Call of the Data Analysis 2025: Viewing Climate Change across the Globe

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April 18, 2025

Outline

Primary Research Question

- The center of the competition is centered on the analysis of **climate change and related events, exploring their impacts.**
- Main Question: How has climate change effected the world over the last 30 years?
- Breaking this down into four main categories:
  - Annual Surface Temperature
  - Mean Sea Level Change
  - Climate Related Disasters
  - Forest and Carbon Levels

Data

- Annual Surface Temperature
  - From 1961 to 2023 over different countries and regions
- Mean Sea Level Change
  - 1992 - 2025 over various regions
- Climate Related Disasters
  - 1980 - 2024 over a plethora of countries and regions
- Forest and Carbon Levels
  - 1992 - 2022 focused on forested areas and carbon footprint of countries around the globe

Key Questions

- How has the surface temperature increased over the past 60 years?
- How has sea level changed over the last 30 years?
- Have climate related disasters increased over the last 40 years? Are there any regions that seem more disposed to these disasters?
- Has deforestation played a large role into these other categories?

Data

- All data was exported from the IMF's different websites regarding their climate data. Three websites in total which will be found at the references slide.
- The Mean Sea Level Change and Annual Surface Temperature were found at the climate and weather page.
- The Climate Related Disasters was found on the Adaptation page or dashboard.
- The forest and carbon levels data was found on the Mitigation page.

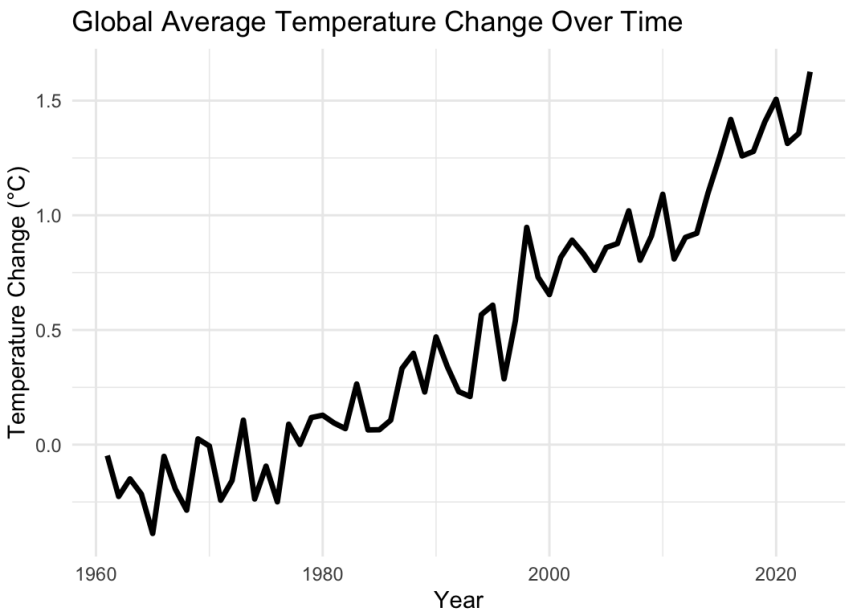
Packages Used

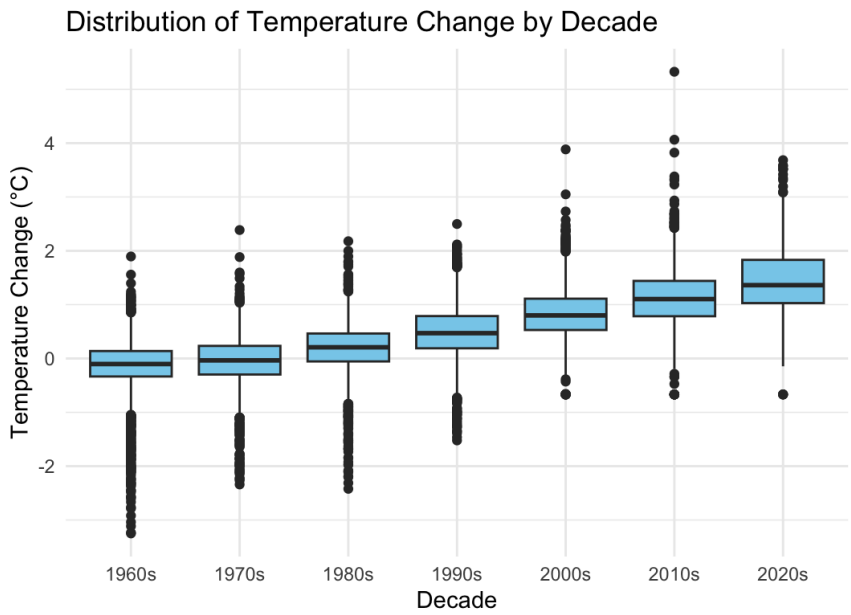
- Since the data could be exported as csv files there was no need to scrape it from the web.
- However, various other packages were used in the manipulation and wrangling stage. These include the following:
- readr
  - easy reading in of the data,
- dplyr
  - data manipulation,
- tidyr
  - ensures data is fit for tidyverse use,
- forcats
  - focuses on factors.
- countrycode
  - a convenient way to convert different country codes for data manipulation

