces memory usage and improves clarity.

After these cleaning steps, the dataset is ready for exploratory data analysis.

	Entity	Year	Deaths - Drought	Deaths - Flood	Deaths - Earthquake	Deaths - Extreme weather	Deaths - Extreme temperature	Deaths - Volcanic activity	Deaths - Wildfire	Deaths - Gout
0	Afghanistan	1969	0.0	NaN	NaN	NaN	NaN	NaN	NaN	NaN
1	Afghanistan	1971	0.0	NaN	NaN	NaN	NaN	NaN	NaN	NaN
2	Afghanistan	1972	0.0	150.0	11.0	NaN	NaN	NaN	NaN	NaN
3	Afghanistan	1973	0.0	NaN	NaN	NaN	NaN	NaN	NaN	NaN
4	Afghanistan	2000	9.0	NaN	NaN	NaN	NaN	NaN	NaN	NaN

(7517, 13)

	Year	Deaths - Drought	Deaths - Flood	Deaths - Earthquake	Deaths - Extreme weather	Deaths - Extreme temperature	
count	7517.000000	2.077000e+03	4.160000e+03	2049.000000	3434.000000	1016.000000	64
mean	1987.641878	2.259850e+04	6.743598e+03	4757.582723	1652.297321	1155.123031	49
std	29.006697	1.899511e+05	1.217503e+05	22651.011157	13739.969498	6965.321131	304
min	1900.000000	0.000000e+00	0.000000e+00	0.000000	0.000000	0.000000	0
25%	1973.000000	0.000000e+00	2.000000e+00	5.000000	2.000000	8.750000	0
50%	1995.000000	0.000000e+00	2.200000e+01	50.000000	21.000000	65.000000	0
75%	2010.000000	0.000000e+00	1.272500e+02	692.000000	213.750000	300.000000	3
max	2024.000000	3.000000e+06	3.700000e+06	277005.000000	304495.000000	74809.000000	3869

◀

▶

```

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7517 entries, 0 to 7516
Data columns (total 13 columns):
 #   Column           Non-Null Count Dtype  
 --- 
 0   Entity            7517 non-null   object  
 1   Year              7517 non-null   int64   
 2   Deaths - Drought 2077 non-null   float64 
 3   Deaths - Flood   4160 non-null   float64 
 4   Deaths - Earthquake 2049 non-null   float64 
 5   Deaths - Extreme weather 3434 non-null   float64 
 6   Deaths - Extreme temperature 1016 non-null   float64 
 7   Deaths - Volcanic activity 648 non-null   float64 
 8   Deaths - Wildfire    806 non-null   float64 
 9   Deaths - Glacial lake outburst flood 13 non-null   float64 
 10  Deaths - Dry mass movement 149 non-null   float64 
 11  Deaths - Wet mass movement 1210 non-null   float64 
 12  Deaths - Fog      4 non-null    float64 

dtypes: float64(11), int64(1), object(1)
memory usage: 763.6+ KB

```



dtype: int64

	Entity	Year	Deaths - Drought	Deaths - Flood	Deaths - Earthquake	Deaths - Extreme weather	Deaths - Extreme temperature	Deaths - Volcanic activity	Deaths - Wildfire	Deaths - Glacial lake outburst flood
0	Afghanistan	1969	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	Afghanistan	1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	Afghanistan	1972	0.0	150.0	11.0	0.0	0.0	0.0	0.0	0.0
3	Afghanistan	1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	Afghanistan	2000	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

```
<class 'pandas.core.frame.DataFrame'>
```

```
RangeIndex: 7517 entries, 0 to 7516
```

```
Data columns (total 13 columns):
```

#	Column	Non-Null Count	Dtype
0	Entity	7517 non-null	object
1	Year	7517 non-null	int64
2	Deaths - Drought	7517 non-null	int64
3	Deaths - Flood	7517 non-null	int64
4	Deaths - Earthquake	7517 non-null	int64
5	Deaths - Extreme weather	7517 non-null	int64
6	Deaths - Extreme temperature	7517 non-null	int64
7	Deaths - Volcanic activity	7517 non-null	int64
8	Deaths - Wildfire	7517 non-null	int64
9	Deaths - Glacial lake outburst flood	7517 non-null	int64
10	Deaths - Dry mass movement	7517 non-null	int64
11	Deaths - Wet mass movement	7517 non-null	int64
12	Deaths - Fog	7517 non-null	int64

```
dtypes: int64(12), object(1)
```

```
memory usage: 763.6+ KB
```

4. Exploratory Data Analysis (EDA)

In this section, the dataset is explored to uncover patterns and insights about the human impact of natural disasters.

The goal is to identify which disaster types have caused the most deaths, how their impact has evolved over time,

and whether certain types of disasters are becoming more or less frequent.

