Climate change

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Secretary General
WMO

WEATHER CLIMATE WATER
TEMPS CLIMAT EAU

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World Meteorological Organization
Organisation météorologique mondiale

World Meteorological Organization

- UN Specialized Agency on **weather, climate & water** with 193 Members
- 2nd oldest UN Agency, 1873- with **science and technology** based action
- Coordinates work of > 200 000 national experts from meteorological & hydrological services, academia & private sector
- Co-Founder and host agency of IPCC, WMO SG UN Climate Principal

- Global real-time standardized weather & climate observing system backbone of weather & climate services
- 13 WMO global centres, which provide global short and long term forecasts
- Sharing of know-how, developed => developing countries & regional co-operation

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WMO Mission/key activities

1. World climate observation & research
2. Weather, climate and hydrological services
3. Earth System observations coordination & technology standardization
4. Strengthening of the national service capabilities
5. Efficient governance

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Why WMO?

1. Weather forecasts not possible without WMO
2. Aviation not possible without WMO
3. Climate science very limited without WMO
4. Global sharing of data and know-how
5. Great contribution to public safety, agriculture, energy, health, businesses & all means of transportation (road, marine, railroad)

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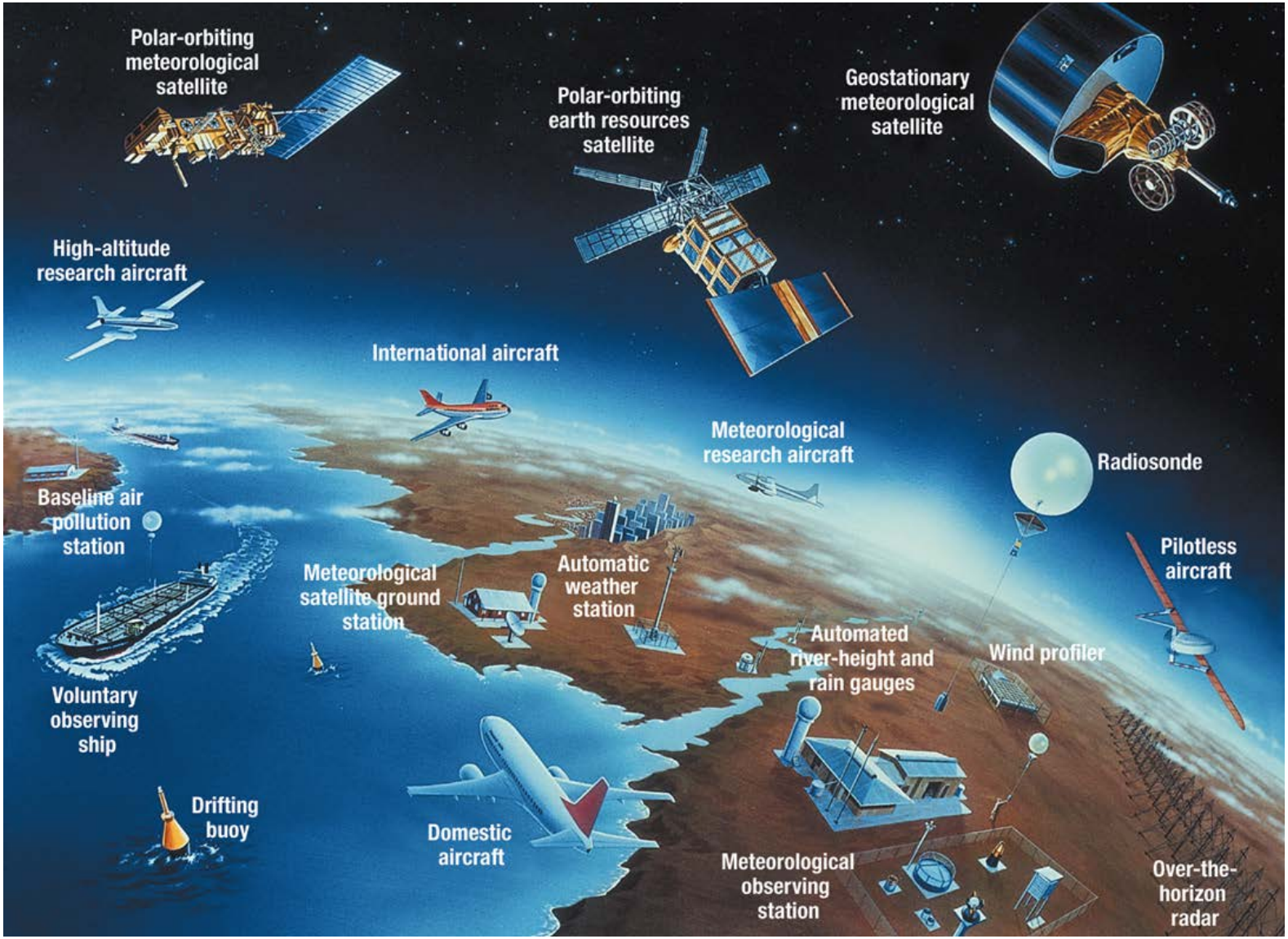
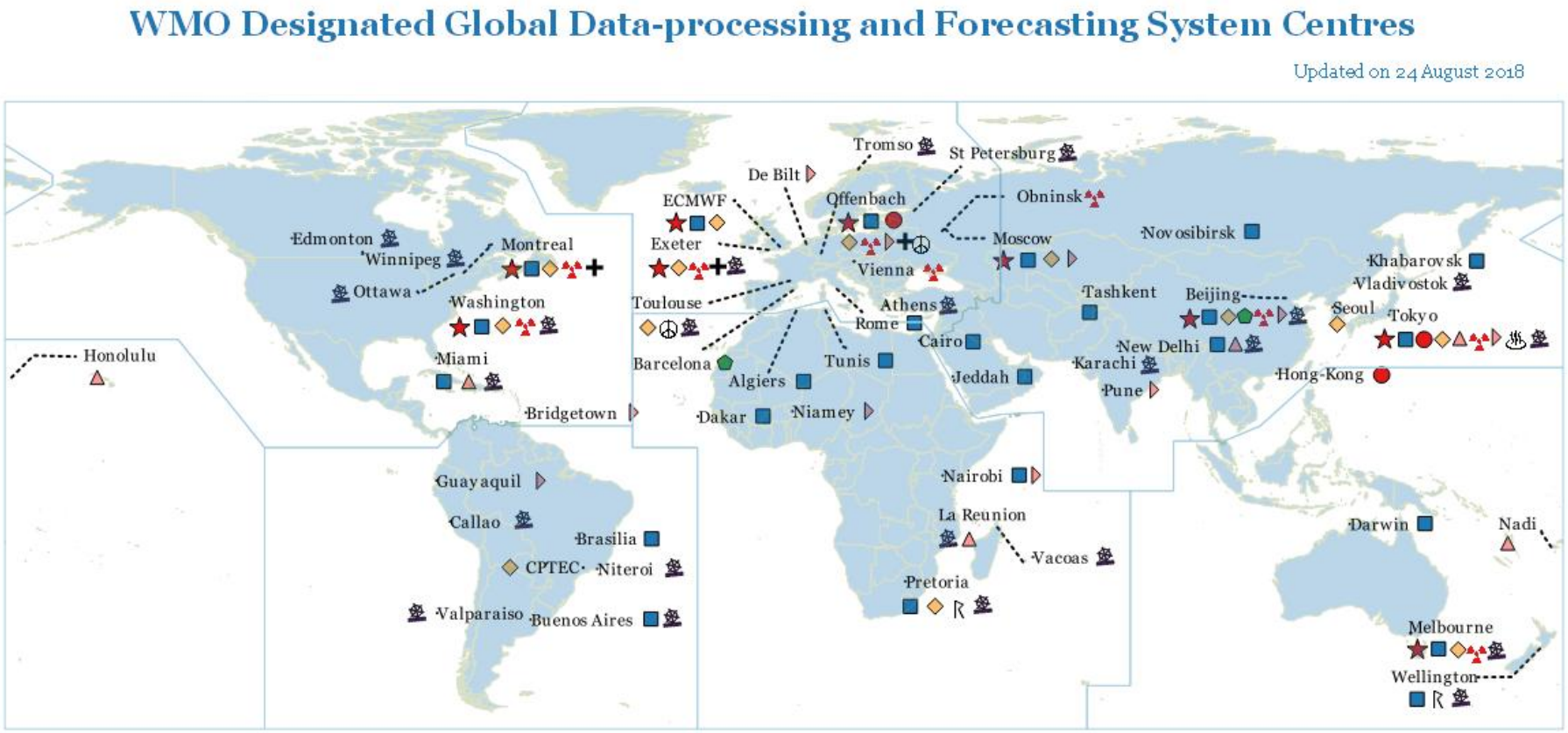
Integrated global observing system

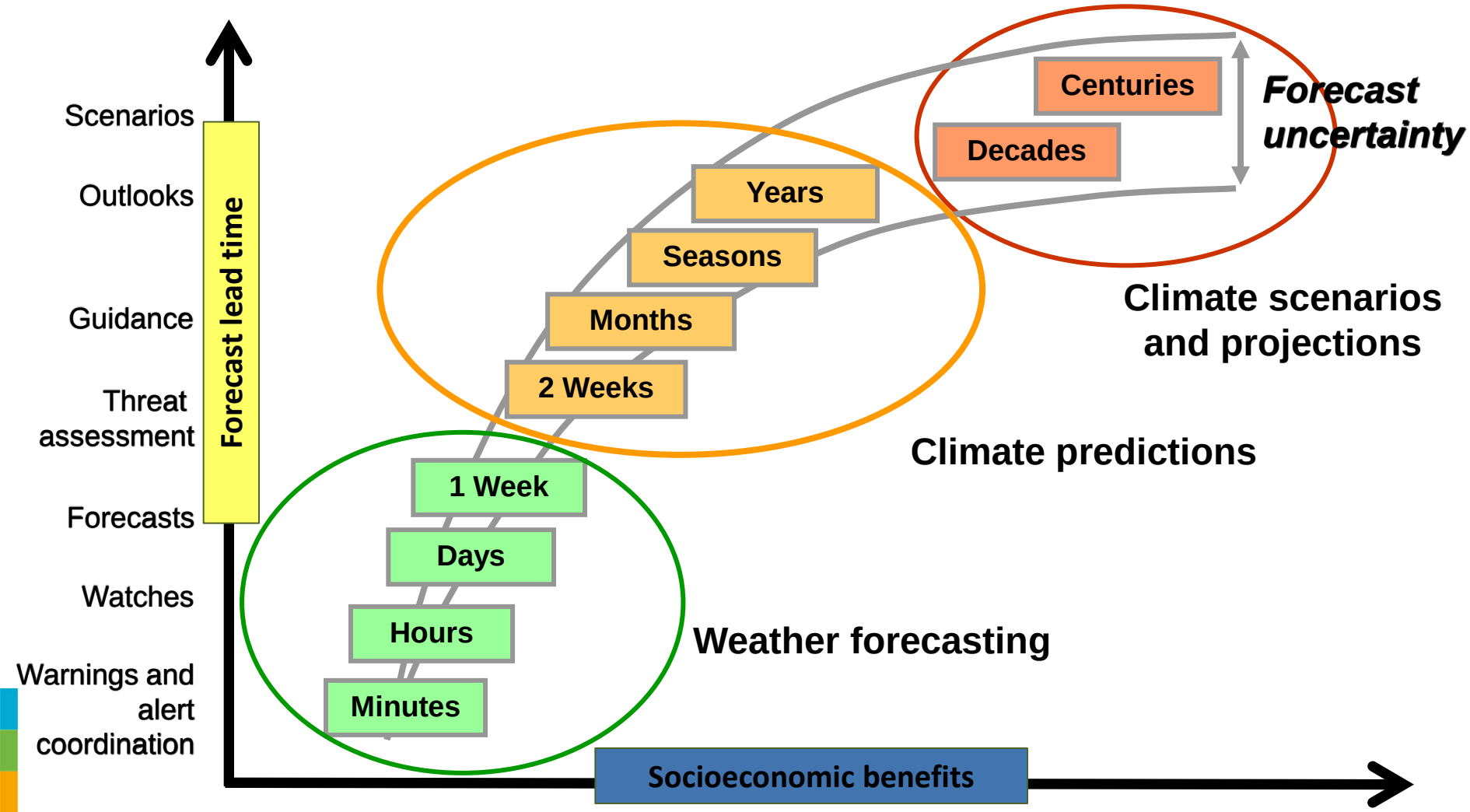


WMO Forecast & Climate Centres



* World Meteorological Centres are also Global Producing Centres for a) Deterministic Numerical Weather Prediction, b) Ensemble Numerical Weather Prediction, and c) Long-Range Forecasts.

