

# Module VII

## Global Climate Change\_II



*Lecture 8 (20 August 2024)*  
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**Department of Social Relations  
EAST WEST UNIVERSITY**

## **Topic covers:**

1. Impacts of climate change
2. Mitigation and adaptation to climate change

# What are the Impacts of Climate Change?

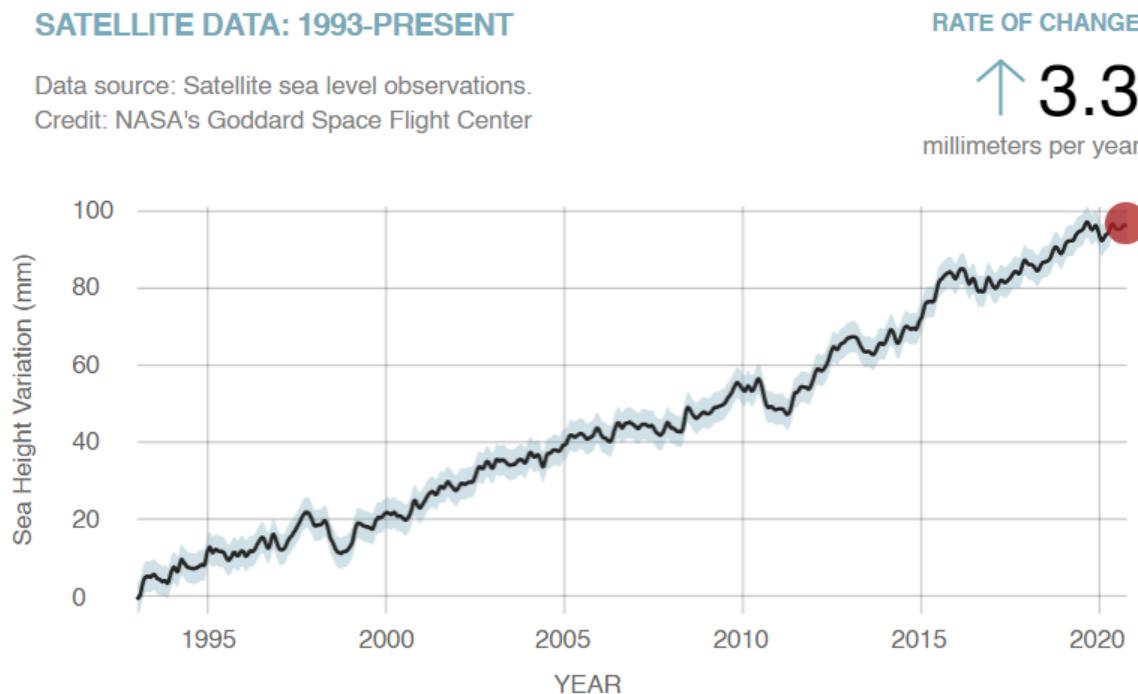
# **Impacts of Climate Change**

- Change will continue through this century and beyond
- Changes in sea level
- Melting of arctic ice
- Temperatures will continue to rise
- Changes in precipitation patterns
- More droughts and heat waves

• **Hurricanes will become stronger and more intense**  
<https://www.theguardian.com/environment/ng-interactive/2021/oct/14/climate-change-happening-now-stats-graphs-maps-cop26?>

## Sea Level Change

Sea level rise is caused primarily by two factors related to global warming: the added water from melting ice sheets and glaciers and the expansion of seawater as it warms.



# Melting of Arctic Ice

Arctic likely to become ice-free

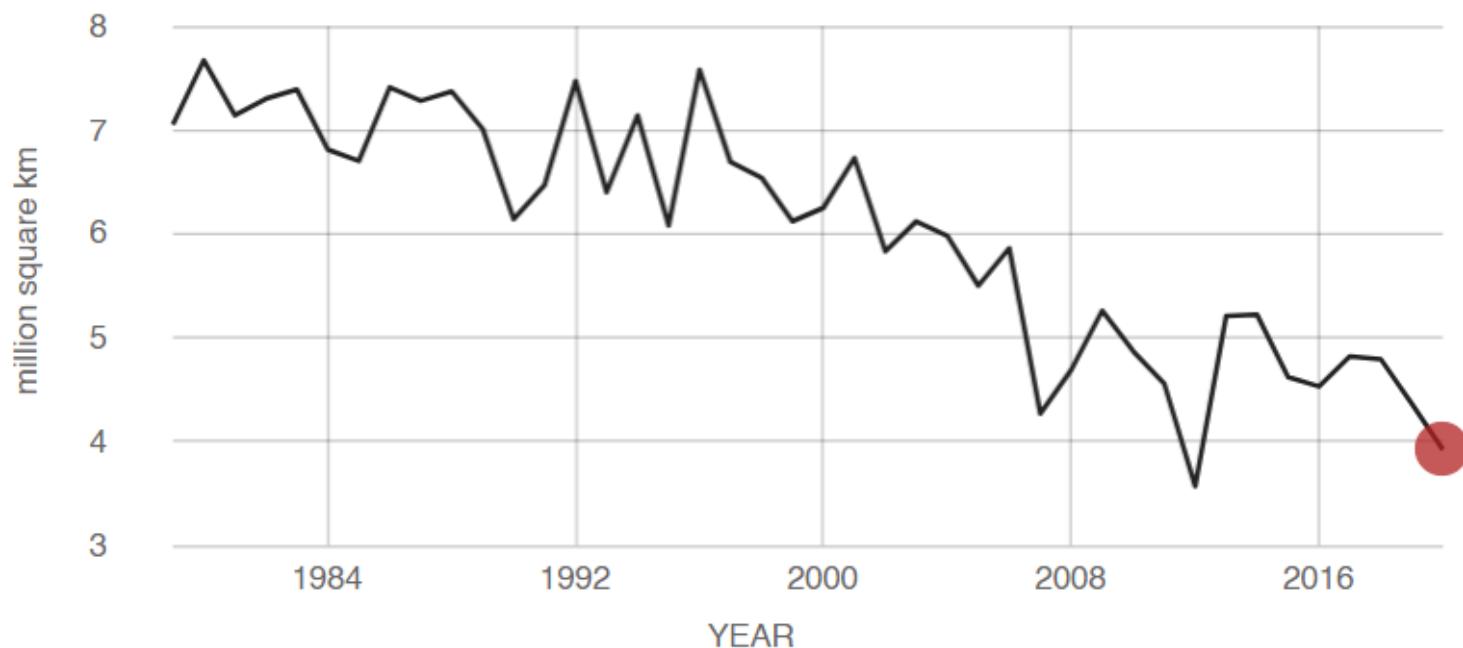
## AVERAGE SEPTEMBER MINIMUM EXTENT

Data source: Satellite observations. Credit: [NSIDC/NASA](#)

## RATE OF CHANGE

↓ 13.1

percent per decade



## Local Sea-Level Projections

Oceanic processes, gravitational effects and local processes like land subsidence lead to substantial **regional differences in sea-level projections**. This website allows you to browse through local sea-level projections provided by Kopp et al. (2014), extended by data based on Rasmussen et al. (2018) and Bamber et al. (2019).

Search for a tide gauge station: Grid\_22.0\_90.0

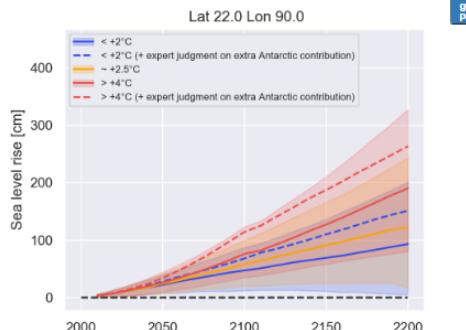
You can also select a tide gauge station on the zoomable map below:



At locations where no tide gauge station is available, gridded sea-level projections can be selected (yellow squares). Gridded sea-level projections come with substantially higher uncertainties. Therefore, we **strongly recommend to use projections for tide gauge stations whenever possible!**

Sea-level projections are presented for three **scenarios** leading to different

We strongly recommend using projections for tide gauge stations if possible!



**Figure:** Local sea-level projections at lat 22.0 lon 90.0 for different global warming trajectories. The solid lines represent multi-model medians, the shaded areas capture the 66% uncertainty range. Dashed lines show median sea-level projections including revised Antarctic ice-sheet contributions from Bamber et al. (2019).

