Project 2: Climate Disasters

MATH-516 Applied Statistics

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Introduction

- The Intergovernmental Panel on Climate Change (IPCC) projects an increase in the frequency of climate-related disasters, as a result of climate change acceleration
- In contrast, with the exception of wildfires and heat waves, the number of deaths per disaster has dramatically decreased over the same period

Aim of the project: Discuss the consequences of climate change and economic development on the regional frequency and death toll of climate disasters

Data

- EM-DAT database (accessed on 08/07/2023) contains data on the frequency and severity/impact of disasters worldwide
- Data from 1960 to 2022
- Inclusion criteria
  - At least ten deaths
  - At least 100 affected
  - A call for international assistance or an emergency declaration
- Disasters are reported by country and hazard type (flood, drought, extreme temperature, epidemic, etc)
- For each disaster, we have (among others)
  - the country and location
  - the start and end date
  - total number of deaths (variable `InitTotalDeaths`)
  - total number of deaths normalized by the country's population wrt population in 2020 (variable `TotalDeaths`)
  - the classification of the country (similar to the classification by the IPCC in 6 regions) (variable `New_Regions`)

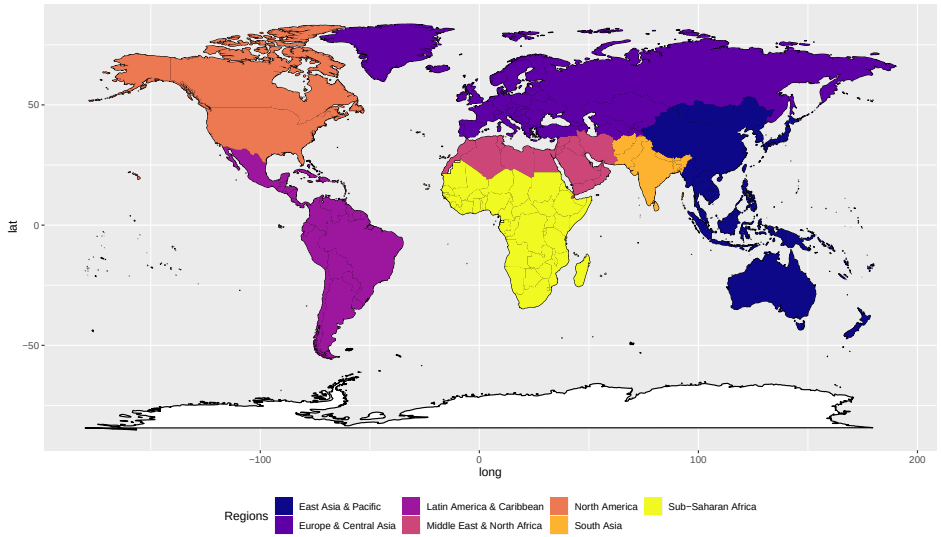
Data

- We will focus on either meteorological or hydrological disasters
  - you are free to choose from: **flood**, **storm**, or **extreme temperature**

```
# A tibble: 10 x 7
   DisNo        Year DisasterGroup DisasterSubgroup DisasterType DisasterSubtype
   <chr>       <dbl> <chr>         <chr>            <chr>        <chr>
 1 1963-0065-~  1963 Natural       Hydrological     Flood        <undefined>
 2 1969-9007-~  1969 Natural       Climatological   Drought      Drought
 3 1971-0044-~  1971 Natural       Hydrological     Landslide    Landslide
 4 1971-9085-~  1971 Natural       Climatological   Drought      Drought
 5 1972-0002-~  1972 Natural       Hydrological     Flood        <undefined>
 6 1972-0151-~  1972 Natural       Geophysical      Earthquake   Ground movement
 7 1976-0028-~  1976 Natural       Geophysical      Earthquake   Ground movement
 8 1976-0031-~  1976 Natural       Hydrological     Flood        <undefined>
 9 1978-0083-~  1978 Natural       Hydrological     Flood        <undefined>
10 1980-0033-~  1980 Natural       Hydrological     Flood        <undefined>
# i 1 more variable: Country <chr>
```

Data

- The classification of the regions is as follows
  - 1: East Asia & Pacific
  - 2: Europe & Central Asia
  - 3: Latin America & Caribbean
  - 4: Middle East & Africa
  - 5: North America
  - 6: South Asia



Data

- We provide you with the following additional datasets
  - population of countries from 1960 to 2021
  - Gross Domestic Product (GDP) from 1960 to 2021 (aggregated over each region)
  - CO_2 worldwide emissions (metric tons **per capita**) from 1900 to 2020
- You are free to look for additional datasets that might be of interest

Discussion on Modelling Objectives

Possible questions of interest

- What (if anything) can we infer about the impact of increasing CO_2 emissions on the frequency of climate disasters?
- What (if anything) can we infer about the impact of the economic development on the severity of climate disasters?
- Are all regions in the world affected equally by climate change?

Modelling aspect

- Did you consider transformations of some variables?
- Does the fit of the model(s) give you confidence in your conclusions?
- Discuss shortcomings and possible improvements of your model(s)