Weather-climate: seamless framework



Adapted from NOAA 2011

WMO (historical) Reform 2019-

- **Reduction of technical commissions 8 => 2**, holistic Earth System, multihazard approaches (unity of weather-climate-water-oceans)
- Establishment of **Scientific Advisory Panel**, 15 World leading experts and **Research Board** (Science to services)
- Engagement of **private sector** in WMO activities
- Additional emphasis on **capacity development**: advisory services for World Bank, Green Climate Fund, UNDP etc. on climate investments
- Strategic **partnerships**: WHO, FAO, ICAO, IMO, UNESCO & UNEP

- **Secretariat reform** late 2019: new organization, director posts open for applicants, wider duties for P staff, rationalization of administrative work

- **Shorter, less and action oriented meetings**

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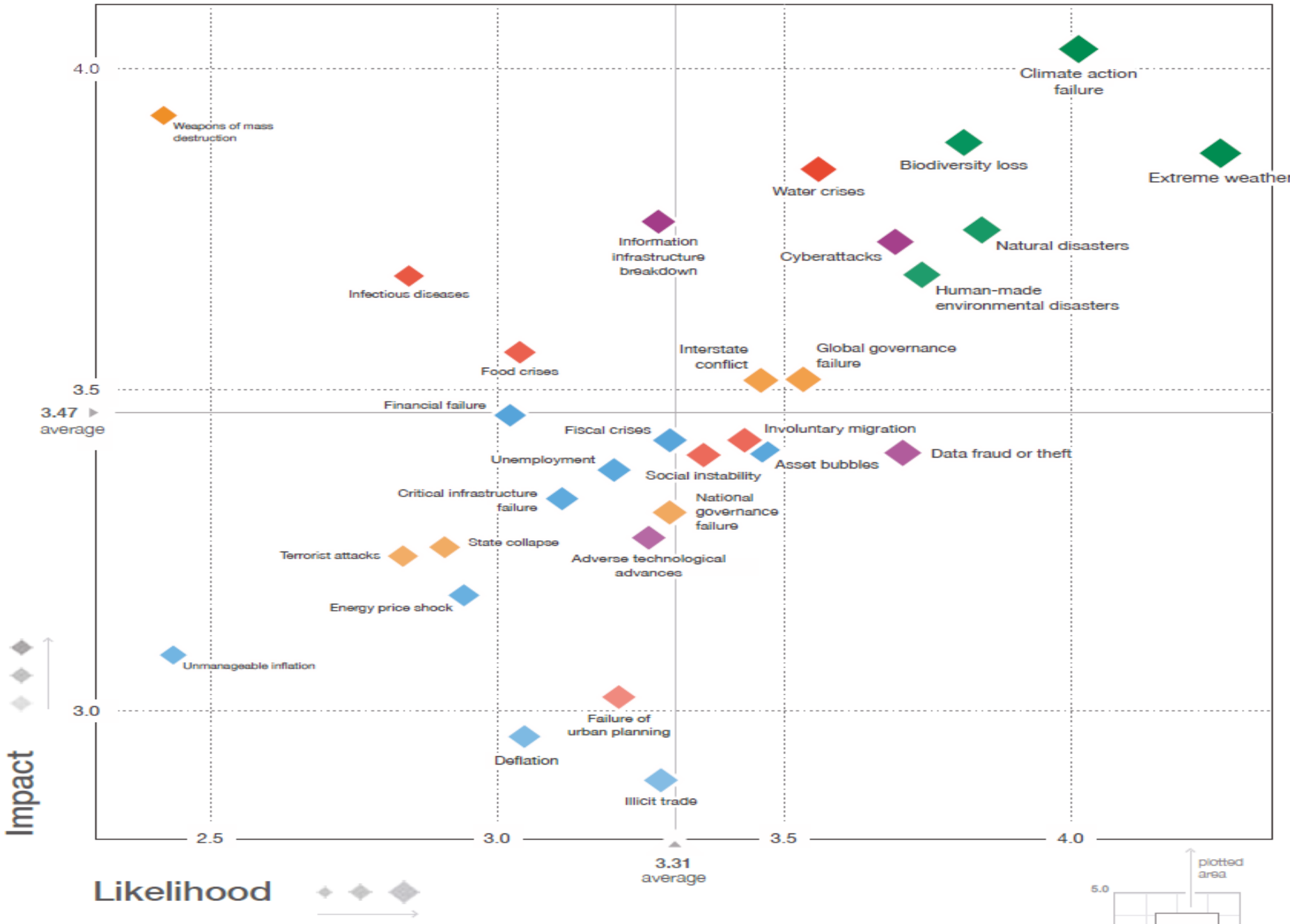
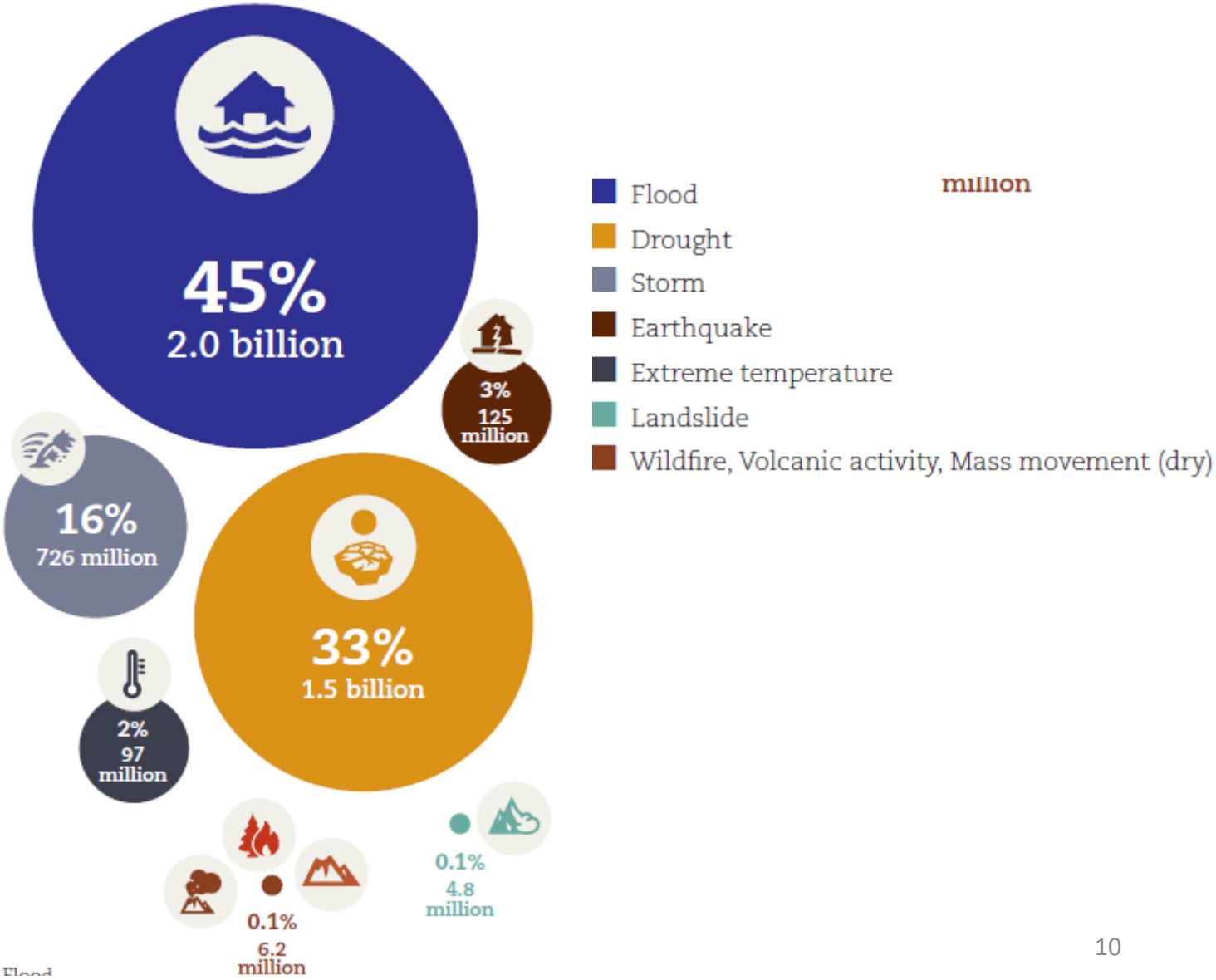
Biggest risks for World economy 2020/WEF



~4.5 billion people affected 1998-2017
96% weather related



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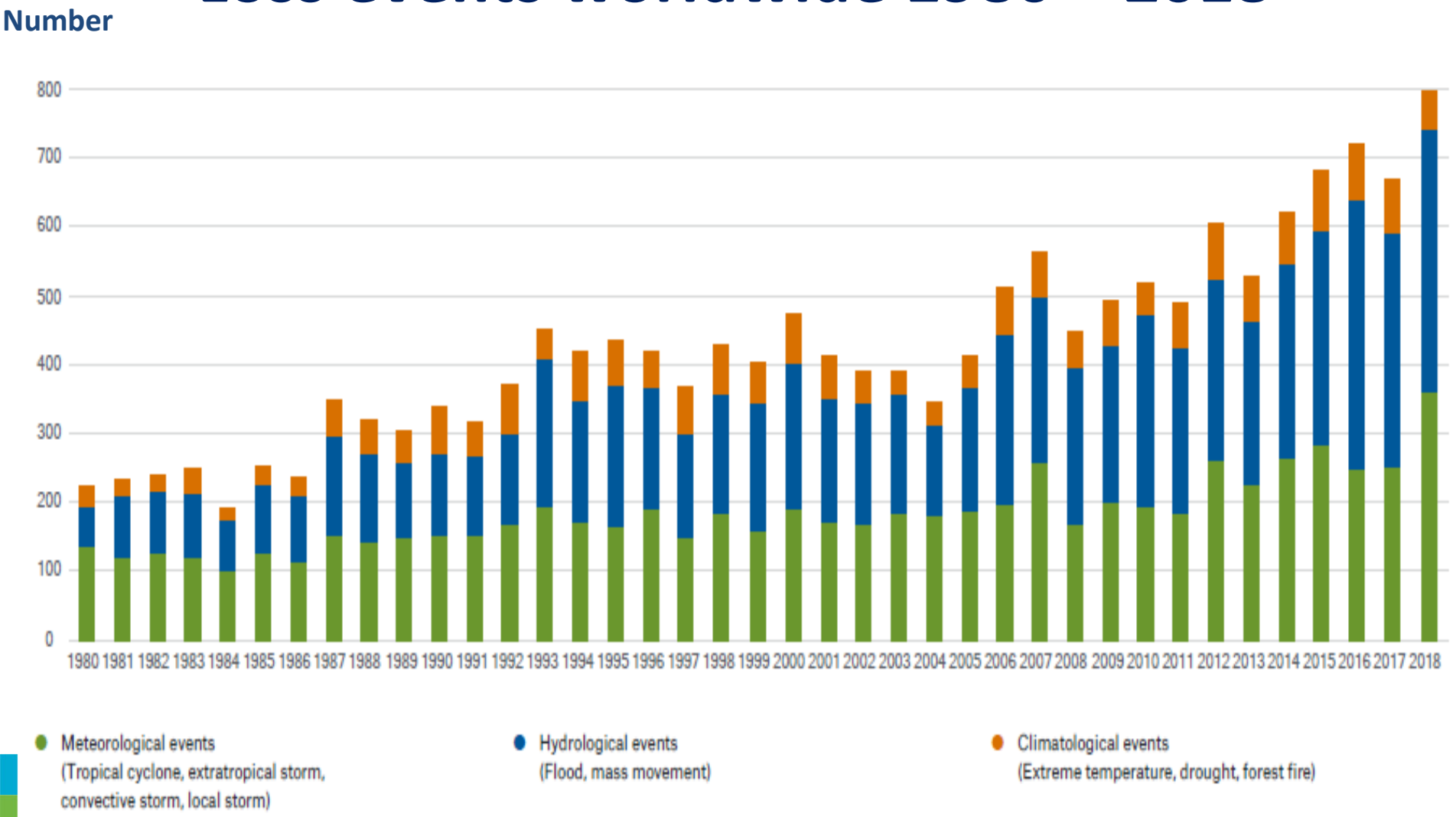
Most expensive disasters 1998-2017