Local Sea Level Rise [cm]		
year	median	uncertainty ranges
		66% 90%
2030	12 [14]	3-21 [4-23] -3-28 [-3-30]
	12	3-21
	13 [15]	3-22 [5-24] -3-29 [-2-31]
2050	22 [28]	7-39 [11-46] -4-51 [-1-58]
	24	7-41
	26 [34]	10-44 [16-53] -1-57 [4-68]
2100	47 [68]	12-87 [33-109] -12-119 [9-141]
	58	20-99
	76 [114]	35-123 [66-182] 8-163 [37-250]

# **Impact of climate change in Bangladesh**

- CC will result in **increasing and severe frequent tropical cyclones**, with higher wind speeds and storm surges causing more damages in the coastal region
- **Heavier and irregular rainfall** during the Monsoon will result in:
  - Higher river flows, causing over-topping and breaching of embankments, and widespread flood
  - Riverbank erosion resulting in loss of homes and agricultural land
  - Increased sedimentation in the riverbeds leading to drainage congestion
- **Melting of the Himalayan glaciers** will lead to higher river flows
- **Sea level rise**, leading to the submerge of the low lying coastal region and **Saline water** intrusion
- **Warmer and more humid weather**, leading to the increasing prevalence of disease. Climate change is likely to increase the incidence of water-borne and air-borne disease, bacteria, and parasites.

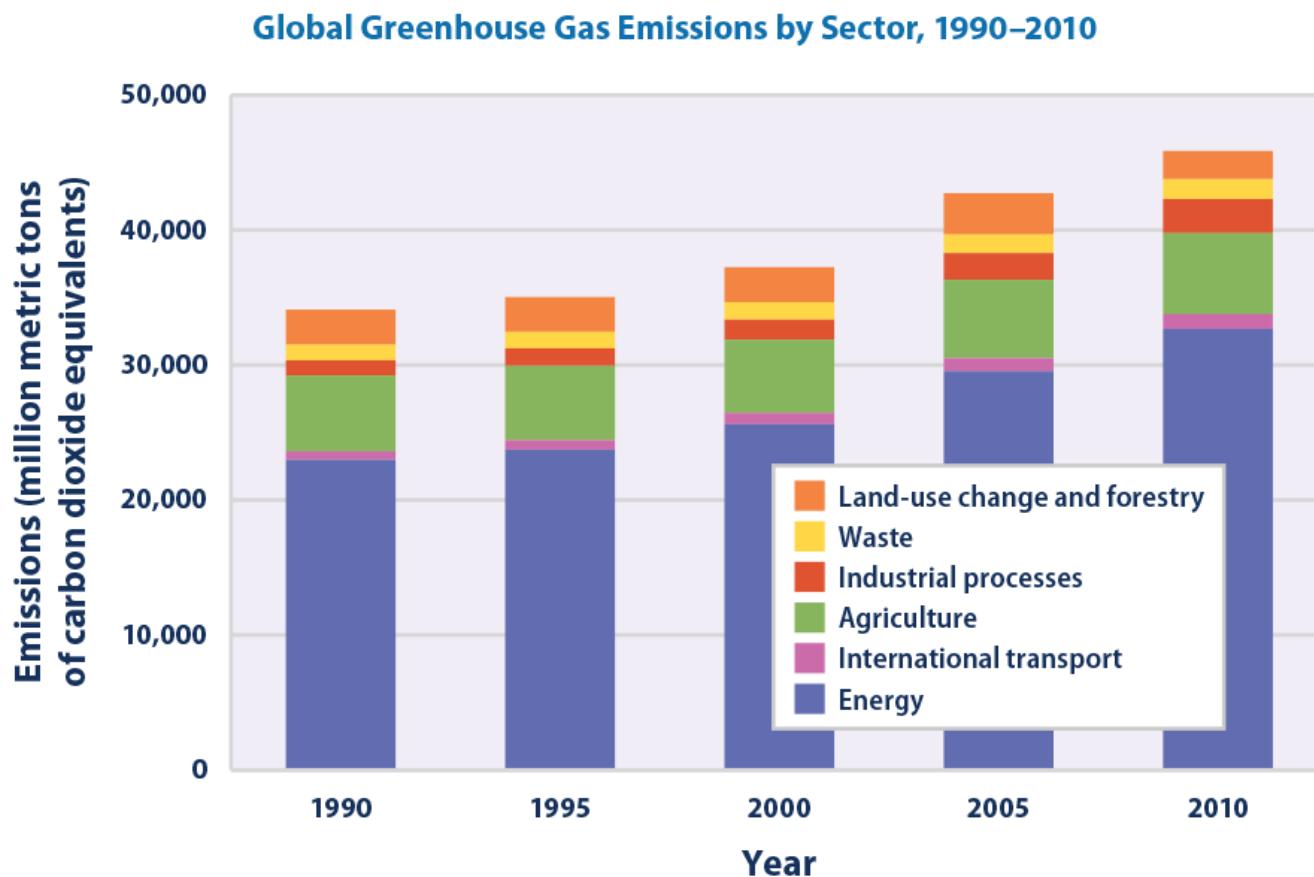
# **Impact of climate change in Bangladesh**

- Each of these changes is likely to seriously **affect agriculture** (crops, livestock, and fisheries). The higher temperature and changing rainfall patterns, coupled with increased flooding, rising salinity in the coastal belt and droughts are likely to reduce crop yields and crop production
- **Shortage of safe drinking water** is likely to become more pronounce, especially in the coastal belt and in drought-prone areas in the north-west
- **Increase riverbank erosion and saline** water intrusion in coastal areas are likely to **displace hundreds of thousands of people**
- All of these changes threaten the **food security, livelihoods and health** of the poor

Who is Emitting how much Green House Gas?

Who should take the responsibility for the climate Change ?

# Global GHG Emissions by Sectors



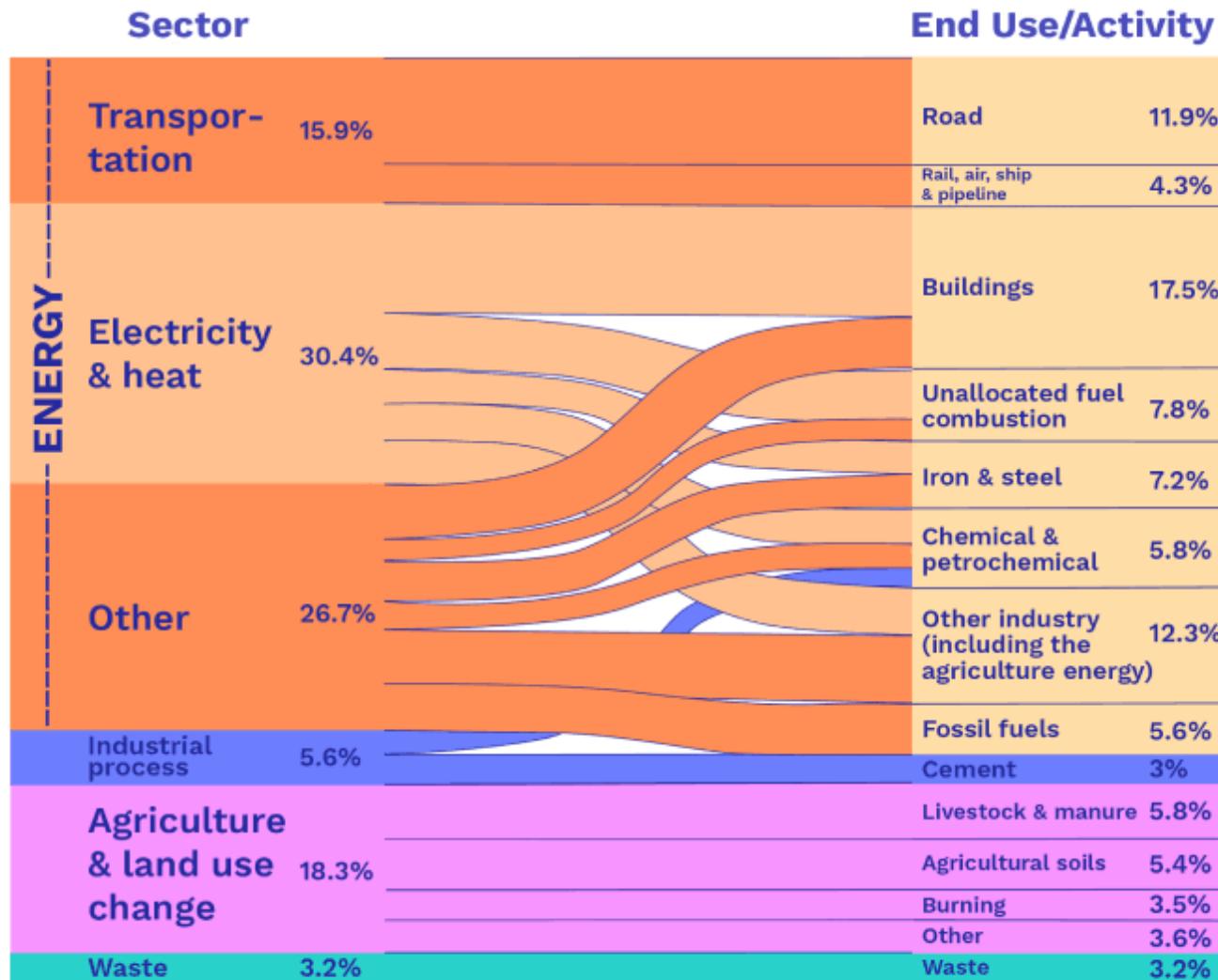
Data sources:

- WRI (World Resources Institute). 2014. Climate Analysis Indicators Tool (CAIT) 2.0: WRI's climate data explorer. Accessed May 2014. <http://cait.wri.org>.
- FAO (Food and Agriculture Organization). 2014. FAOSTAT: Emissions—land use. Accessed May 2014. [http://faostat3.fao.org/faostat-gateway/go/to/download/G2/\\*E](http://faostat3.fao.org/faostat-gateway/go/to/download/G2/*E).

For more information, visit U.S. EPA's "Climate Change Indicators in the United States" at [www.epa.gov/climate-indicators](http://www.epa.gov/climate-indicators).

# World Greenhouse Gas Emissions in 2016

Total: 49.4 GtCO<sub>2</sub>e



Source: Greenhouse gas emissions on Climate Watch. Available at: <https://www.climatewatchdata.org>

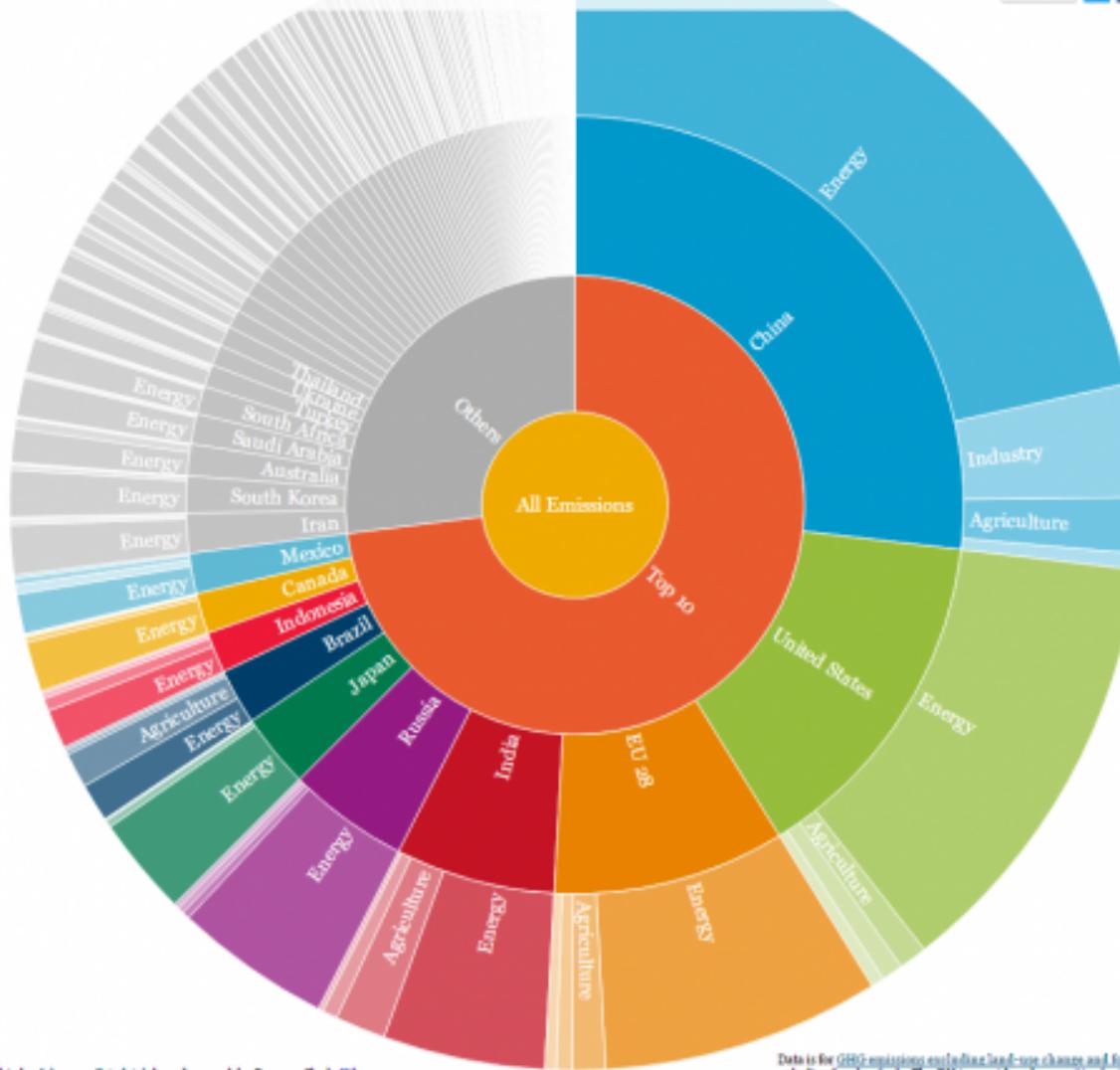
# Global GHG Emissions by Countries

## Explore the World's Greenhouse Gas Emissions

Find the newest data on global greenhouse gas emissions on [CAIT Climate Data Explorer](#)



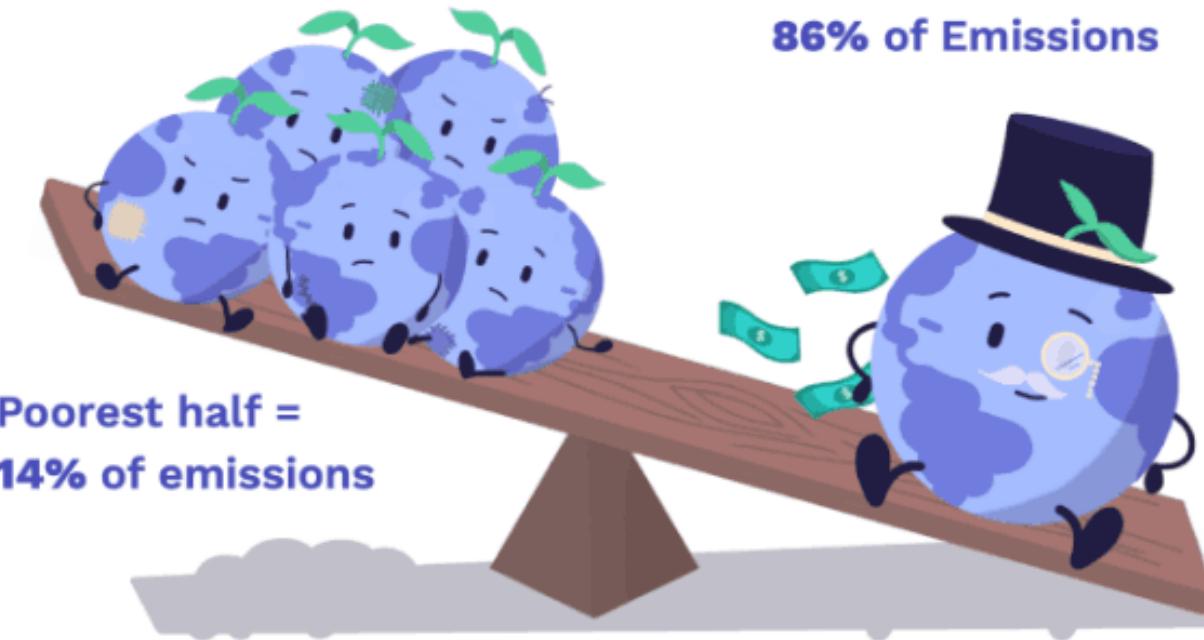
Embed



Graphic by Johannes Friedrich based on work by Duncan Clark, [Ella](#), [Miles Rostock](#) and [Jance Davies](#). Thanks also to Jamie Cotta.

