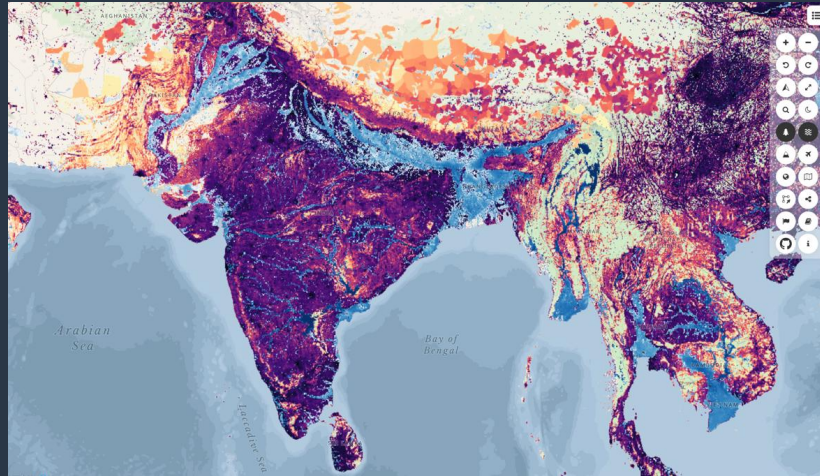
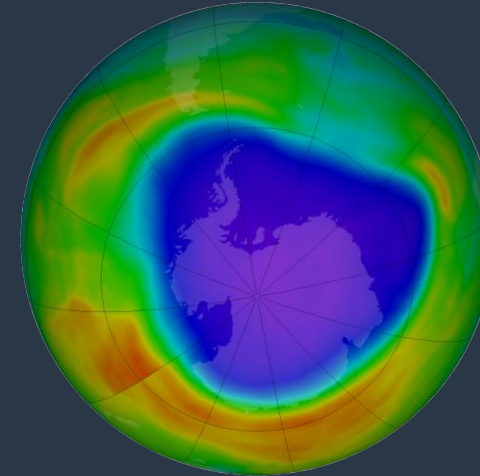


Leveraging Geospatial Information to Tackle Global Challenges

UN
environment
programme



Geospatial



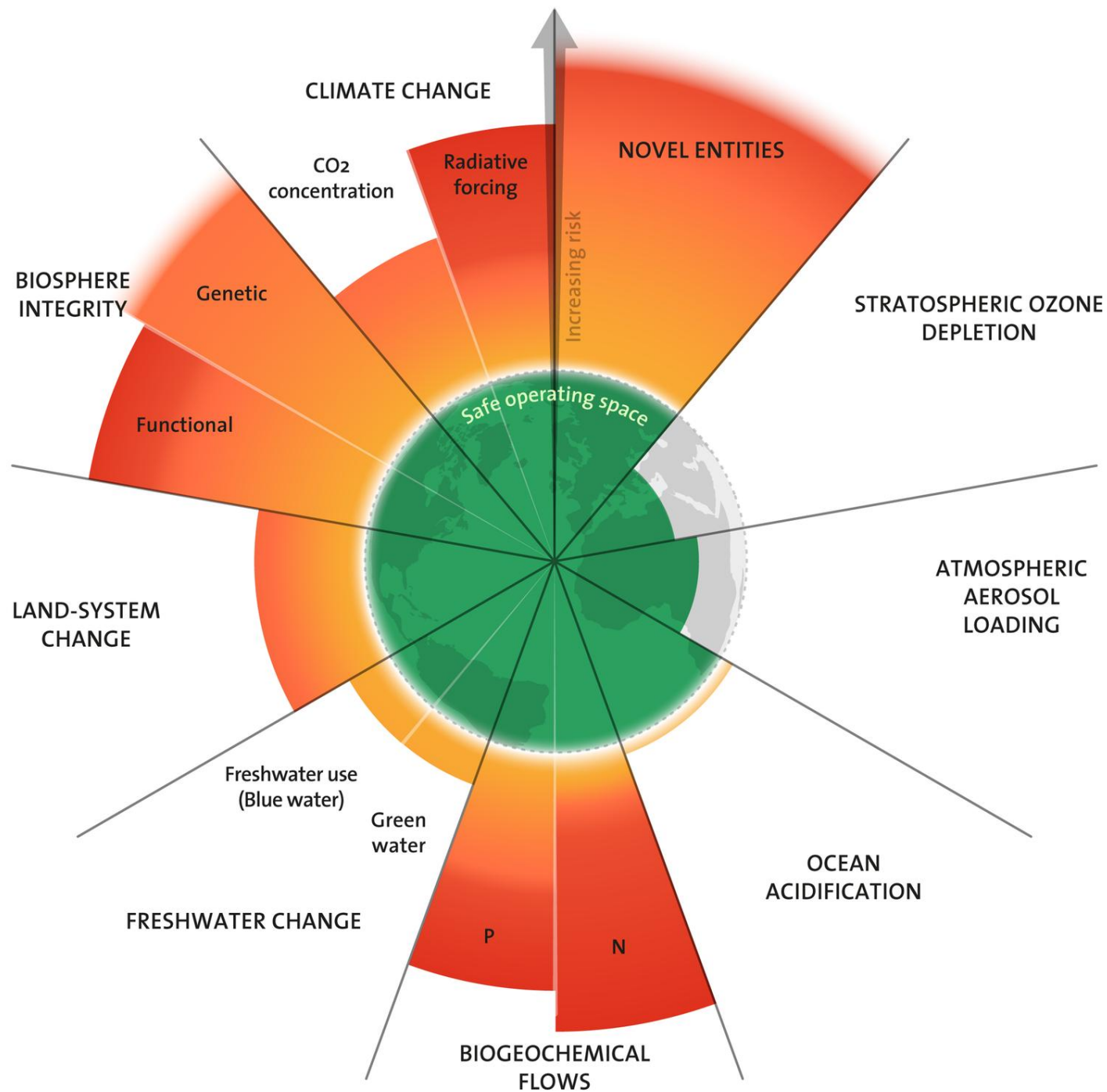
Satellite

Pascal Peduzzi
UN-GGIM 13th Plenary Meeting

*“Thanks to fossil fuel
and the industrial
revolution, humanity
made a giant step
forward”*



*“Thanks to fossil fuel
and the industrial
revolution, humanity
made a giant step
forward”*

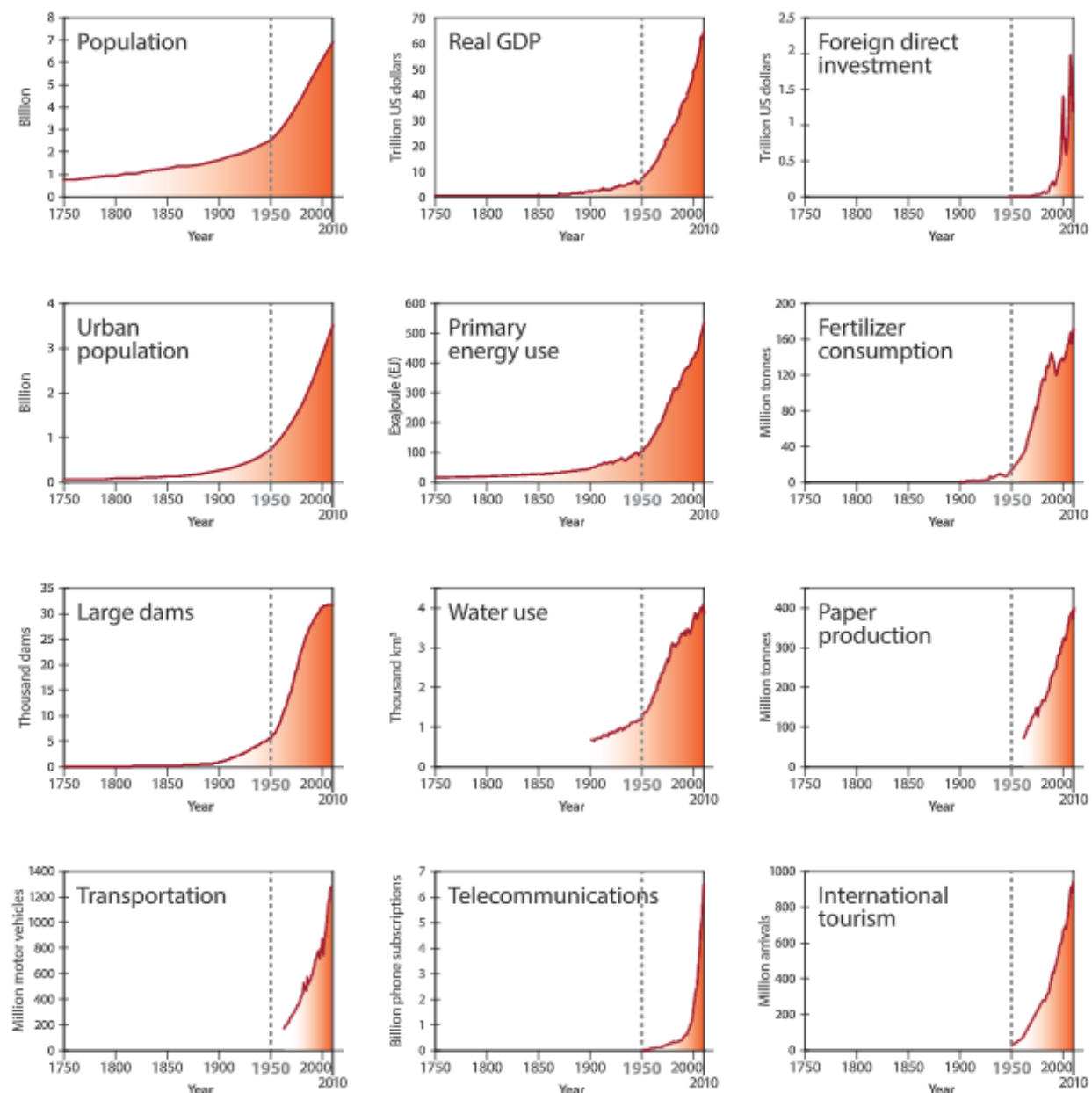


2025 Earth beyond 7 of 9 Planetary Boundaries

Findlay, H. S., Feely, R. A., Jiang, L. Q., Pelletier, G., & Bednaršek, N. (2025). Ocean acidification: another planetary boundary crossed. *Global Change Biology*, 31(6), e70238.

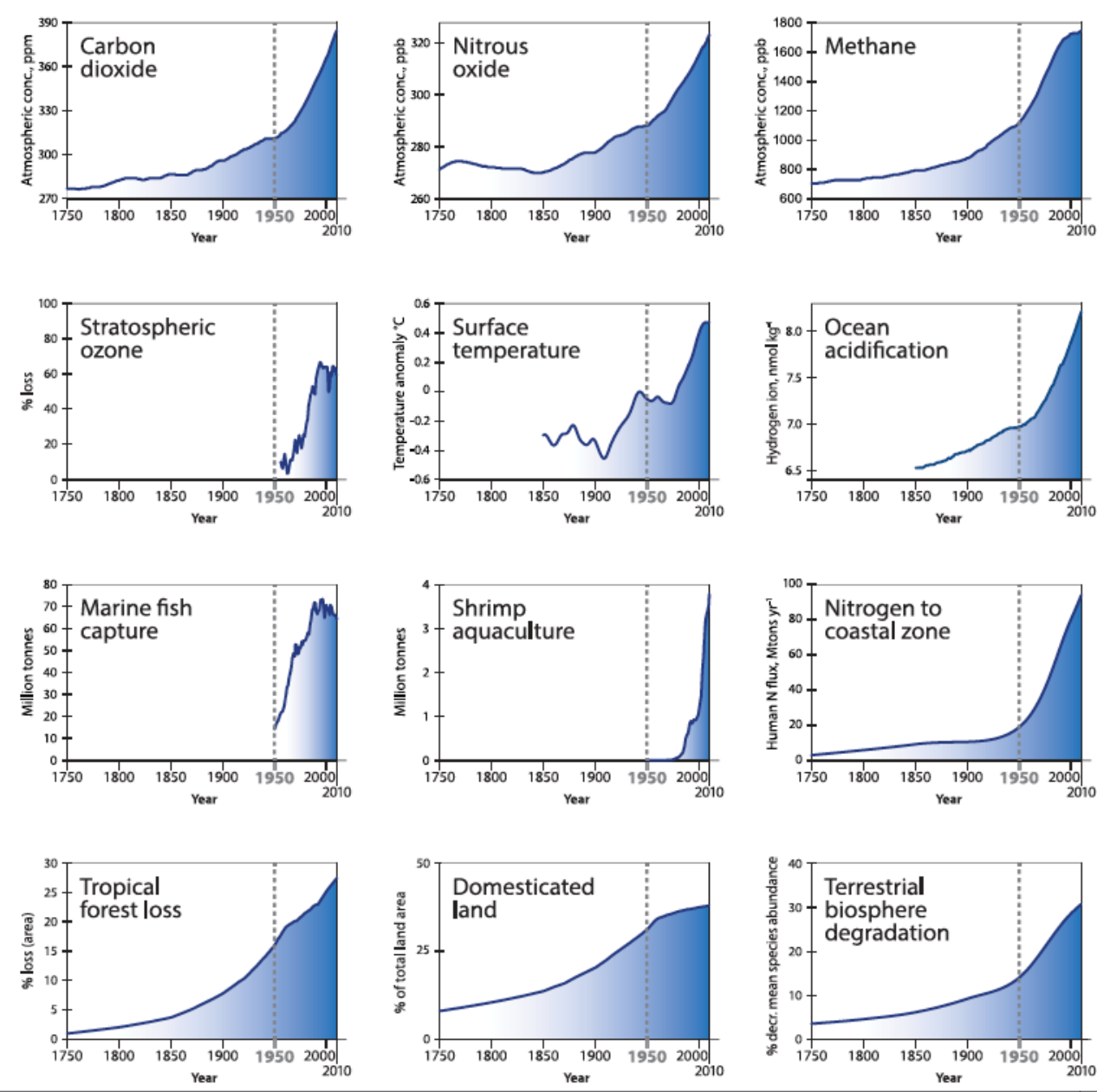
Human activities have
accelerated after WWII
i.e. since 1950

Steffen et al. (2016), The trajectory of
the Anthropocene: The Great
Acceleration, *the anthropocene review*,
2(1), 81-98.



So did the related impacts

Steffen et al. (2016), The trajectory of the Anthropocene: The Great Acceleration, *the anthropocene review*, 2(1), 81-98.

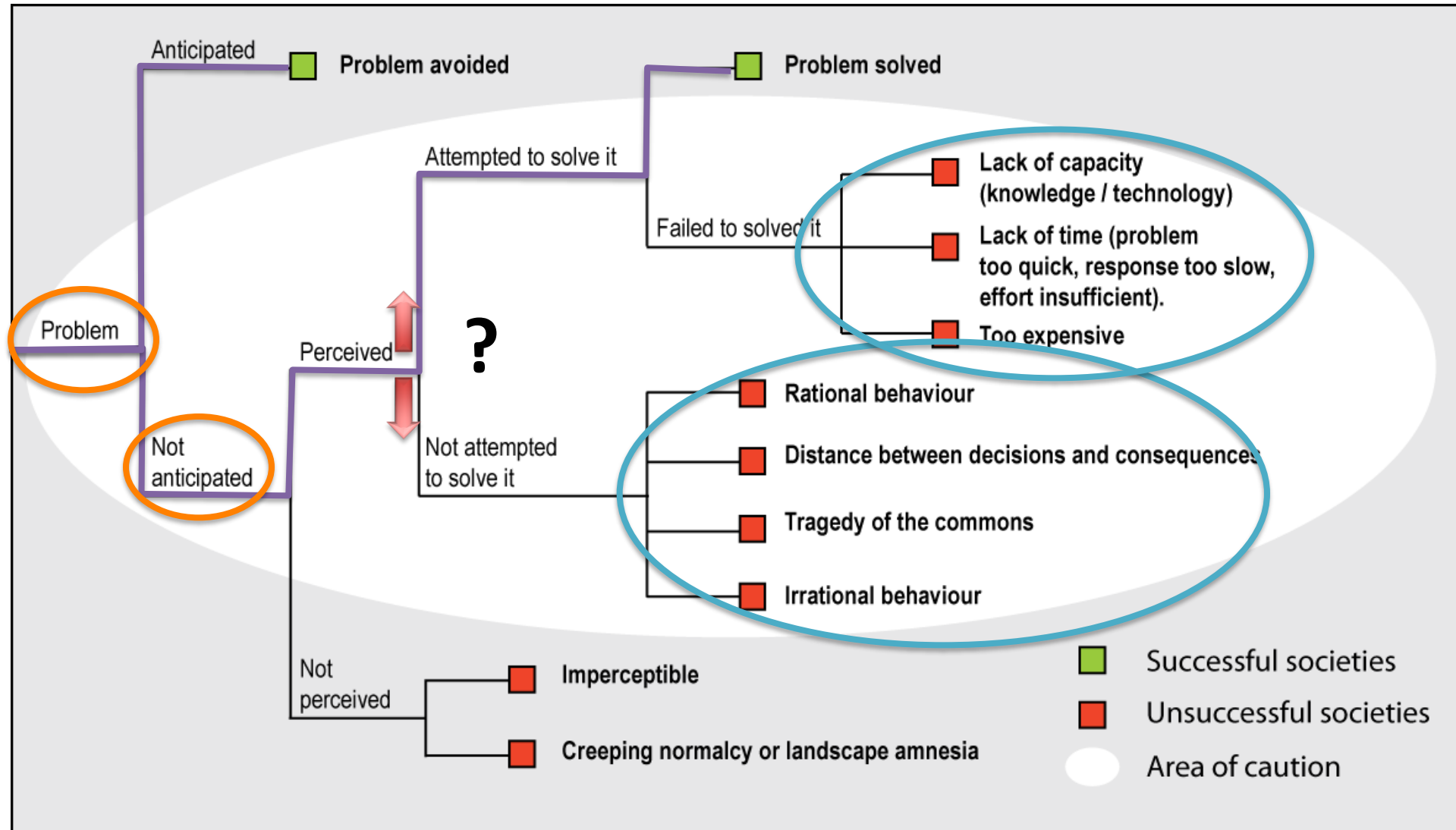




«Anyone who believes exponential growth can go on forever in a finite world is either a madman or an economist.»

The Economics of the Coming Spaceship Earth – Kenneth Boulding, economist (1966)

Pathway to successful societies



Sources: Peduzzi, P. (2012) Risk and global change: developing scientific methods for advocacy and awareness raising, University of Lausanne, Switzerland.

Narrow pathway to sustainable development

Like in a GPS, data tell us :

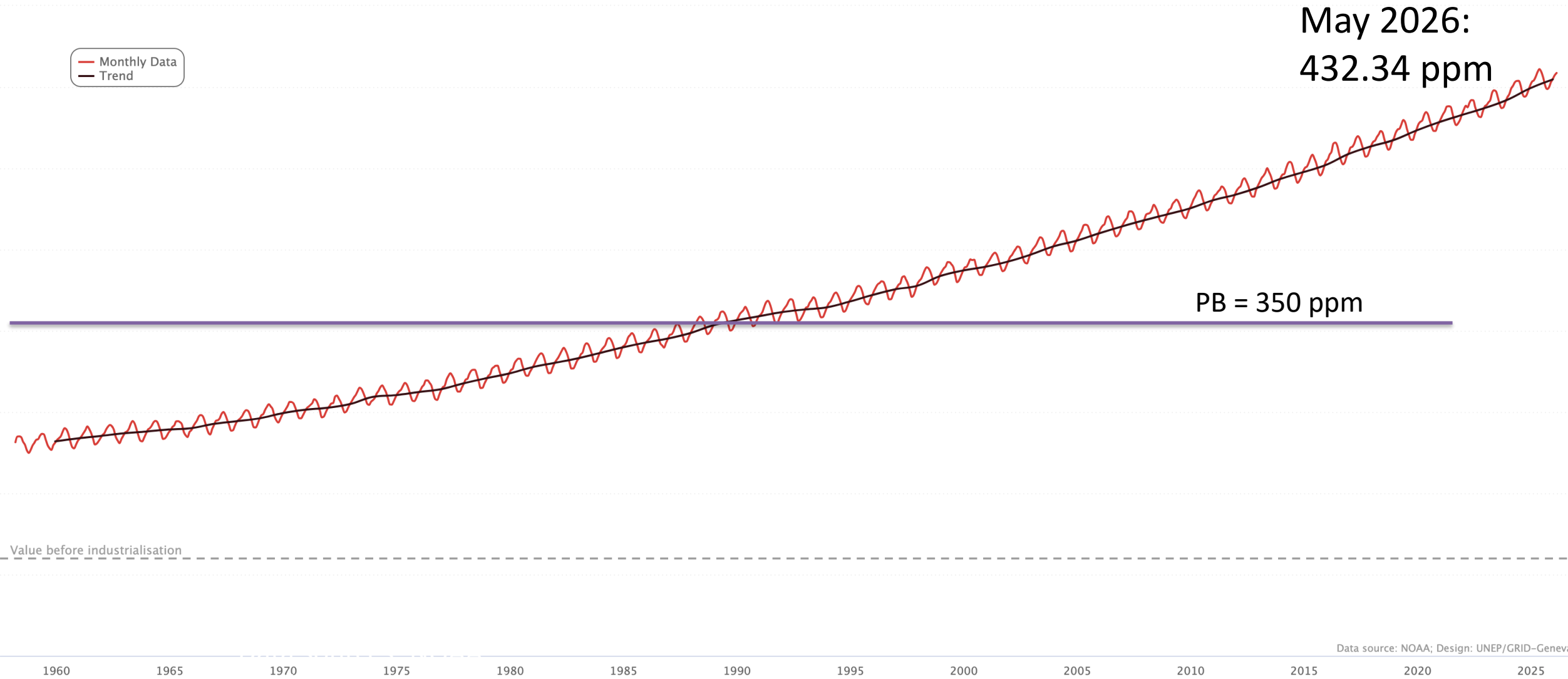
- Where we are (status)
- Where we came from (track)
- At what speed we are moving (trends)
- Where we may be going (scenarios)



Trends in Atmospheric Carbon Dioxide Concentration

Monthly and annual mean carbon dioxide concentrations globally averaged over marine surface sites

ppm



Data source: NOAA; Design: UNEP/GRID-Geneva

Sources: <https://graphs.unepgrid.ch>

Temporal resolution: yearly



Global Surface Temperature

Four independant data sources show nearly identical long-term warming trends.
Based on 1881–1920 average (except JMA 1891–1920 average).