Name and date	Countries/territories affected	Sum of Total Damages (billion US$)
Hurricane Katrina – Sep.2005	USA	156.3
Hurricane Harvey – Aug. 2017	USA	95.0
Hurricane Irma – Sep.2017	USA & Caribbean Islands	80.8
Hurricane Maria – Sep.2017	Caribbean Islands& USA	69.7
Hurricane Sandy – Oct. 2012	USA & Caribbean Islands	53.5
Flood – July & Aug. 1998	China	44.9
Flood – Aug.2011 to Jan. 2012	Thailand	43.4
Hurricane Ike – Sep.2008	USA & Caribbean Islands	36.3
Hurricane Ivan – Sep.2004	USA, Caribbean Islands & Venezuela	29.9
Hurricane Wilma – Oct.2005	USA, Mexico, Belize, Honduras & Caribbean Islands	25.0

Largest relative losses 1998-2017

Name and date	Countries/territories affected	Economic losses (billion US$)	Economic losses (%GDP)
Hurricane Irma – Sep.2017	Sint Maarten	2.50	797
Hurricane Irma – Sep.2017	Saint Martin	4.10	584
Hurricane Irma – Sep.2017	British Virgin Islands	3.00	309
Hurricane Maria – Sep.2017	Dominica	1.46	259
Hurricane Ivan – Sep.2004	Grenada	1.15	148
Hurricane Ivan – Sep.2004	Cayman Islands	4.43	129
Hurricane Georges – Sep.1998	Saint Kitts and Nevis	0.60	110
Hurricane Erika – Aug. 2015	Dominica	0.50	90
Hurricane Mitch – Oct. & Nov. 1998	Honduras	5.68	73
Hurricane Maria – Sep.2017	Puerto Rico	68.00	69

Loss events worldwide 1980 – 2018



Accounted events have caused at least one fatality and/or produced normalised losses ≥ US$ 100k, 300k, 1m, or 3m (depending on the assigned World Bank income group of the affected country).

Source:
Munich Re

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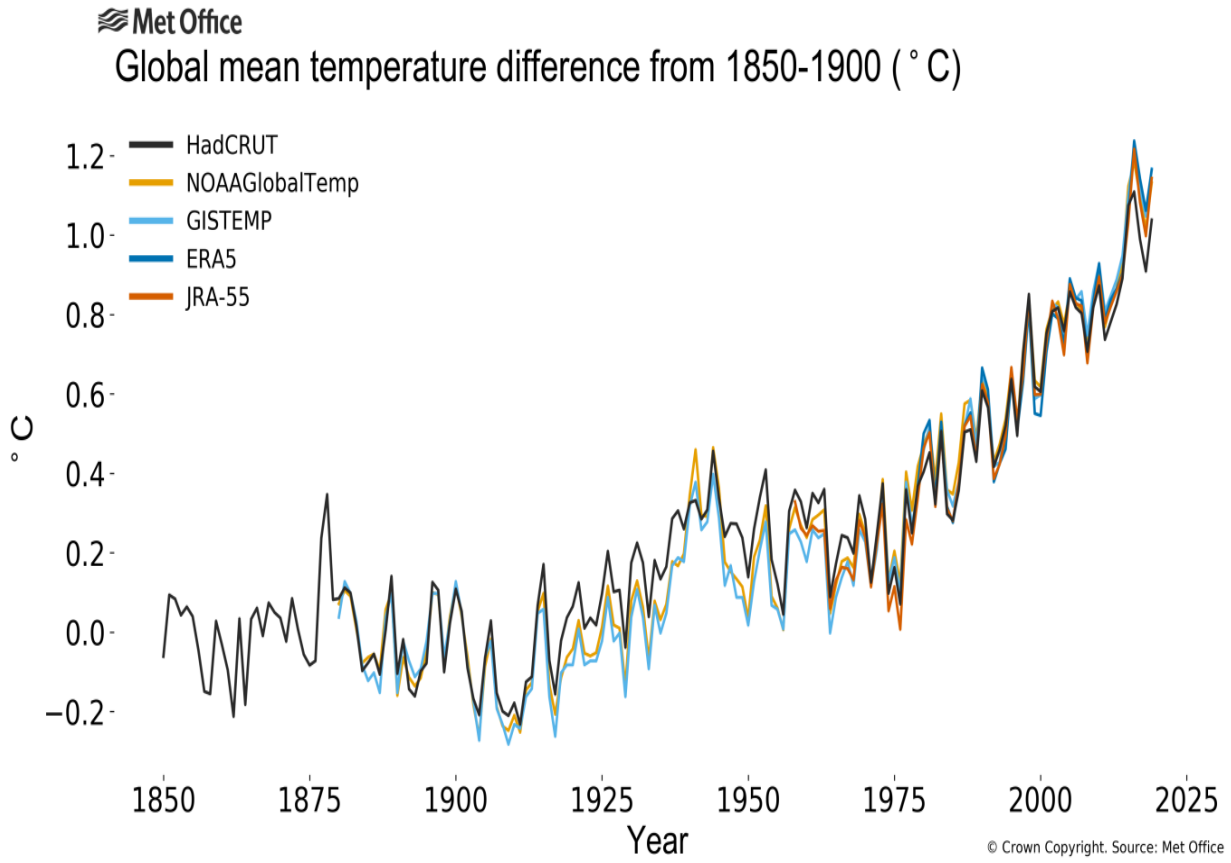
2019 global temperature: + 1.1°C increase

(Reference 1850-1900)



Past 5 years

2019 2018 2017 2016 2015

Ranked top warmest years

2016 1st , **2019** 2nd

2015-2019

warmest 5 year period

2010-2019

warmest 10 year period

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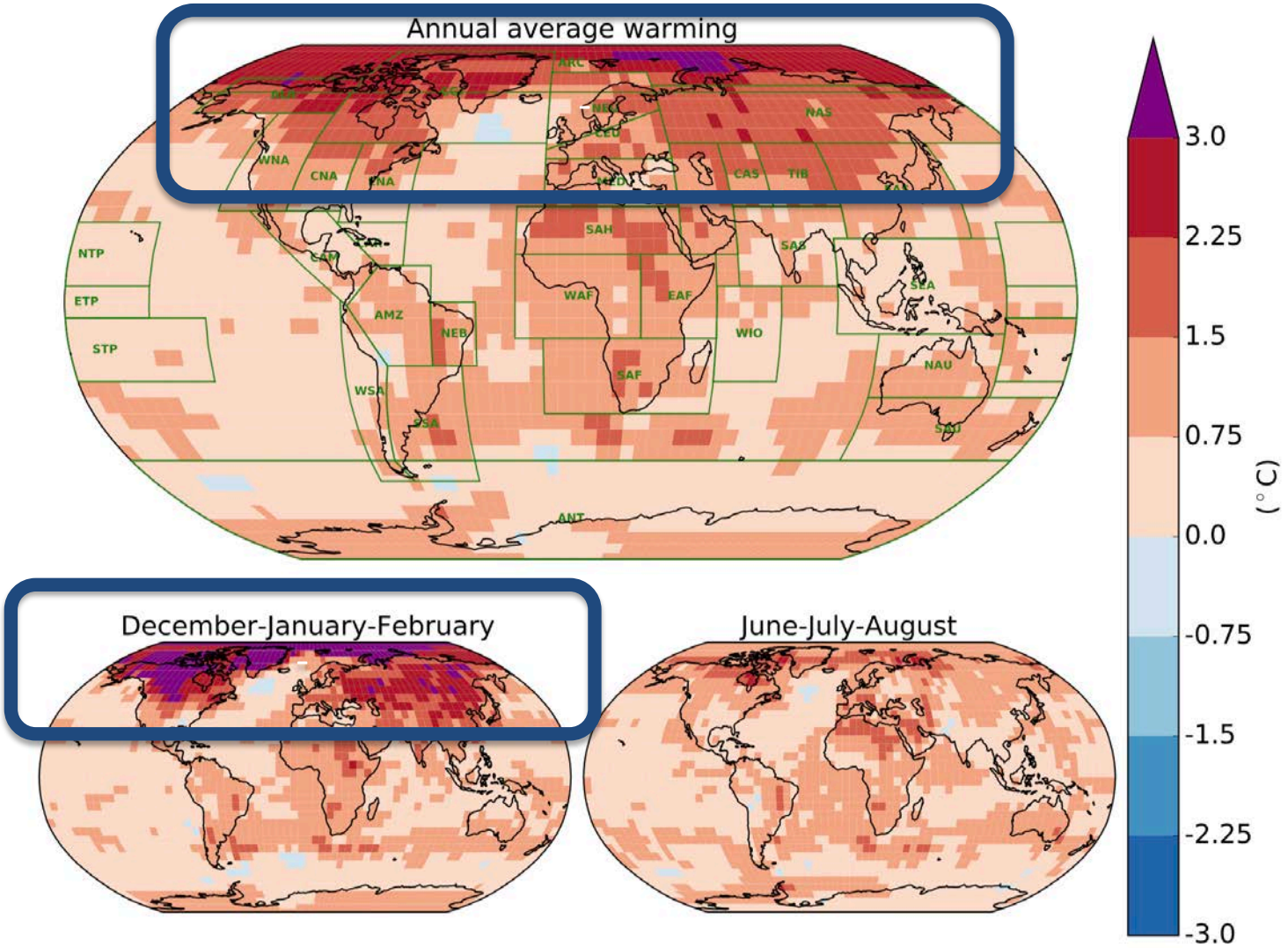
Warming so far

Regional warming in the decade 2006-2015 relative to preindustrial



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Source: IPCC Special Report on Global Warming of 1.5°C