Data is for GHG emissions excluding land-use change and forestry and excluding bunker fuels. The EU is considered an entity for this graph.  
For more information visit our WRI blog.

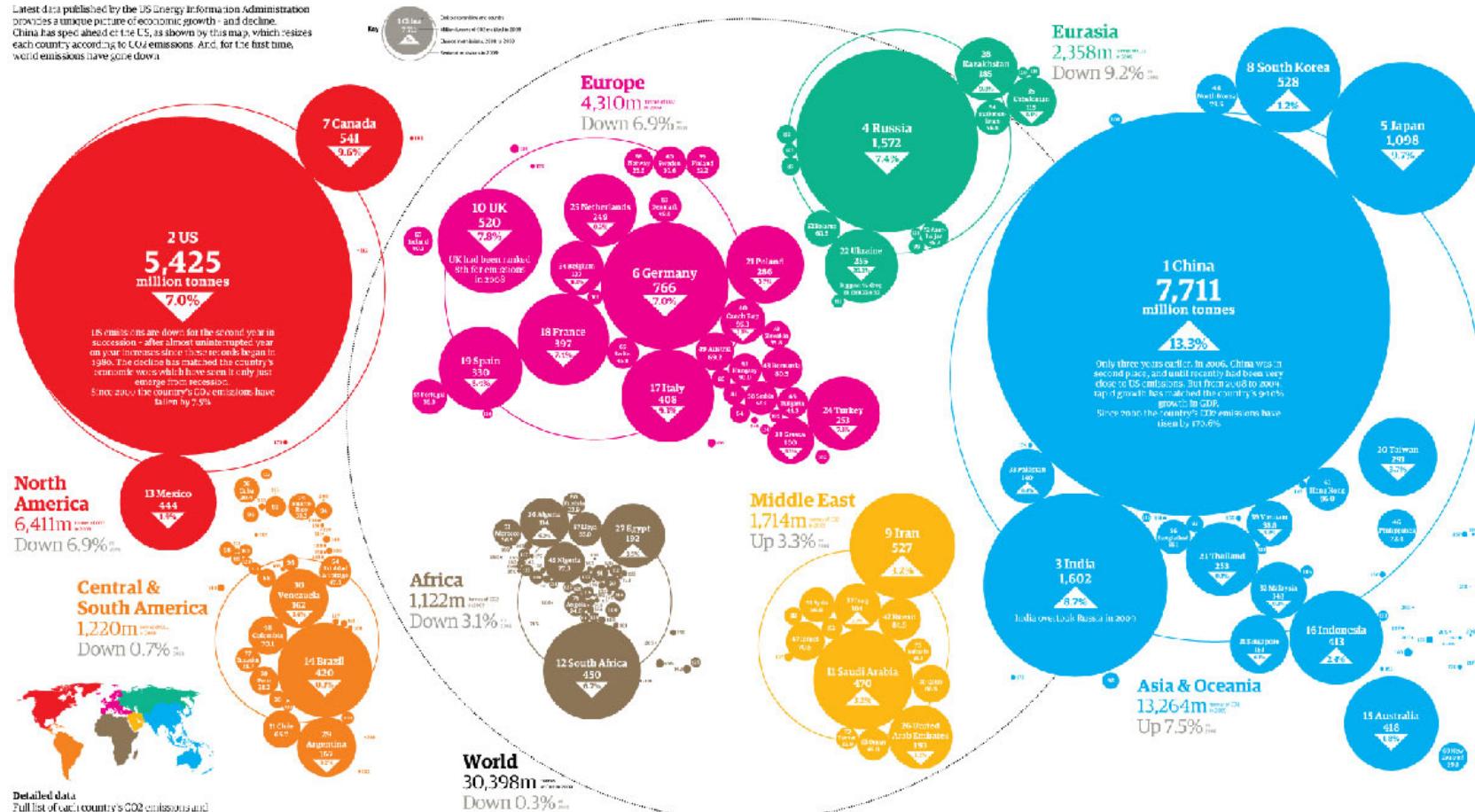
# Inequality in CO<sub>2</sub> Emissions



Source: <https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions>

# An atlas of pollution: the world in carbon dioxide emissions

Latest data published by the US Energy Information Administration provides a unique picture of economic growth - and decline. China has sped ahead of the US, as shown by this map, which resizes each country according to CO<sub>2</sub> emissions. And, for the first time, world emissions have gone down.

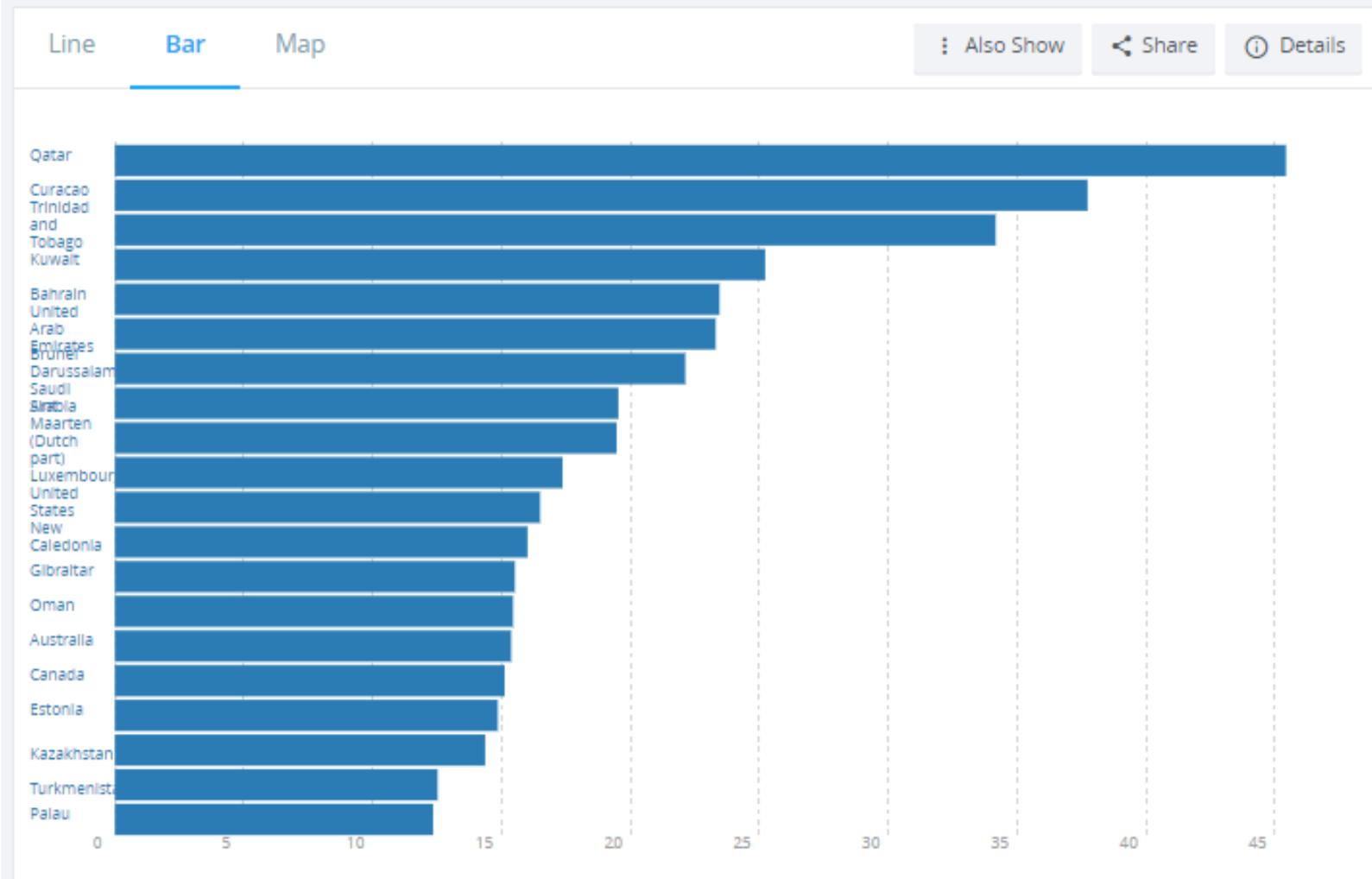


**Detailed data**  
Full list of each country's CO<sub>2</sub> emissions and  
movement in the world emissions league table

# CO2 emissions (metric tons per capita)

Carbon Dioxide Information Analysis Center, Environmental Sciences Division, Oak Ridge National Laboratory, Tennessee, United States.