2024: +1.59°C
2025: +1.43°C

The last 10 years were the top 10 warmest
Since the beginning of the measurments

Temperature
Anomaly (°C)

1.6

- NOAA National Climatic Data Center
- NASA Goddard Institute for Space Studies
- Japanese Meteorological Agency
- Met Office Hadley Centre/Climatic Research Unit

1.4

1.2

1.0

0.8

0.6

0.4

0.2

0.0

-0.2

-0.4

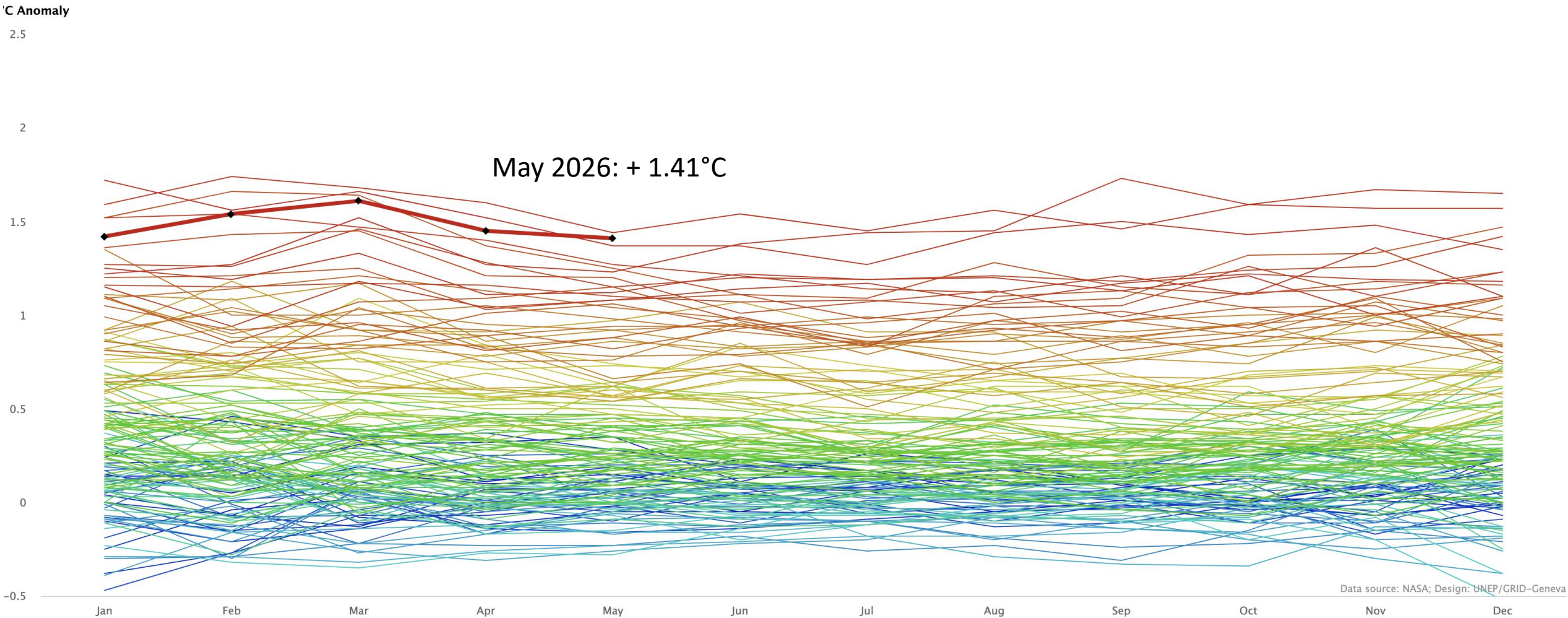
1880 1890 1900 1910 1920 1930 1940 1950 1960 1970 1980 1990 2000 2010 2020

Data source: NASA, NOAA, JMA, MetOffice; Design: UNEP/GRID-Geneva

Temporal resolution: monthly

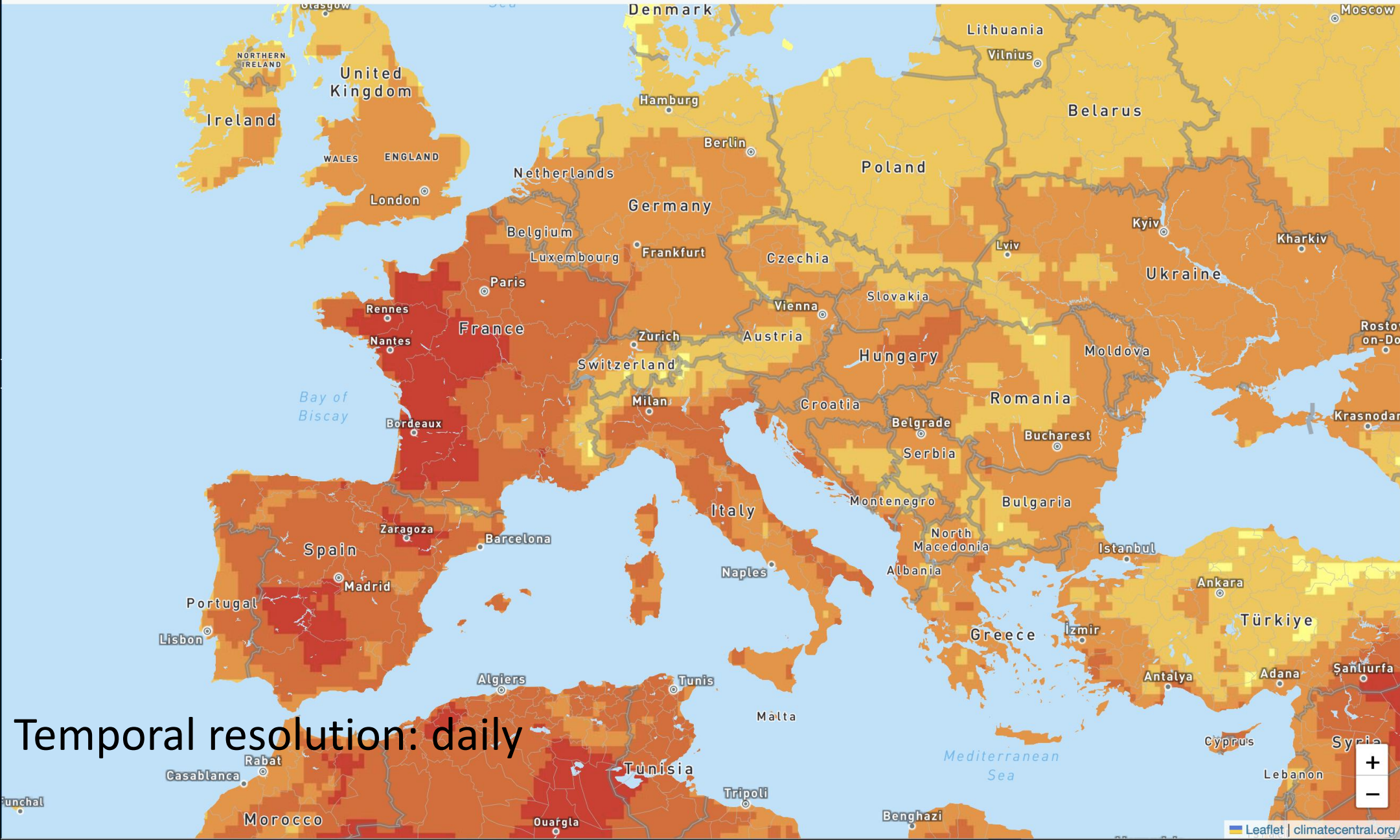
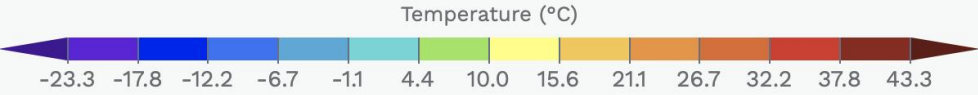
Temperature Anomaly

Difference from 1881–1920 (original data) annual mean (difference as compared with pre-industrial era). Lines colored by year 1880–current.

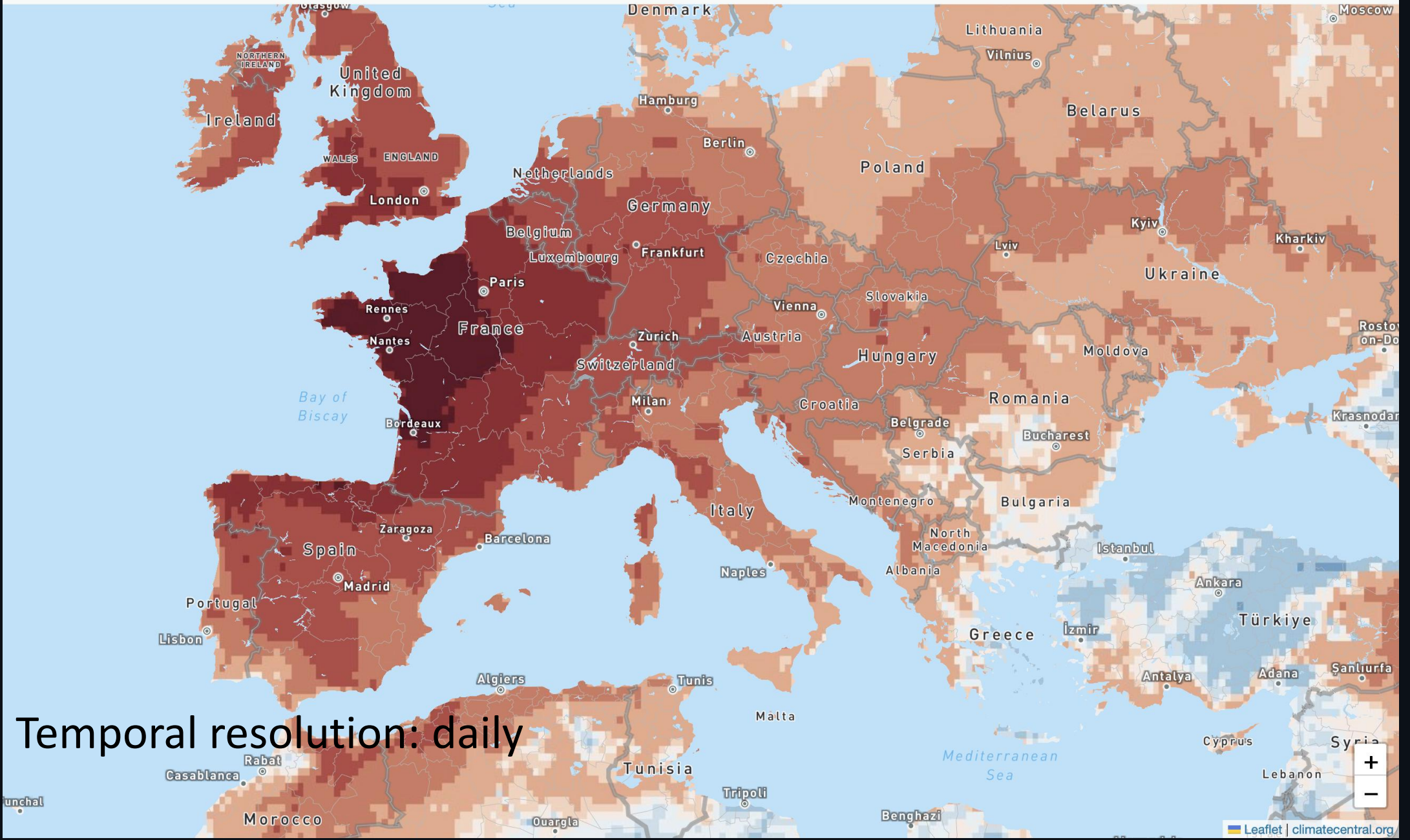
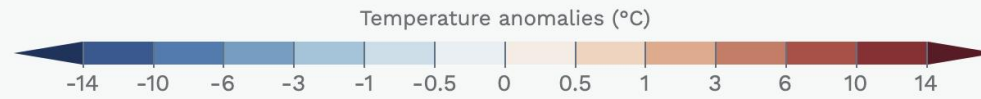


Temperature

for average temperatures, Jun 23, 2026



Difference from Normal for average temperatures, Jun 23, 2026

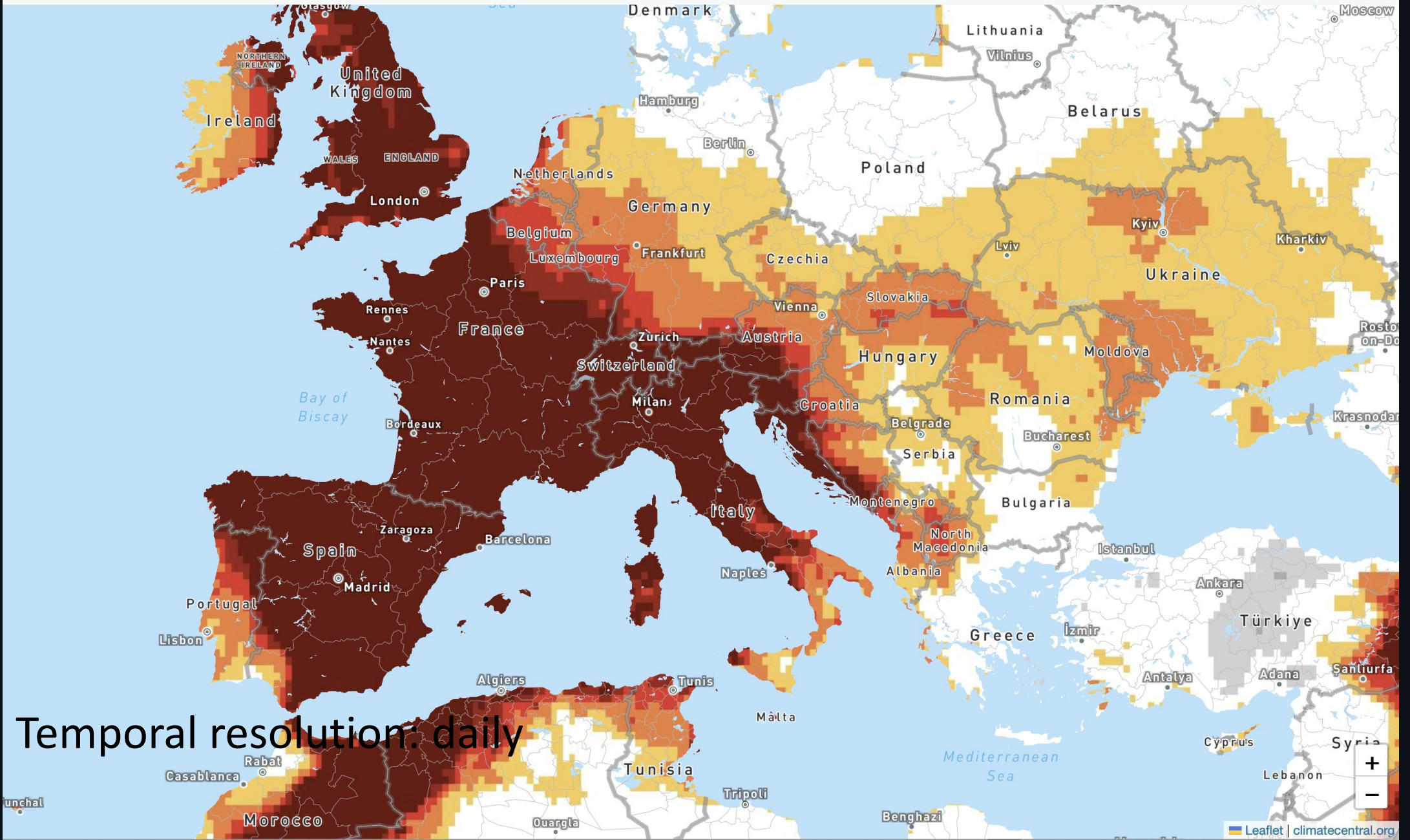
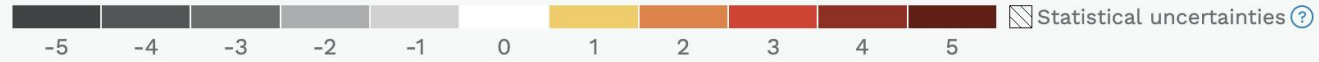


Temporal resolution: daily

Climate Shift Index [Learn more...](#)

for average temperatures, Jun 23, 2026

Change in likelihood due to climate change



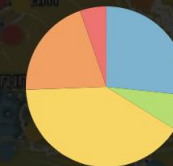
Take action >

Russia

World population real-time exposure to air pollution

LIVE 14:00, Apr. 20

Air quality	Number of people	
WHO target	2 081 931 800	(26.7%)
Good	560 587 050	(7.2%)
Moderate	3 165 931 400	(40.6%)
Unhealthy for sg	1 585 610 900	(20.3%)
Unhealthy	410 830 250	(5.3%)
Very Unhealthy	226	(<0.1%)
Hazardous	0	(<0.1%)



5 722 959 826 (73.3%)

people exposed to polluted air worse than WHO recommended limits

*estimated every 4 hours using real-time measurements

Air breathed by age

AQI	0-4	5-19	20-39	40-59	60+
Good	2.5%	6.8%	7.8%	5.9%	3.8%
Moderate	0.7%	1.9%	2.2%	1.6%	0.9%
Unhealthy for sensitive groups	3.5%	9.8%	12.5%	9.5%	5.4%
Unhealthy	1.7%	5.1%	6.4%	4.8%	2.4%
Very Unhealthy	0.4%	1.2%	1.5%	1.4%	0.8%

UN
environmental
programme

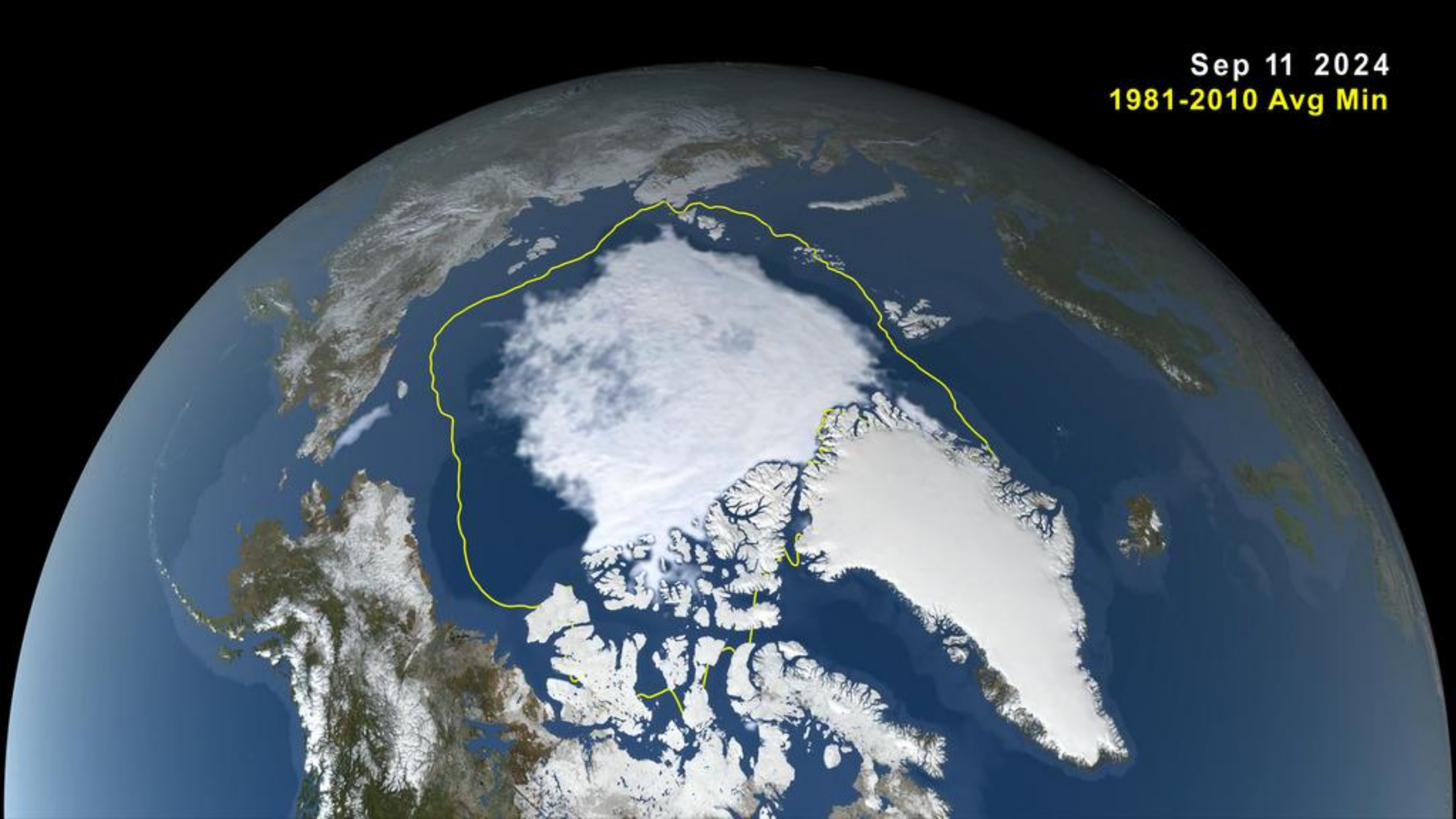
Temporal resolution: hourly

WHO target Good Moderate Unhealthy for sensitive groups Unhealthy Very unhealthy Hazardous