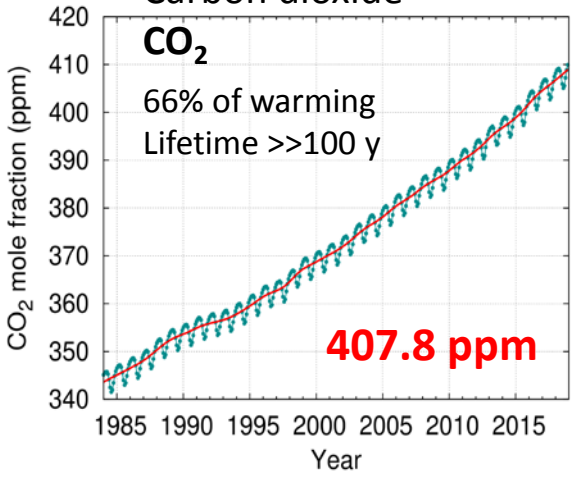
Greenhouse gases: new records

Carbon dioxide

CO_2

66% of warming

Lifetime >>100 y

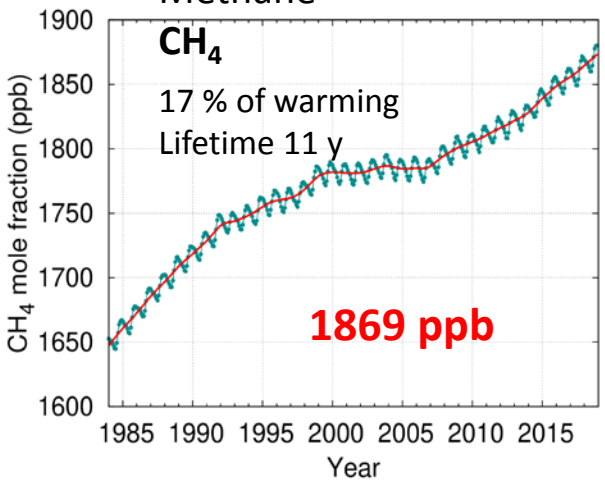


Methane

CH_4

17 % of warming

Lifetime 11 y

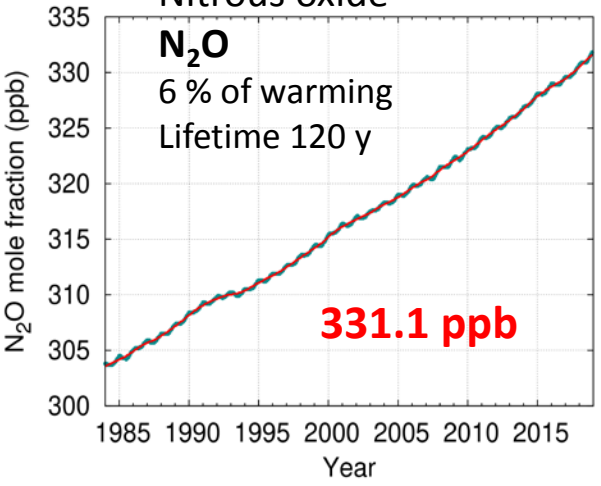


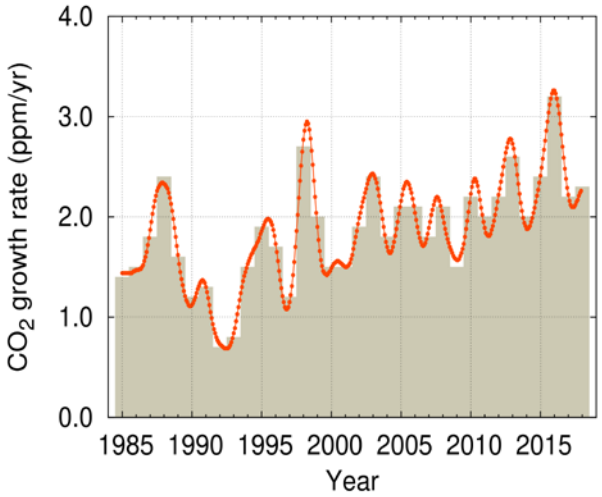
Nitrous oxide

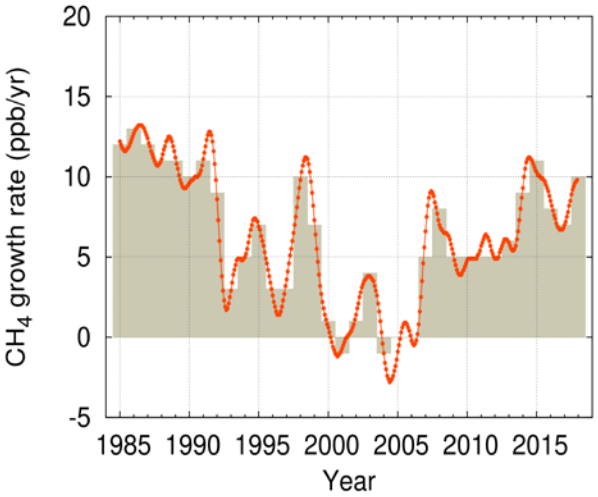
N_2O

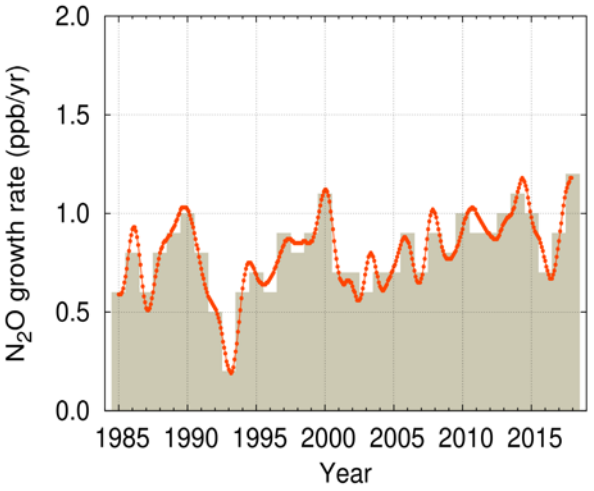
6 % of warming

Lifetime 120 y









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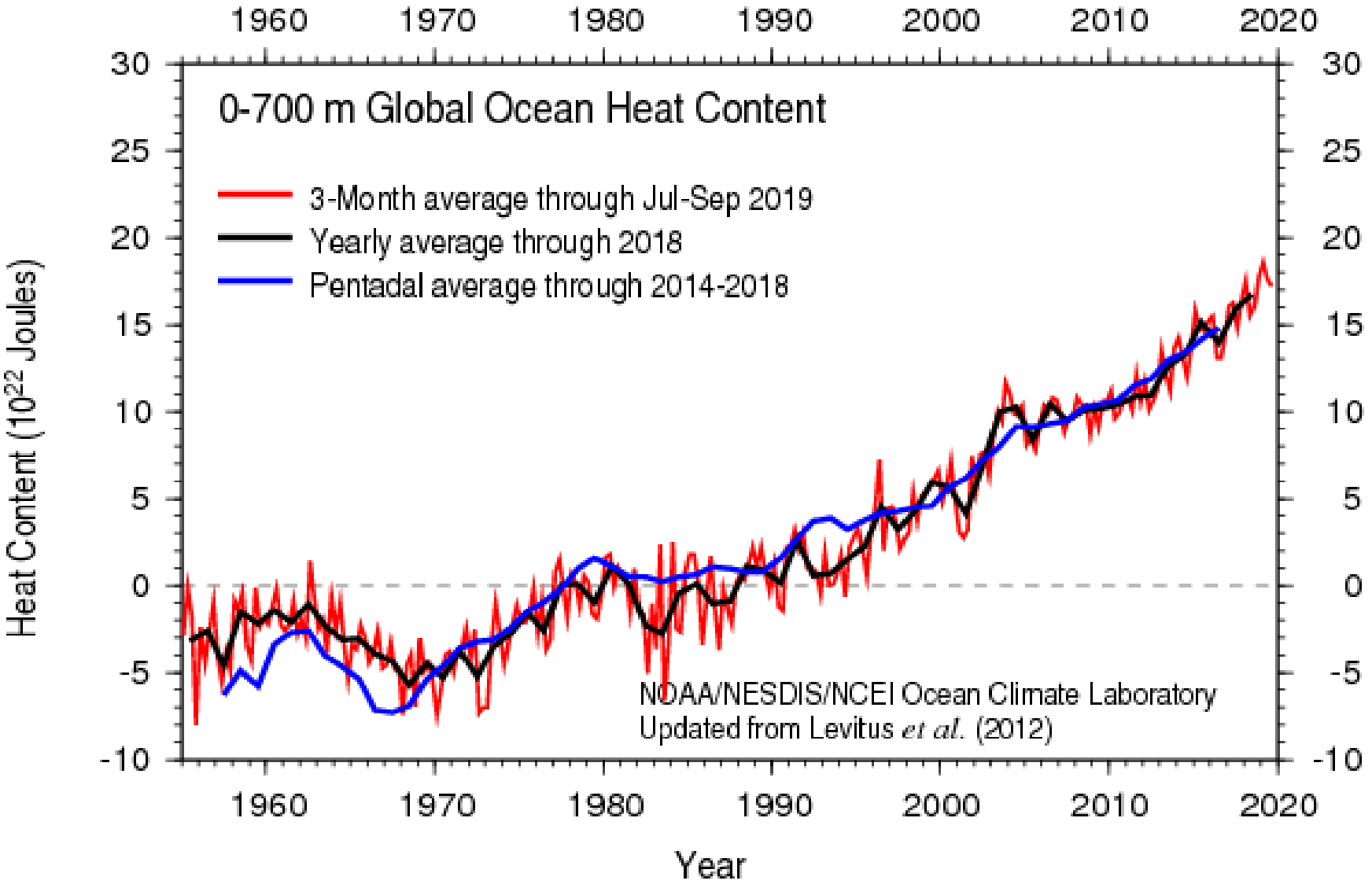
Ocean heat content highest on record



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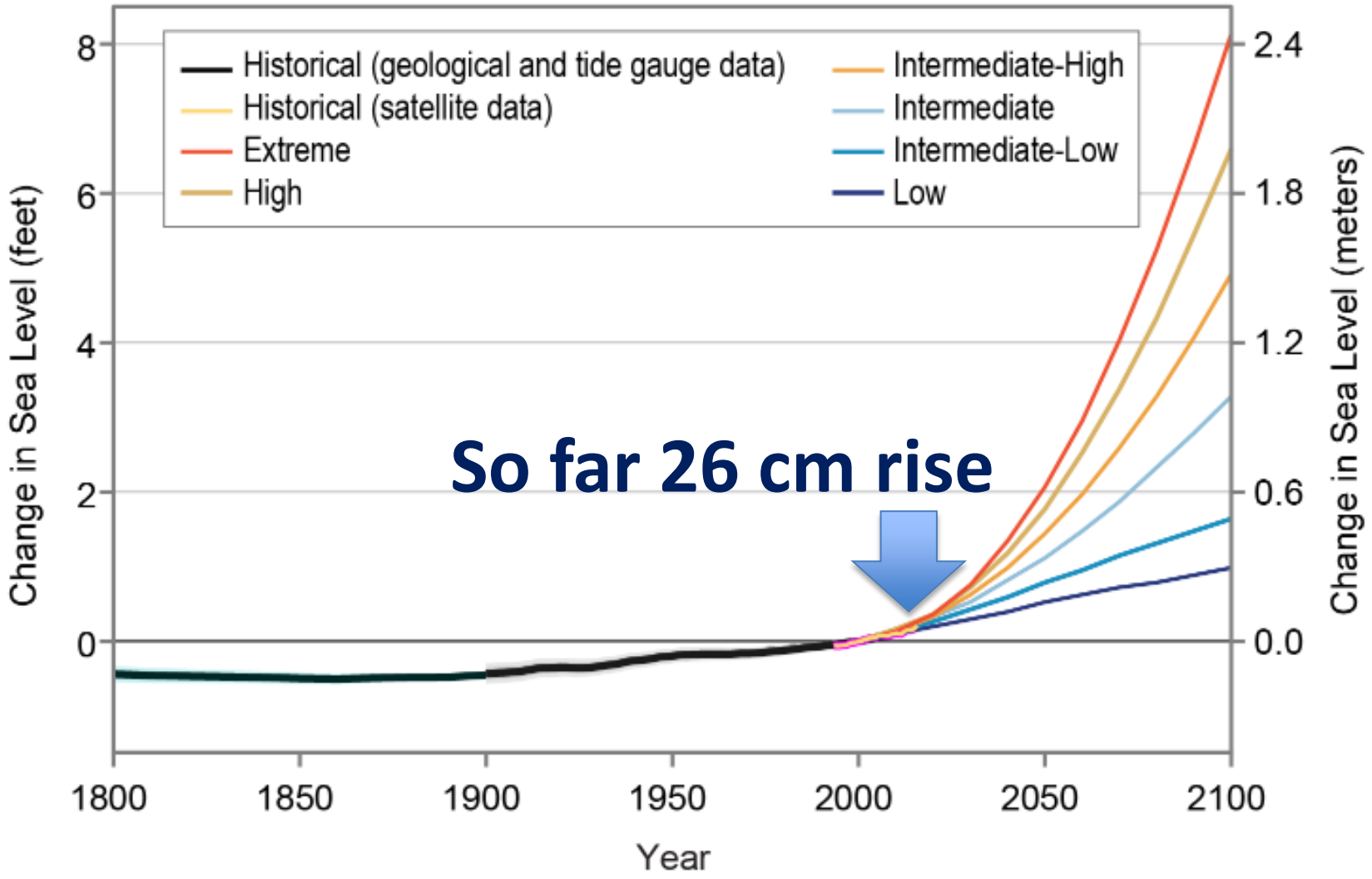
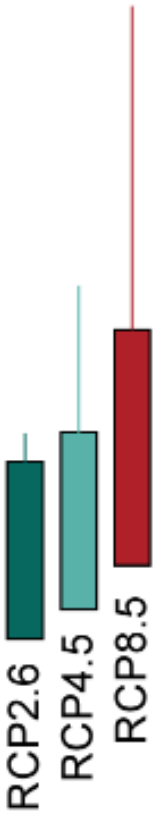
Emissions-sea level rise 1800-2100





