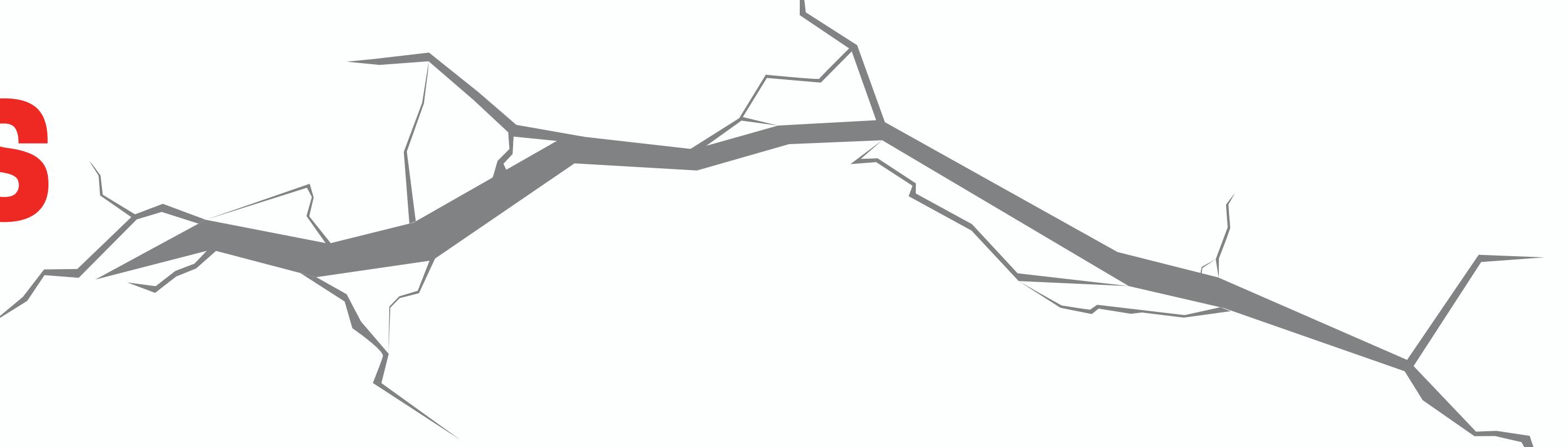


DISASTERS IN CONTEXT: MAPPING AND ANALYSIS

By Sam Harris



1. INTRODUCTION



Since 2000, mass disaster events like floods, droughts, and earthquakes have negatively impacted vulnerable populations around the world. Often, these disasters are unpredictable and thus unpreventable. However, through preparation and knowledge of risk, officials can mitigate disasters' impact. To understand the risk of a disaster happening in a certain place, disaster event data must be placed in the context of that place. This understanding leads to the objective of this project.



2. OBJECTIVE

This project combines world disaster event data with World Bank country indicator data to place historical disaster events in a given country's developmental context. Understanding historical disasters by their type, impact, and development context is crucial in learning how different disaster types affect different countries.



3. DATASETS



The EM DAT Database contains impact and location data for every world mass disaster event since 1900. For this project, only data from the 15,000+ disaster events from 2000-2023 will be used.



The World Bank Development Indicator Database contains comparable statistics about global development by country. For this project, the variables GDP per capita, infant mortality rate, life expectancy, electricity percentage, and tons of CO₂ emitted are used.



4. METHODS

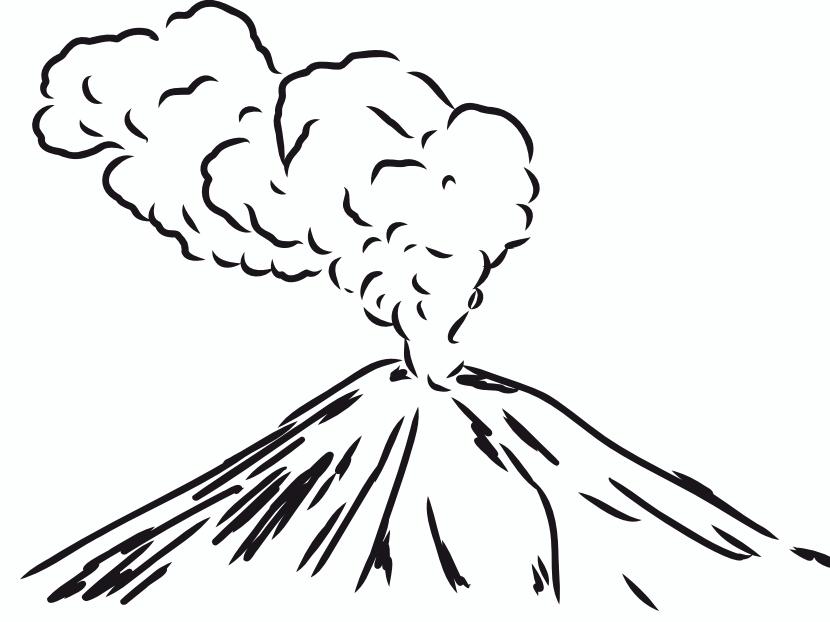
Development Score captures a country's overall development in a given year compared to the rest of the world. The following equation calculates the development score on a 5-50 scale, where D is the decile function:

$$\text{Development Score} = D(\text{Life Expectancy}) + D(\text{Infant Mortality, decreasing}) + D(\text{Carbon Dioxide Emitted}) + D(\text{Electricity Percentage}) + D(\text{GDP Per Capita})$$

Risk Score captures a country's overall risk of a certain disaster type based on historical disaster events and development. The score is modeled off of FEMA's Risk Index for US counties. This project uses a linear risk score model, and the weights reflect an emphasis on Impact (# of deaths and affected individuals) along with a lesser equal emphasis on Development Score and Frequency (how often a disaster type occurs). The variables have been normalized to be on a 0-100 scale, and the Development Score scale has been inverted for the calculation:

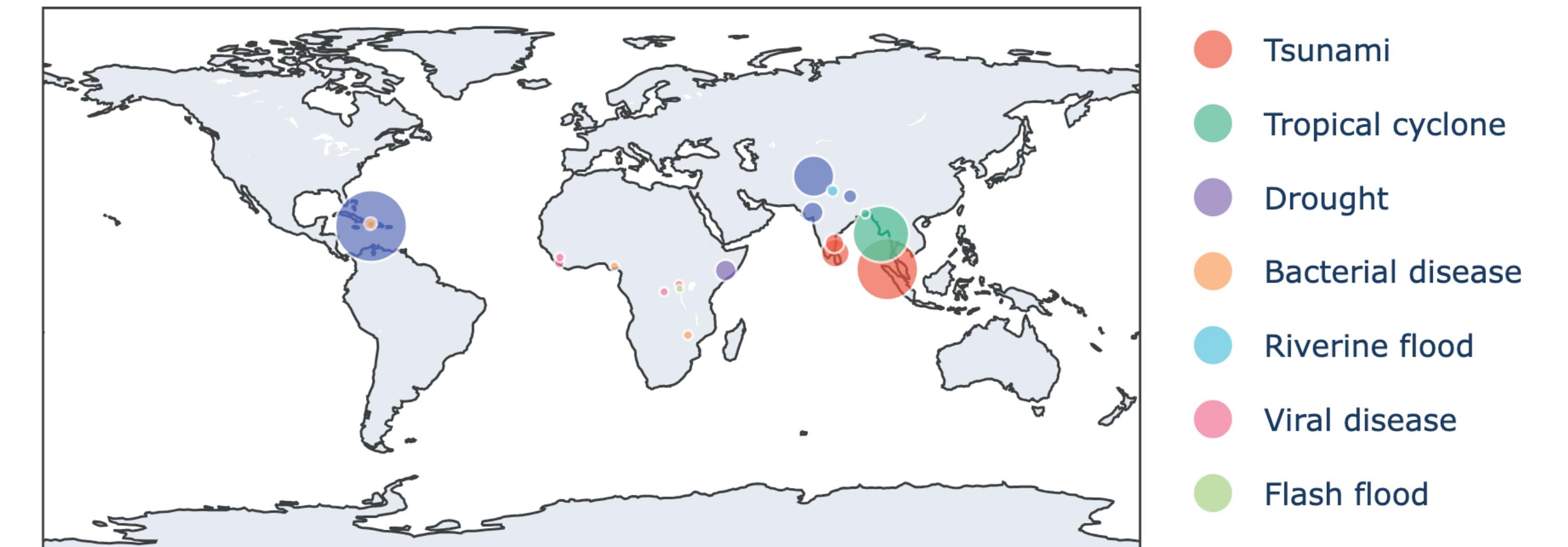
$$\text{Risk Score} = .5 \times \text{Impact} + .25 \times \text{Inverted Development Score} + .25 \times \text{Frequency}$$