Packages Used

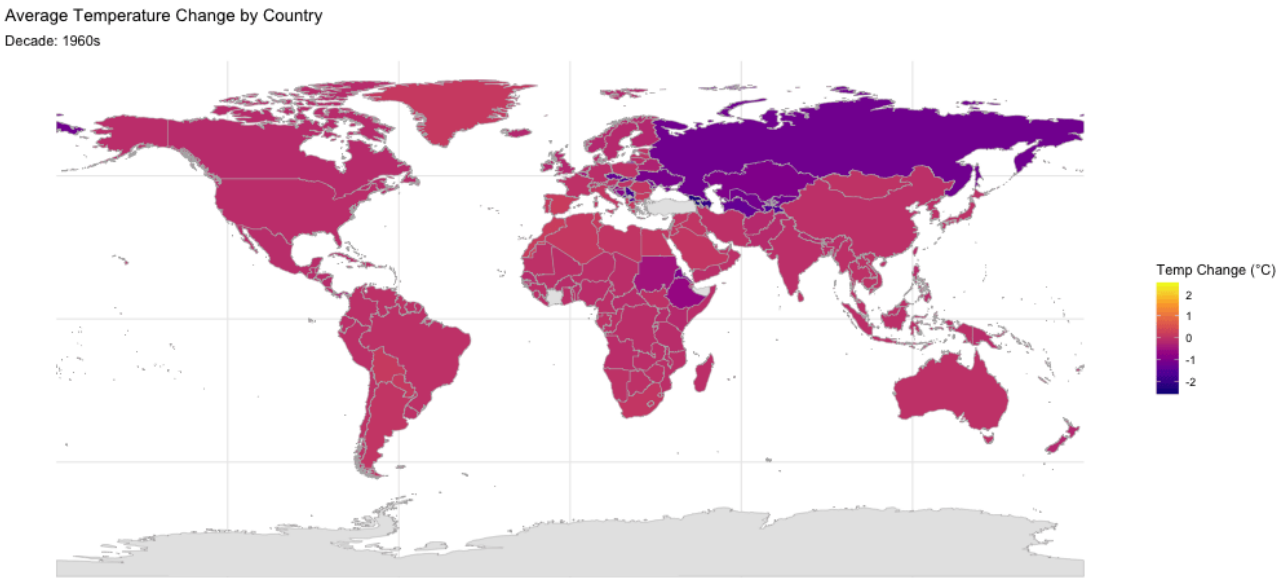
- ggplot2
  - A basic plotting library
- rnaturalearth
  - A package that provides ease of use maps of the world
- sf
  - spatial features for better maps
- gganimate
  - create animated graphics
- gifski
  - allow for animated graphics to be saved in gif format