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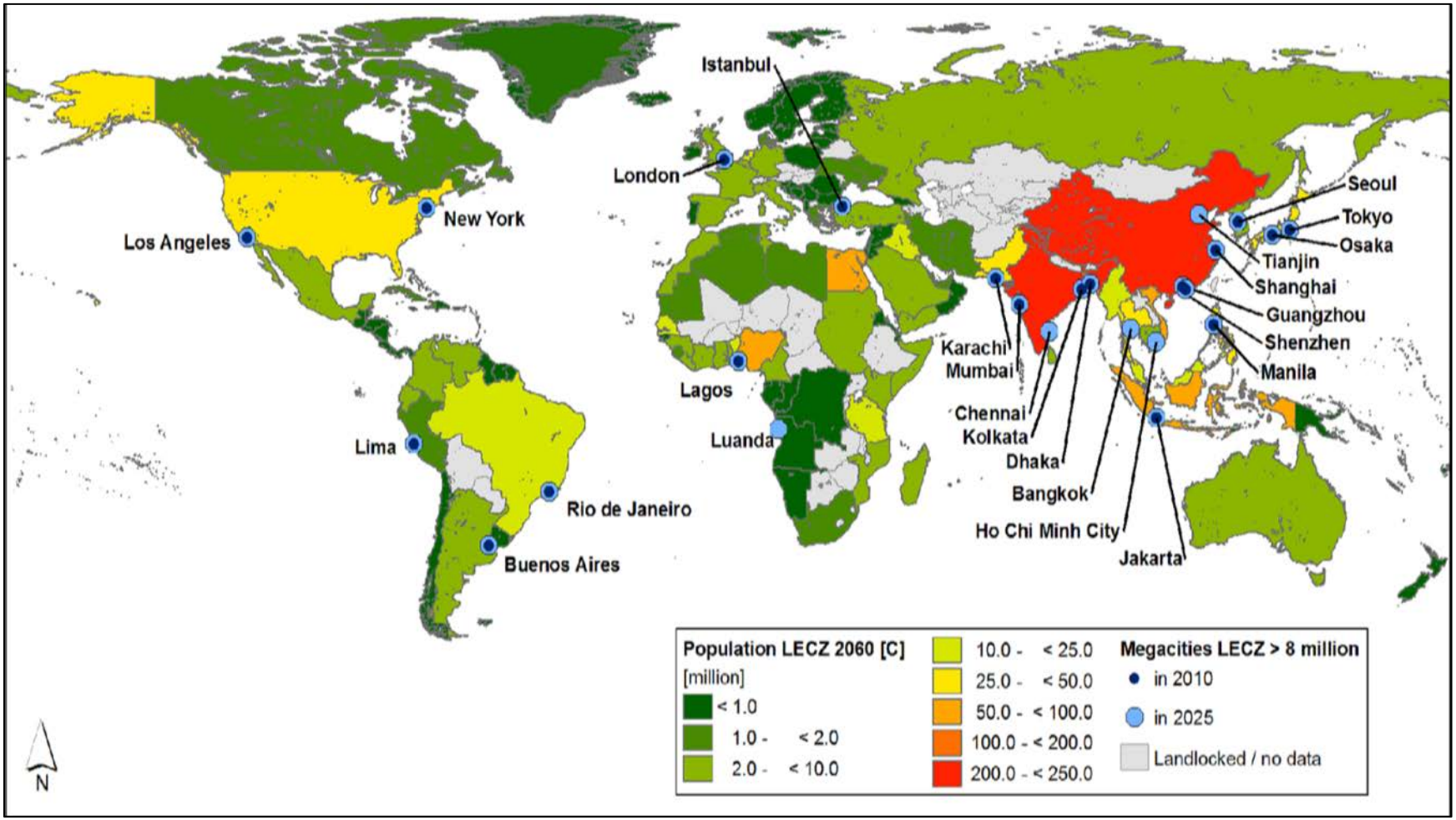
Population in low elevation coastal zones

2060 projections



Source: Neumann, Vafeidis, Zimmermann, Nicholls 2015

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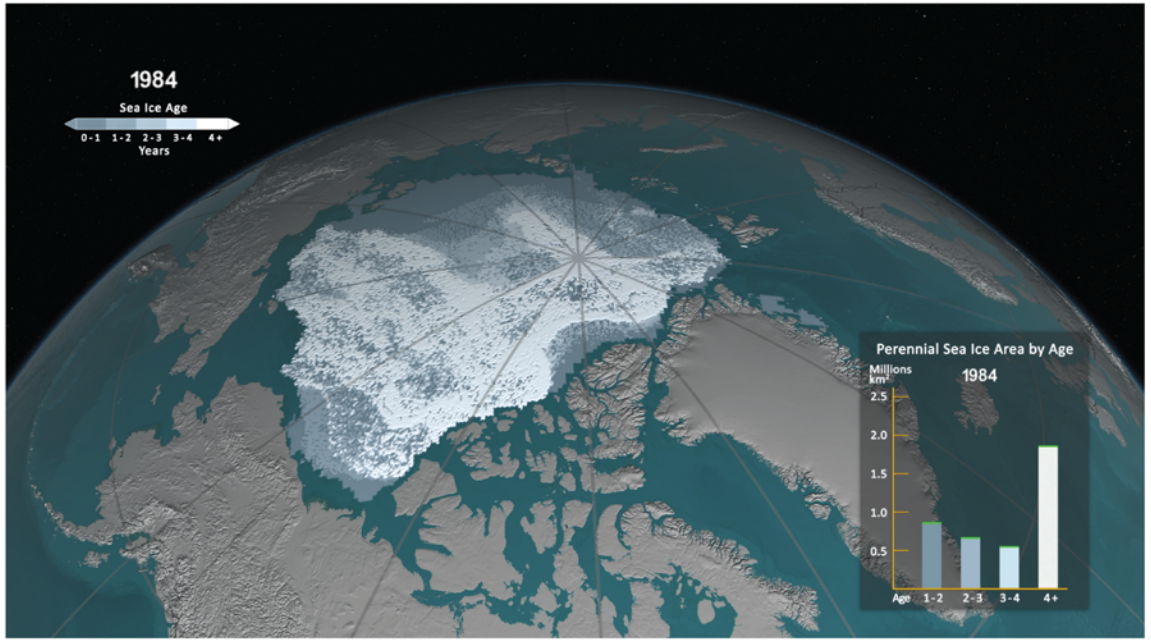
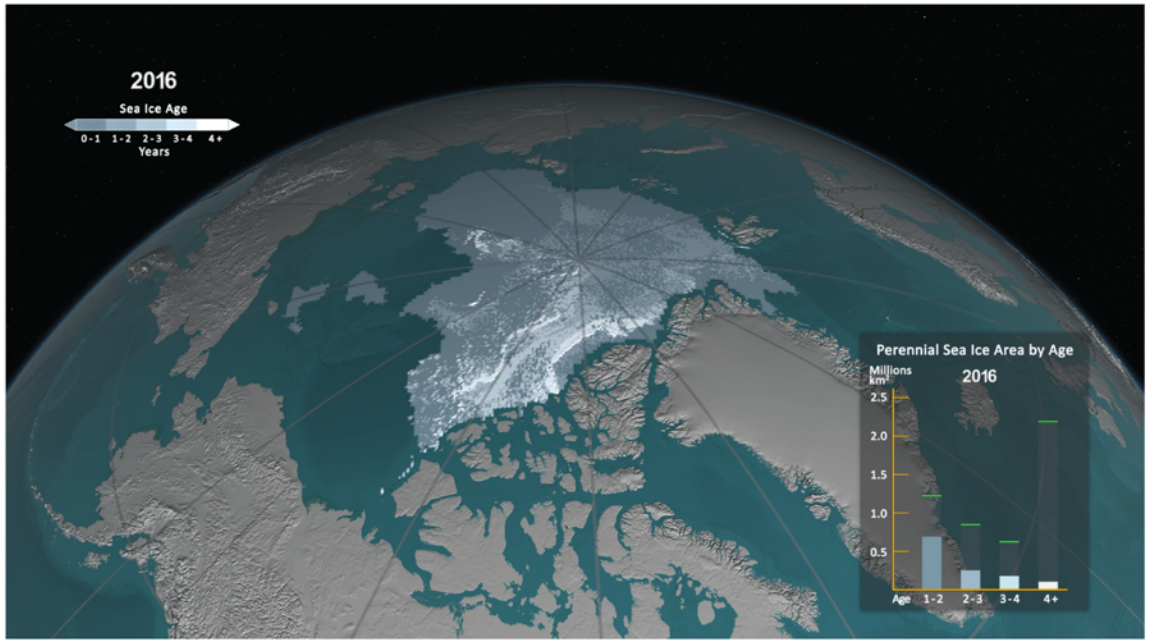
Largest changes in the Arctic