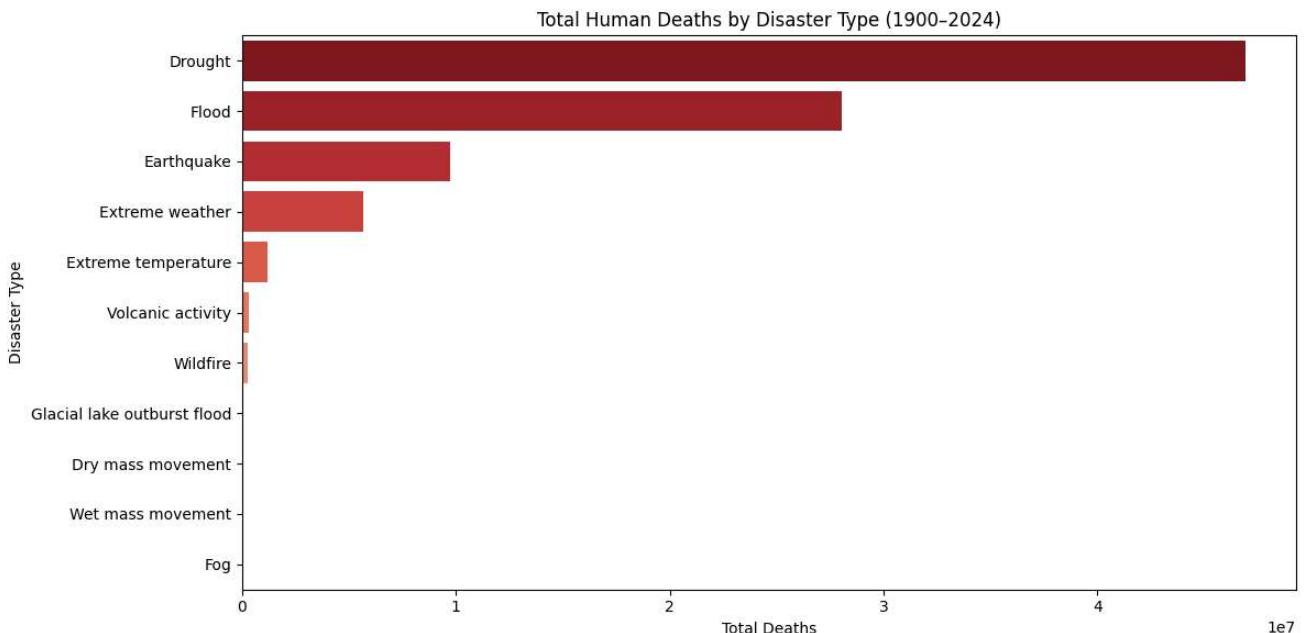
The analysis begins with a general overview of total deaths by disaster type, followed by a closer look at

historical trends and long-term changes in individual disaster categories.

4.1 Overview of Total Deaths by Disaster Type

To understand which types of natural disasters have been the most deadly throughout history, the total number of deaths was calculated for each disaster type between 1900 and 2024.

This gives a high-level overview of which disasters have had the greatest human impact globally and serves as a foundation for more detailed trend analysis in the next sections.



The bar chart shows that **droughts and floods** have historically caused the highest number of deaths worldwide, far exceeding other types of natural disasters.

These two categories dominate the global death toll, reflecting how vulnerable past societies were to food shortages and large-scale flooding events.

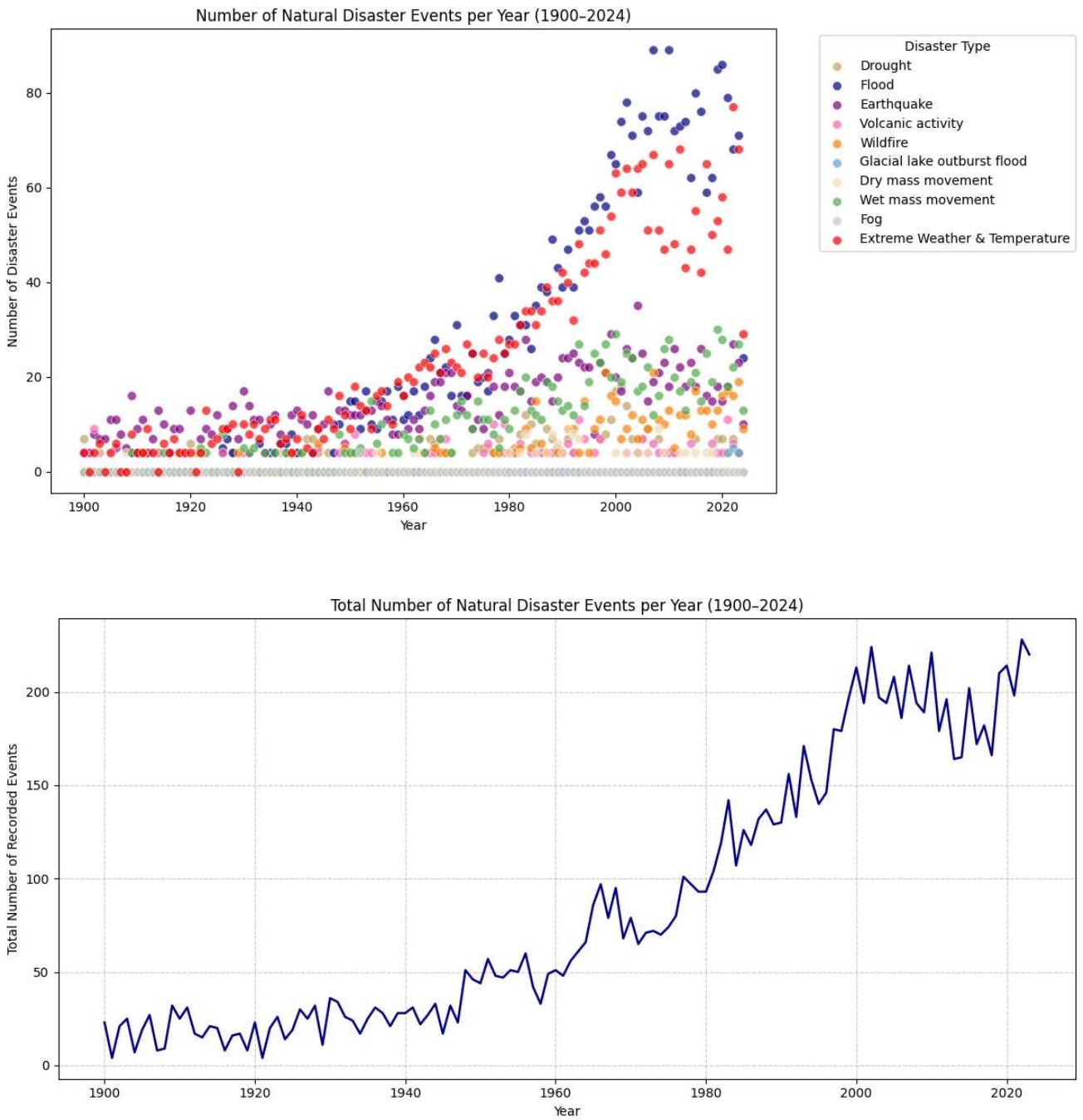
Other disasters, such as **earthquakes** and **extreme weather**, also caused significant loss of life, while **volcanic activity** and **wildfires** show relatively smaller global impact.