Global Average Temperature over time

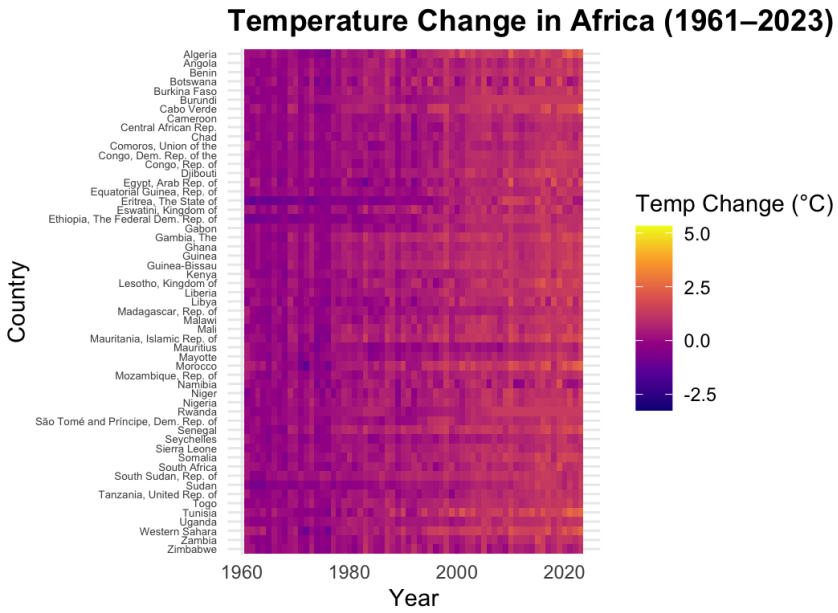


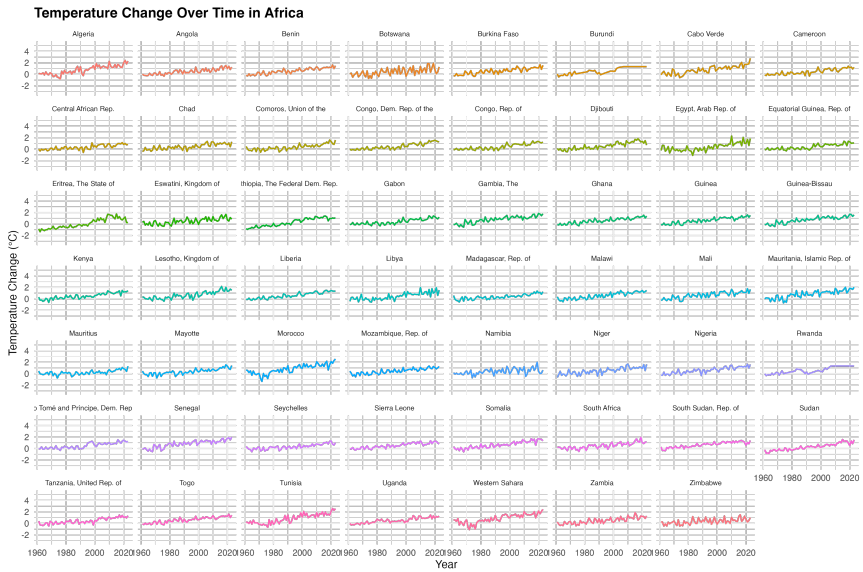


World Map of Average Temperature over the years

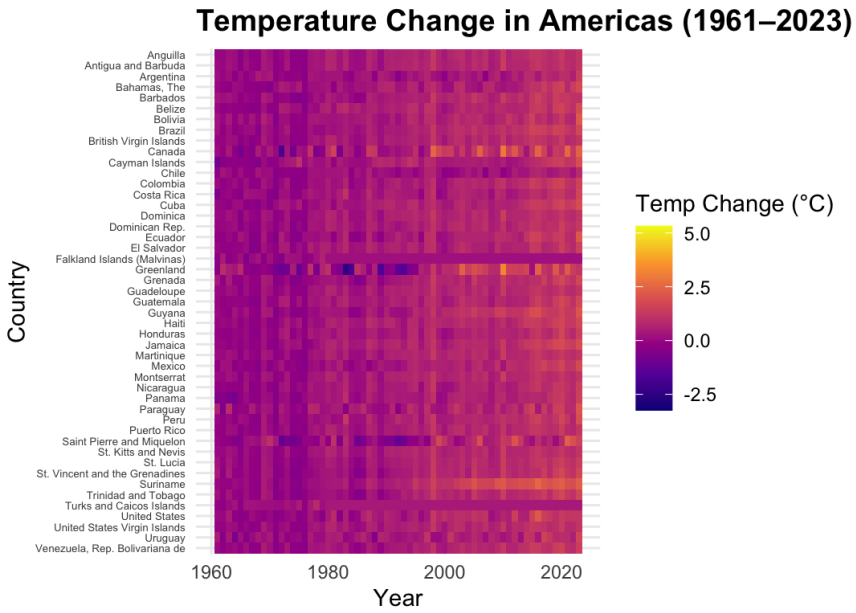


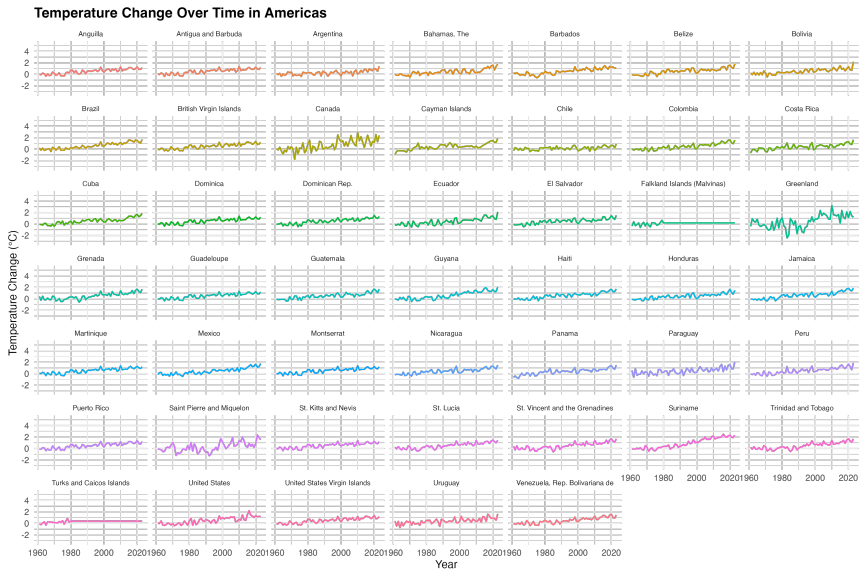
Africa


Temperature Change in Africa (1961–2023)
Country
Year
Temp Change (°C)
5.0
2.5
0.0
-2.5
1960
1980
2000
2020