5. MAPPING + ANALYSIS DEVELOPMENT + RISK SCORE



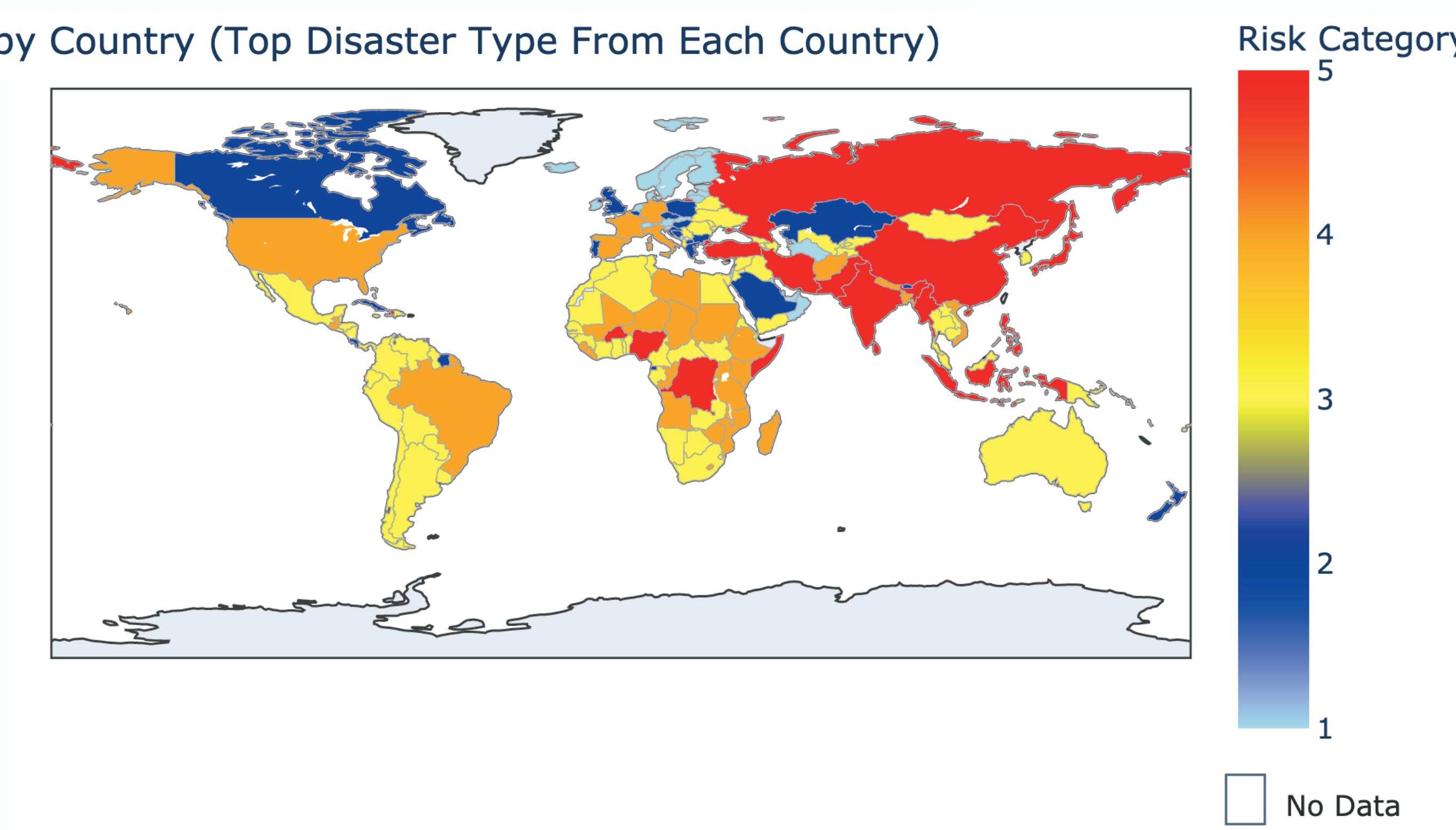
Top 20 Highest Death Toll Disasters by Development Status

Least Developed ▾



- The above map shows the deadliest disasters by development type. The size of the dot indicates the number of deaths, and the color shows the disaster subtype.

Risk Score by Country (Top Disaster Type From Each Country)



- The risk score map reflects the highest risk score disaster type in each country. The scores have been binned into different risk categories as indicated by the color scale.