Multi-year ice

1984



2016



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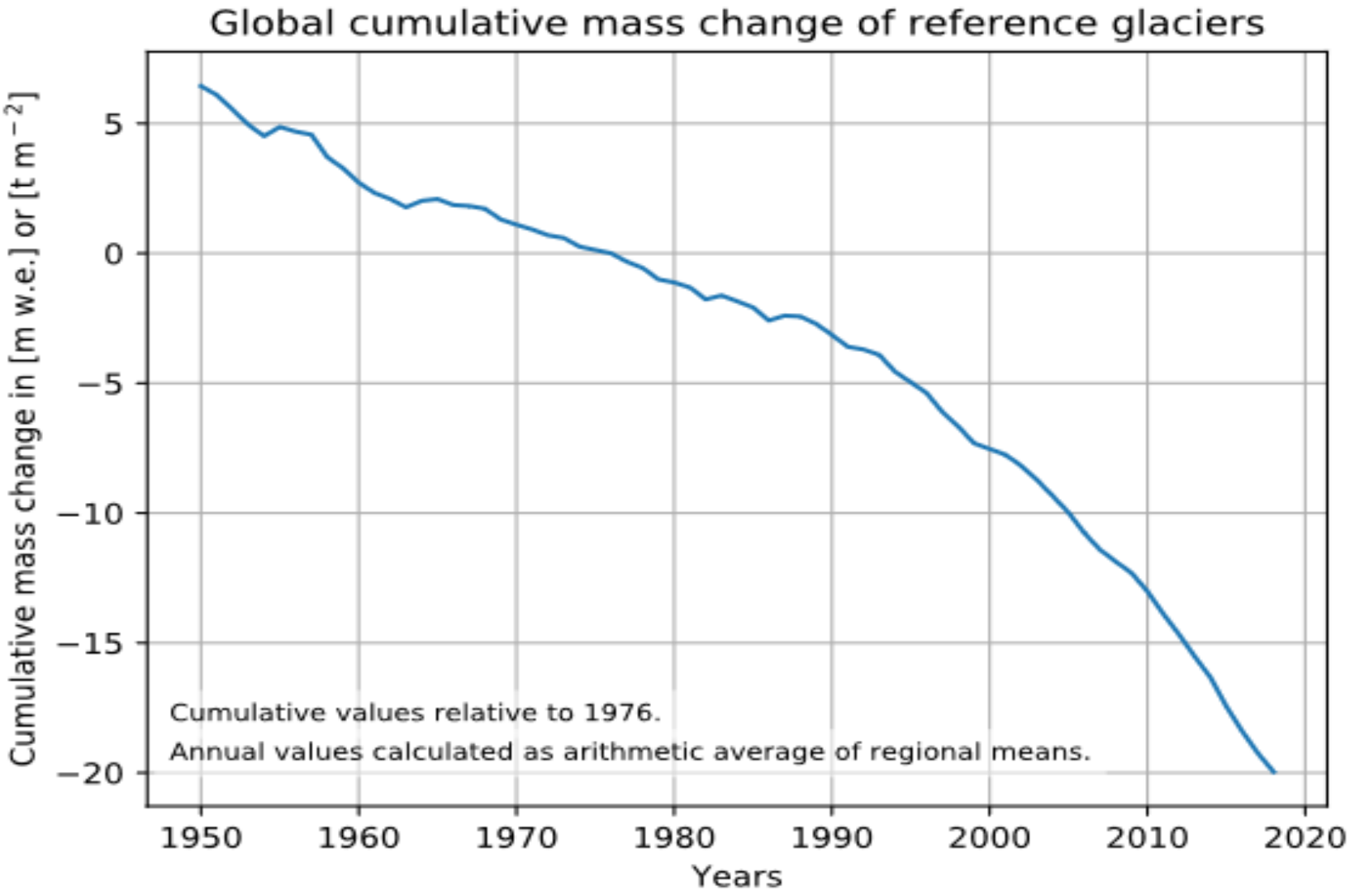
Melting of global 31 glaciers 1950-2018



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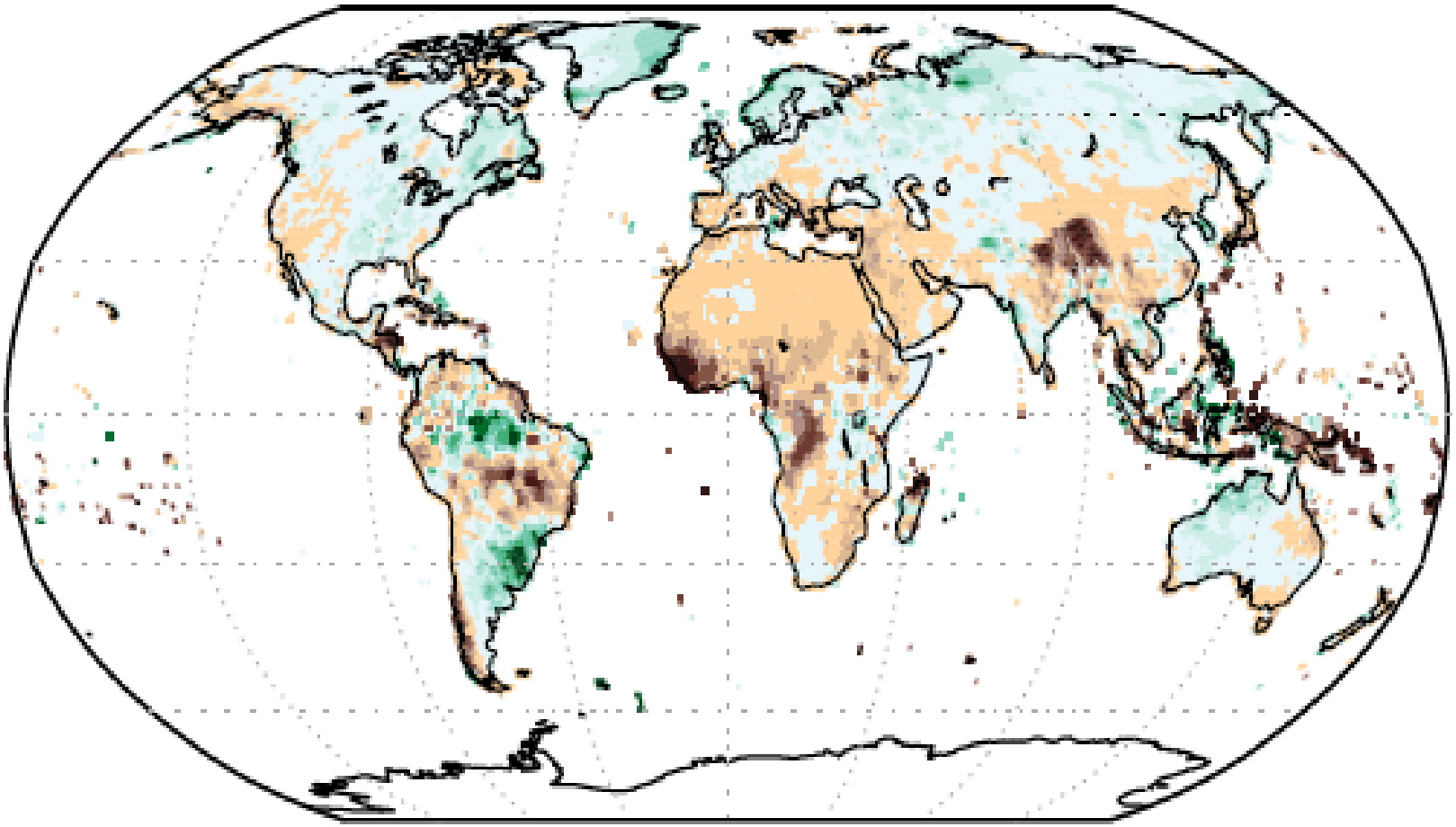
Global precipitation 1986–2015 vs. 1901–1960



Change in Precipitation (inches)

−12 −10 −8 −6 −4 −2 0 2 4 6 8 10 12

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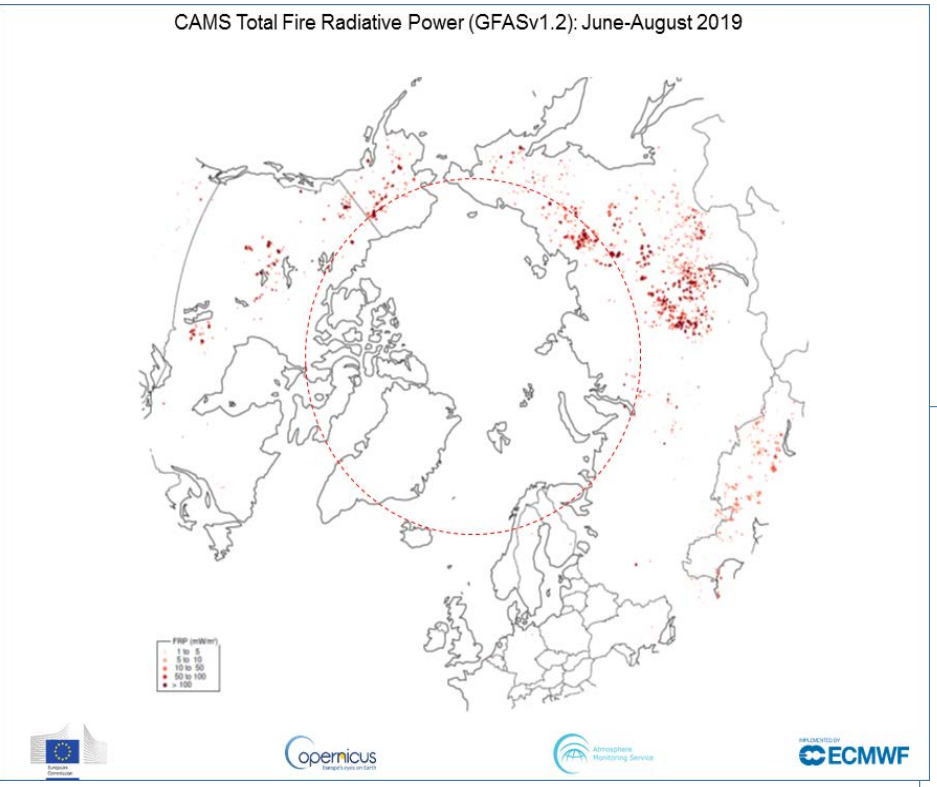
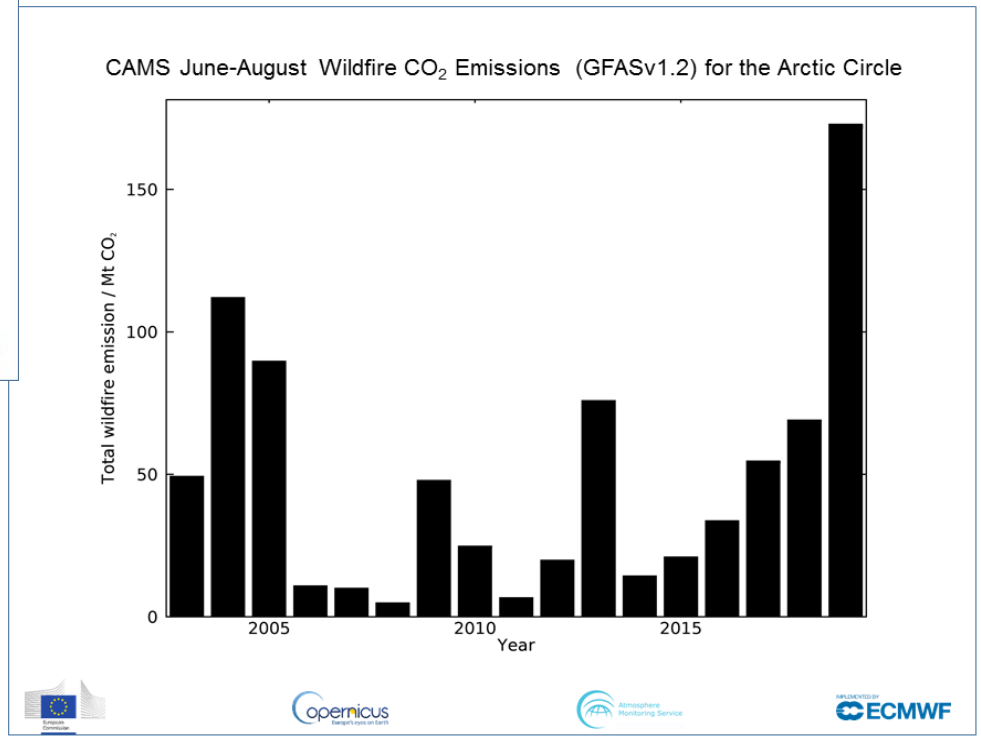
Wild fires contribute to CO_2 emissions