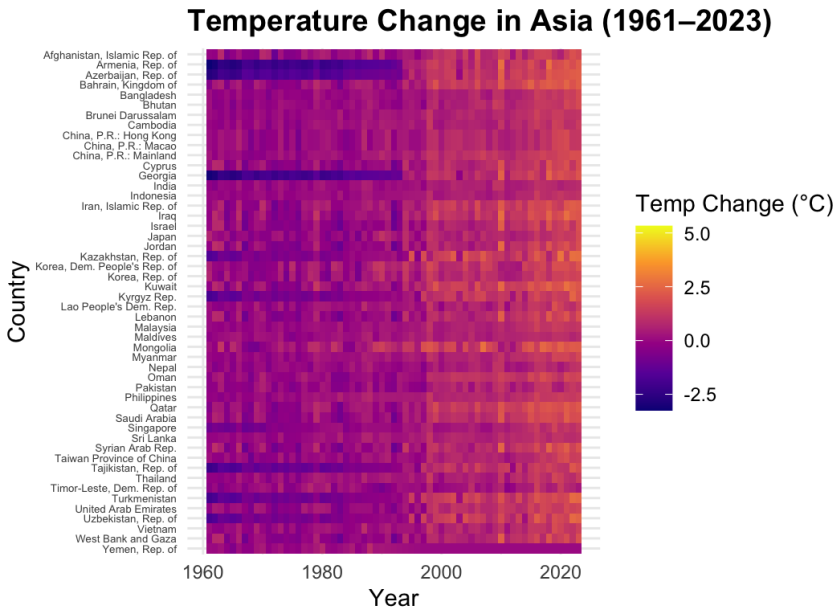

Temperature Change Over Time in Africa
Temperature Change (°C)
Year

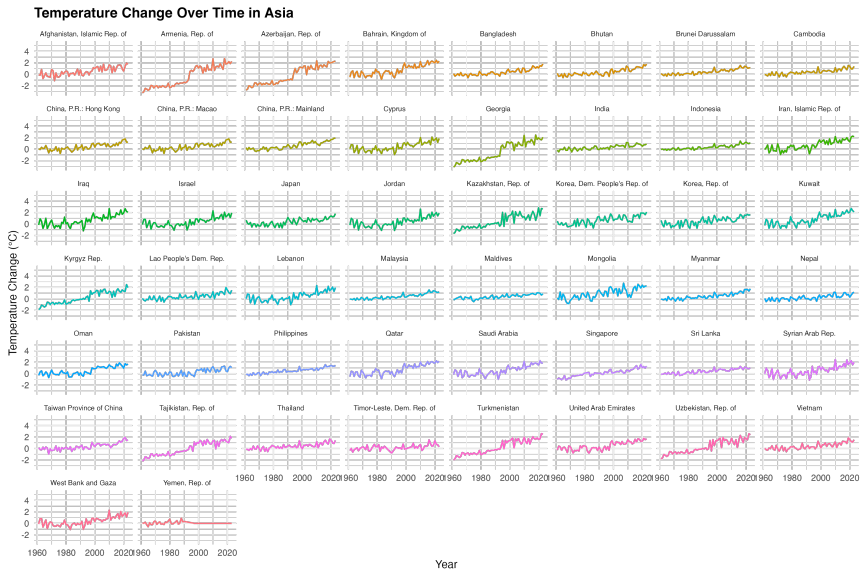
Americas


Temperature Change in Americas (1961–2023)
Country
Anguilla
Antigua and Barbuda
Argentina
Bahamas, The
Barbados
Belize
Bolivia
Brazil
British Virgin Islands
Canada
Cayman Islands
Chile
Colombia
Costa Rica
Cuba
Dominica
Dominican Rep.
Ecuador
El Salvador
Falkland Islands (Malvinas)
Greenland
Grenada
Guadeloupe
Guatemala
Guyana
Haiti
Honduras
Jamaica
Martinique
Mexico
Montserrat
Nicaragua
Panama
Paraguay
Peru
Puerto Rico
Saint Pierre and Miquelon
St. Kitts and Nevis
St. Lucia
St. Vincent and the Grenadines
Suriname
Trinidad and Tobago
Turks and Caicos Islands
United States
United States Virgin Islands
Uruguay
Venezuela, Rep. Bolivariana de
1960
1980
2000
2020
Year
Temp Change (°C)
5.0
2.5
0.0
-2.5