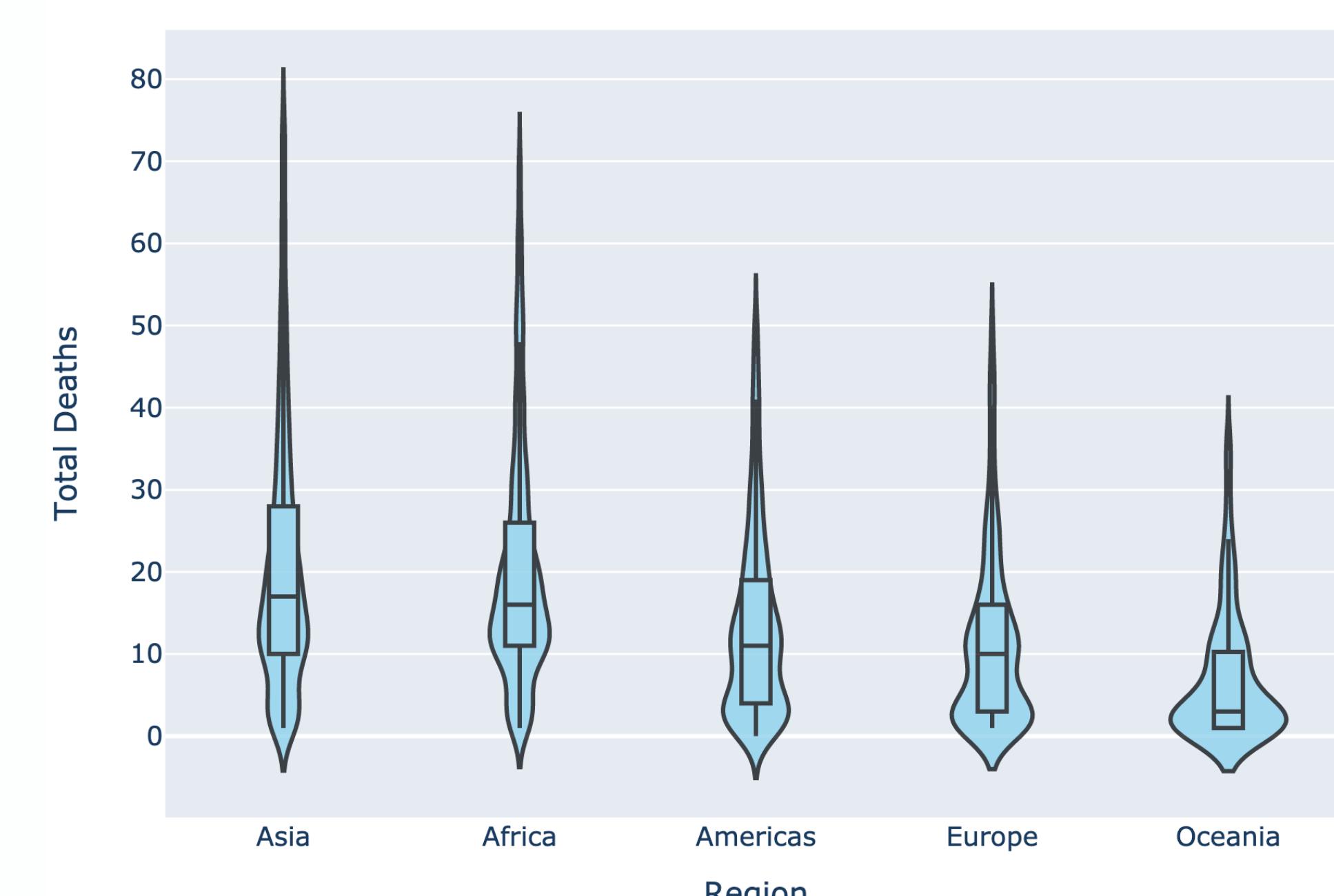
Median Total Deaths by Country Development Score



- The line graph shows the median death toll for disaster events by country development score. A downward trend is observed, indicating more developed countries have fewer deaths in a typical disaster event.