This overview suggests that while some disasters are rare, their consequences can be catastrophic — a topic explored in more detail in the following sections.

4.2 Overview of Disaster Frequency

The scatter and line plot provide an overall view of how the frequency of natural disasters has changed over time. A clear turning point appears around 1960, after which the total number of recorded events rises noticeably across most disaster types. The most significant growth is observed in floods and extreme weather, both showing a consistent upward trend likely linked to climate change and expanded global reporting.

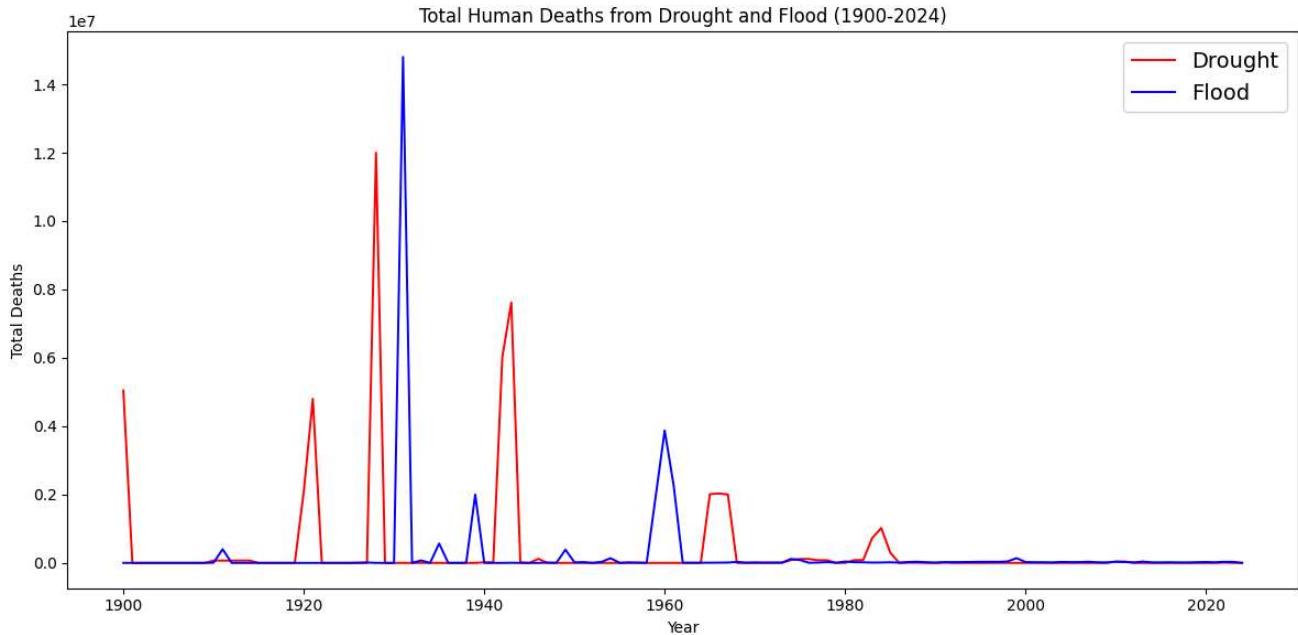
Overall, the pattern suggests that natural disasters have become more frequent since the 1960s, but their human impact varies depending on the type of hazard and the level of preparedness. These general trends will be explored in greater detail in the following sections, which focus on specific disaster types and their historical developments.



4.3 Droughts and Floods (1900 – 2024)

This section focuses on droughts and floods, the two disaster types that historically caused the highest number of deaths worldwide. To better understand their impact, two graphs are presented: a line chart showing the total number of deaths over time, and a scatter plot illustrating how frequently these disasters occurred each year. Together, these visualizations reveal not only how deadly these events were, but also how their occurrence patterns have changed throughout history.

The analysis again uses 1960 as a dividing point, as earlier results indicated a clear shift in both the number of disaster events and total fatalities around that time.