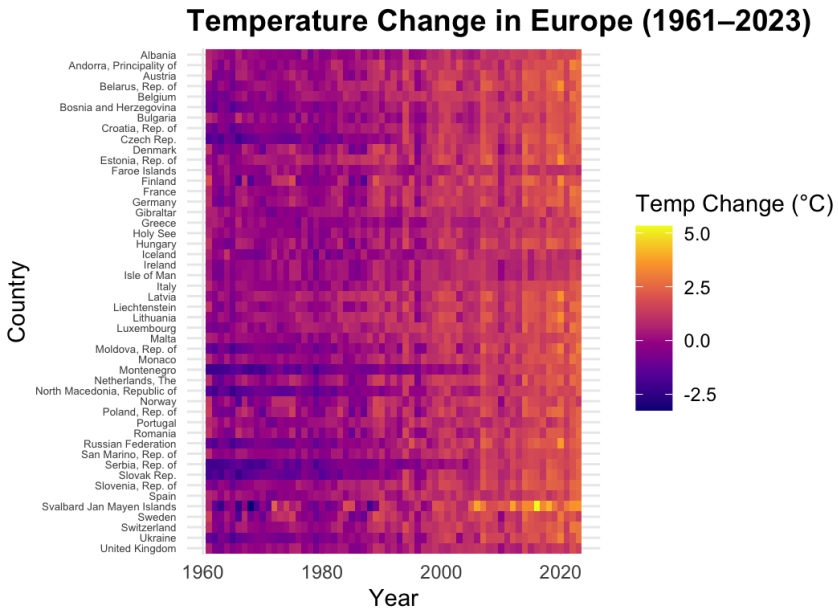

Temperature Change Over Time in Americas
Temperature Change (°C)
Year

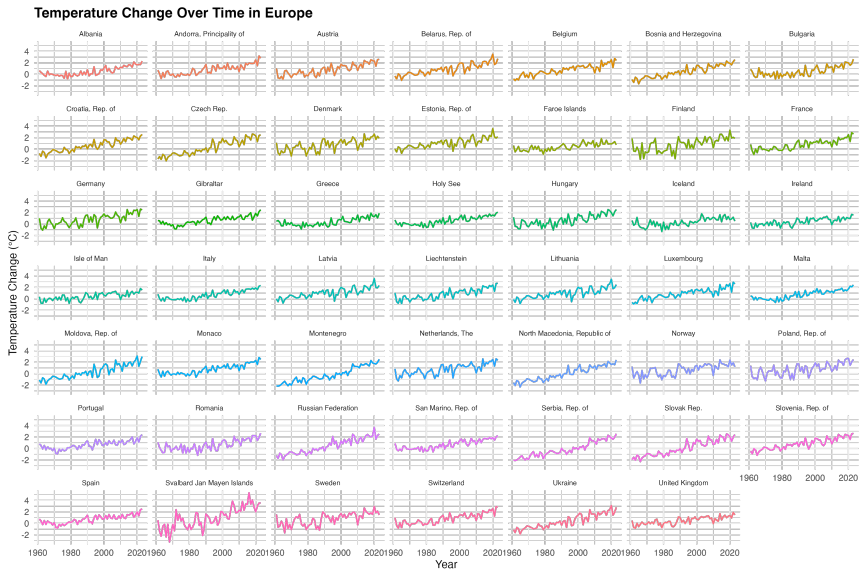
Asia


Temperature Change in Asia (1961–2023)
Country
Year
1960
1980
2000
2020
Temp Change (°C)
5.0
2.5
0.0
-2.5