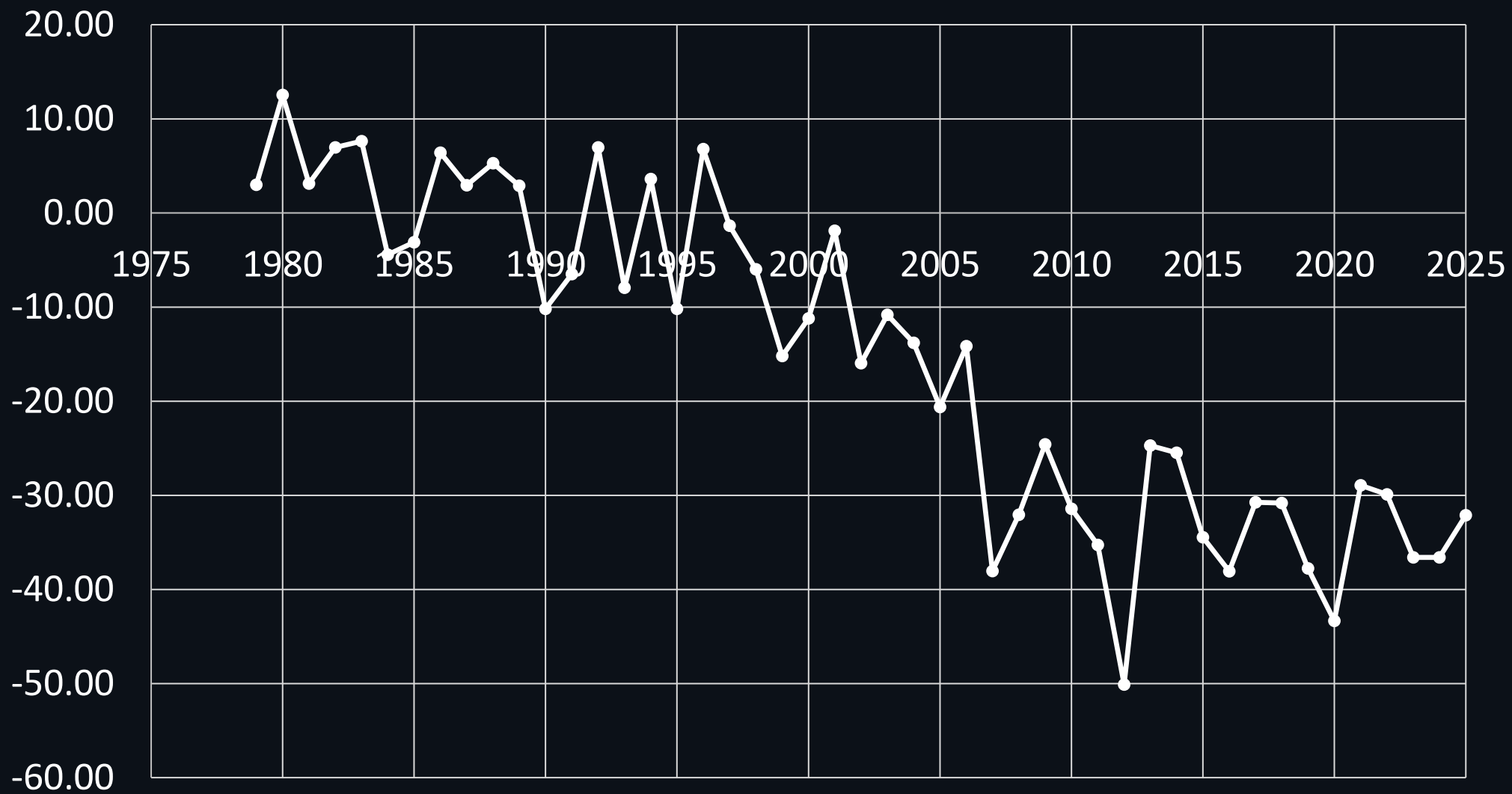
1

Leaflet

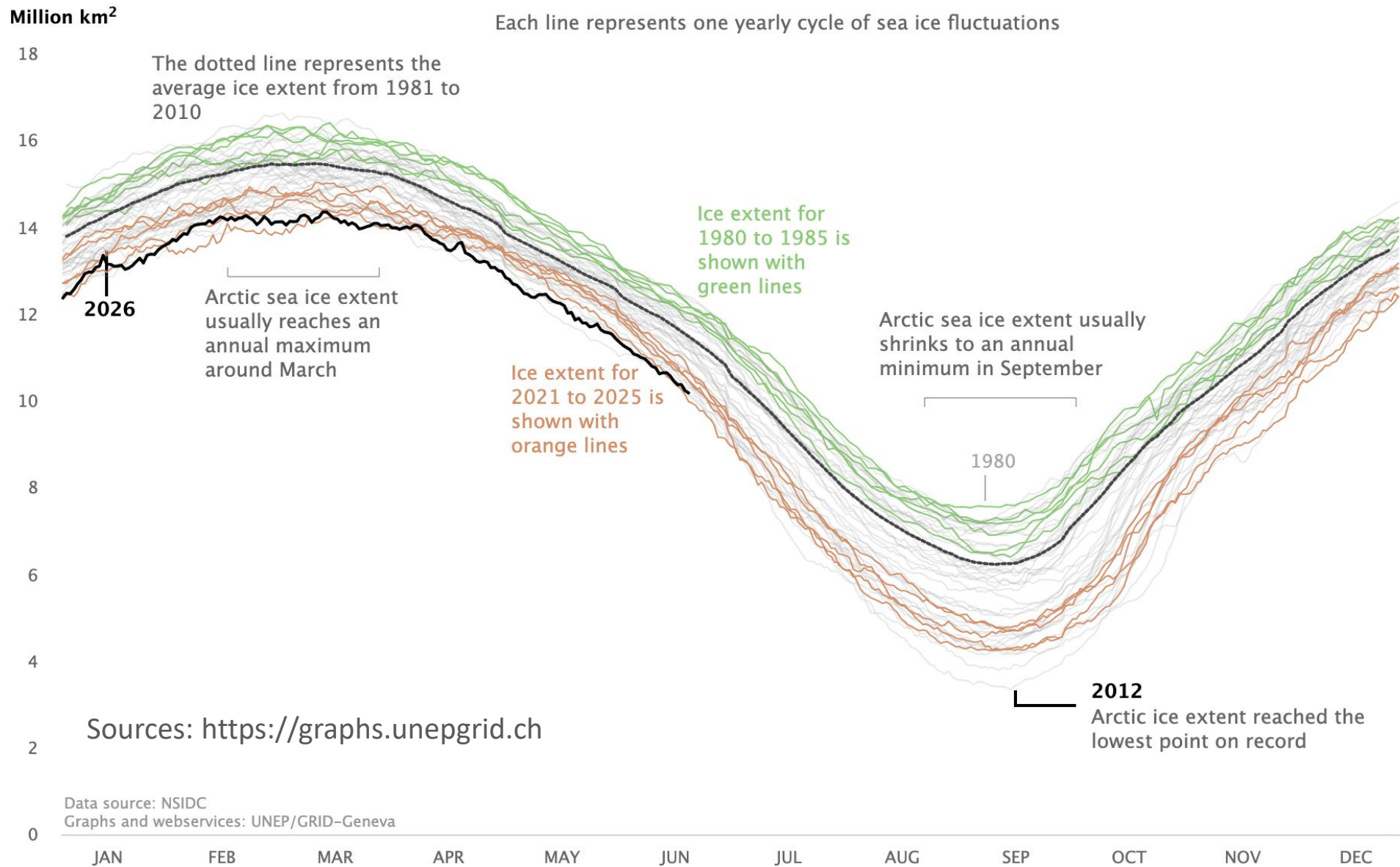
Sep 11 2024
1981-2010 Avg Min



Min. ext.



Arctic Sea Ice Extent

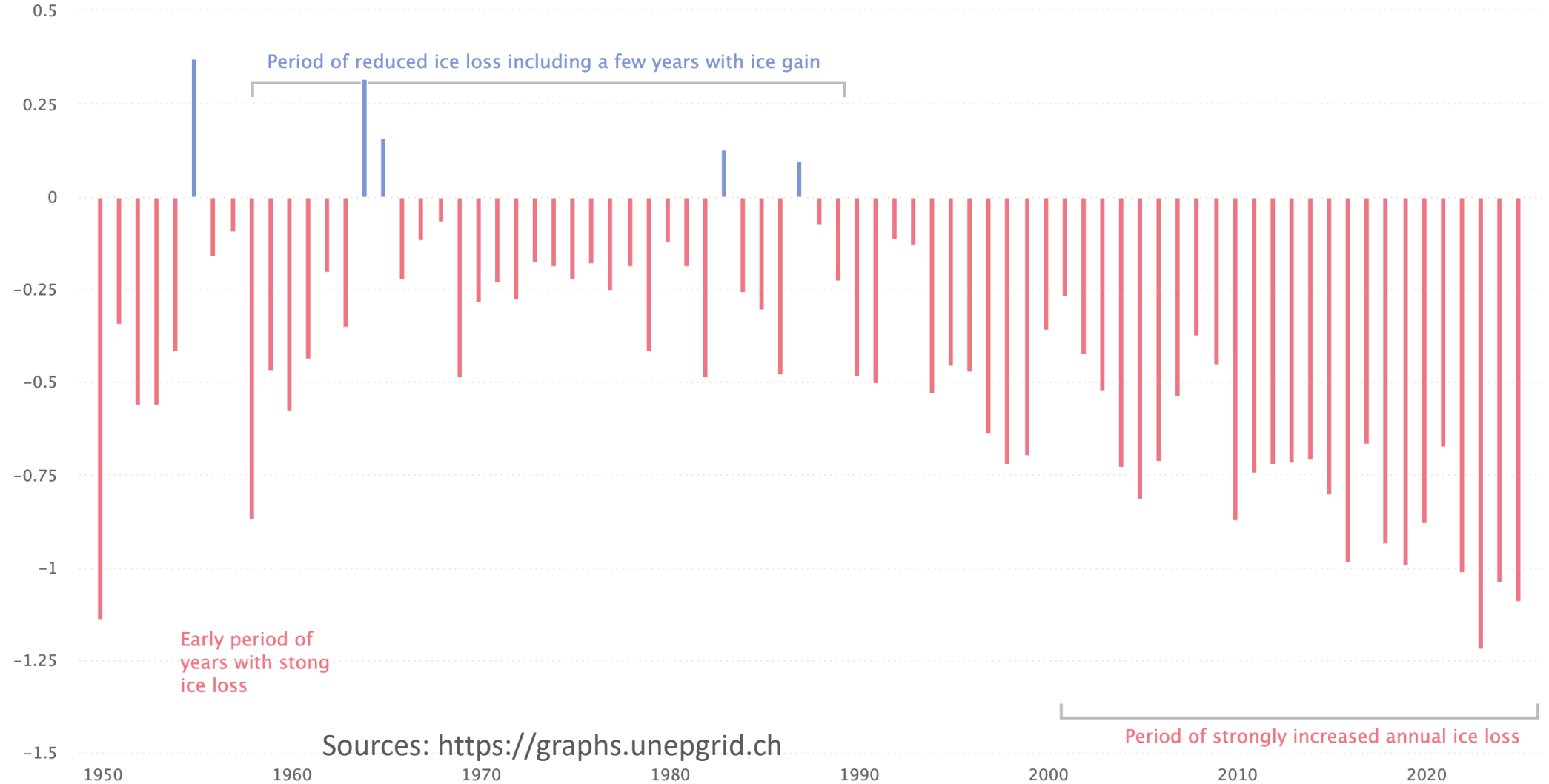


Change in Glacier Mass



Mean annual
annual mass balance
(m w.e.)

Annual annual mass balances of 'reference' glaciers with more than 30 continued observation years



Glacier mcCarty (Alaska, USA)



2004

Glacier du Trift (Valais, Suisse)

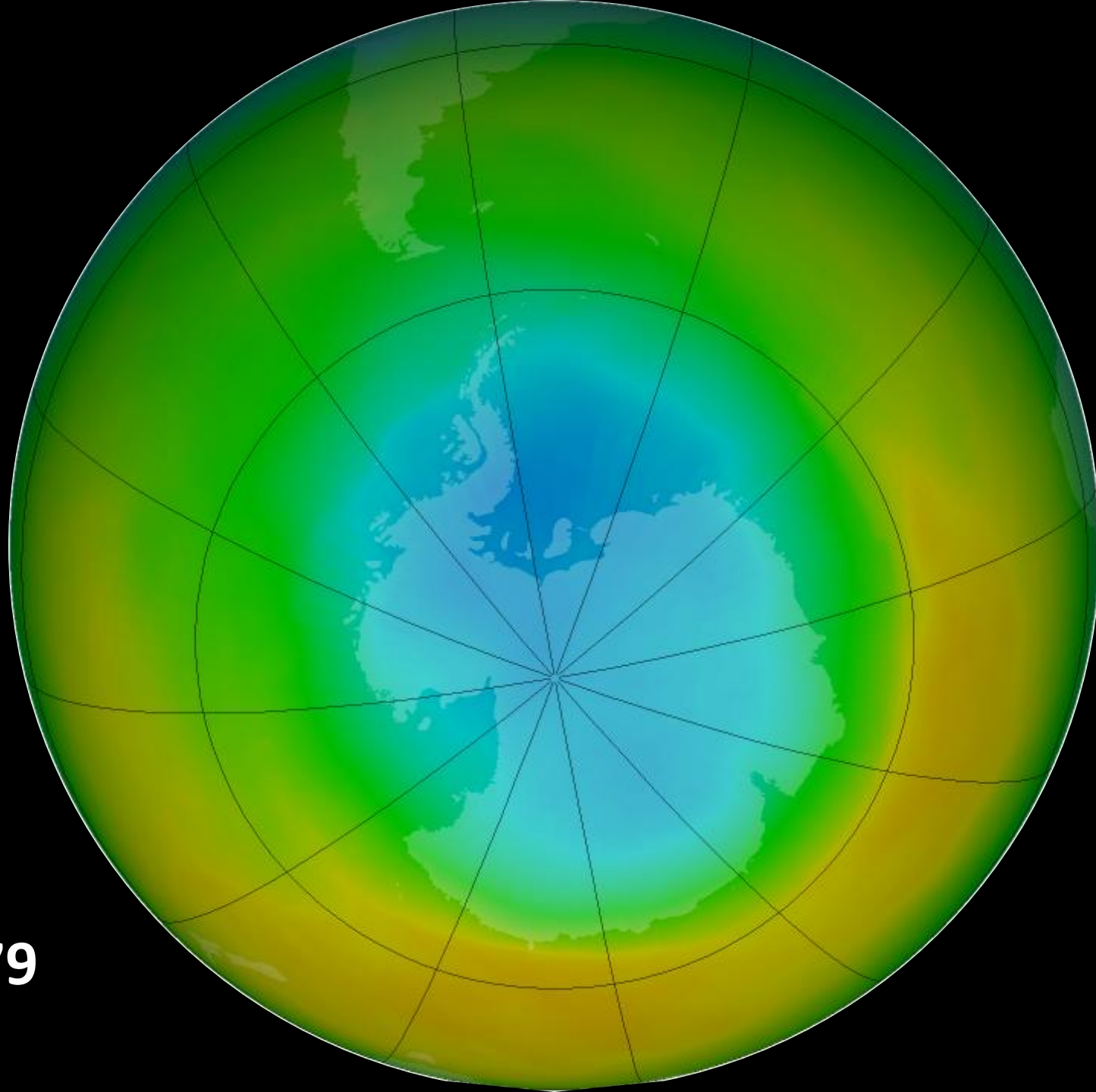


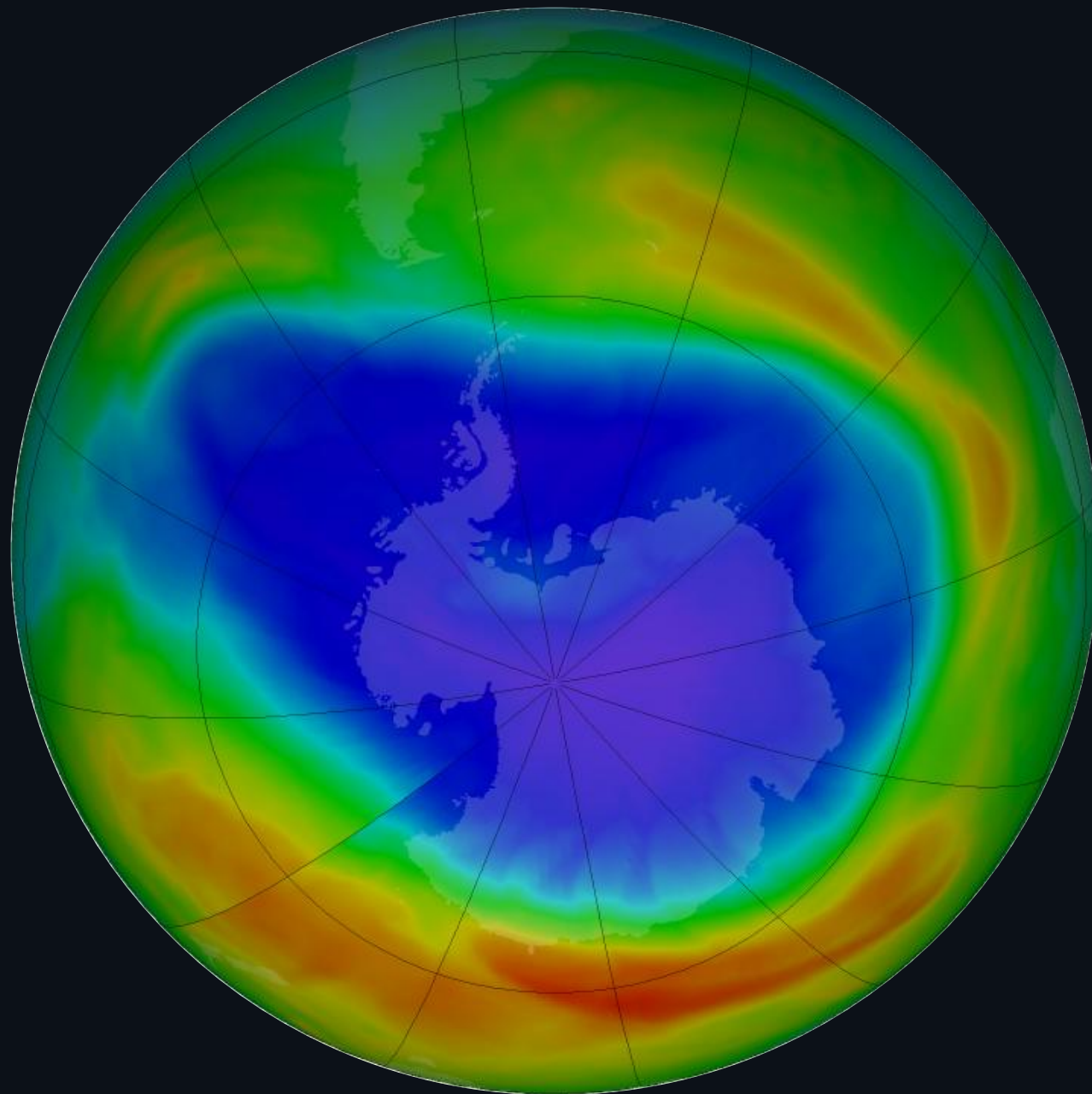
Glacier d'Aletch (Valais, Suisse) Patrimoine mondiale de l'Humanité (UNESCO)