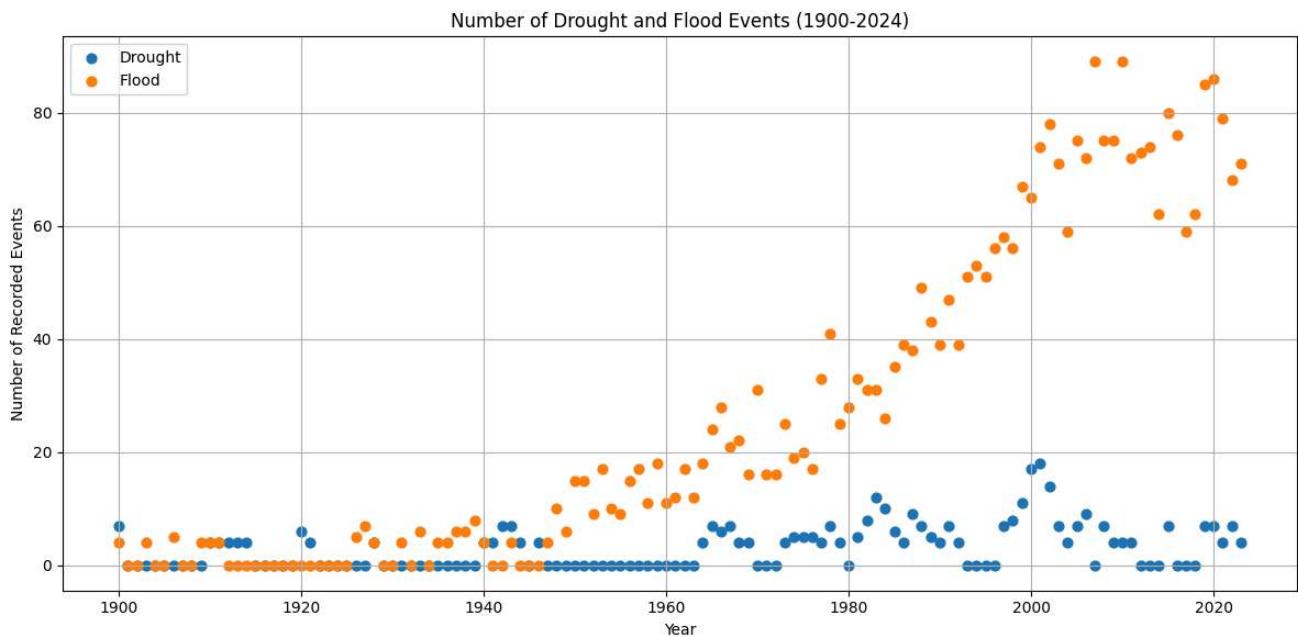


Deaths by Drought before 1960: 38080000

Deaths by Drought after 1960: 8857088

Deaths by Flood before 1960: 20457148

Deaths by Flood after 1960: 7596218



The data show a striking contrast between droughts and floods in both frequency and human impact.

- Drought: Despite being responsible for the highest total death toll — about **38 million deaths before 1960 and 8.9 million after** — droughts remain relatively rare events. Their frequency has increased only slightly, from fewer than 5 recorded events per year in the early 20th century to around 10 per year today. This pattern suggests that while droughts have become somewhat more common, their lethality has dropped sharply due to advances in agriculture, food aid, and famine prevention.
- Floods: In contrast, floods show a major rise in both occurrence and global impact. Deaths dropped **from about 20.5 million before 1960 to 7.6 million after**, yet the number of flood events surged dramatically — from roughly 5 per year at the start of the 1900s to more than 80

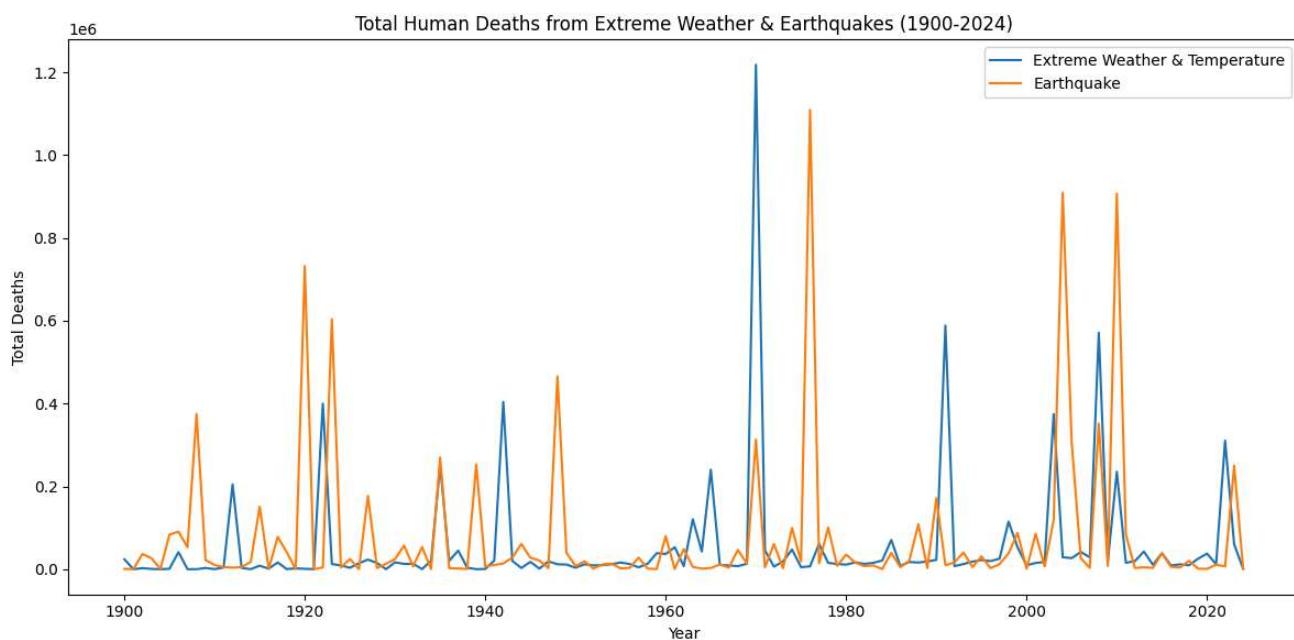
per year in recent decades. This steep increase reflects the growing influence of climate change, urban expansion, and heavier rainfall patterns, even as improvements in infrastructure and disaster preparedness have reduced overall mortality.