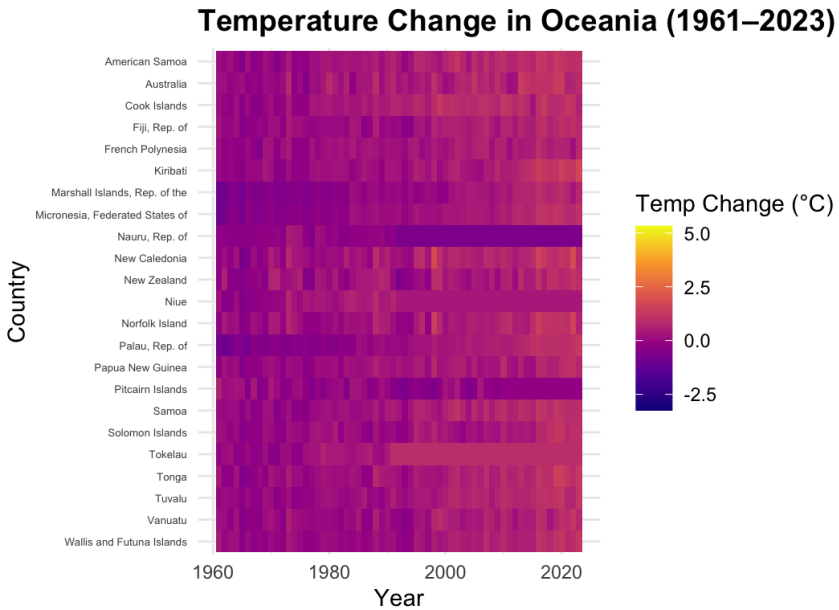

Temperature Change Over Time in Asia
Temperature Change (°C)
Year

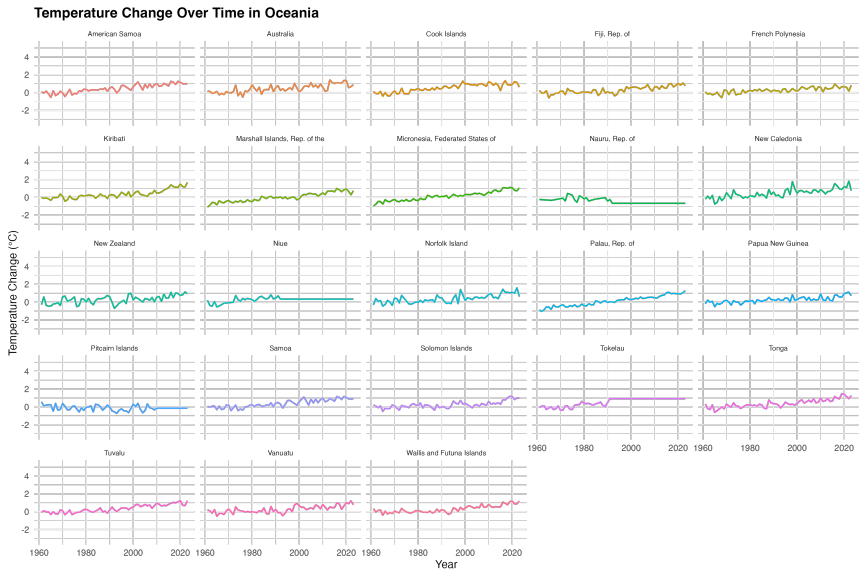
Europe


Temperature Change in Europe (1961–2023)
Country
Albania
Andorra, Principality of
Austria
Belarus, Rep. of
Belgium
Bosnia and Herzegovina
Bulgaria
Croatia, Rep. of
Czech Rep.
Denmark
Estonia, Rep. of
Faroe Islands
Finland
France
Germany
Gibraltar
Greece
Holy See
Hungary
Iceland
Ireland
Isle of Man
Italy
Latvia
Liechtenstein
Lithuania
Luxembourg
Malta
Moldova, Rep. of
Monaco
Montenegro
Netherlands, The
North Macedonia, Republic of
Norway
Poland, Rep. of
Portugal
Romania
Russian Federation
San Marino, Rep. of
Serbia, Rep. of
Slovak Rep.
Slovenia, Rep. of
Spain
Svalbard Jan Mayen Islands
Sweden
Switzerland
Ukraine
United Kingdom
1960
1980
2000
2020
Year
Temp Change (°C)
5.0
2.5
0.0
-2.5