2000

1979

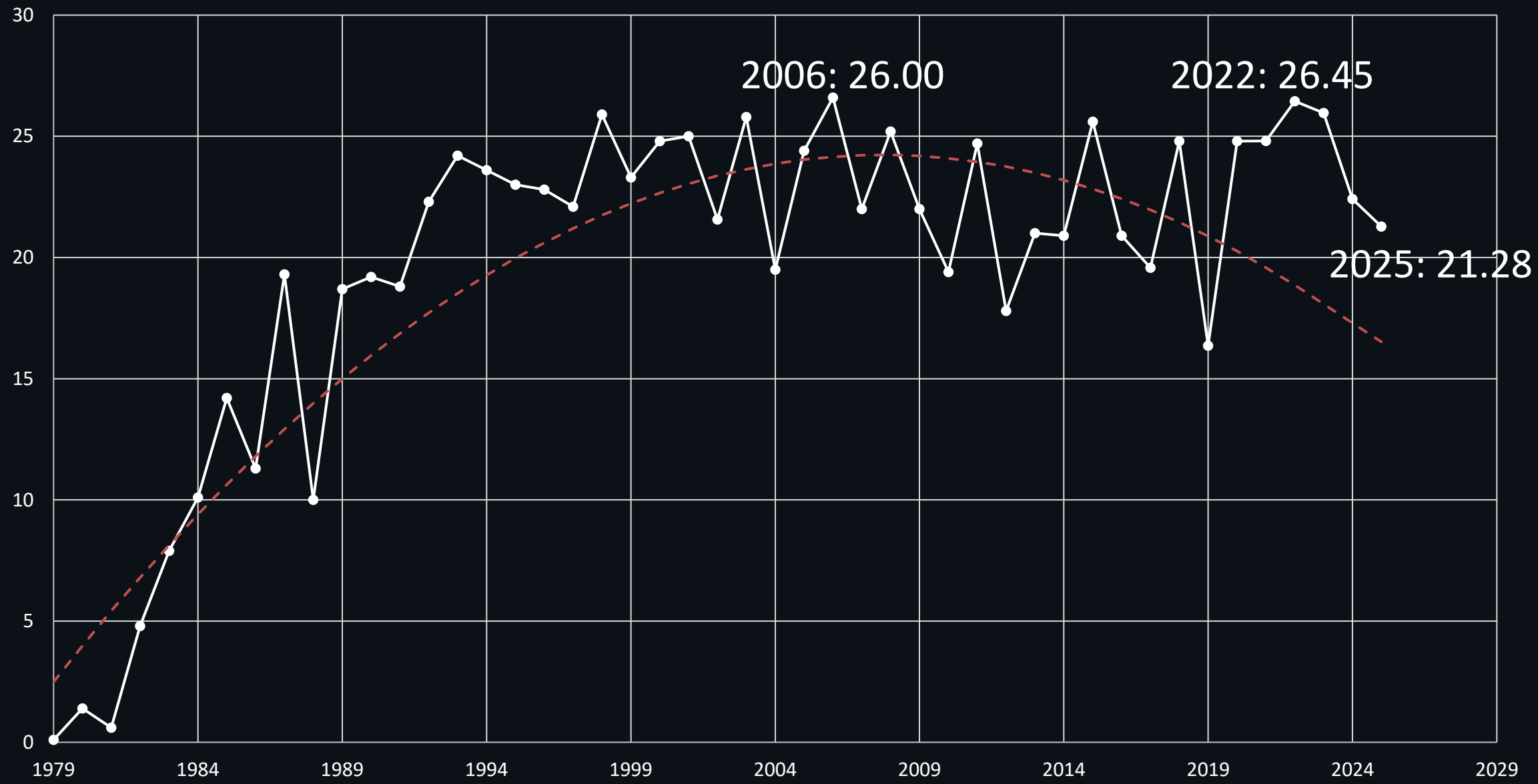




2025

Size of maximum Antarctic Ozone hole

million km²



Antarctic Ozone Hole Area

Million km²

Each line represents one yearly cycle of ozone hole area fluctuations

30

09.09.2000

Ozone hole area reaches
highest point on record

25

20

The thick black line represents the
values for the actual year

The dotted line represents the average
ozone hole area from 1979 to 1988

15

10

Ozone concentrations for 2021 to 2025
are shown with blue lines

Ozone concentrations for 1979 to 1985
are shown with green lines

5

Data source: NASA
Graphs and webservices: UNEP/GRID-Geneva

0

JAN

FEB

MAR

APR

MAY

JUN

JUL

AUG

SEP

OCT

NOV

DEC

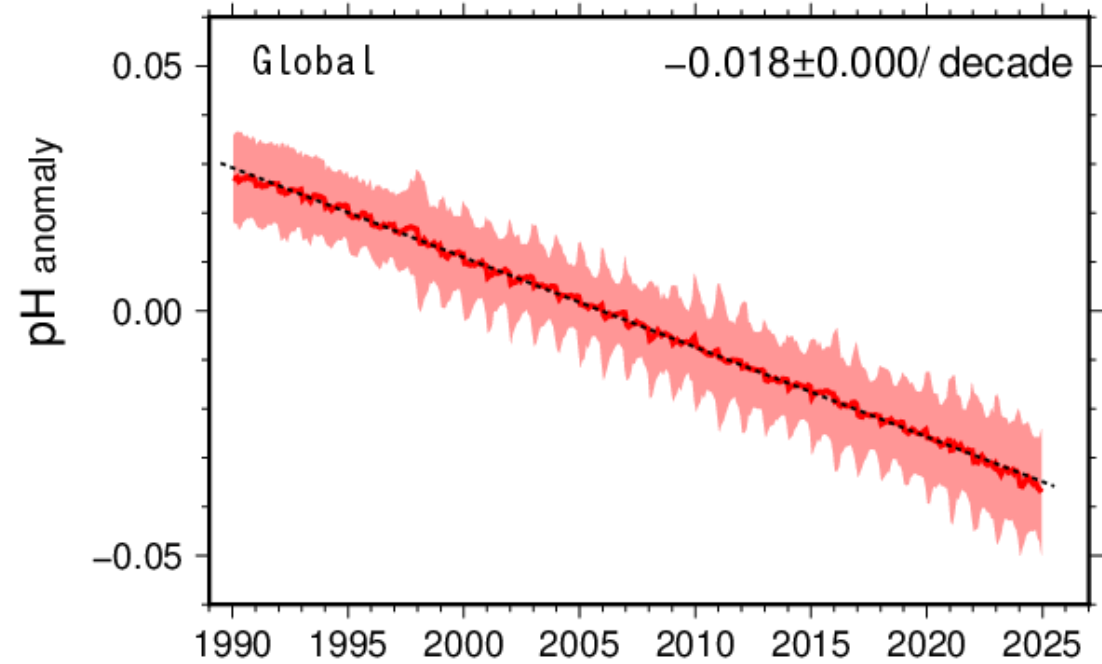
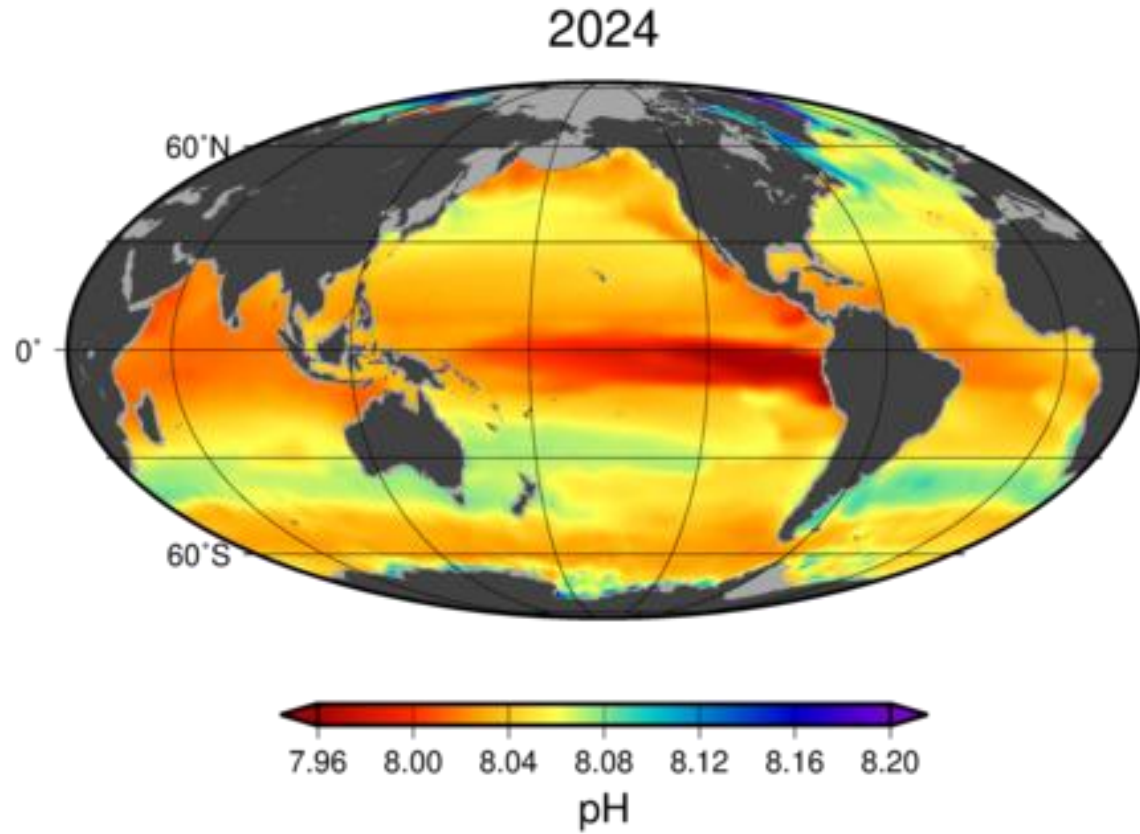
SUMMER

Sources: <https://graphs.unepgrid.ch>

WINTER



Ocean acidification

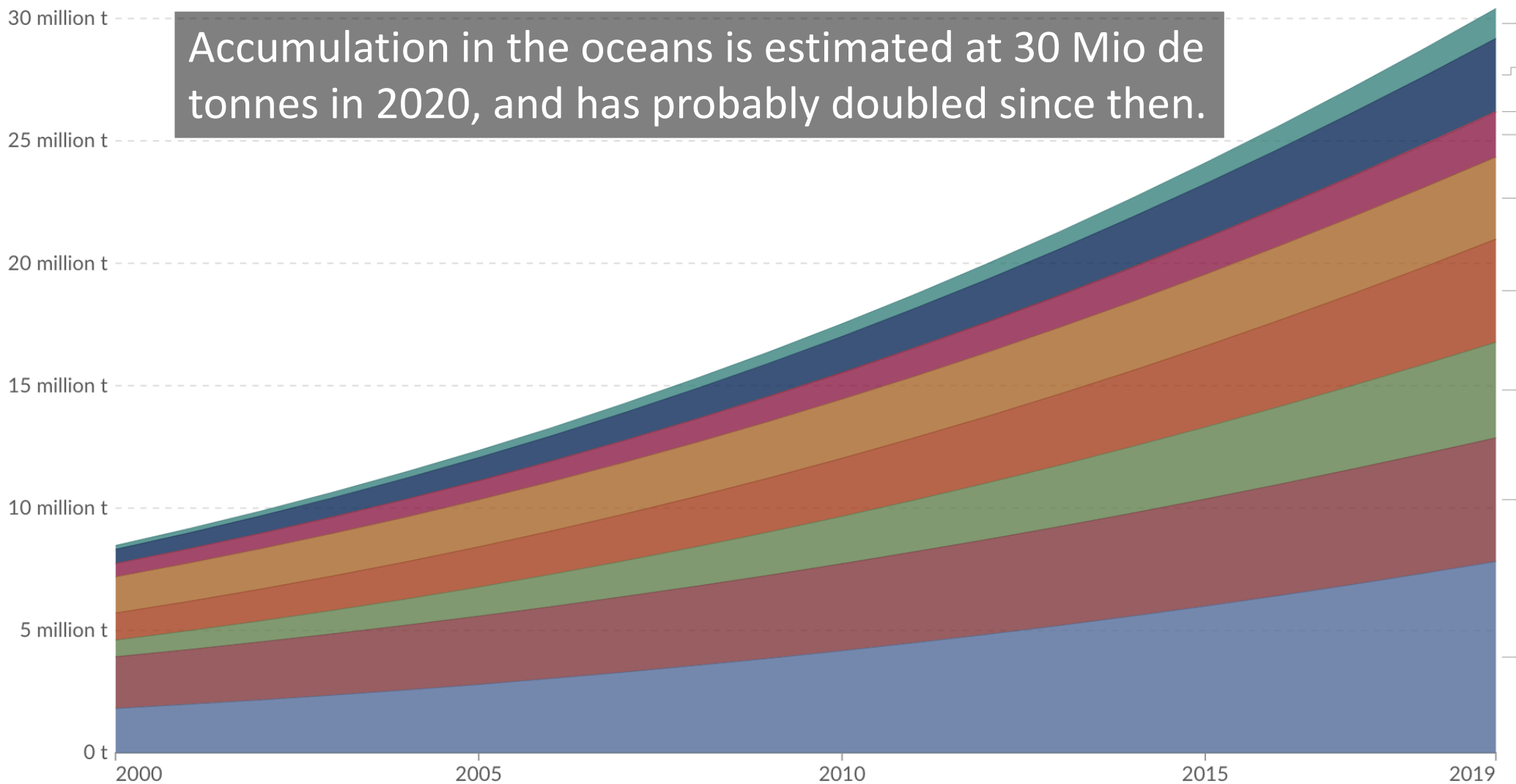


Plastic waste accumulated in the oceans, 2000 to 2019

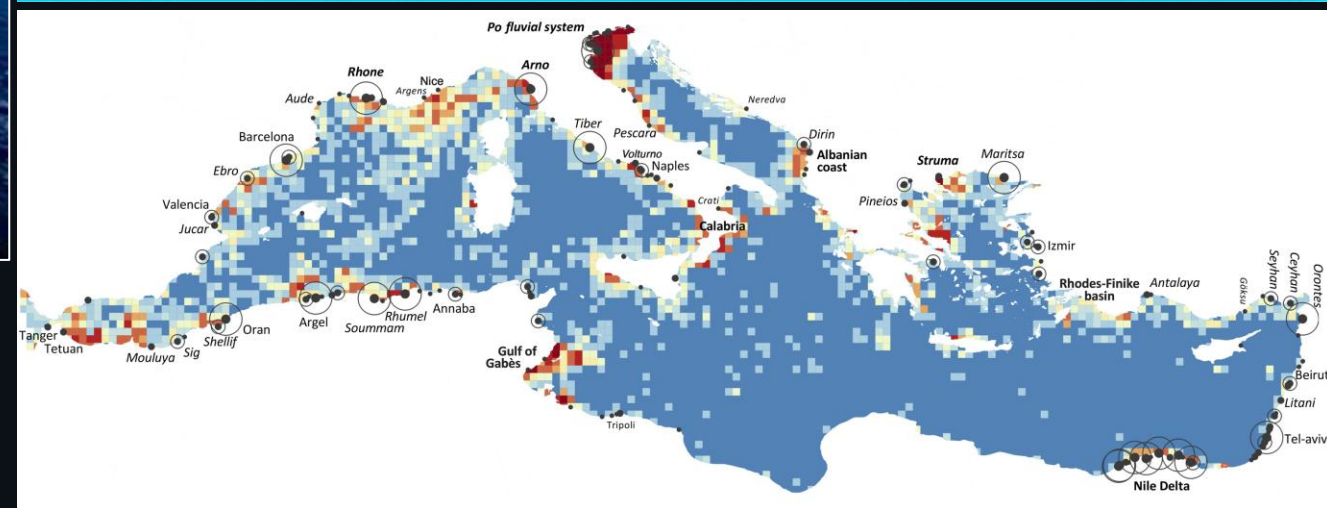
The amount of plastic waste that has accumulated in the oceans since 1951. This is calculated as the running total of plastic flowing into the ocean each year.

Table

Chart



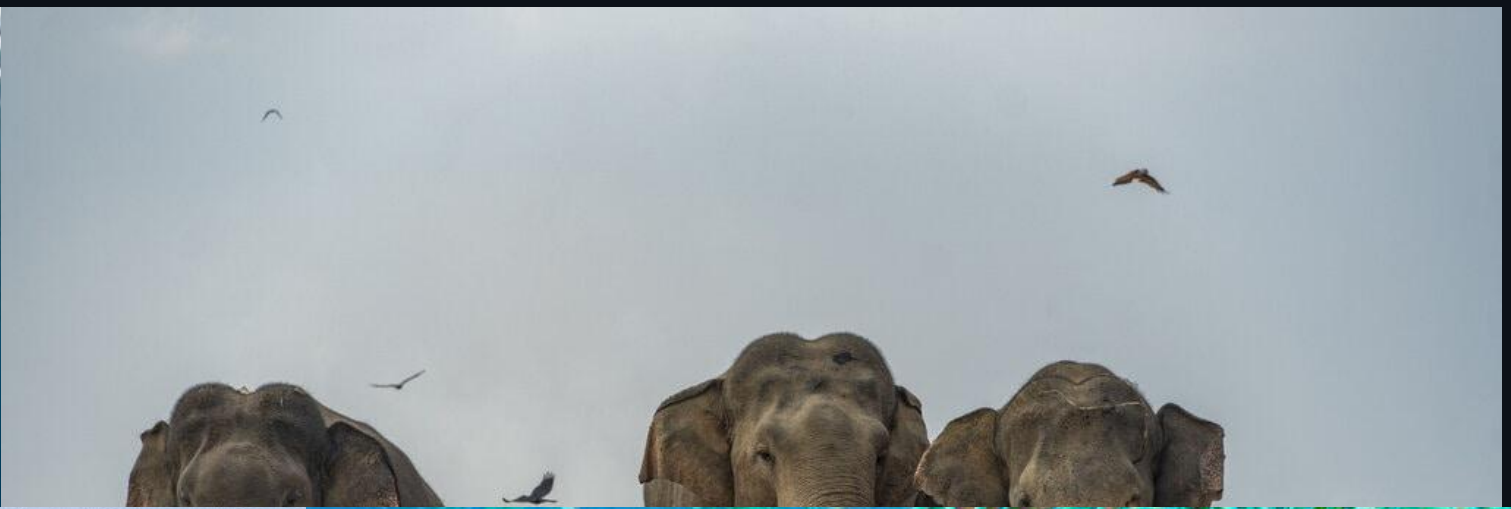
Detecting macro marine litter from space, is now (big enough) to be a reality



Source ESA, Sentinel 2

Challenges are for micro plastics, or for below water marine litters







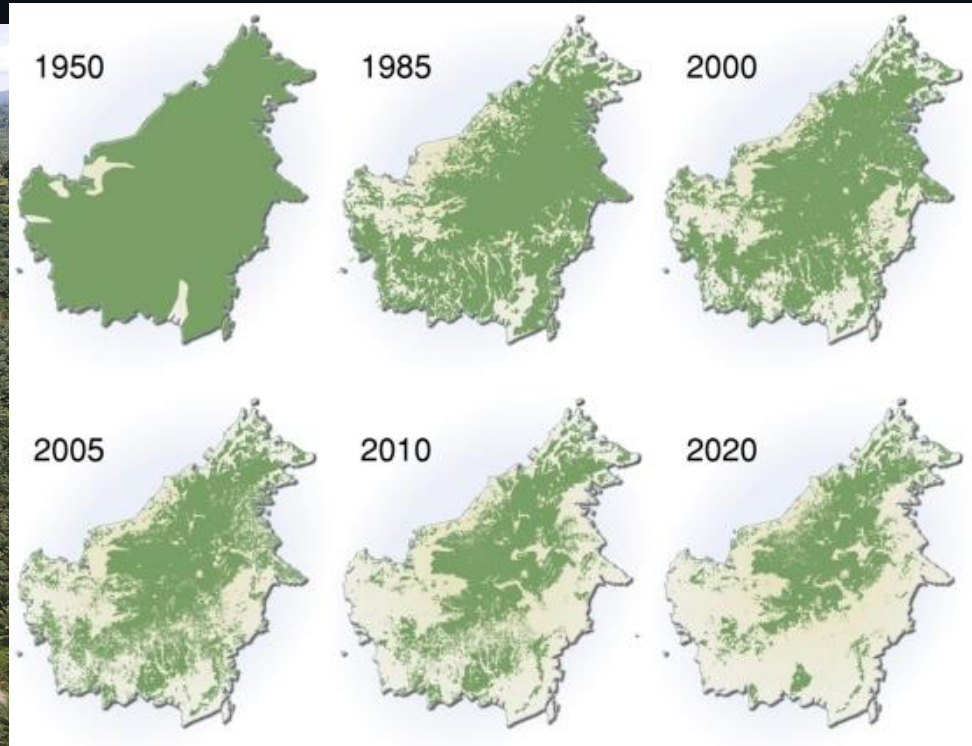
Monitoring deforestation (Bolivia)



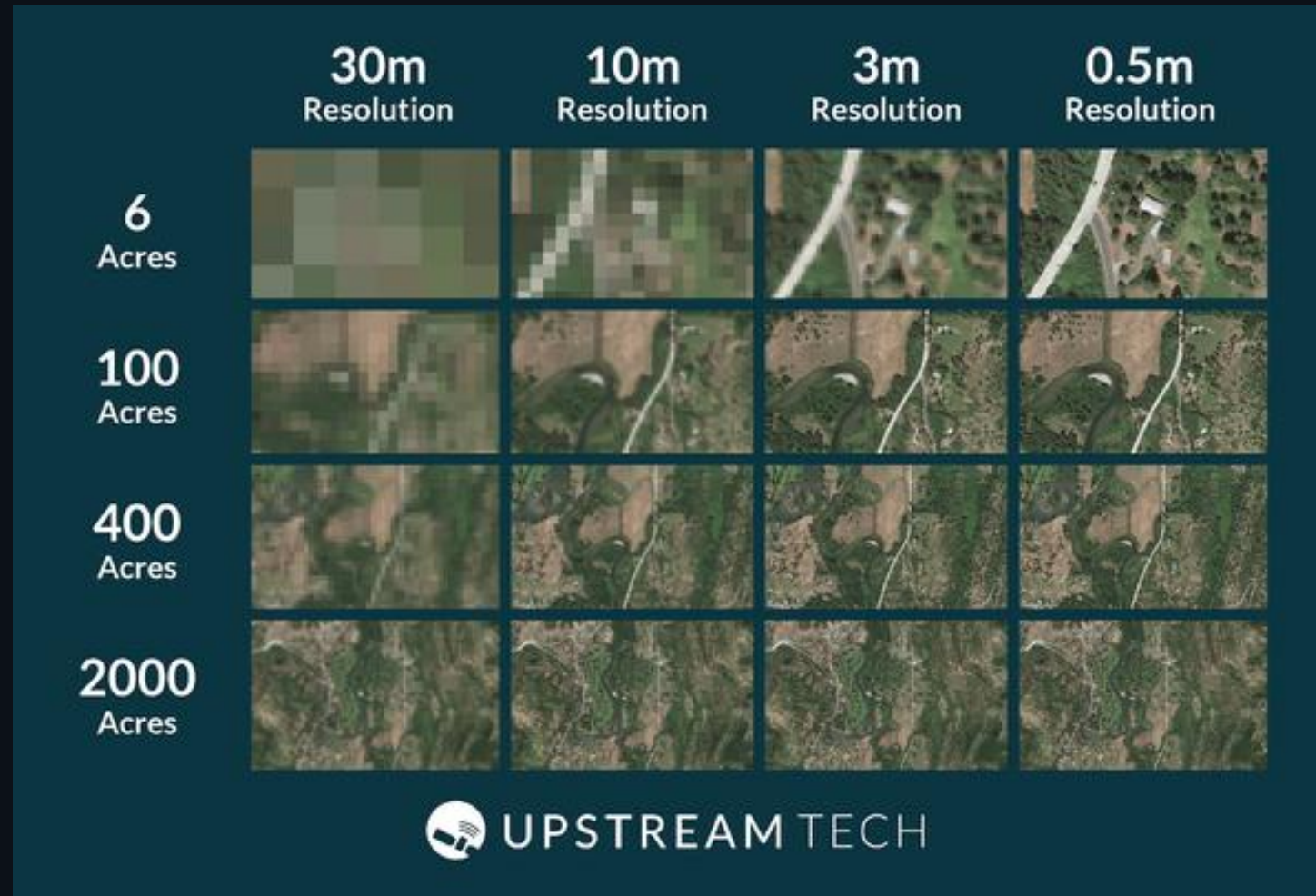


Iguaçu Region (Brazil, Paraguay, Argentina) Monitoring deforestation

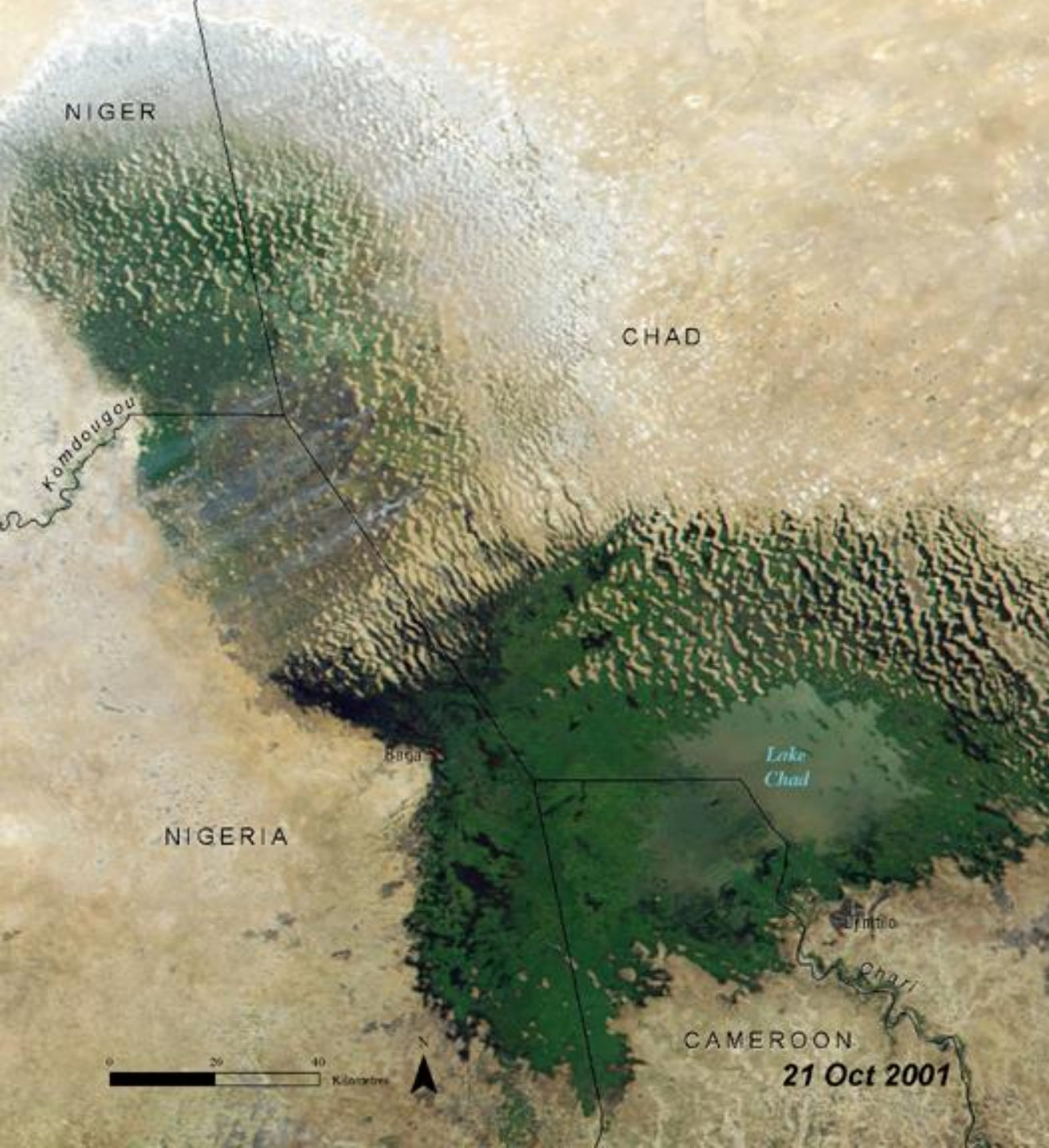




We have improved drastically temporal, spatial and spectral resolutions.
We can now observe deforestation at 0.5 m if we wish to.
But we are still observing deforestation !