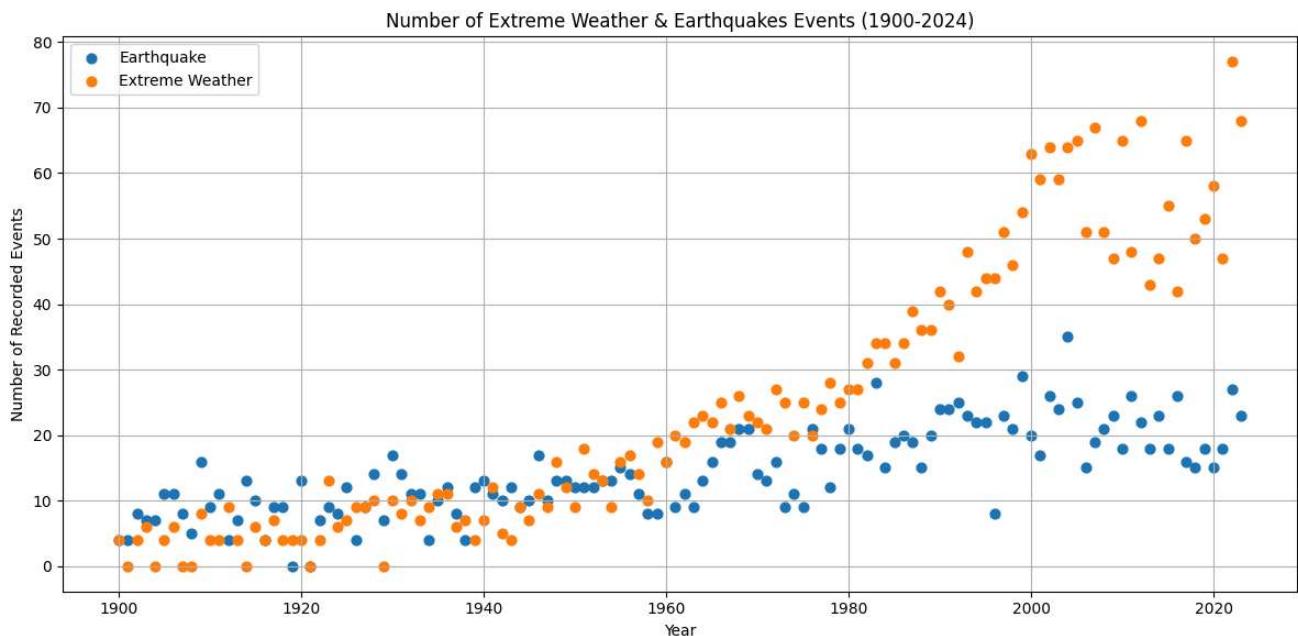
Overall, while the human toll of these disasters has fallen, the frequency of especially floods has risen sharply since the 1960s. This shift highlights the success of modern prevention systems, but also the continuing challenge of managing the increasing number of weather-related disasters worldwide.

4.4 Extreme Weather and Earthquakes (1900–2024)

After examining floods and droughts, which dominated the early 20th century, this section focuses on **extreme weather and earthquakes** — two disaster types that have become increasingly relevant in recent decades. According to the EM-DAT classification used by Our World in Data, Extreme Weather includes tropical cyclones, hurricanes, typhoons, storms, and tornadoes, while Extreme Temperature covers heatwaves and cold spells. In this analysis, these two categories were combined into a single group — Extreme Weather & Temperature — to provide a clearer and more logical overview of weather-related disasters.

The data were grouped by year to show how total deaths evolved between 1900 and 2024, again distinguishing the periods **before and after 1960**, when a clear shift in disaster patterns was observed. By comparing both the death tolls and event frequency, this section explores whether the modern rise in disasters also corresponds to greater human losses.





Deaths by Earthquakes before 1960: 3992844

Deaths by Earthquakes after 1960: 5755443

Deaths by Extreme Weather before 1960: 1812242

Deaths by Extreme Weather after 1960: 5035352

The chart shows that earthquakes and extreme weather both caused significant fatalities, but with different long-term patterns.

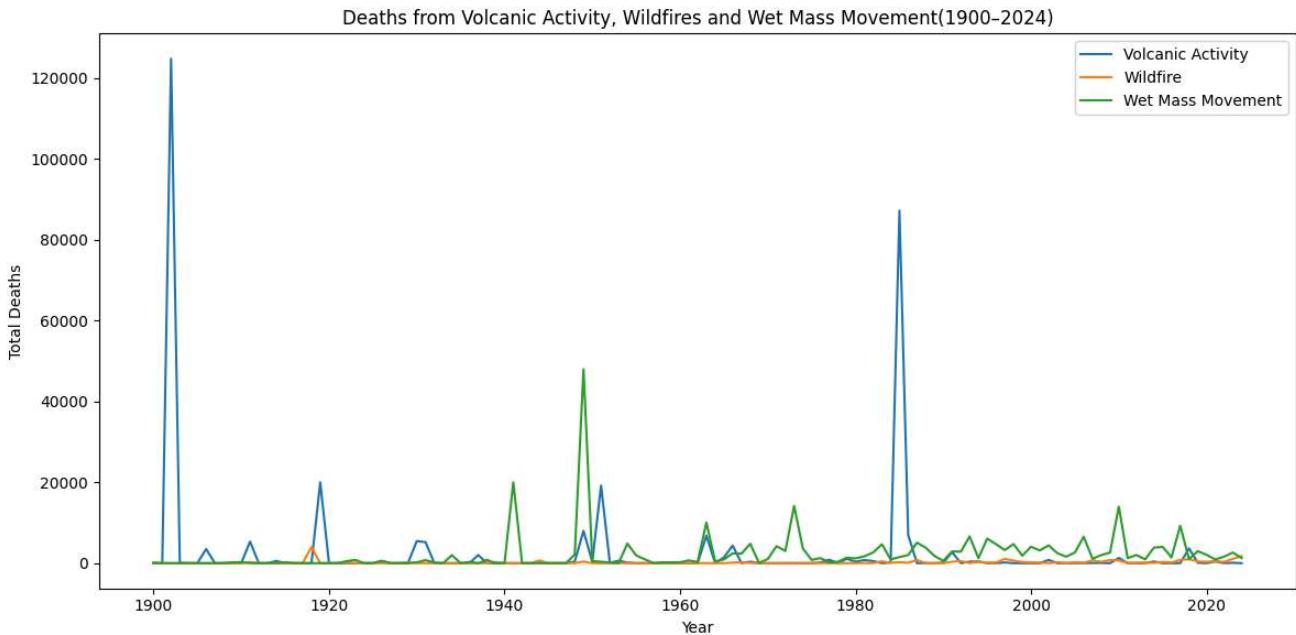
- Earthquakes: About **4 million deaths occurred before 1960 and 5.8 million afterward**. The number of recorded earthquake events also increased from roughly 15 per year in the early 1900s to about 28 per year today. This rise may reflect both a real increase in global seismic activity and improved detection and reporting systems. However, the dataset does not include information on earthquake magnitude, so it is unclear whether these events represent minor or major quakes. Comparing only felt or destructive earthquakes would provide a more accurate view of long-term changes in seismic activity.
- Extreme Weather: Deaths grew **from about 1.8 million before 1960 to 5 million afterward**, alongside a dramatic rise in event frequency — from around 10 per year to roughly 70 per year. This sharp increase highlights the intensifying impact of climate change and the growing exposure of human populations to extreme heat, storms, and temperature events.