Temperature Change Over Time in Europe
Temperature Change (°C)
Year

Oceania

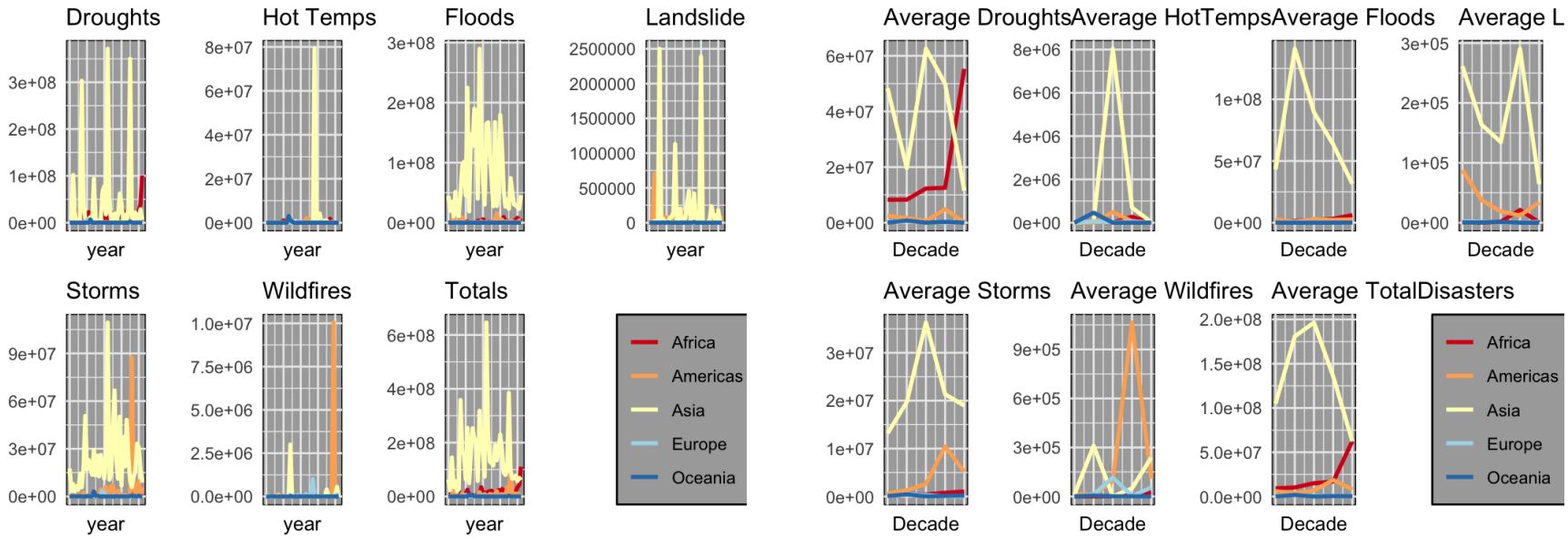

Temperature Change in Oceania (1961–2023)
American Samoa
Australia
Cook Islands
Fiji, Rep. of
French Polynesia
Kiribati
Marshall Islands, Rep. of the
Micronesia, Federated States of
Nauru, Rep. of
New Caledonia
New Zealand
Niue
Norfolk Island
Palau, Rep. of
Papua New Guinea
Pitcairn Islands
Samoa
Solomon Islands
Tokelau
Tonga
Tuvalu
Vanuatu
Wallis and Futuna Islands
Country
1960
1980
2000
2020
Year
Temp Change (°C)
5.0
2.5
0.0
-2.5


Temperature Change Over Time in Oceania
American Samoa
Australia
Cook Islands
Fiji, Rep. of
French Polynesia
Kiribati
Marshall Islands, Rep. of the
Micronesia, Federated States of
Nauru, Rep. of
New Caledonia
New Zealand
Niue
Norfolk Island
Palau, Rep. of
Papua New Guinea
Pitcairn Islands
Samoa
Solomon Islands
Tokelau
Tonga
Tuvalu
Vanuatu
Wallis and Futuna Islands
Temperature Change (°C)
Year

Remarks on Annual Surface Temp

- It appears to have gotten warmer in every region and country but Oceania had the smallest growth in Temperature.
- This rise in temperatures will provide insight to the other categories and their relationship with the climate