License : CC BY-4.0 [\(i\)](#)



# Some countries have contributed more to climate change than others

## North America

457 billion tonnes CO<sub>2</sub>  
29% global cumulative emissions

### USA

399 billion tonnes CO<sub>2</sub>  
25% global cumulative emissions

## Asia

457 billion tonnes CO<sub>2</sub>  
29% global cumulative emissions

### China

200 billion tonnes CO<sub>2</sub>  
12.7% global cumulative emissions

### Japan

62 b/t  
4%

## EU-28

353 billion tonnes CO<sub>2</sub>  
22% global cumulative emissions

## Russia

101 b/t CO<sub>2</sub>  
6% global emissions

### Ukraine

19 b/t CO<sub>2</sub>  
1.2%

### Turkey

9.6 b/t  
0.6%

## India

48 b/t  
3%

### Iran

17 b/t  
1%

### Saudi Arabia

14 b/t  
0.9%

### South Africa

19.8 b/t  
1.3%

### Algeria

14.3 b/t  
0.9%

### Nigeria

12.8 b/t  
0.8%

### Brazil

7.5 b/t  
0.5%

### Venezuela

17.4 b/t  
1.1%

### Philippines

12.5 b/t  
0.8%

### Kazakhstan

12 b/t  
0.8%

### Indonesia

12 b/t  
0.8%

### Iraq

12 b/t  
0.8%

### Vietnam

12 b/t  
0.8%

### Pakistan

12 b/t  
0.8%

### North Korea

12 b/t  
0.8%

### UAE

12 b/t  
0.8%

### Thailand

12 b/t  
0.8%

### Malaysia

12 b/t  
0.8%

### Uzbekistan

12 b/t  
0.8%

### Taiwan

12 b/t  
0.8%

### Kenya

12 b/t  
0.8%

### Colombia

12 b/t  
0.8%

### Argentina

12 b/t  
0.8%

### Chile

12 b/t  
0.8%

### Australia

12 b/t  
0.8%

## Oceania

20 billion tonnes CO<sub>2</sub>  
1.2% global emissions

## Europe

514 billion tonnes CO<sub>2</sub>  
33% global cumulative emissions

## Africa

43 billion tonnes CO<sub>2</sub>  
3% global emissions

## South America

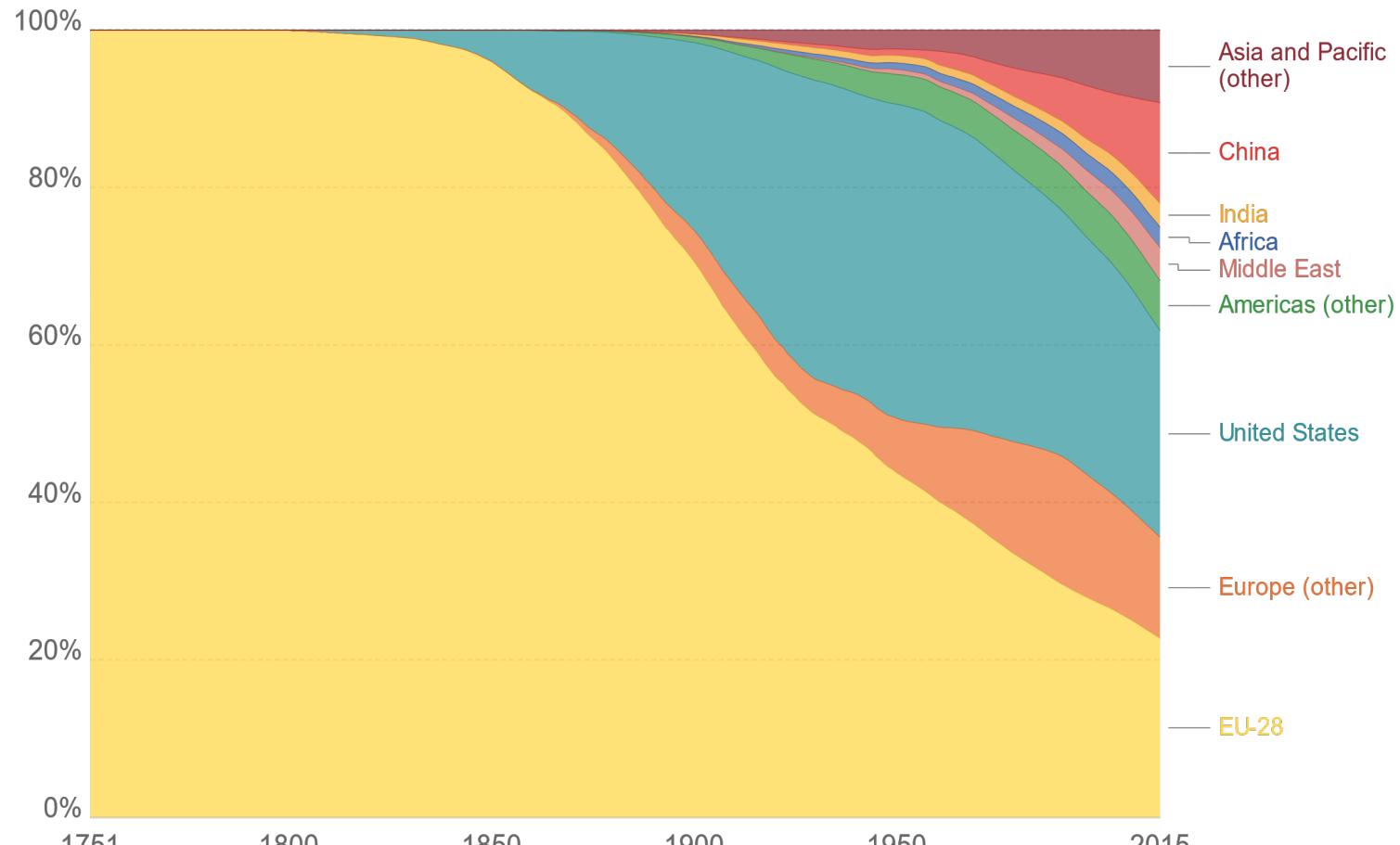
40 billion tonnes CO<sub>2</sub>  
3% global emissions

Source: <https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions>

# Cumulative CO<sub>2</sub> emissions by world region



Cumulative carbon dioxide (CO<sub>2</sub>) emissions by region from the year 1751 onwards. Emissions are based on territorial emissions (production-based) and do not account for emissions embedded in trade.