Overall, while preparedness and technology have limited the lethality of some disasters, the data reveal a clear shift toward more frequent climate-related events, underlining the urgent need for continued global adaptation and resilience.

4.5 Volcanic Activity, Wildfires, and Wet Mass Movements (1900 - 2024)

This section focuses on volcanic activity, wildfires, and wet mass movements — disaster types that historically caused fewer deaths compared to floods or droughts, but show noticeable changes in frequency over time. Two graphs are presented: a line chart showing total deaths per year and a scatter plot displaying the number of recorded events annually between 1900 and 2024. Together,

they highlight how these disasters, although less deadly overall, have evolved in both occurrence and impact throughout the past century.



Deaths by Volcanic Activity before 1960: 196554

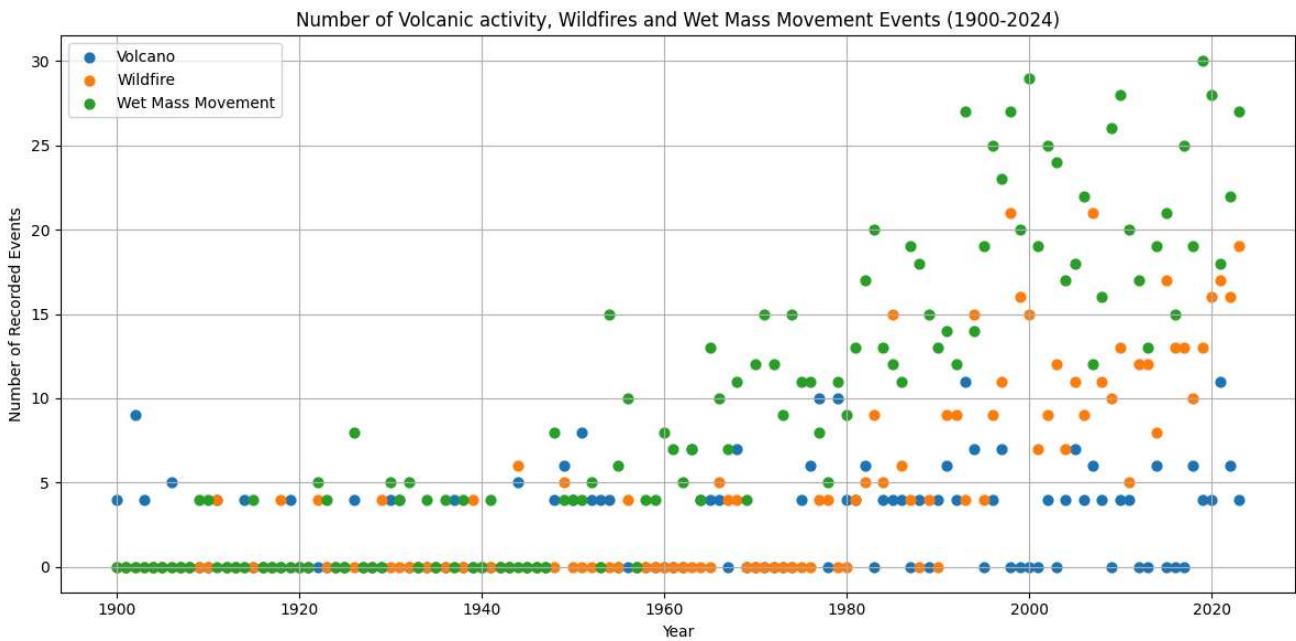
Deaths by Volcanic Activity after 1960: 121890

Deaths by Wildfire before 1960: 6112

Deaths by Wildfire after 1960: 16076

Deaths by Wet Mass Movement before 1960: 85986

Deaths by Wet Mass Movement after 1960: 192049



The results reveal that these disaster types show no clear long-term trend in fatalities, but a steady increase in frequency since the mid-20th century.

- Volcanic Activity: About **197,000 deaths occurred before 1960 and 122,000 after**. Two major peaks dominate the record — one in the early 1900s and another in the 1980s — representing a few catastrophic eruptions that caused most fatalities. The number of recorded volcanic events has roughly doubled, from about 4 per year in the early 1900s to around 8 per year in recent

decades, with fewer years entirely free of volcanic activity. This suggests more consistent global monitoring and possibly a real increase in minor eruptions.

- Wildfires: Deaths increased slightly, **from around 6,000 before 1970 to 16,000 after**. However, the number of wildfire events rose sharply — from roughly 4 per year to nearly 18 per year today. This upward trend likely reflects the growing influence of climate change, land-use changes, and human settlement expansion in fire-prone regions.
- Wet Mass Movements: This category shows several deadly spikes, particularly in the mid-20th century, but no consistent long-term pattern in fatalities. **Around 68,000 deaths occurred before 1960, compared with 192,000 after 1960**, indicating that while total deaths have risen, the trend remains irregular rather than steadily increasing. In contrast, the frequency of such events has grown significantly — from around 4 per year in the early 1900s to nearly 28 per year today — suggesting more frequent rainfall-triggered landslides and slope failures.