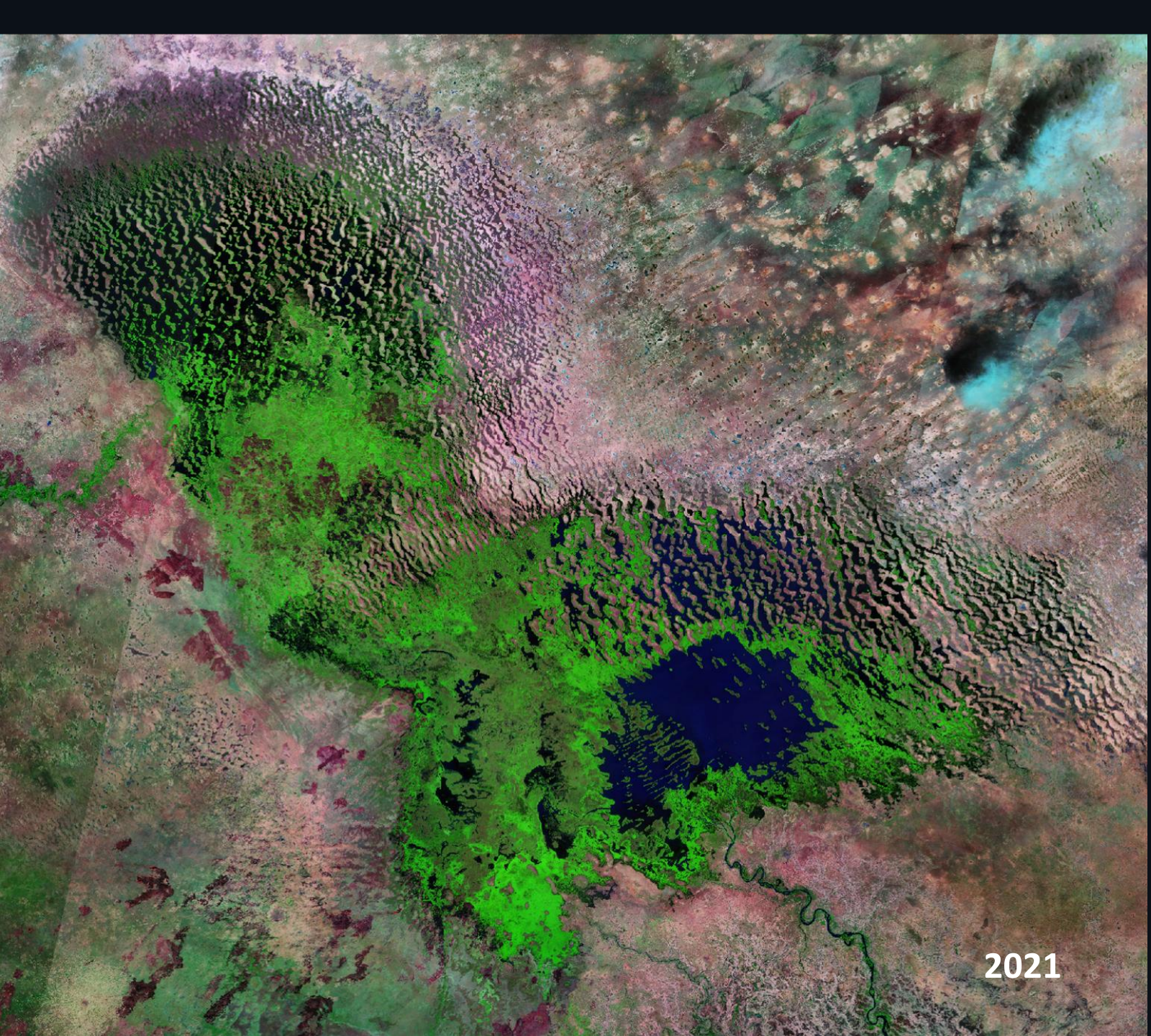
An overview of spatial resolution from satellites. Imagery © 2018 Planet Labs Inc., Maxar (formerly Digital Globe), European Space Agency. All rights reserved. Post processing and analysis by Upstream Tech.



Lake Chad (Chad, Nigeria, Cameroon)

Since the early 1960's, rainfall over the basin decreased significantly while irrigation increased dramatically over the same period. The lake is especially susceptible to climatic variability as it is rather shallow, with an average depth of 4.11 m. As a result of decreased rainfall and increased water usage, the extent of Lake Chad decreased by 95 per cent over 45 years.





2021

Lake Chad (Chad, Nigeria, Cameroon)

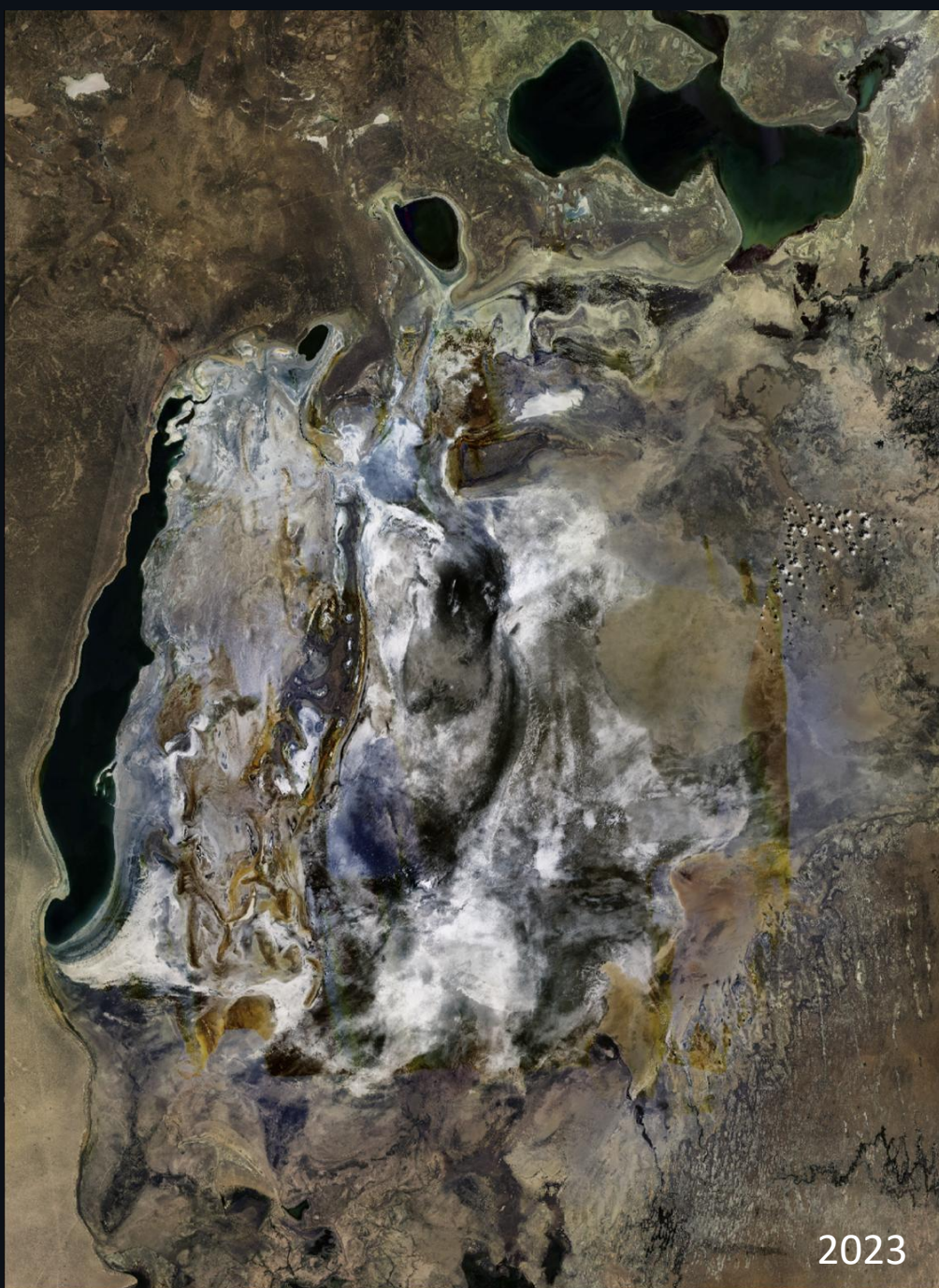
Since the early 1960's, rainfall over the basin decreased significantly while irrigation increased dramatically over the same period. The lake is especially susceptible to climatic variability as it is rather shallow, with an average depth of 4.11 m. As a result of decreased rainfall and increased water usage, the extent of Lake Chad decreased by 95 per cent over 45 years.



Aral sea (when cotton
absorbs a sea)

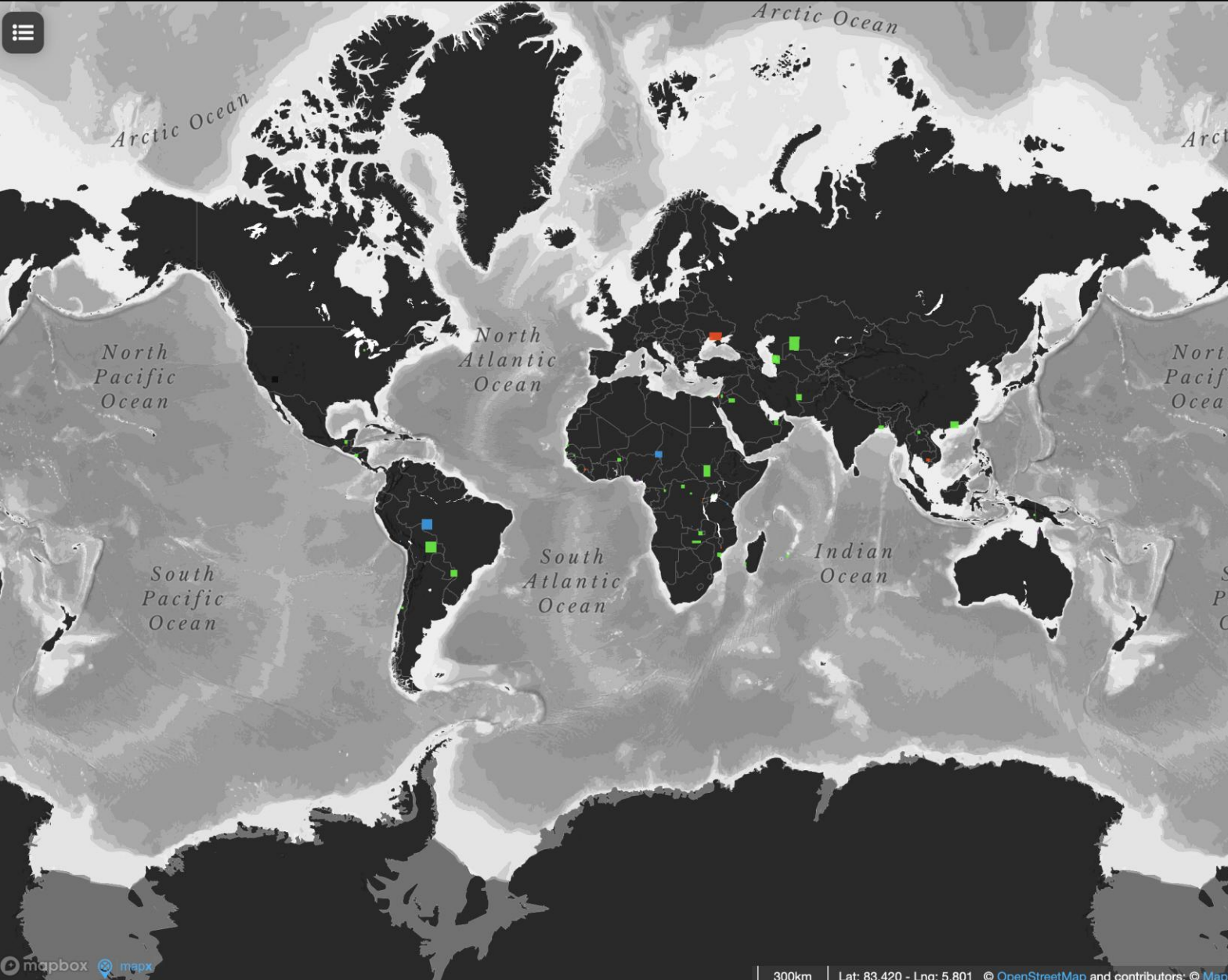


Aral sea (when cotton
absorbs a sea)





12 Oct. 2013



EXAMINE A HOTSPOT

🔍 Search

Theme (none ▾)



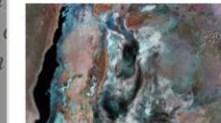
AL-ZAATARI
Jordan, Syrian Arab Republic

Disasters and Conflicts ■



AL'ISAWIYAH
Saudi Arabia

Ecosystems ■



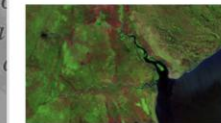
ARAL SEA
Kazakhstan

Ecosystems ■



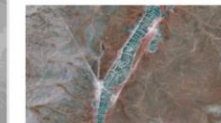
ARLY NATIONAL PARK
Burkina Faso

Ecosystems ■



BEIRA FIRE SCARS
Mozambique

Ecosystems ■



BOU CRAA
Western Sahara

Resource Extraction ■



BUMBA
Democratic Republic of the Congo

Ecosystems ■

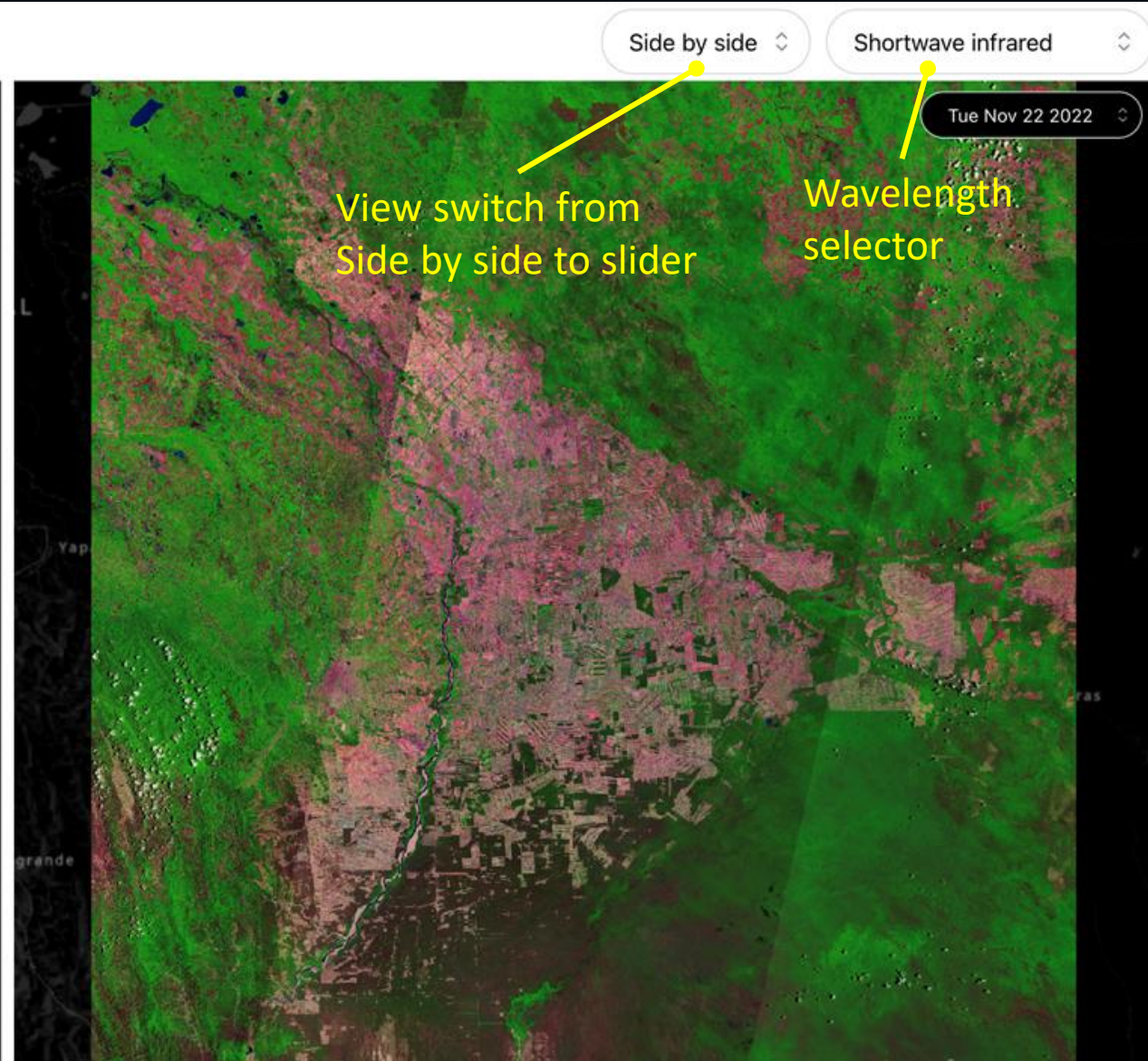
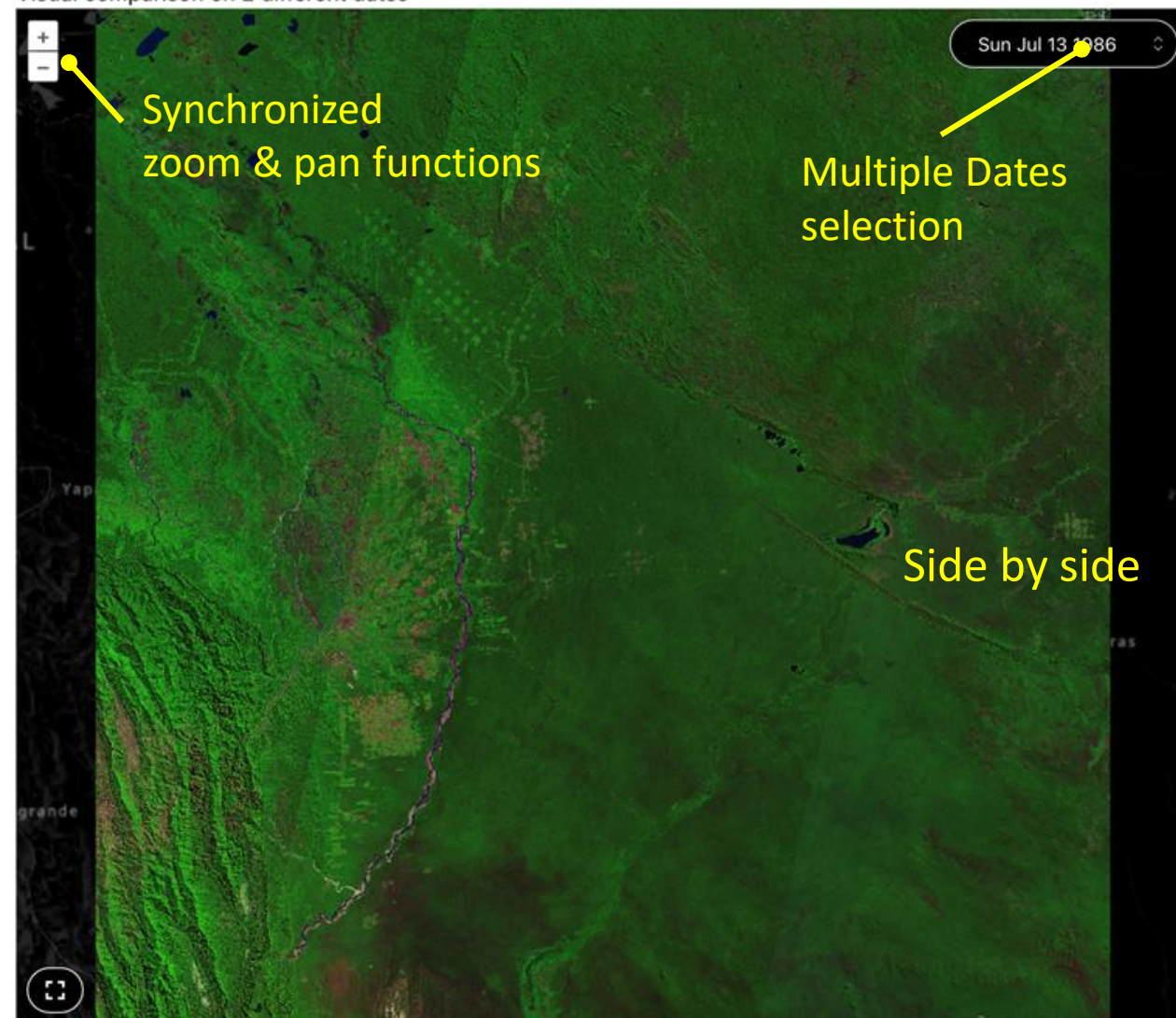