Source: OWID based on the Global Carbon Project (2017)

CC BY-SA

# Some contribute a lot more to climate change than others

Share of global population

Richest 1%  
Richest 10%



Middle 40%



Poorest 50%



Share of cumulative emissions  
1990-2015

GtCO<sub>2</sub>

30

20

10

0

1990

2015

15%

37%

41%

7%

## **Global GHG Emissions Per person**

But that is only one way to look at the data - and it doesn't take account of how many people live in each country. If you look at per capita emissions, a different picture emerges where:

- Some of the world's smallest countries and islands emit the most per person - the highest being Gibraltar with 152 tonnes per person
- The US is still number one in terms of per capita emissions among the big economies - with 18 tonnes emitted per person
- China, by contrast, emits under six tonnes per person, India only 1.38
- For comparison, the whole world emits 4.49 tonnes per person

# Just 100 companies responsible for 71% of global emissions, study says

A relatively small number of fossil fuel producers and their investors could hold the key to tackling climate change



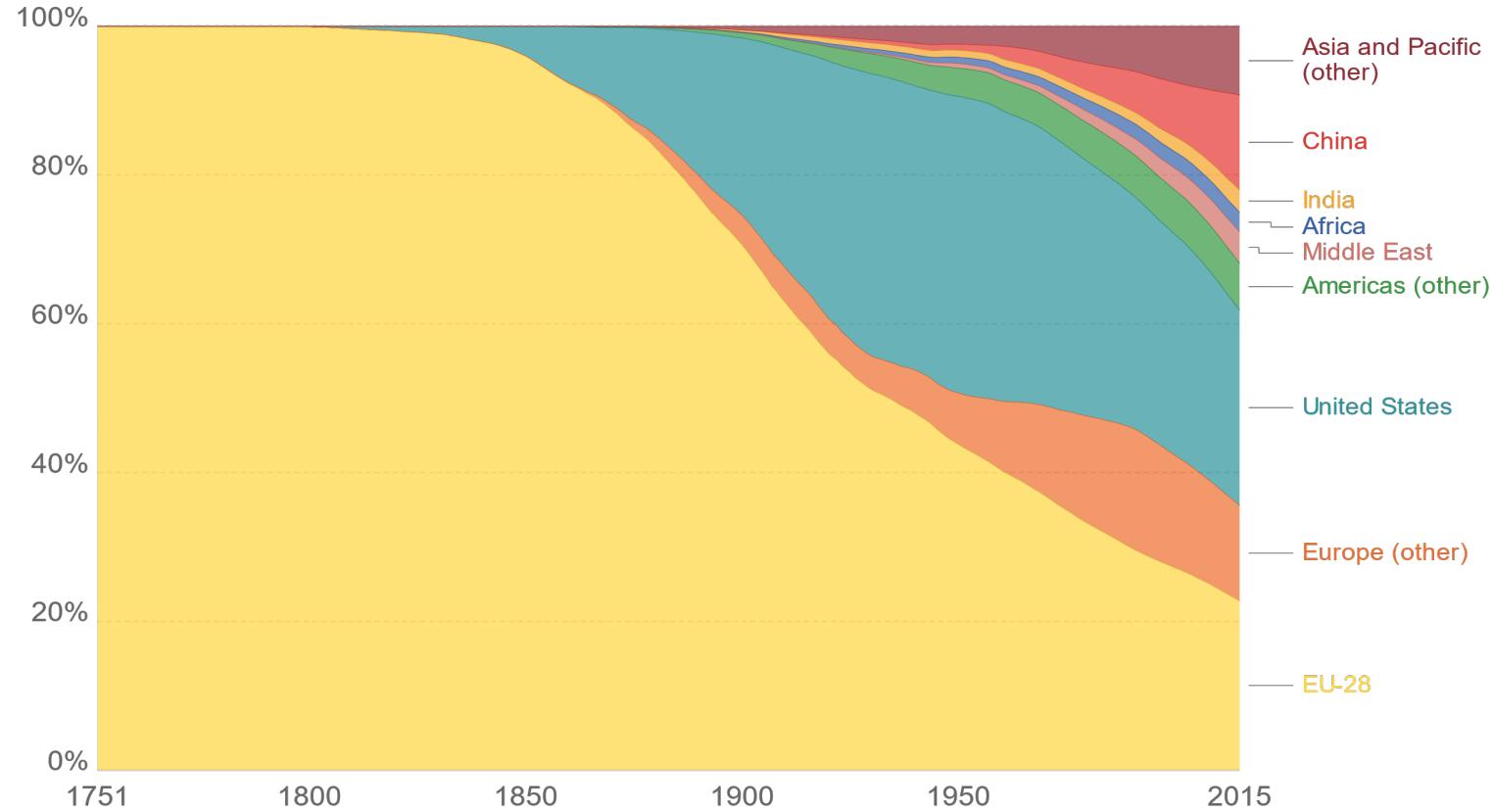
▲ An oil rig exploring for oil and gas. A new report says more than 50% of global industrial emissions since 1988 can be traced to just 25 companies. Photograph: Dazman/Getty Images/iStockphoto

<https://www.theguardian.com/sustainable-business/2017/jul/10/100-fossil-fuel-companies-investors-responsible-71-global-emissions-cdp-study-climate-change>

# Cumulative CO<sub>2</sub> Emissions by World Regions

## Cumulative CO<sub>2</sub> emissions by world region

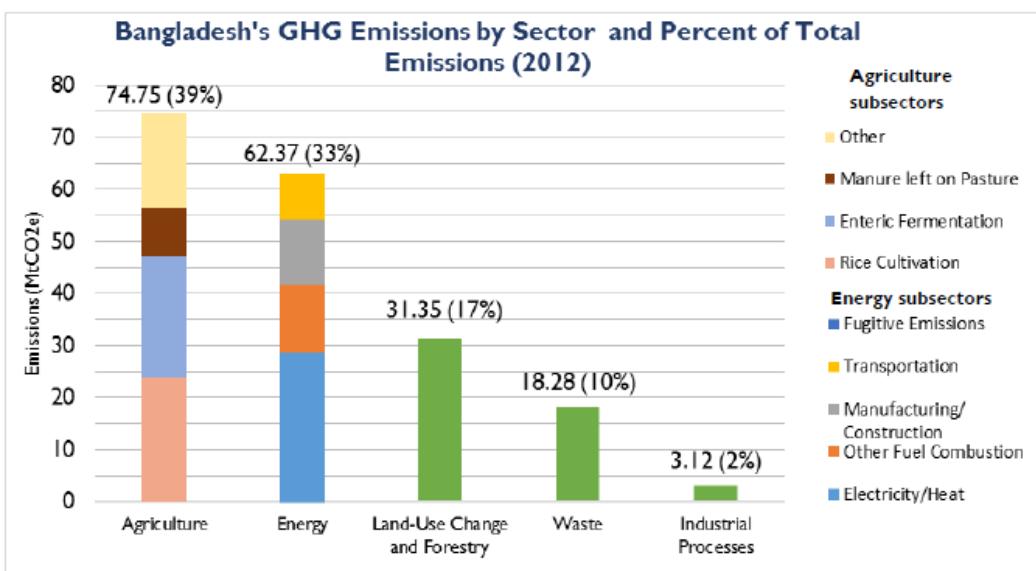
Cumulative carbon dioxide (CO<sub>2</sub>) emissions by region from the year 1751 onwards. Emissions are based on territorial emissions (production-based) and do not account for emissions embedded in trade.



Source: OWID based on the Global Carbon Project (2017)

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# GHG Emissions of Bangladesh



## Greenhouse Gas Emissions and Emissions Targets



World's Top Emitters Interactive Chart | World Resources Institute ([wri.org](https://www.wri.org))  
<https://www.climatewatchdata.org/>