Overall, while fatalities from these disasters remain relatively low and variable, their increasing frequency — especially for wildfires and wet mass movements — highlights a clear shift toward more frequent but smaller-scale natural hazards in recent decades.

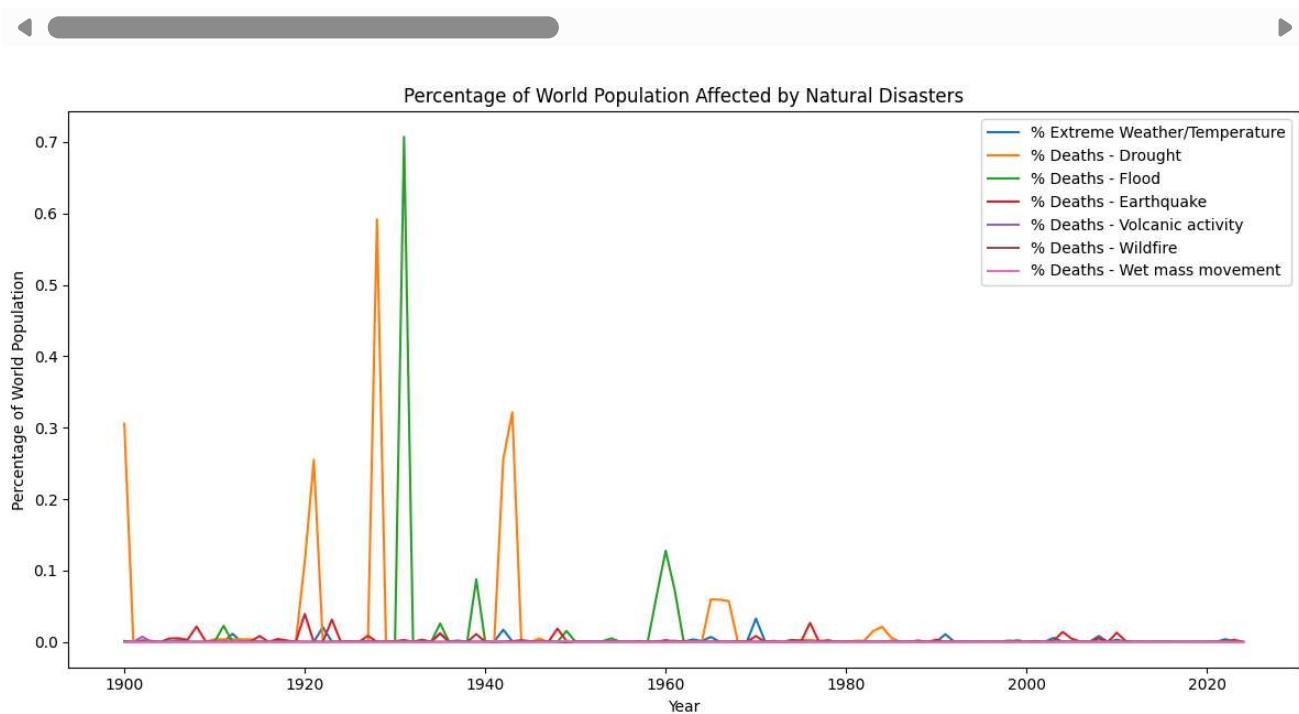
4.6 Deaths Relative to Global Population

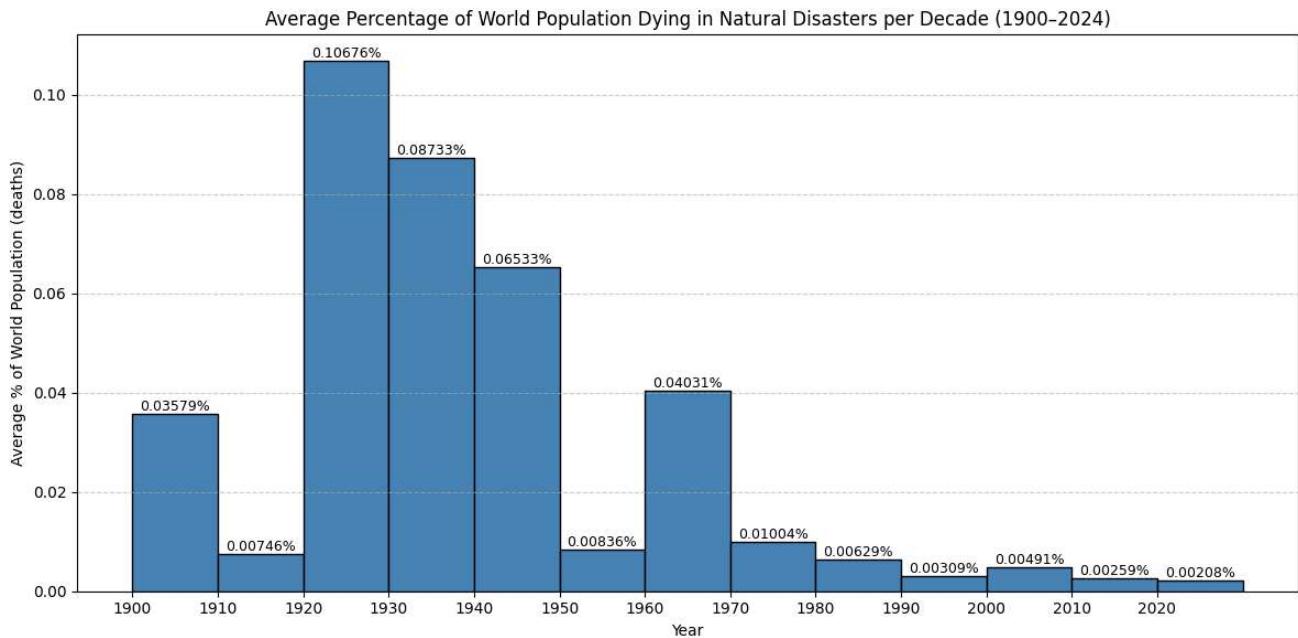
To better understand the broader human impact of natural disasters, the total number of deaths was also compared to the size of the global population in each year between 1900 and 2024. This approach reveals how the proportion of people dying in disasters changed over time, rather than focusing only on absolute death counts.