CAMPO-MA'AN FOREST
Cameroon

Santa Cruz region (Bolivia)

MAP COMPARATOR

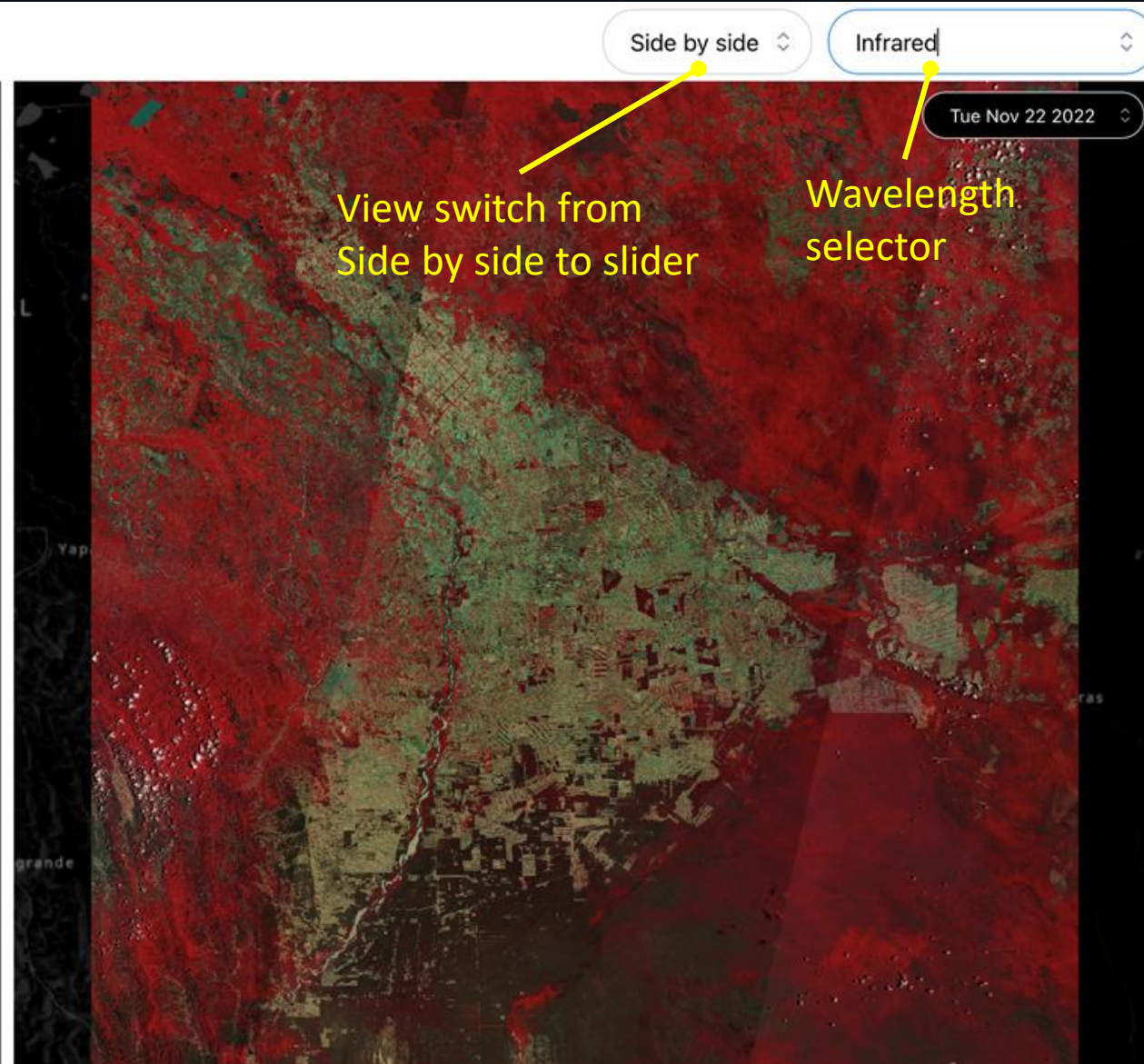
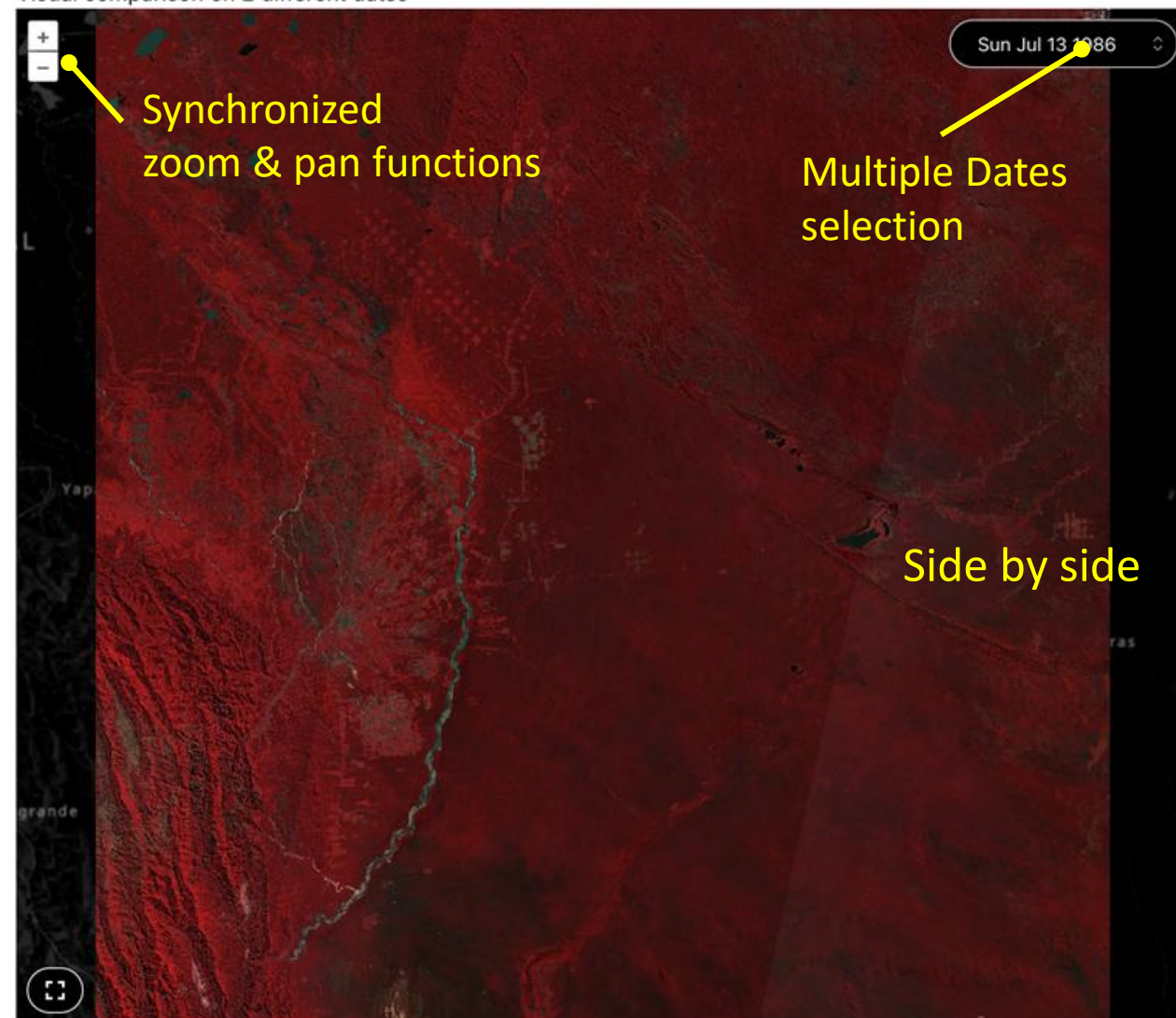
Visual comparison on 2 different dates



Santa Cruz region (Bolivia)

MAP COMPARATOR

Visual comparison on 2 different dates



2023-09-27 00:00 - 2023-09-27 23:59, Sentinel-2 L1C, False color

Gaza 27 Sept. 2023



Credit: European Union, contains modified Copernicus Sentinel data 2024, processed with B

2024-09-26 00:00 - 2024-09-26 23:59, Sentinel-2 L1C, False color

Gaza 26 Sept. 2024



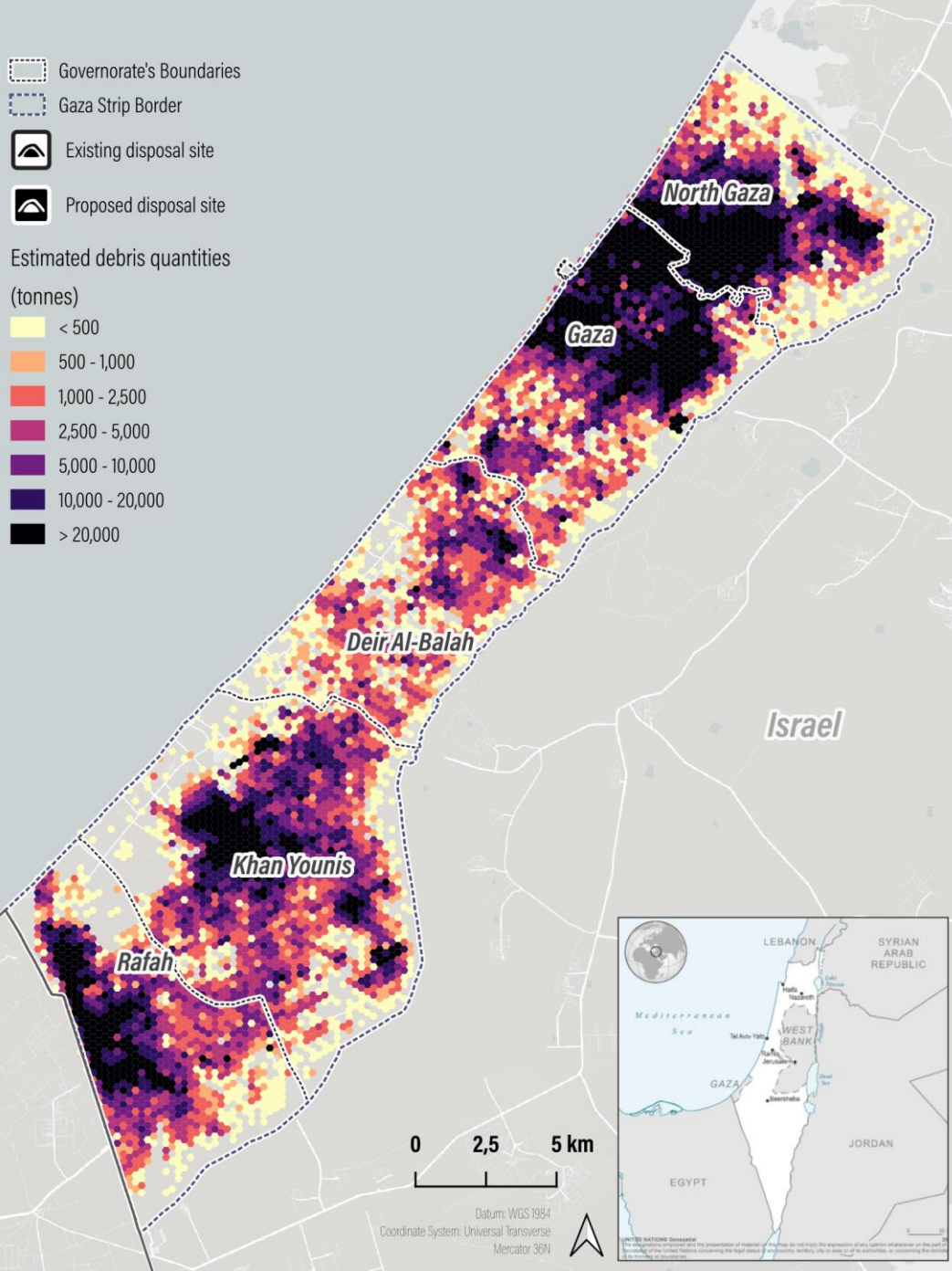
Credit: European Union, contains modified Copernicus Sentinel data 2024, processed with B



- Governorate's Boundaries
- Gaza Strip Border
- Existing disposal site
- Proposed disposal site

Estimated debris quantities
(tonnes)

- < 500
- 500 - 1,000
- 1,000 - 2,500
- 2,500 - 5,000
- 5,000 - 10,000
- 10,000 - 20,000
- > 20,000



The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

57 million tons of debris after the war in Gaza
Recycled: 0.17%, at this pace it will take 140 years
There are urgent needs for help.



Photo: Hassan Partow, UNEP

Global Resource Information Database - Geneva

Statistical data

Our strength lies in the quality and scope of our data. Drawing from 34 authoritative sources, we provide reliable and timely indicators to support informed decision-making.

MORE THAN 3,500 STATISTICAL INDICATORS FROM 34 TRUSTED PROVIDERS

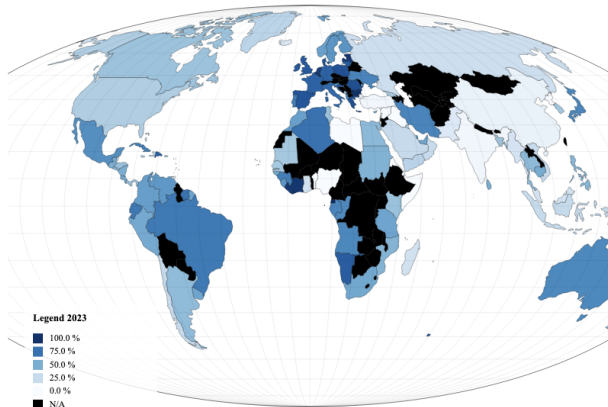
Search all data (e.g. CO2, Land)

[Advanced search](#)

[API](#)

FEATURED STATISTICAL DATA

+ - Reset



Source: United Nations Statistics Division - multiple sources

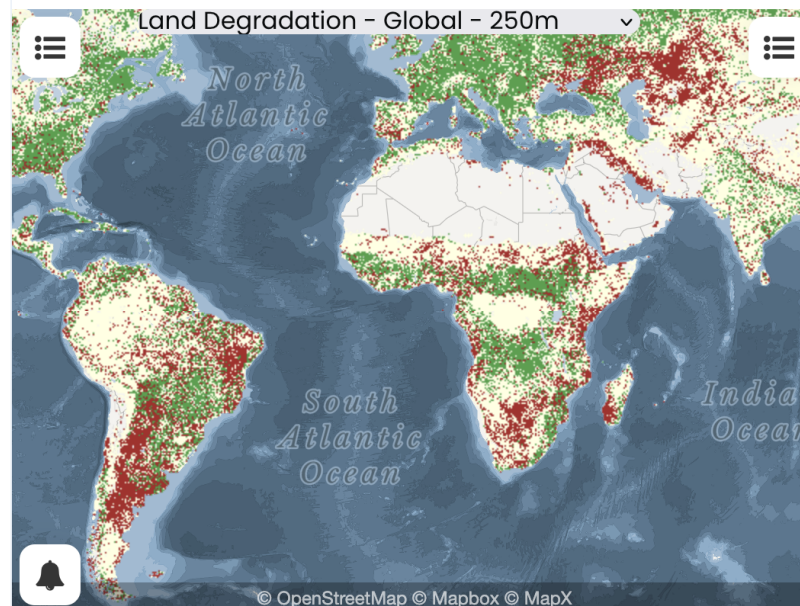
Geospatial data

More than 2000 geospatial datasets can be explored on MapX, our cloud-based platform designed to make spatial information accessible, interactive, and actionable.

MORE THAN 2000 GEOSPATIAL DATASETS

Search geospatial

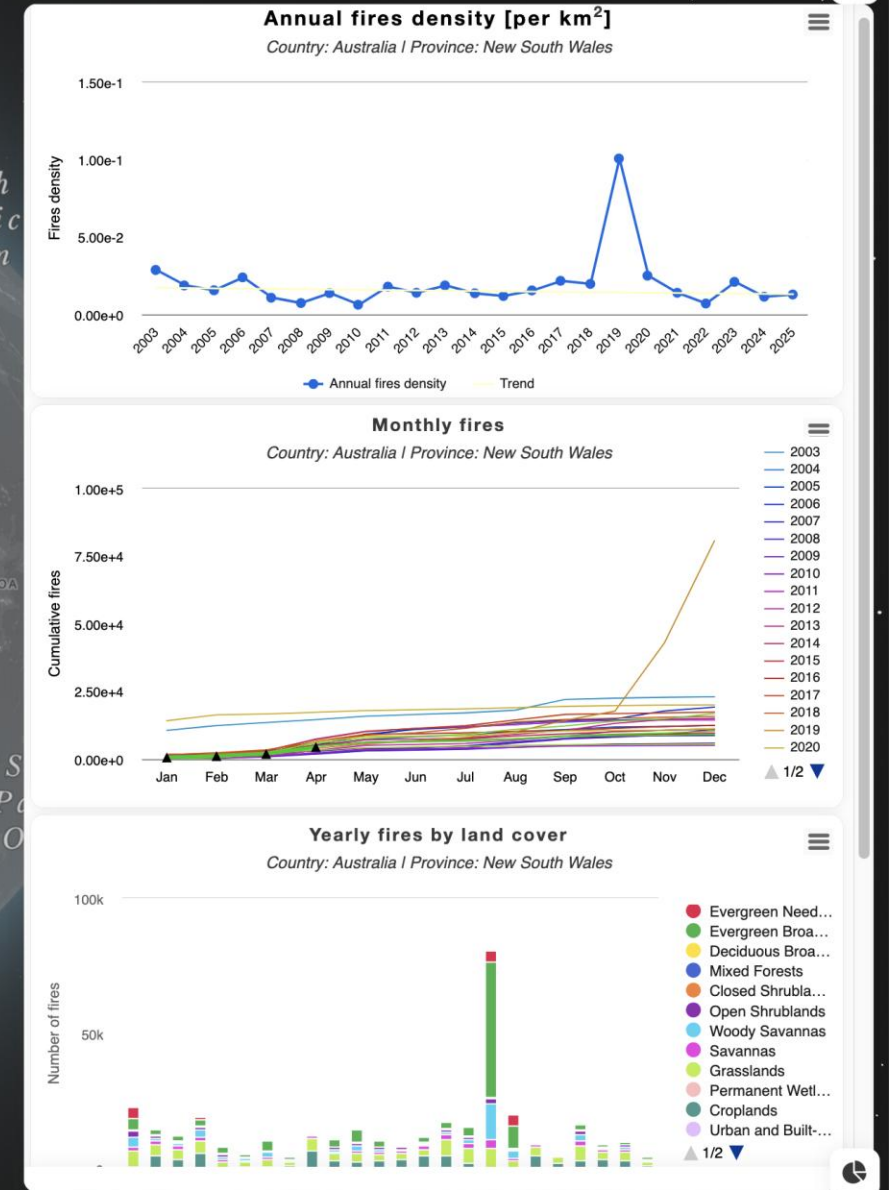
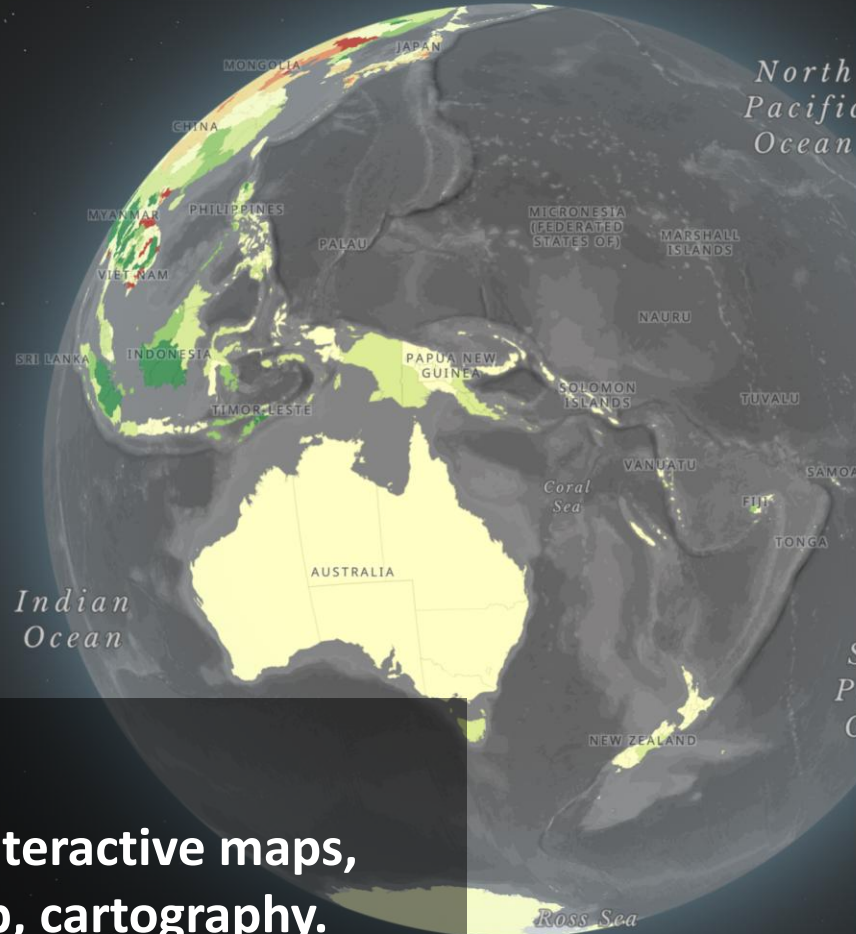
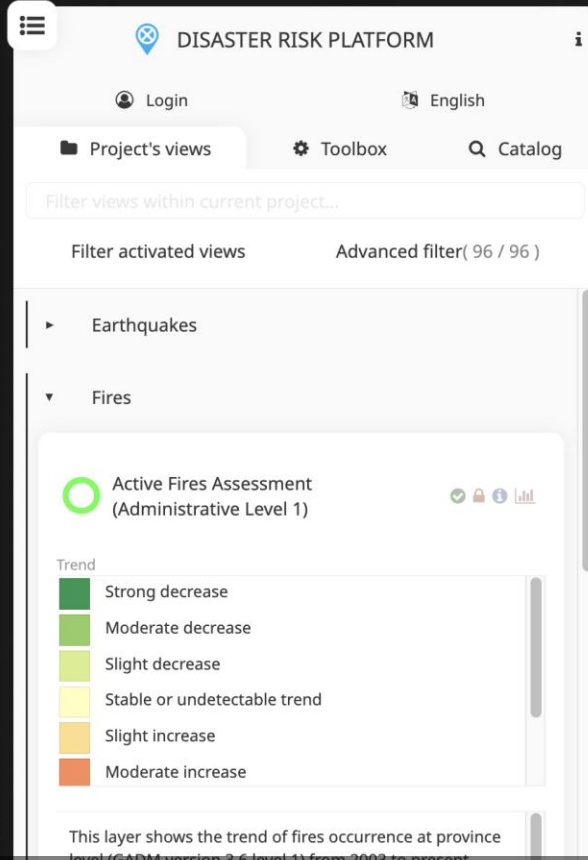
FEATURED GEOSPATIAL DATA



© OpenStreetMap © Mapbox © MapX

GRID-Geneva database includes:
5500 datasets (2100 geospatial datasets + 3500 statistics datasets).
The geospatial module (MapX) is already fully operational (since 2015).
The new statistics module will be operational in September 2025.