# Climate Change Adaption, Mitigation and Development

## **What to do?**

**Mitigation** A human intervention to reduce the sources or enhance the sinks of greenhouse gases (GHGs).

**Adaptation** The process of adjustment to actual or expected climate and its effects.

## What to do?



Prevent



Mitigate



Adapt

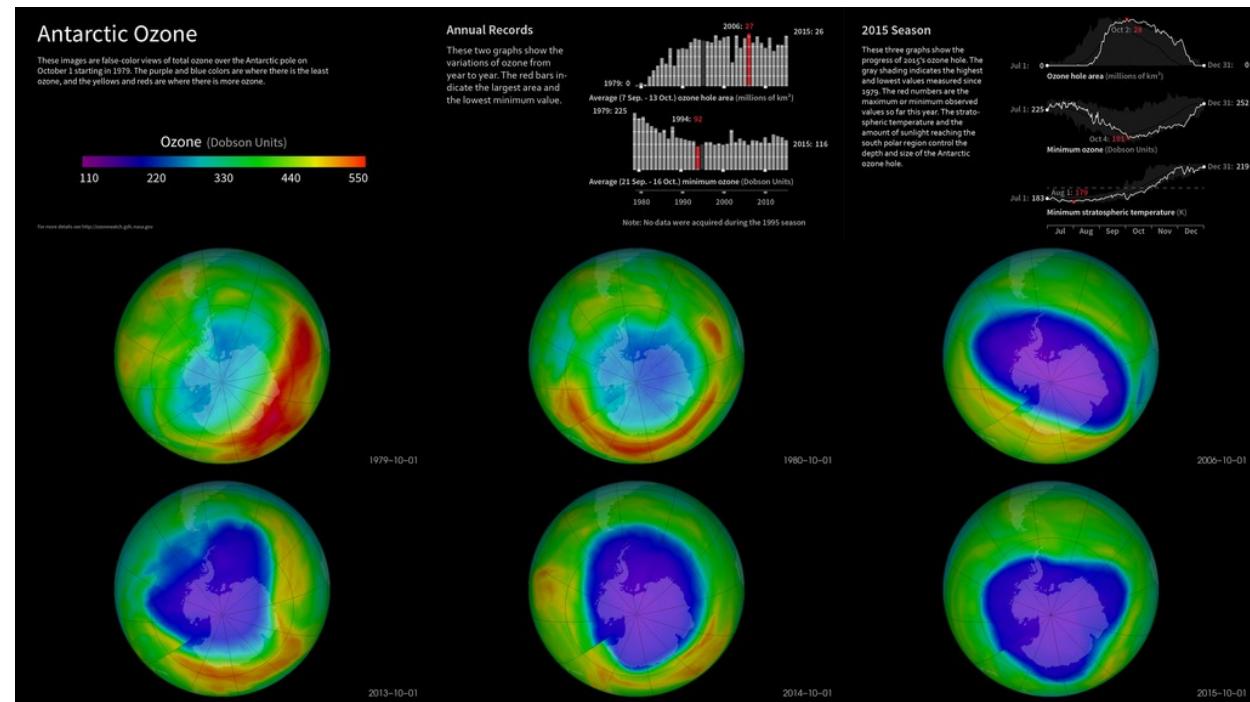
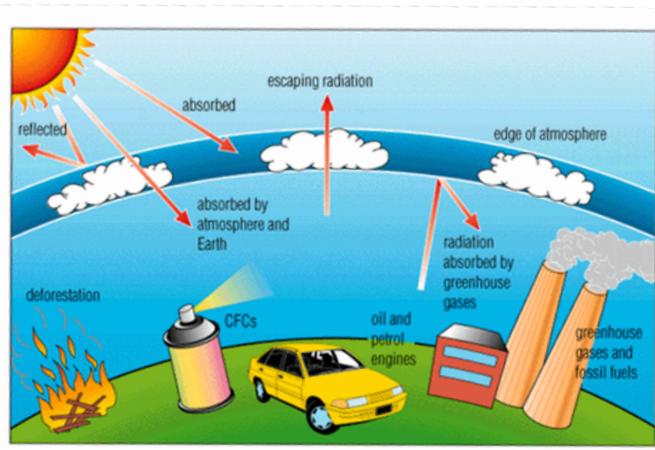
## An activity is considered Mitigation if it:

- Contributes to the reduction of GHG intensity per unit of output
- Limits the burning of fossil fuels for energy and uses lower carbon or renewable sources
- Uses energy more efficiently in agriculture, homes, offices and industries
- Plans transport systems and urban development appropriately
- Reduces emissions from poor forest and land use practices
- Stores carbon in the soil through conserving forests and managing land more sustainably.

## **An activity is considered Adaptation if it:**

- Reduces the risk, exposure or sensitivity of human or natural systems to climate change and climate variability
- Increases the potential or capability of a system to adapt to effects and impact of climate stimuli
- Builds problem solving capacity to develop responses to climate variability and change
- Incorporates climate risk information into decision-making.

# Does it matter if we act or not?



# Climate Action

- Compassionate** (feel for) **about Environment**
- Apathy** (An absence of emotion or enthusiasm) **to Action**
- Be Sensible** (Showing reason or sound judgment)
- Turn knowledge into Action**
- Think Globally, Act Locally**

## Useful Reference to Learn more about Climate Change

- <https://www.ipcc.ch/assessment-report/ar6/>
- <https://climatescience.org/>
- <https://climate.nasa.gov/>
- <https://earthobservatory.nasa.gov/global-maps>
- <https://www.climate.gov/teaching>
- <https://www.globalchange.gov/>
- <https://climateanalytics.org/>
- <https://skepticalscience.com/argument.php>
- <https://www.newscientist.com/article/dn11462-climate-change-a-guide-for-the-perplexed/>
- <https://climateanalytics.org/media/decarbonisingasia2019-profile-bangladesh-climateanalytics.pdf>



# Module VII

## Global Climate Change\_III



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EAST WEST UNIVERSITY**

## **Topic covers:**

1. Hazard and disaster
2. Disasters in Bangladesh

<b>Hazard</b>	<b>Disaster</b>
Hazard is an event that has potential for causing injury/ loss of life or damage to property/environment.	Disaster is an event that occurs suddenly/unexpectedly in most cases and disrupts the normal course of life in affected area.
Hazards can lead to disasters.	A disaster is the result of a hazard but at the same time is also a hazardous event.
Hazards come with warnings.	Ignoring warnings can lead to disaster.
Hazards may be inevitable.	Disasters can be prevented.
Hazard occurs at less populated area.	Disaster occurs at overpopulated area.

### A. HAZARDOUS EVENT

e.g. an extreme physical phenomenon such as an earthquake or flood

### B. VULNERABLE POPULATION

Susceptible to human and/or economic loss

NO  
DISASTER

A.

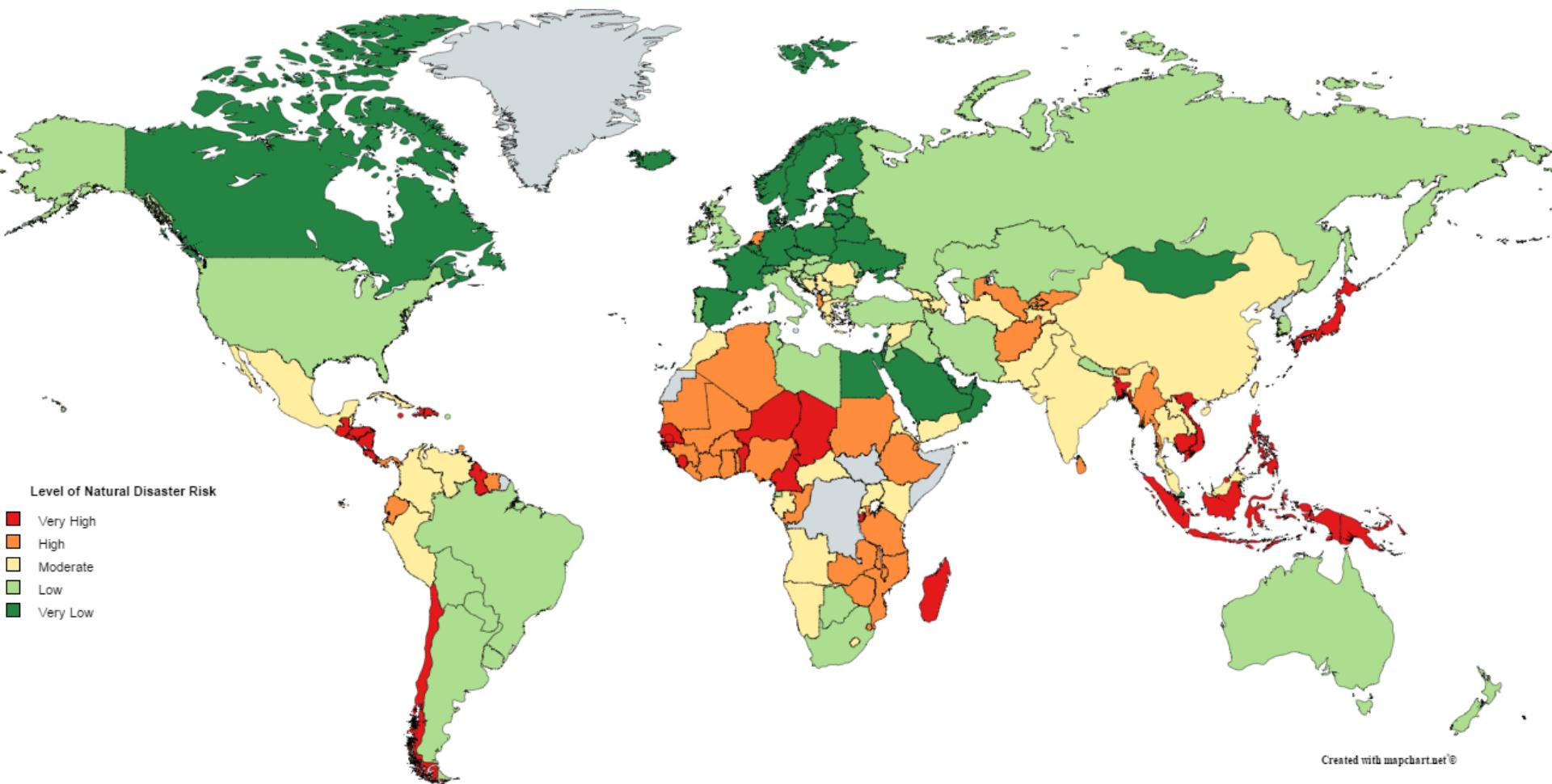
B.