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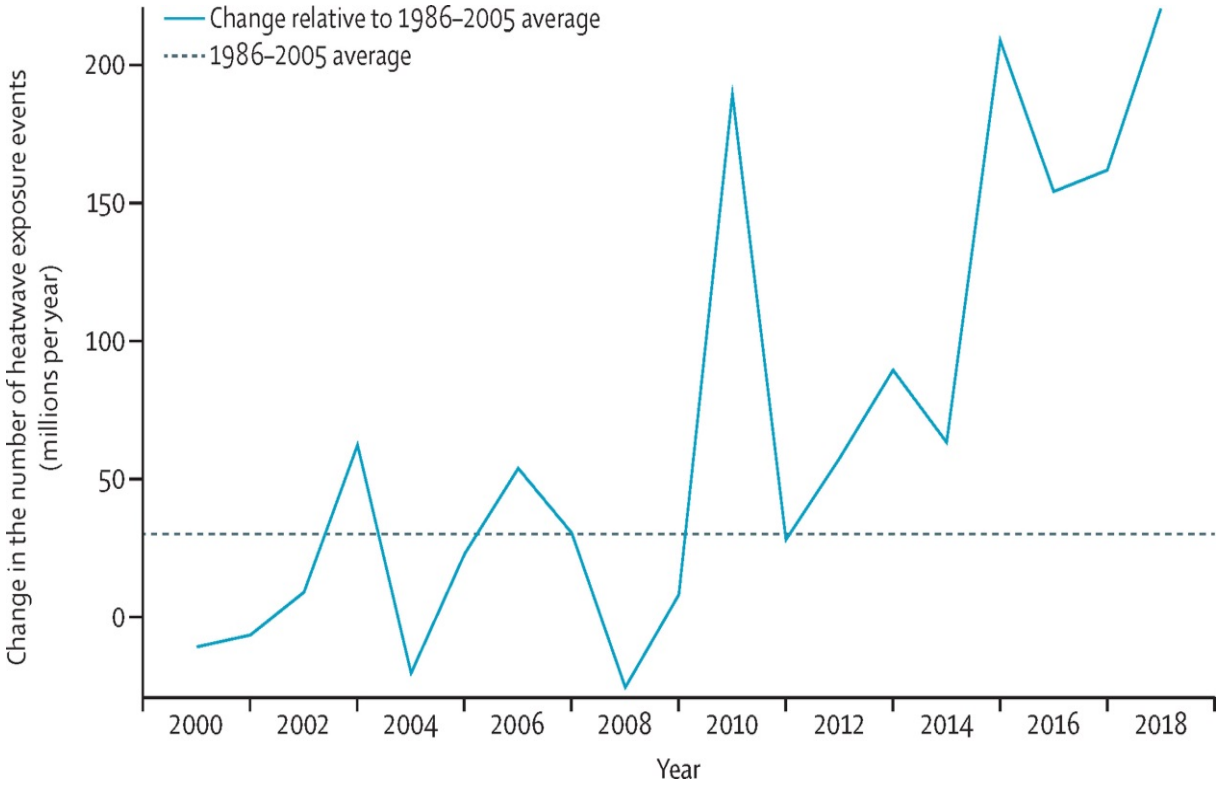
Arctic: summer **CO_2** *emission highest since 2003*

Health

Heat Health risks, Pollution and Vector -borne and water-borne diseases increasing

Exposure to Heatwaves



- **220 million** more exposures than average to heat waves
- **91% of the world's population breathing air in which pollutants exceed WHO air quality guidelines.**

- **Dengue: 1 050 000 cases in Aug-Oct**

85% were reported by:

- **Brazil**
- **Philippines**
- **Mexico**
- **Nicaragua**
- **Thailand**
- **Malaysia**
- **Colombia**

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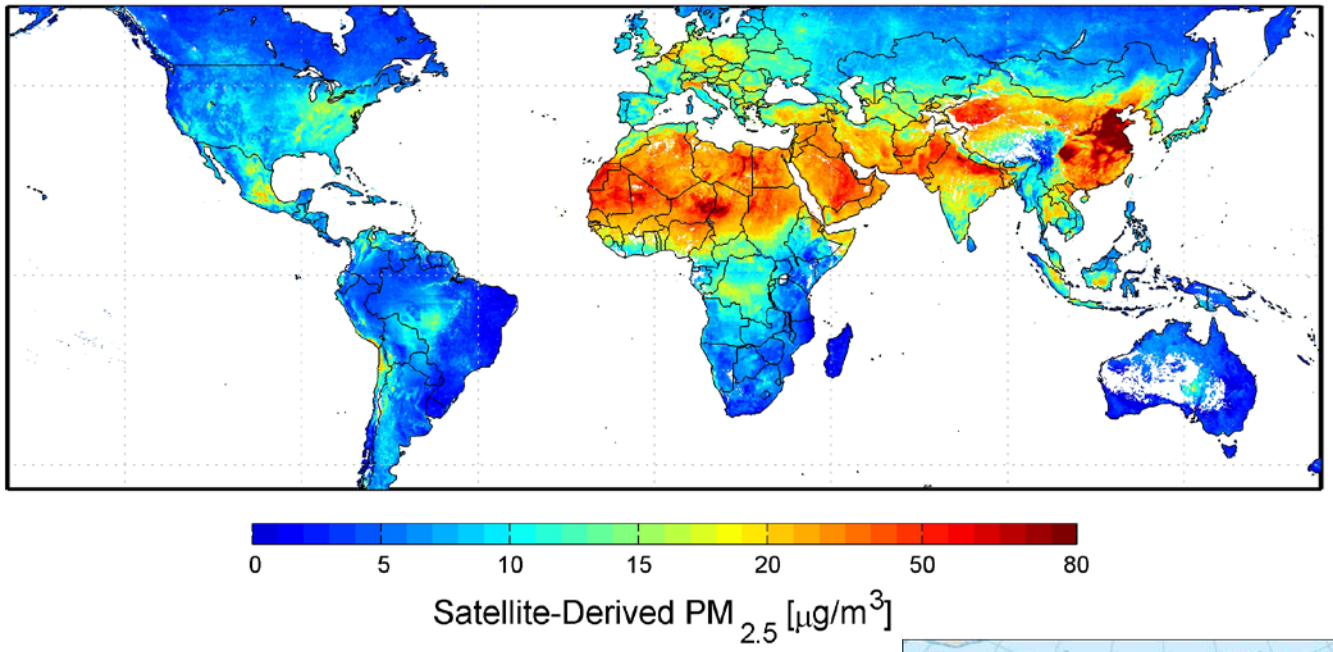
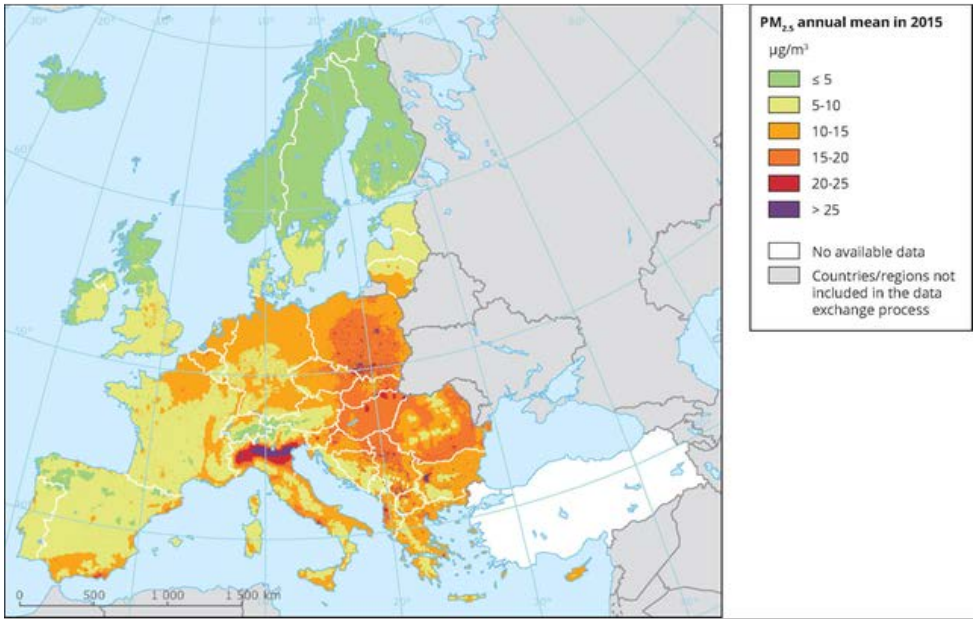
Air Quality, PM 2.5





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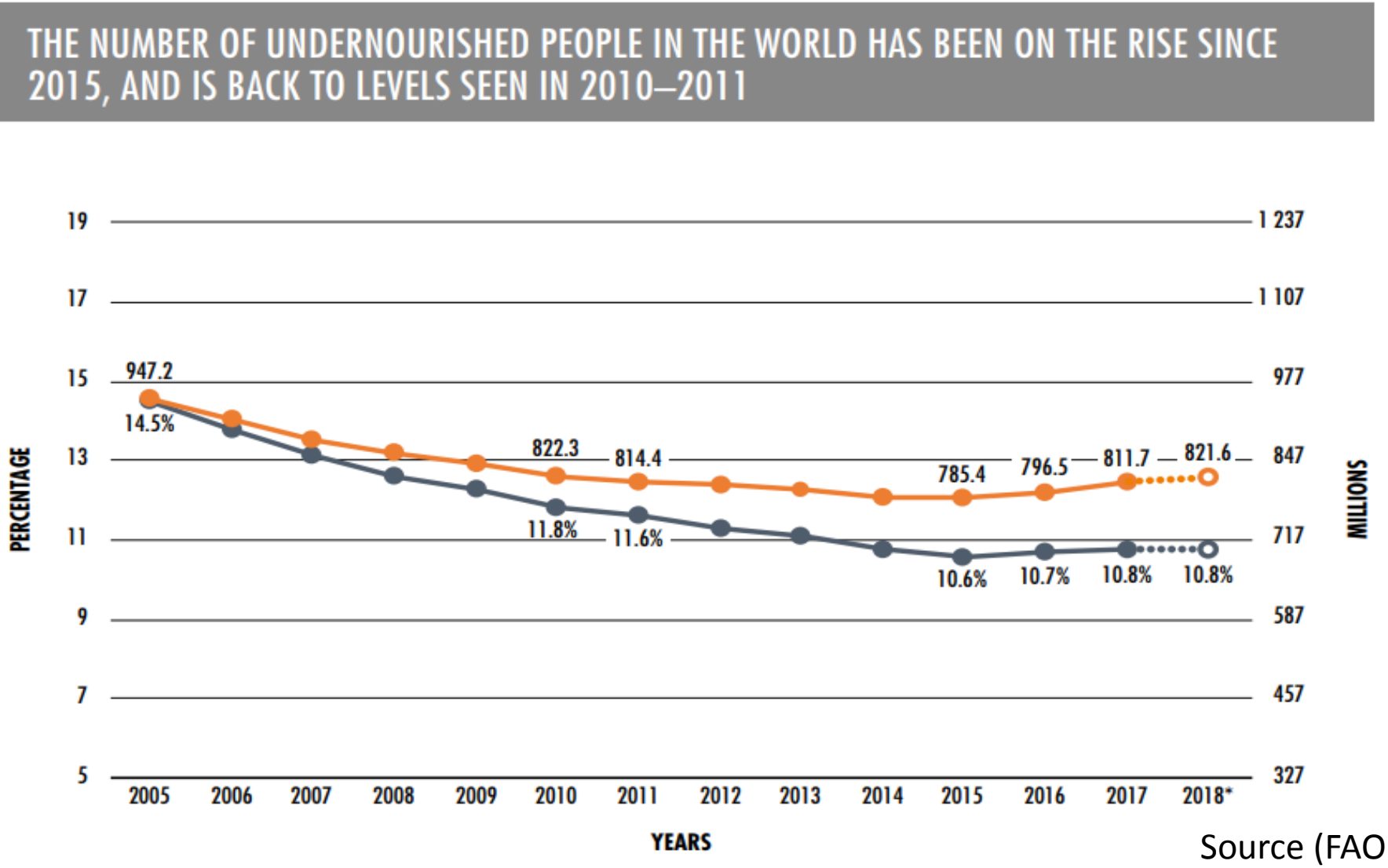
Hunger 2005-2018