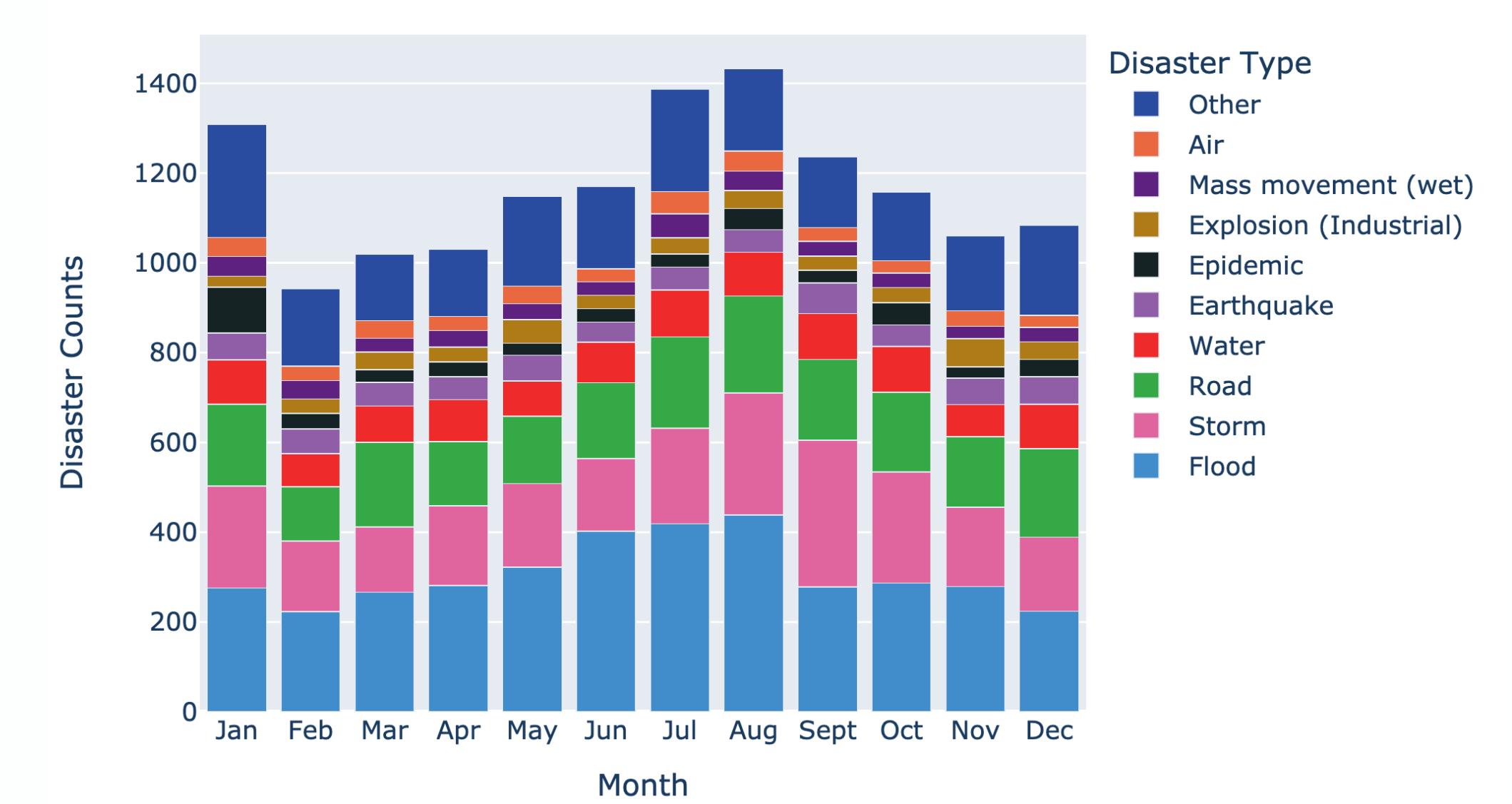
SPATIAL + TEMPORAL TRENDS

Violin Plot of Total Deaths by Region (without outliers)



- The violin plot shows median disaster event deaths are higher in Asia and Africa.

Stacked Bar Chart of Disaster Counts by Month and Disaster Type



- The stacked bar chart shows disaster counts by month since 2000 with color indicating Disaster Type. Most disasters occur during July and August.

6. CONCLUSIONS



- Mass disasters like the 2004 Boxing Day Tsunami dominate the overall death toll numbers.
- Disaster deaths and counts vary by region and month.
- The median death toll for disasters in the least developed countries is at least three times higher than in the developed countries.
- Risk scores allow for an easy comparison of disaster type risks.
- Interactive mapping of disasters by development and risk provides a valuable way to visualize disasters and compare countries.

REFERENCES

- Centre for Research on the Epidemiology of Disasters (CRED). (2024). EM Dat - The International Disaster Database. <https://www.emdat.be/>
- FEMA. (2024). Determining risk. Determining Risk | National Risk Index. <https://hazards.fema.gov/nri/determining-risk>
- The World Bank. (2024). World development indicators. WDI - Home. <https://datatopics.worldbank.org/world-development-indicators/>

QR Code For Interactive Maps