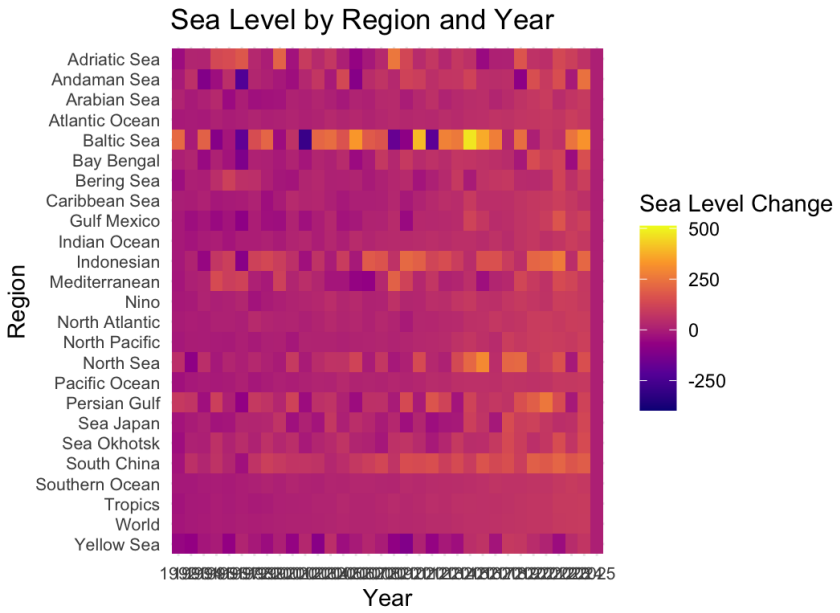
Disasters by region

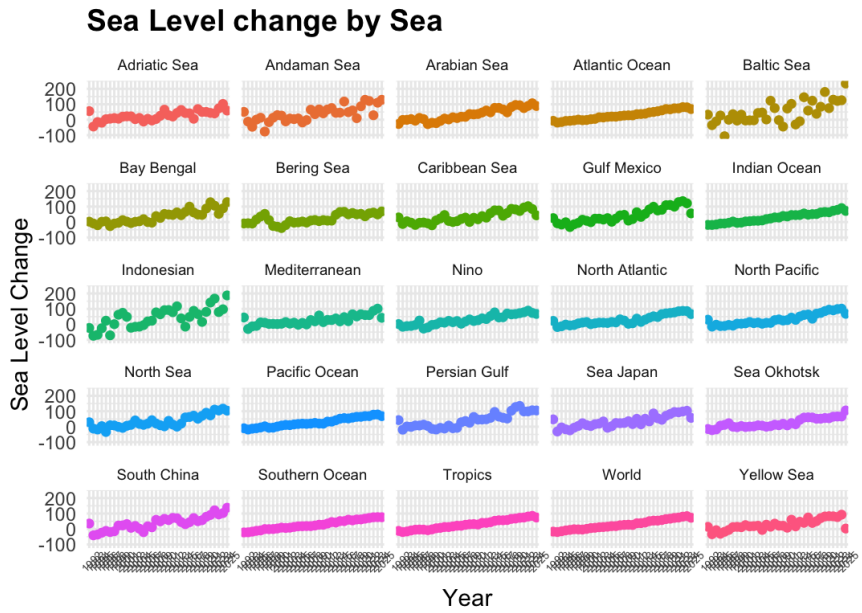


Remarks on Climate Related Disasters

- Asia appears to have the most disasters both on average and in total.
- The only place that had a worse category is in the Americas for wildfires.
- However, it appears that Africa surpassed them in droughts.

Sea Level Changes

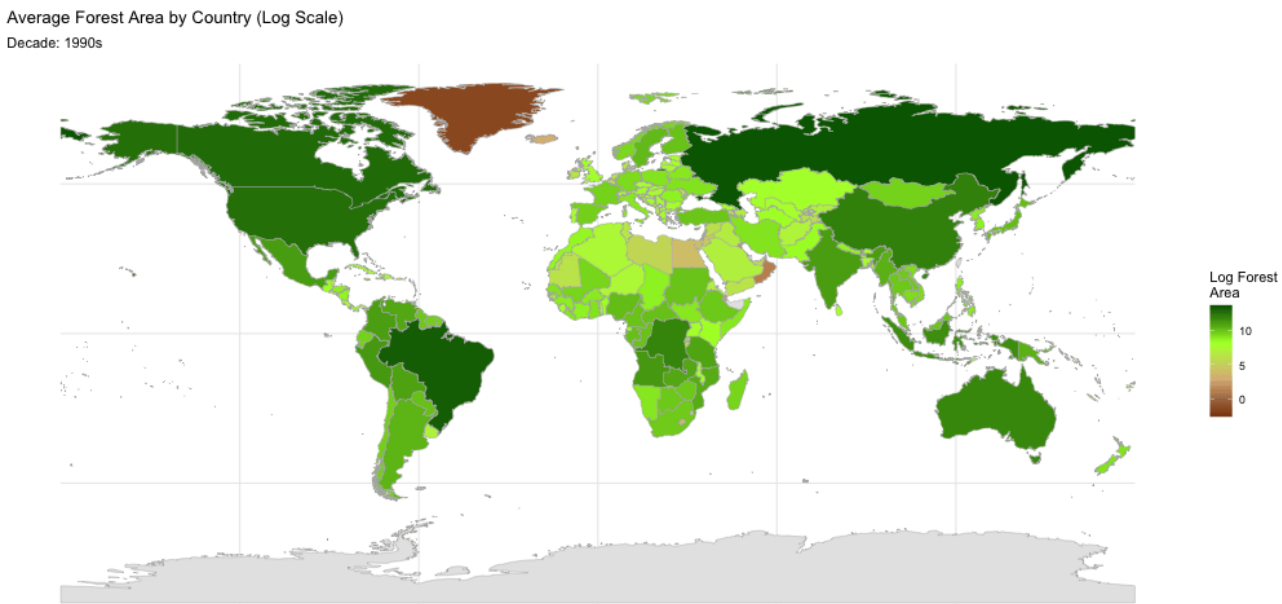




Remarks on Sea Level Changes

- It appears to have gotten warmer in every ocean and sea in the world.
- There appears a steady incline in all areas.

Comparative map of Log Forest Area around the World



Remarks on Forest Area

- There appears to be less log forest area now then there was in the 1990s
- This might cause some of the issues with temperature and disasters

Conculsions

- As the temperature as increased across the globe, other aspects of the climate has been impacted.
  - Disasters have fluctuated but do appear to be more common in current years
  - All sea levels have appeared to have risen
  - Log Forest Area appears to have decreased across the globe.
  - The forest might be the only one to not be an "effect" and rather a cause of the temperature rising

Future Analysis

- Things that we would like to investigate in the future:
  - Which is the cause of the relationship between the forest area and rising temperatures?
  - How many people are affected by the growing number of disasters?
  - Have disasters become more destructive recently compared to the past?
  - Are there other indicators from other sources that we should be worried about?

References and Resources

- Call of the Data Analysis
  - https://iasc-isi.org/2025/01/14/call-of-the-data-analysis-competition-2025/
- Climate and Weather Dashboard (Surface Temperature Change, Mean Sea Level Changes)
  - https://climatedata.imf.org/pages/climate-and-weather
- Mitigation Dashboard (Forest and Carbon)
  - https://climatedata.imf.org/pages/mitigation
- Adaption Dashboard (Climate Related Disasters)
  - https://climatedata.imf.org/pages/mitigation

- **Questions ?!?**