GRID-Geneva Geospatial Database: maps.unepgrid.ch



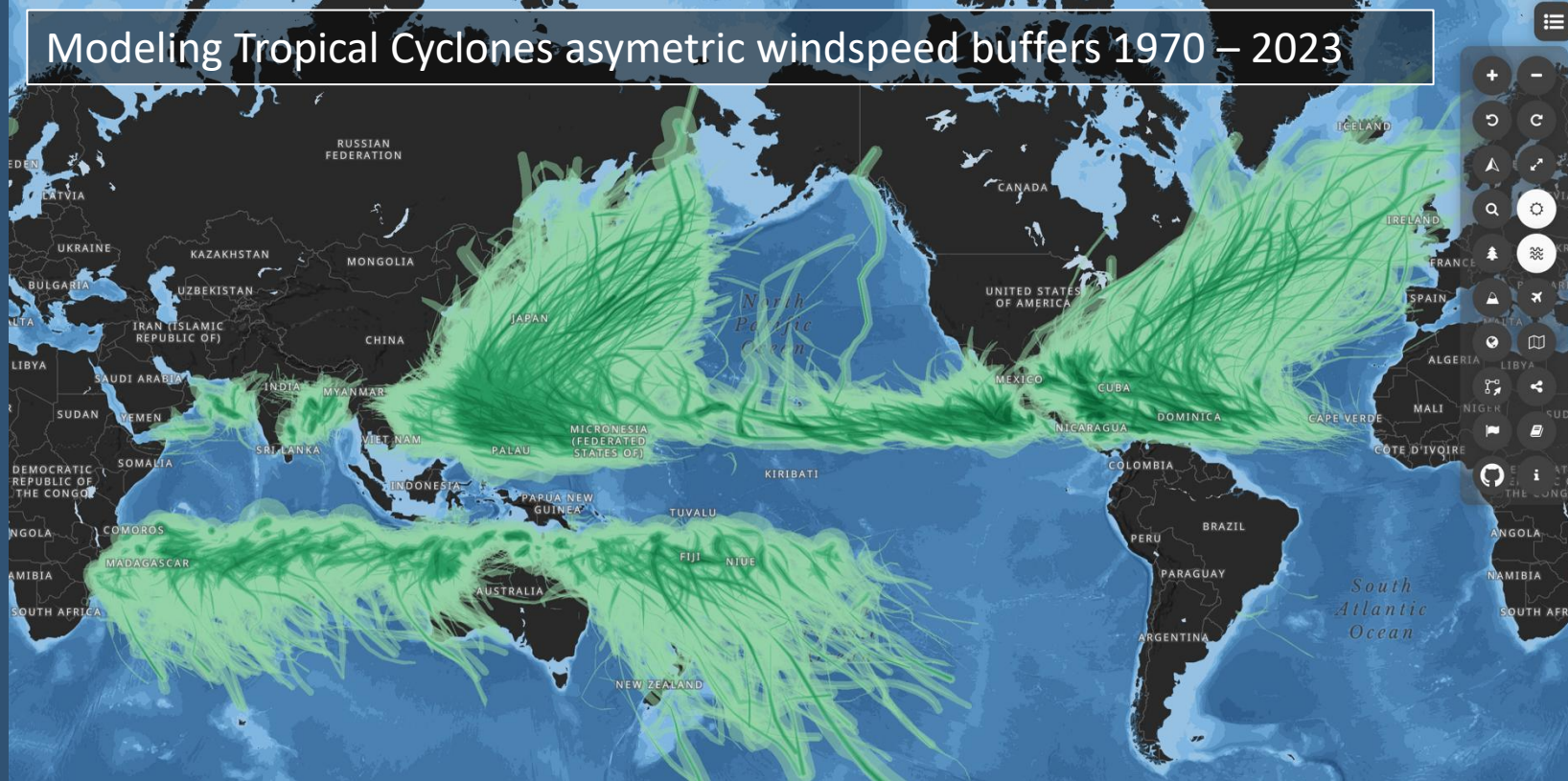
➤ 2100 geospatial datasets

➤ Allow search, visualization, interactive maps, queries, download, story map, cartography.

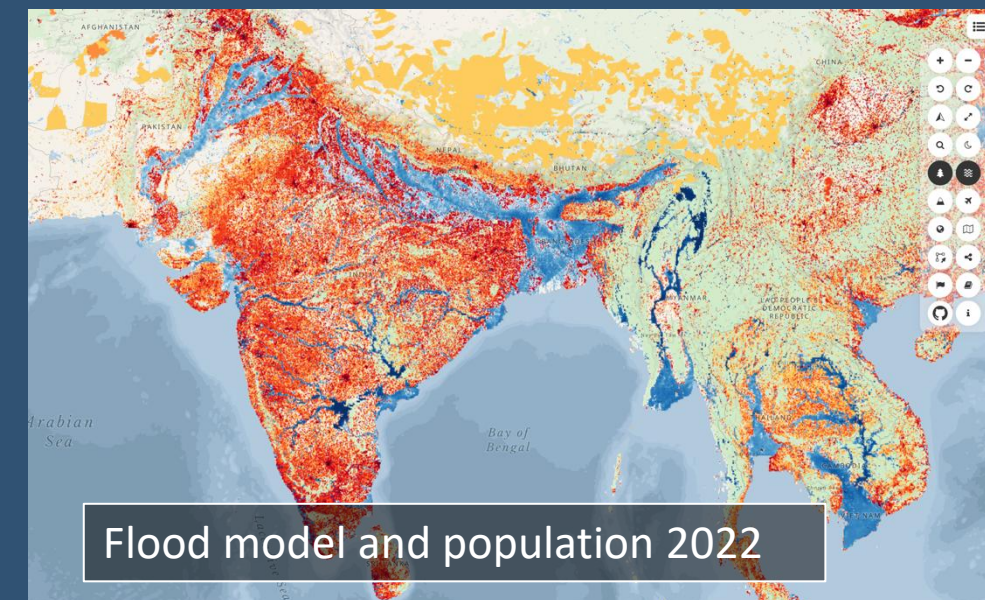
➤ Available in all 6 UN official languages

➤ Developed in 2015, updated ever since.

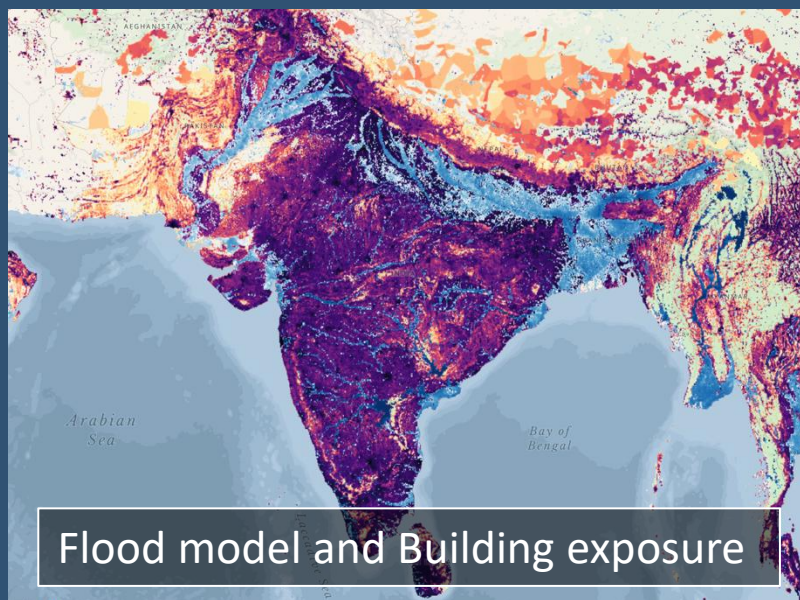
Modeling Tropical Cyclones asymmetric windspeed buffers 1970 – 2023



African conflicts 1997-2001



Flood model and population 2022



Flood model and Building exposure



African conflicts 2020-2024

Global Resource Information Database – Statistics module

Currently under development with 1000 datasets
Aim to provide access to 3100 statistics datasets with automatic updates by September 2025.

- Allows for:
- Data discovery/search
 - Display (graphs, table, map)
 - Interogation/query
 - Access, link and download

UN environment programme

GRID

Data

Grid Stat

About

forest

×

Indicators

Metadata

Chart

Table

Map

Download

Topics

Economy and Population

0

Climate Change

61

Land

6

Food Security, Agriculture

11

Water

0

Biodiversity

4

Show 13 more

Sources

Food and Agriculture Organization of the United Nations (FAO): Statistics Division (ESS)

24

United Nations Statistics Division - multiple sources

10

Food and Agriculture Organization of the United Nations (FAO): Office of the Chief Statistician

7

Climate Watch

14

United Nations Framework Convention on Climate Change - Non-Annex I (countries not listed in Annex I of the UNFCCC, typically developing countries)

14

Forest

Forest area as a proportion of total land area

The indicator describes the extent of forest area as a proportion of total land area. This indicator is based o...

land forest

United Nations Statistics Division - multiple sources

Forest

SDG 15.2.1 Forest area under an independently verified forest management certification scheme

This indicator shows the forest area under an independently verified forest management certifiatio...

forest management forest land cover

Food and Agriculture Organization of the United Nations (FAO): Office of the Chief Statistician

Forest

Forest area as a proportion of total land area

Unit: %

2000 2020

Mollweide

Legend 2020

98.3 %

73.8 %

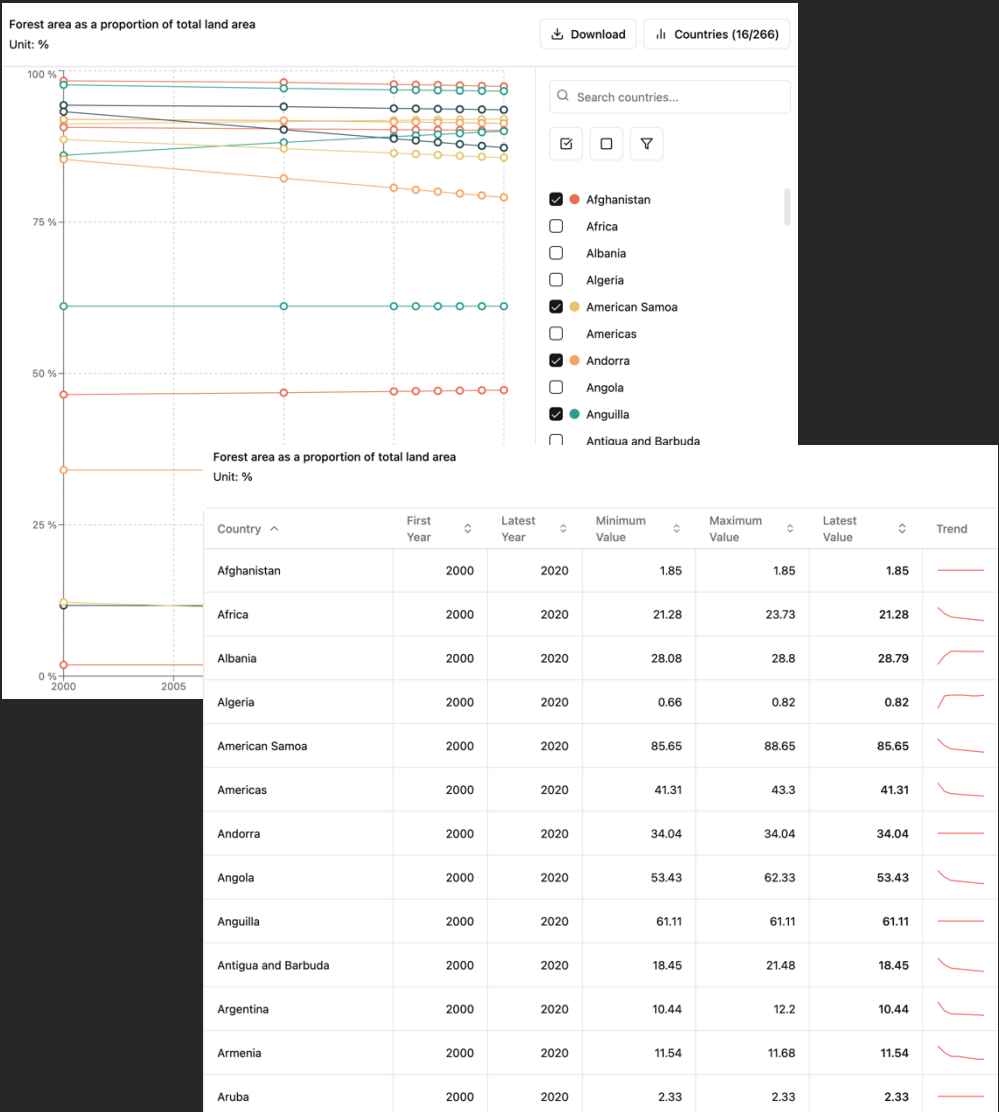
49.2 %

24.6 %

0.0 %

N/A

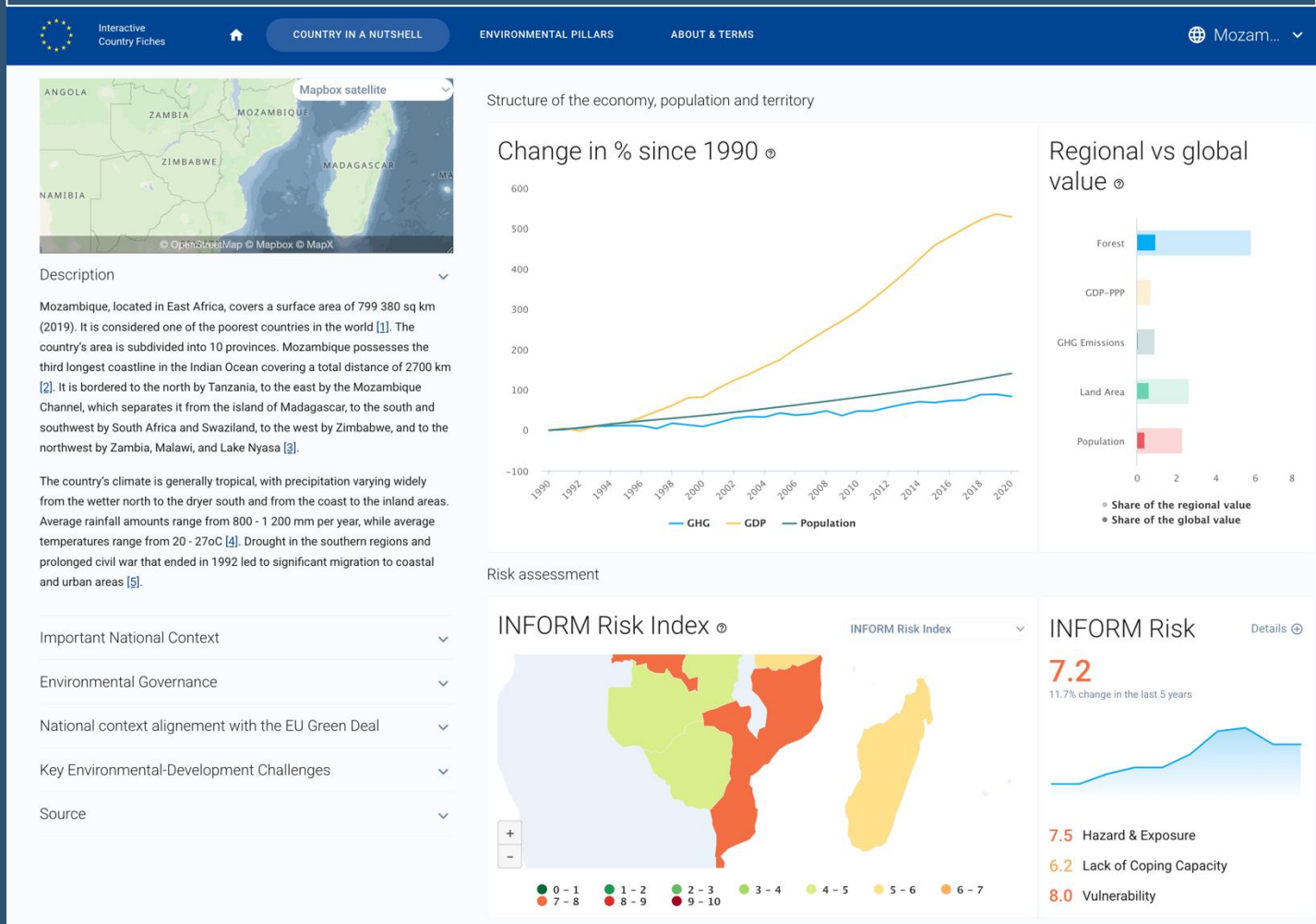
Source: United Nations Statistics Division - multiple sources



On-line, but not yet public

EC Interactive Country Fiches – Environmental Platform (46 countries, 450 indicators per country)

<https://dicf.unepgrid.ch/>



Climate change

DRIVERS PRESSURES STATES IMPACTS RESPONSES

What are the key values and trends?

Participation in Treaties [Nationally Determined Contribution \(NDC\)](#) International Financial Flows (IFF) for Clean Energy

Nationally Determined Contribution

An overview over the Nationally Determined Contribution can be found on the website of [Climate Watch] (<https://www.climatewatchdata.org/ndcs-explore>).

NDC - Overview of commitment

Country	Indicator	Value
Mozambique	Target year (mitigation)	Not Applicable
Mozambique	Target year (adaptation)	2030
Mozambique	NDC summary	Mozambique communicated its mitigation contribution in the form of actions (policies/programmes) and also included an adaptation component in its INDC.
Mozambique	Mitigation contribution type	Actions only
Mozambique	GHG target	Not Applicable
Mozambique	Conditionality	Conditional NDC only
Mozambique	Adaptation included	Yes

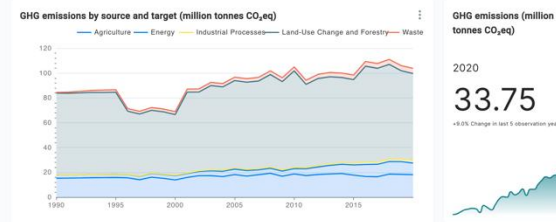
Climate change

DRIVERS PRESSURES STATES IMPACTS RESPONSES

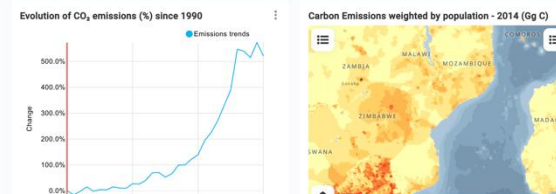
What are the key values and trends?