The global population data were interpolated from historical estimates provided by the United Nations, and disaster-related deaths were expressed as a percentage of the total population for each year. Average percentages were then calculated for each decade to highlight long-term trends in humanity's vulnerability to natural hazards.

Year	Entity	Deaths - Drought	Deaths - Flood	Deaths - Earthquake	Deaths - Volcanic activity	Deaths - Wildfire	Deaths - Glacial lake outburst flood
0 1900	AfricaAsiaCape VerdeHigh-income countriesIndia...	5044000	1200	560	120	0	0
1 1901	AsiaHigh-income countriesJapanWorld	0	0	72	0	0	0
2 1902	AsiaChinaEuropeGuatemalaHigh-income countriesJ...	0	0	36592	124760	0	0
3 1903	AfricaAsiaCanadaComorosHigh-income countrieslr...	0	1000	26520	68	0	0
4 1904	AsiaBangladeshEuropeEuropean Union (27)GreeceH...	0	0	612	0	0	0

5 rows × 23 columns





The results show a dramatic decline in the share of the global population dying from natural disasters over the past century. Between 1900 and 1960, disaster-related deaths often accounted for between **0.03% and 0.1% of the world's population**, with the highest peaks occurring during the **1920s and 1930s** — decades marked not only by global conflict and famine but also by severe droughts and floods that devastated large regions.

After 1970, this proportion fell sharply, reaching **below 0.01%** in the modern era. This decline reflects major improvements in **food security, international aid, early warning systems, and disaster preparedness**, which have greatly reduced the lethality of natural hazards despite their increasing frequency.

While natural disasters continue to affect millions of people each year — destroying homes, livelihoods, and infrastructure — the share of deaths relative to the world's growing population has declined sharply. This trend suggests that although the **number and intensity of disasters have increased**, global population growth and improved resilience have prevented these events from causing a comparable rise in mortality.

5. Conclusion

This project explored the human impact of natural disasters from 1900 to 2024 using global historical data. The analysis revealed that droughts and floods were the deadliest disasters of the early 20th century, responsible for tens of millions of deaths worldwide. Around 1960, a clear turning point emerged — the frequency of natural disasters began to rise sharply, particularly for floods and extreme weather, yet the proportion of deaths relative to the world's population declined dramatically.

These findings suggest that technological progress, improved disaster preparedness, and global cooperation have greatly reduced disaster-related mortality, even as climate change has intensified weather extremes. Although natural disasters continue to displace millions and cause substantial

economic and environmental losses, humanity has become far more resilient to their fatal consequences.

Ultimately, the data highlight both the progress and the ongoing challenge: while the world is better equipped to save lives, reducing the broader human and environmental costs of natural disasters remains one of the defining goals of the 21st century.

	Disaster Type	Total Deaths	Deaths before 1960	Deaths after 1960	Average % of World Population	Trend Summary
0	Drought	46,937,088	38,080,000	8,857,088	0.016843	Sharp decline in deaths
1	Flood	28,053,366	20,457,148	7,596,218	0.009335	Decline in deaths, rise in events
2	Earthquake	9,748,287	3,992,844	5,755,443	0.002470	Slight increase in both deaths and events
3	Extreme Weather & Temperature	15,422,276	1,812,242	5,035,352	0.001519	Strong increase in frequency
4	Volcanic Activity	318,444	196,554	121,890	0.000107	Irregular peaks, low overall deaths
5	Wet Mass Movement	278,035	85,986	192,049	0.000058	Rising frequency and deaths
6	Wildfire	22,188	6,112	16,076	0.000005	Increasing frequency and deaths

6. References

Data sources: EM-DAT, CRED / UCLouvain (2024) – with major processing by Our World in Data.

"Annual number of deaths from droughts – EM-DAT" [dataset]. EM-DAT, CRED / UCLouvain, "Natural disasters" [original data].

<https://ourworldindata.org/natural-disasters>

Accessed: October 2025.

Category Definitions (EM-DAT / Our World in Data)

- **Drought:** Extended period of abnormally low precipitation causing water shortage for people, animals, and plants.
- **Flood:** Overflow of water onto normally dry land, including riverine, flash, coastal, and reservoir flooding.

- **Extreme Weather:** Tropical cyclones, hurricanes, typhoons, storms, tornadoes, hailstorms, and other severe weather events.
- **Extreme Temperature:** Periods of unusually high or low temperatures, such as heatwaves or cold waves.
- **Earthquake:** Sudden movement of the Earth's crust along a fault, including impacts from aftershocks and tsunamis.
- **Volcanic Activity:** Eruptions or events involving lava, ash, gases, or pyroclastic material near volcanic vents.
- **Wildfire:** Uncontrolled fire in forests, grasslands, or other natural areas, often driven by wind and terrain.
- **Mass Movement (Dry/Wet):** Downslope movement of earth materials. Dry types occur without water, while wet types (landslides, mudslides) are triggered by heavy rain or snowmelt.
- **Glacial Lake Outburst Flood (GLOF):** Sudden release of water held by a glacier or moraine, causing rapid downstream flooding.
- **Fog:** Suspension of water droplets near the ground reducing visibility — only one major event recorded (London Smog, 1952).