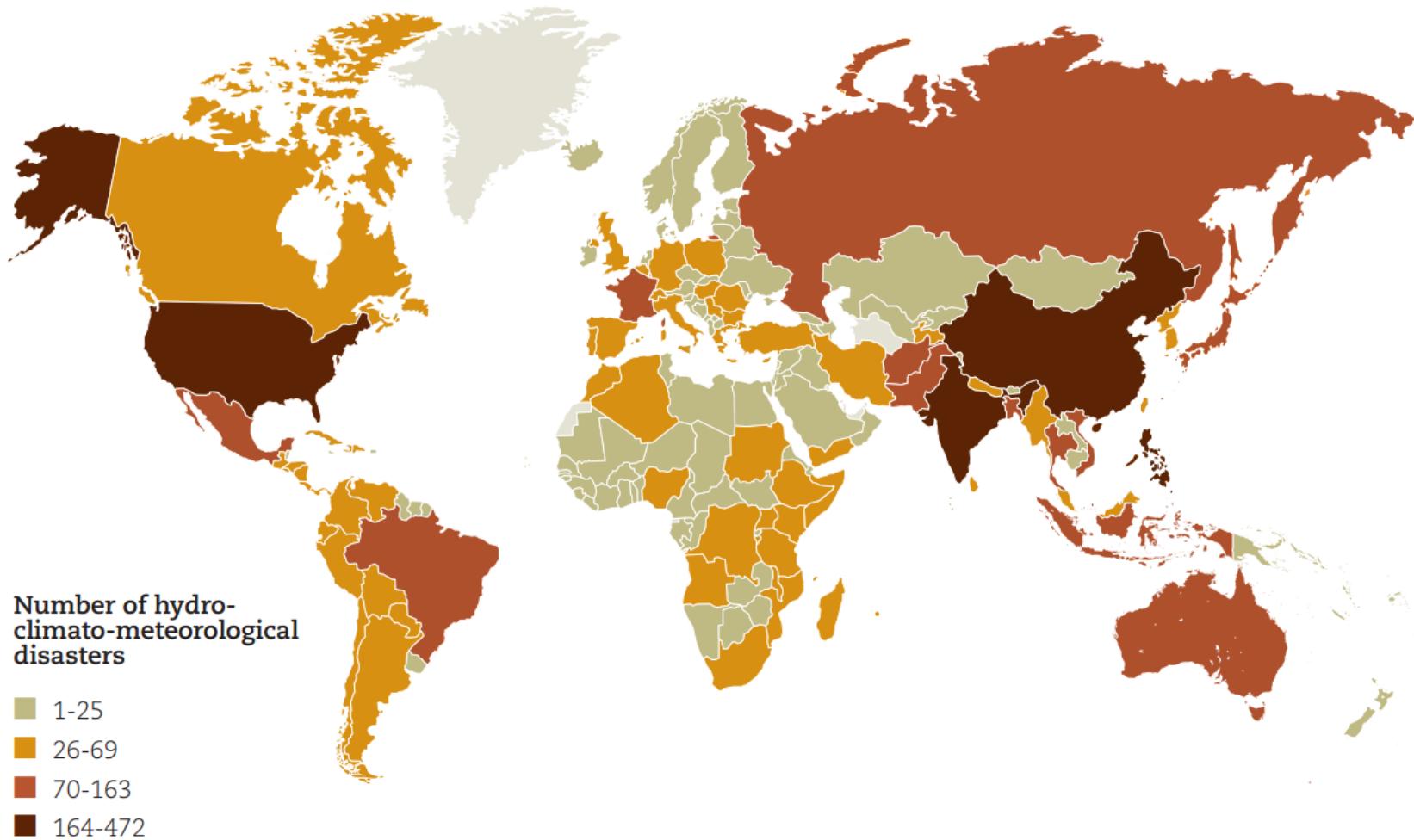
✓ Hazards are two types based on time/duration:

1. **Rapid-onset hazards** last over periods of minutes to several days and examples include major cyclones accompanied by high winds, waves and surges or tsunamis created by submarine earthquakes and landslides.
2. **Slow-onset hazards** develop incrementally over longer time periods and examples include erosion and gradual inundation.

# The effects of natural disasters

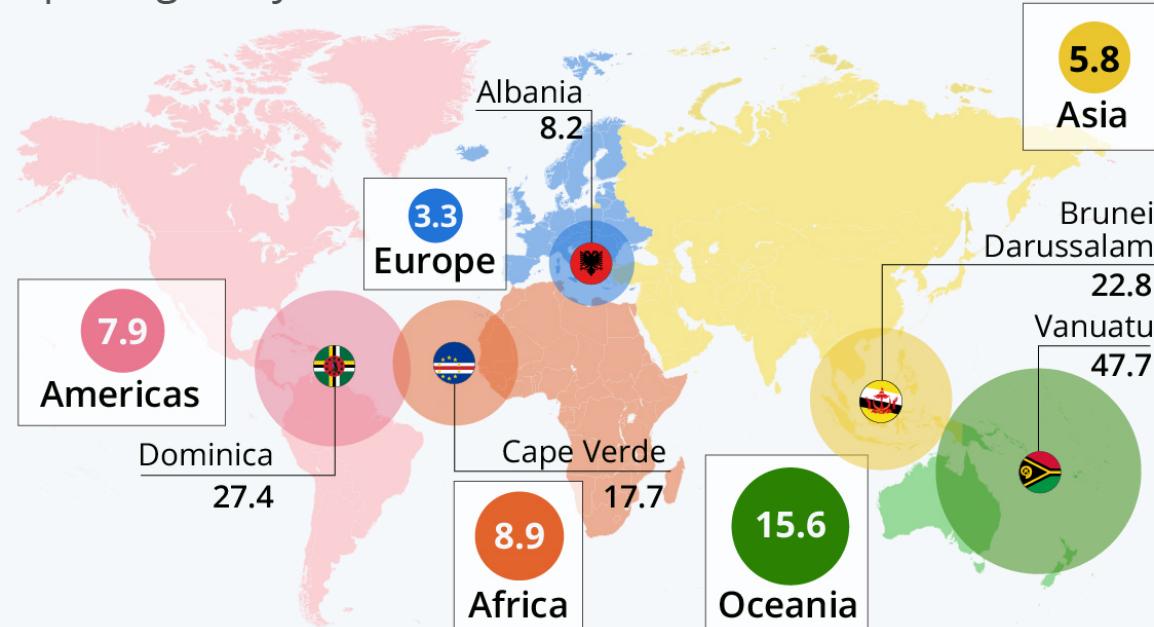


Number of weather-related disasters  
reported per country (1995-2015)



# The Places Most Prone to Disaster

Countries most at risk when facing natural disasters per region by World Risk Index\*



\* World Risk Index calculated via exposure, susceptibility, coping and adaptation, 0 = lowest, 100 = highest

Source: World Risk Index 2021



**Figure 1: Low-lying coastal areas and river deltas of Southeast Asia are highlighted in light blue, and their association with some catastrophic historical typhoon and flooding events is shown**