Overview Emissions per gas and source Emissions per gas and year Economic perspective

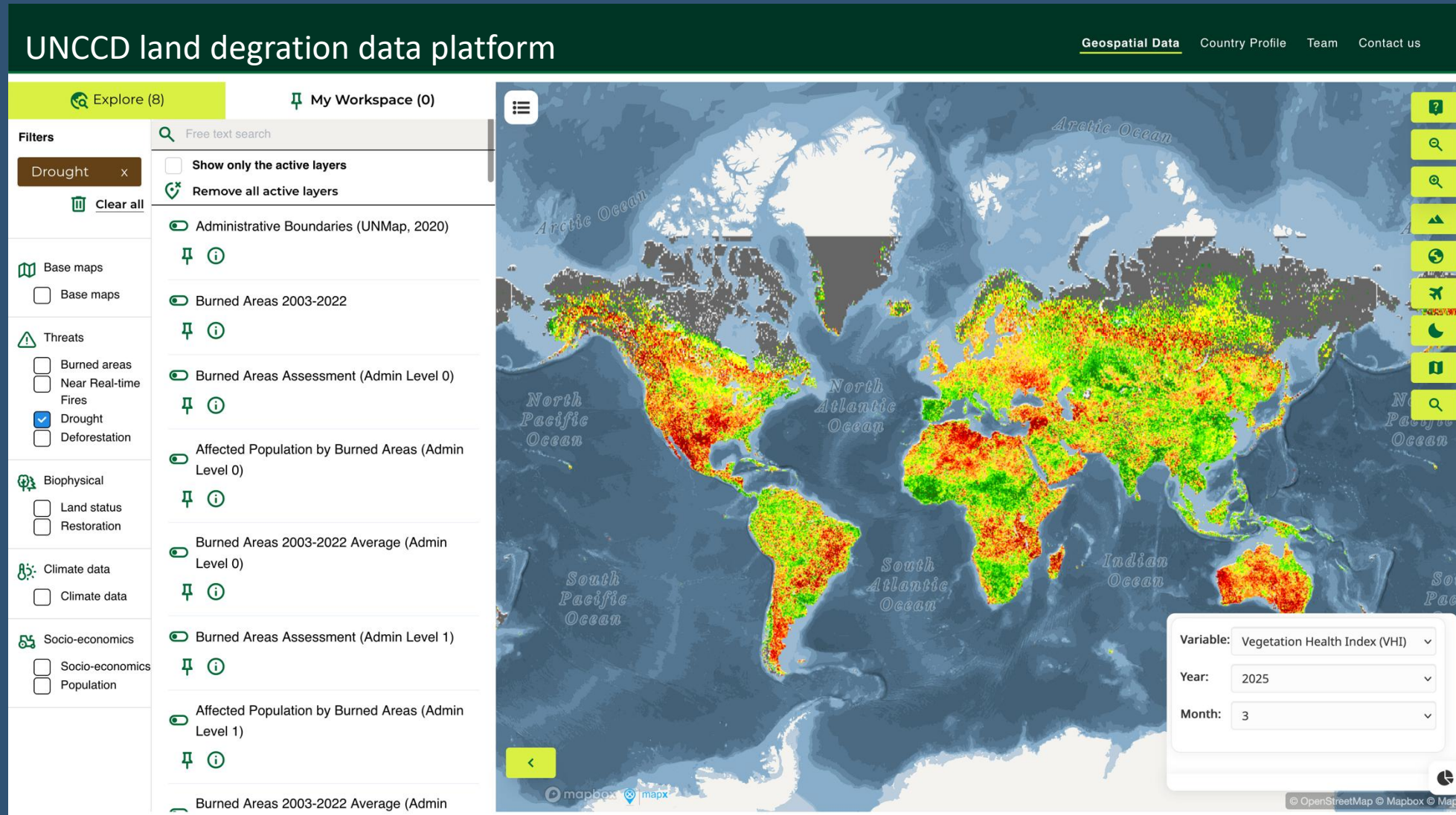
Greenhouse gas emissions (GHG)



CO₂ emissions



UNCCD data platform, covering all member states on land degradation



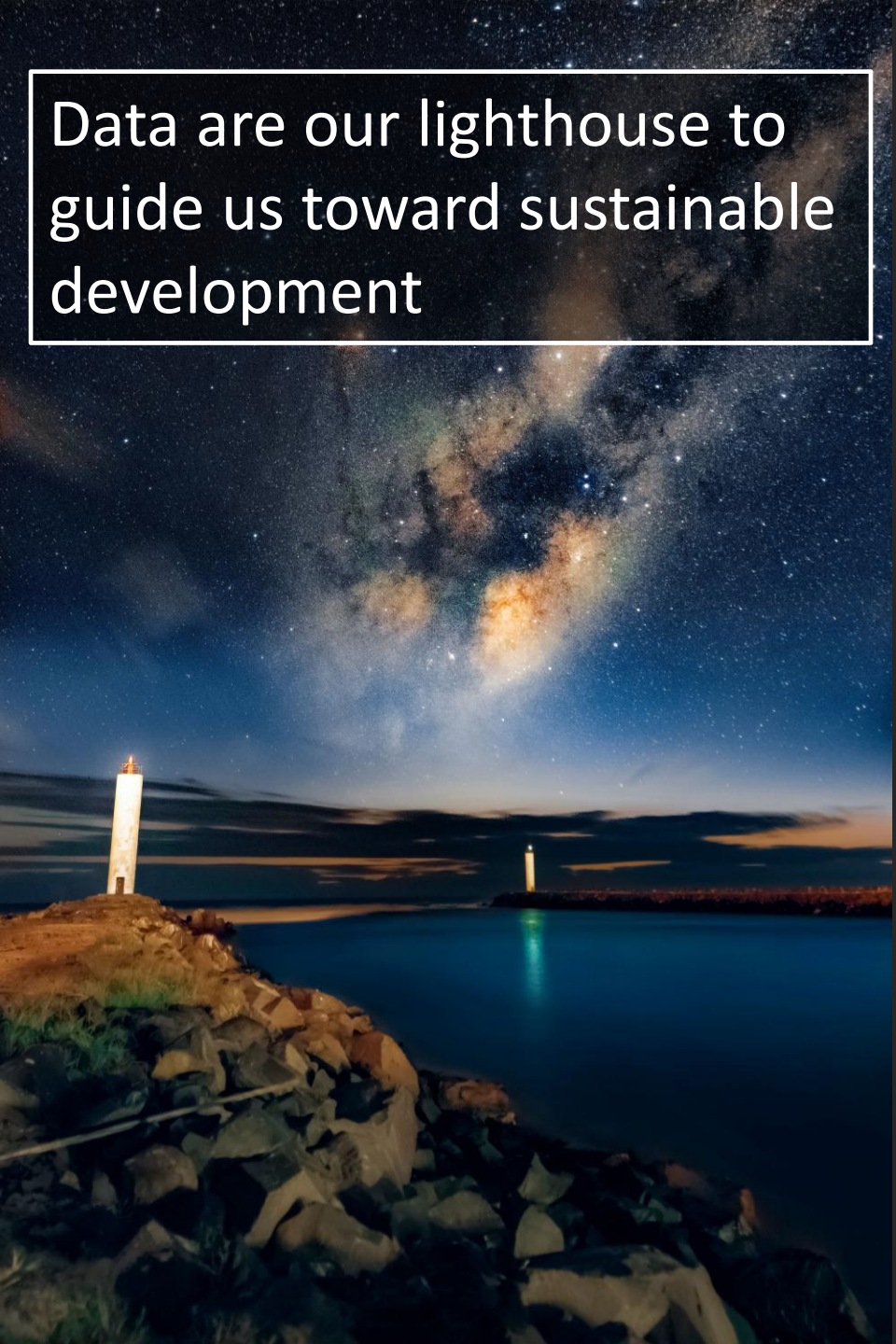
L'Homo sapiens



Bottom line:
We have the brain of a cavemen,
but we are dealing with 21st
century issues.



- Our brain is optimised for solving issues from 200,000 years ago... when chased by a mammoth, we run.
- We are prioritising short-term over long terms.
- We are ill-equipped for slow onset / continuous hazards (e.g. biodiversity loss, pollution, climate change, deforestation,...)



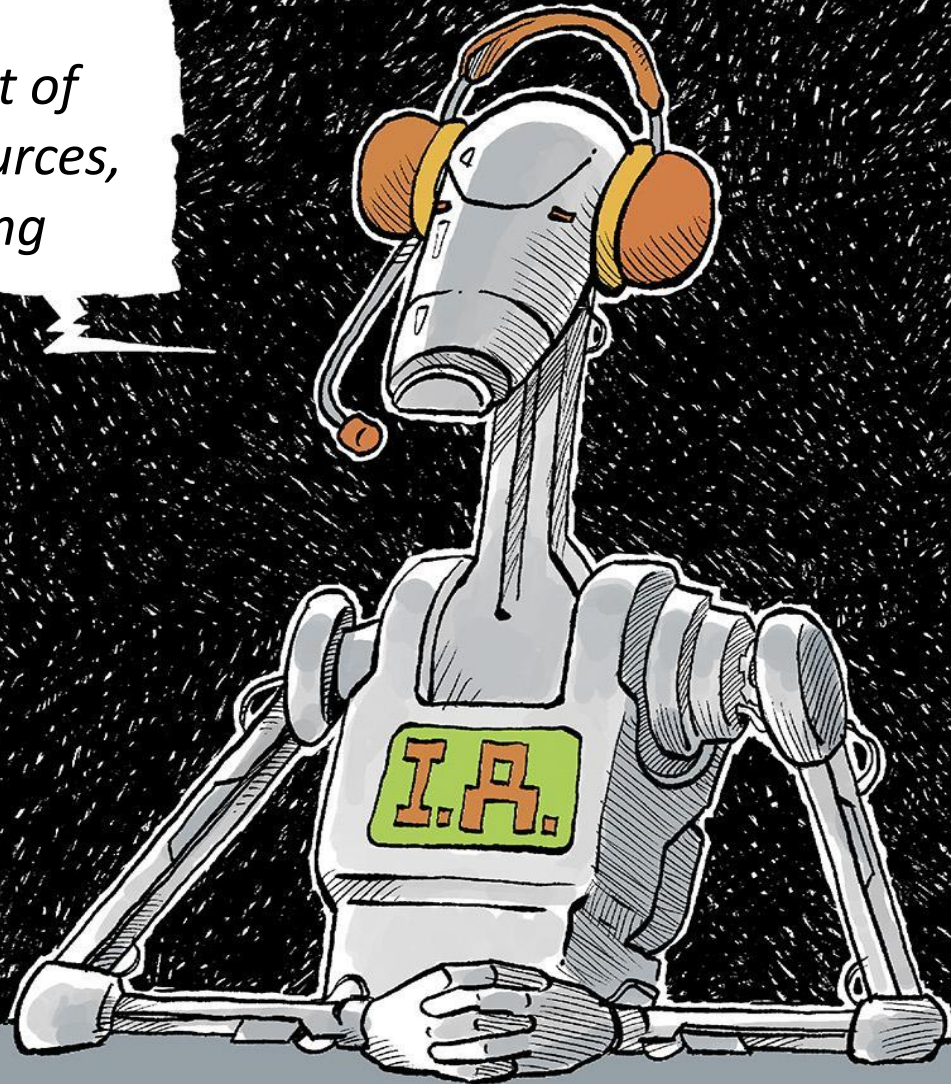
Data are our lighthouse to
guide us toward sustainable
development

Challenges

- We never had so many data, but we never had so many challenges
- Monitoring and forecasting doesn't solve the problem, need to connect data to actions (i.e. used data).
- Data are costly, we need open access for essential data. Meaning public funds (or private but as donation) to keep data in the public open. Risk of data privatisation by geant industry, which we need for common good.
- We need data to debunk Fake news with facts.
- We need to inform many stakeholders (government, economy, education, media, general public, industries,...)
- Digital divide: access of data from the Global South
- Yet, we have enough data to take decisions

Technologies

*Department of
Human Resources,
I'm listening*



Risk

We need sovereignty on clouds and on A.I. These are so far controlled by very limited limited of giant companies, owned by few billionaires. Access to information (social media and media) are also controlled by the same)

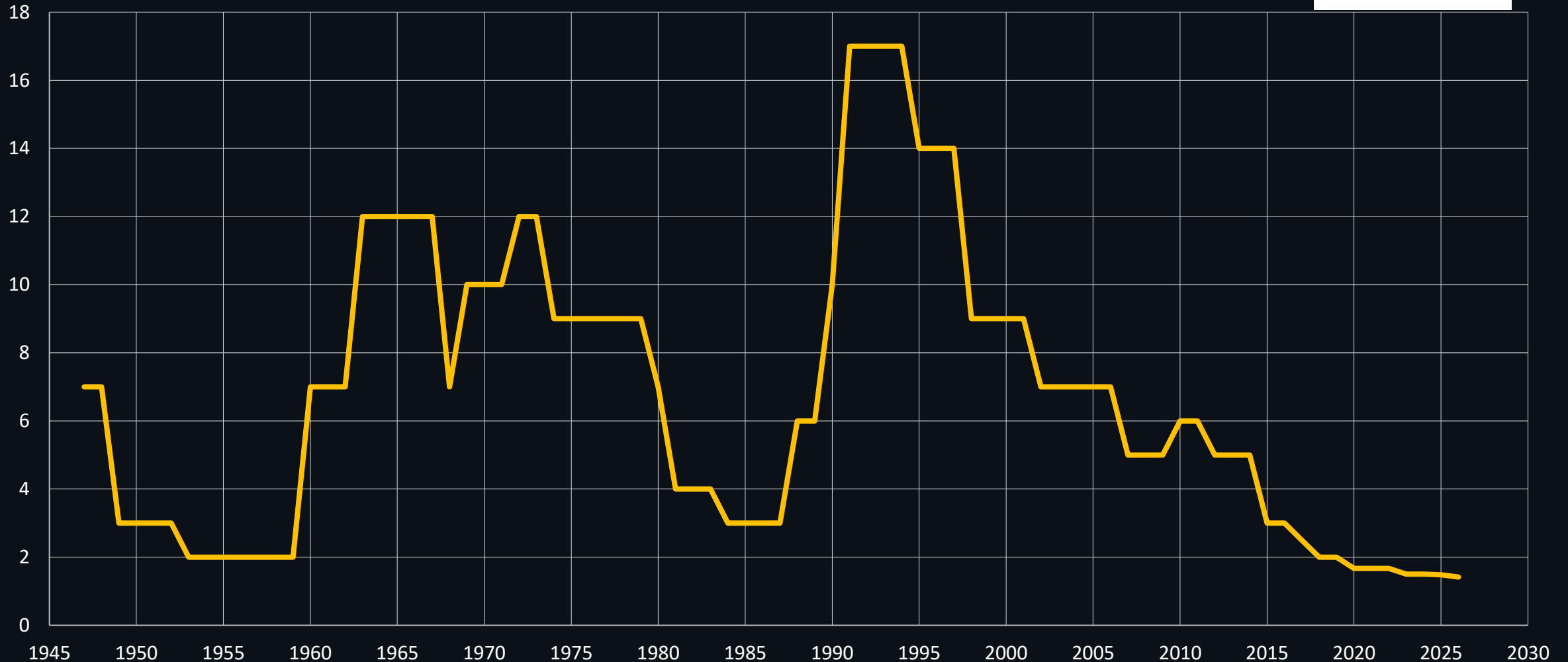
CHAPPATTE

Time is ticking: It is midnight minus 85 sec



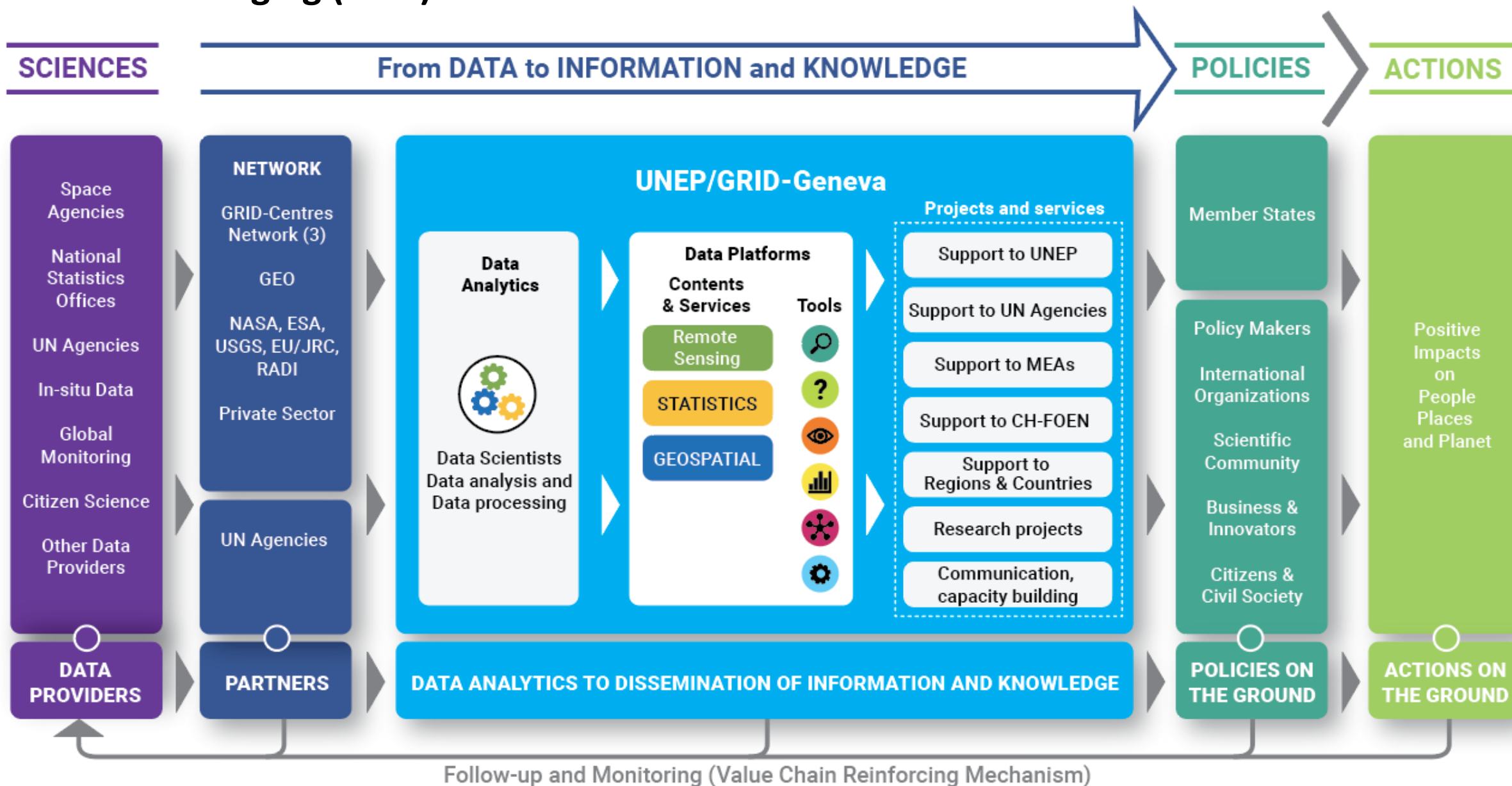
Minutes

DoomsDay Clock



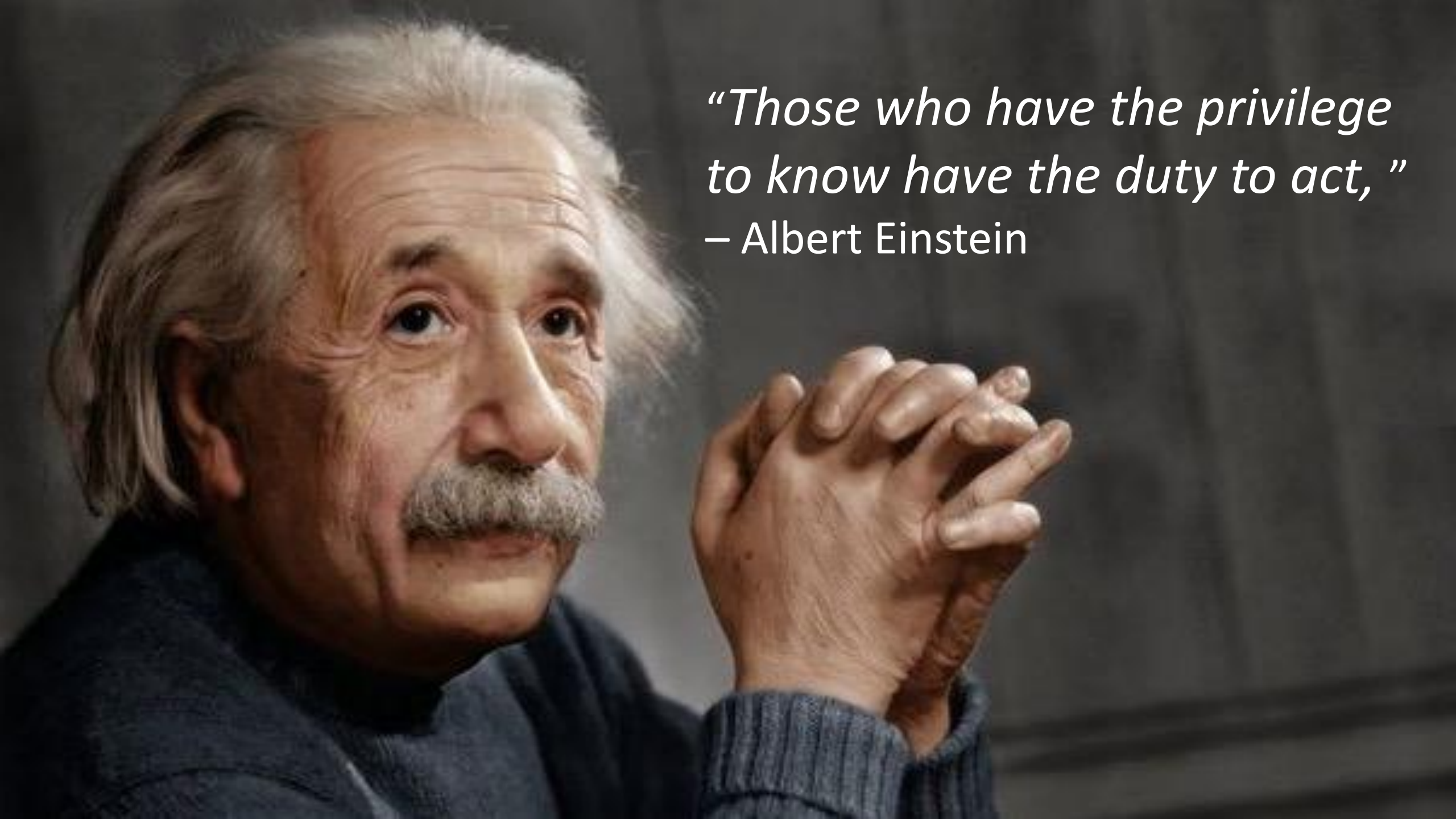
Data source: Bulletin of the atomic scientists

Our role: bridging (data) Science to Policies



We need to transform data to knowledge and then to connect knowledge to actions





*“Those who have the privilege
to know have the duty to act,”*
– Albert Einstein

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