Source (FAO)

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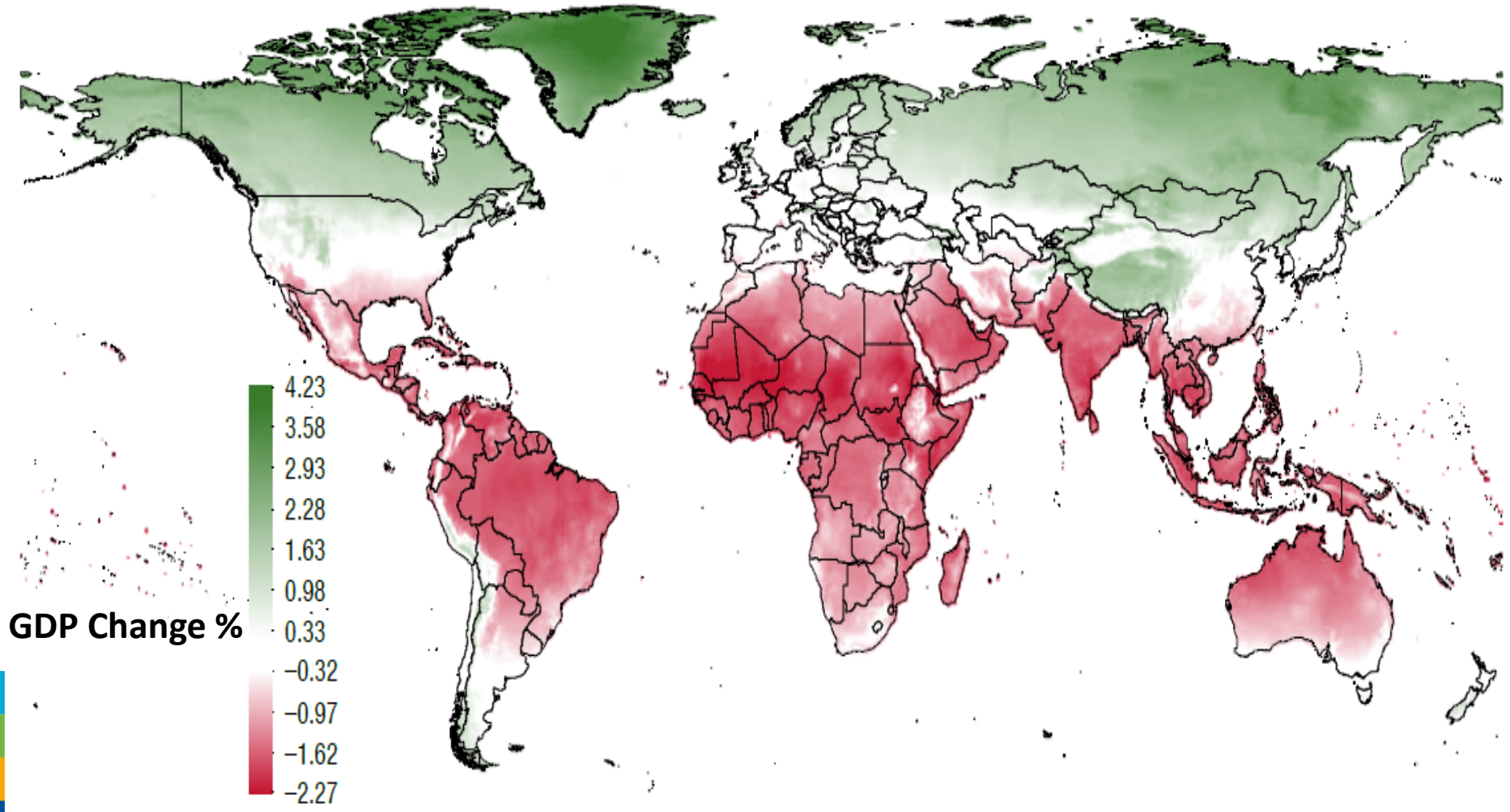
Over 820 million , or 1 in 9 people in the world suffered from hunger

Uneven economic impact of current warming

Impact of 1°C temperature increase on per capita output



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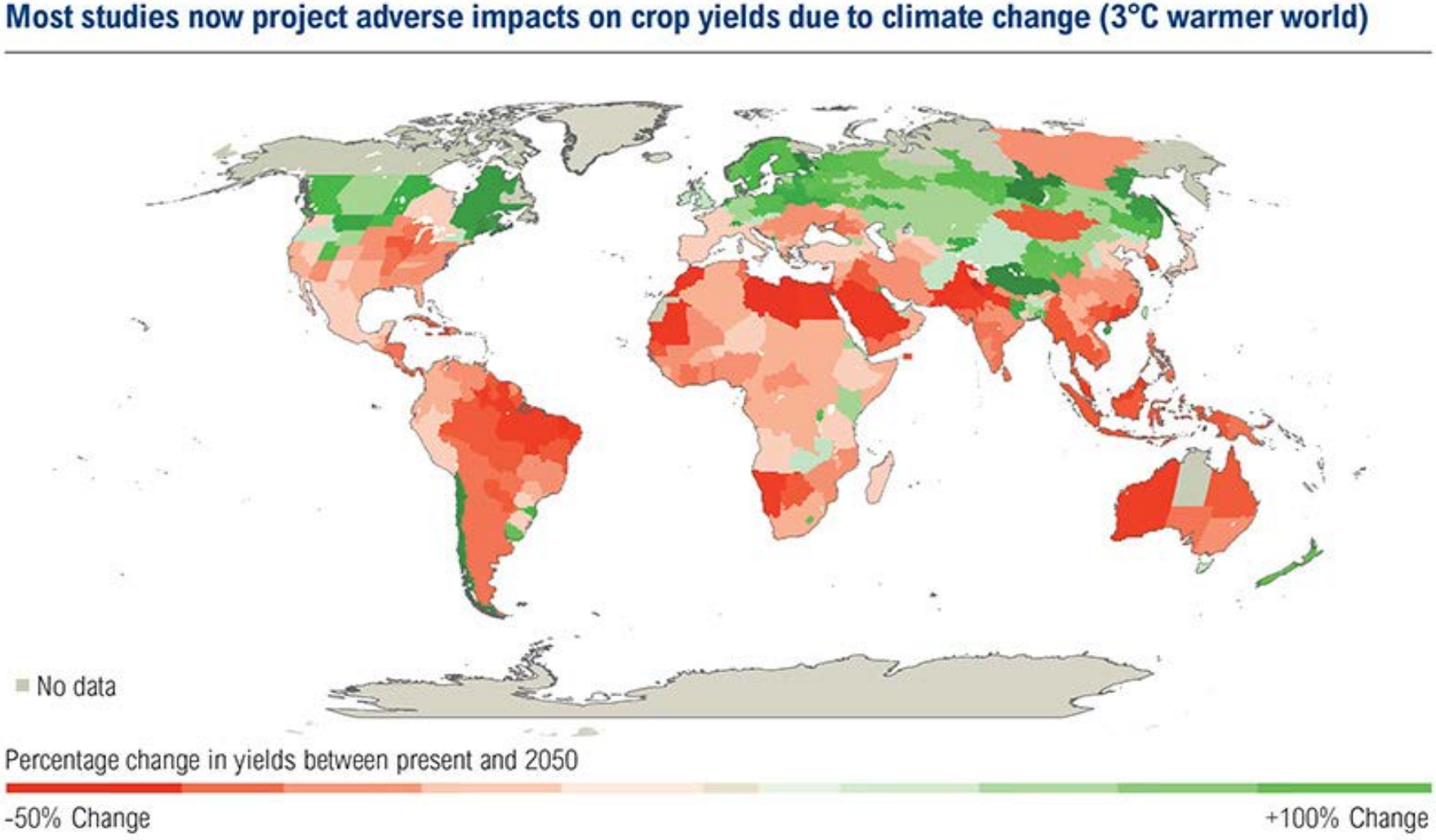
Source: International Monetary Fund (IMF) World Economic Outlook

3 C warming is a major risk for food security

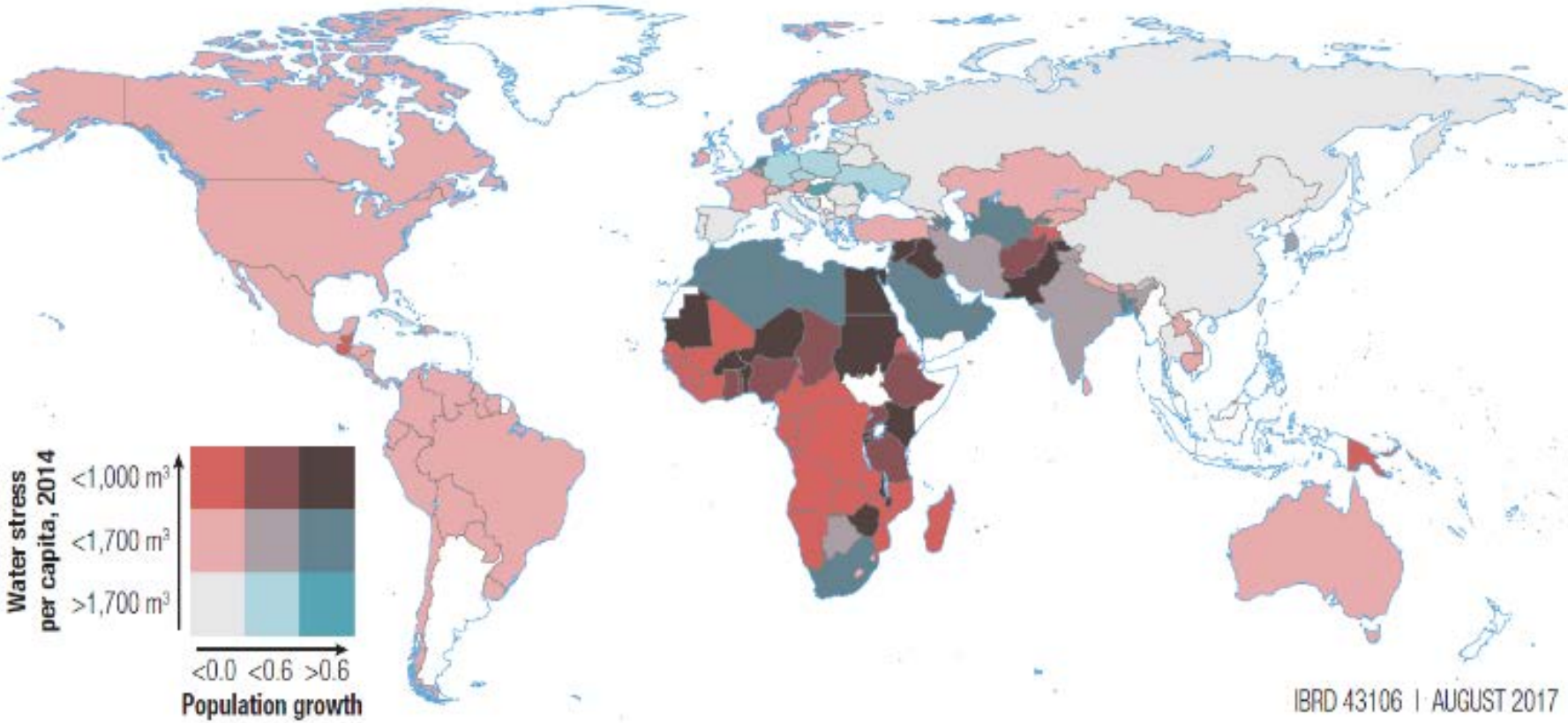
Loss of crop yield in most parts of the world



WORLD RESOURCES INSTITUTE

Sources: http://ow.ly/rpfMN

Water availability & population growth 2050



About **4 billion people**, representing nearly two-thirds of the world population, **experience severe water scarcity** during at least **one month of the year**

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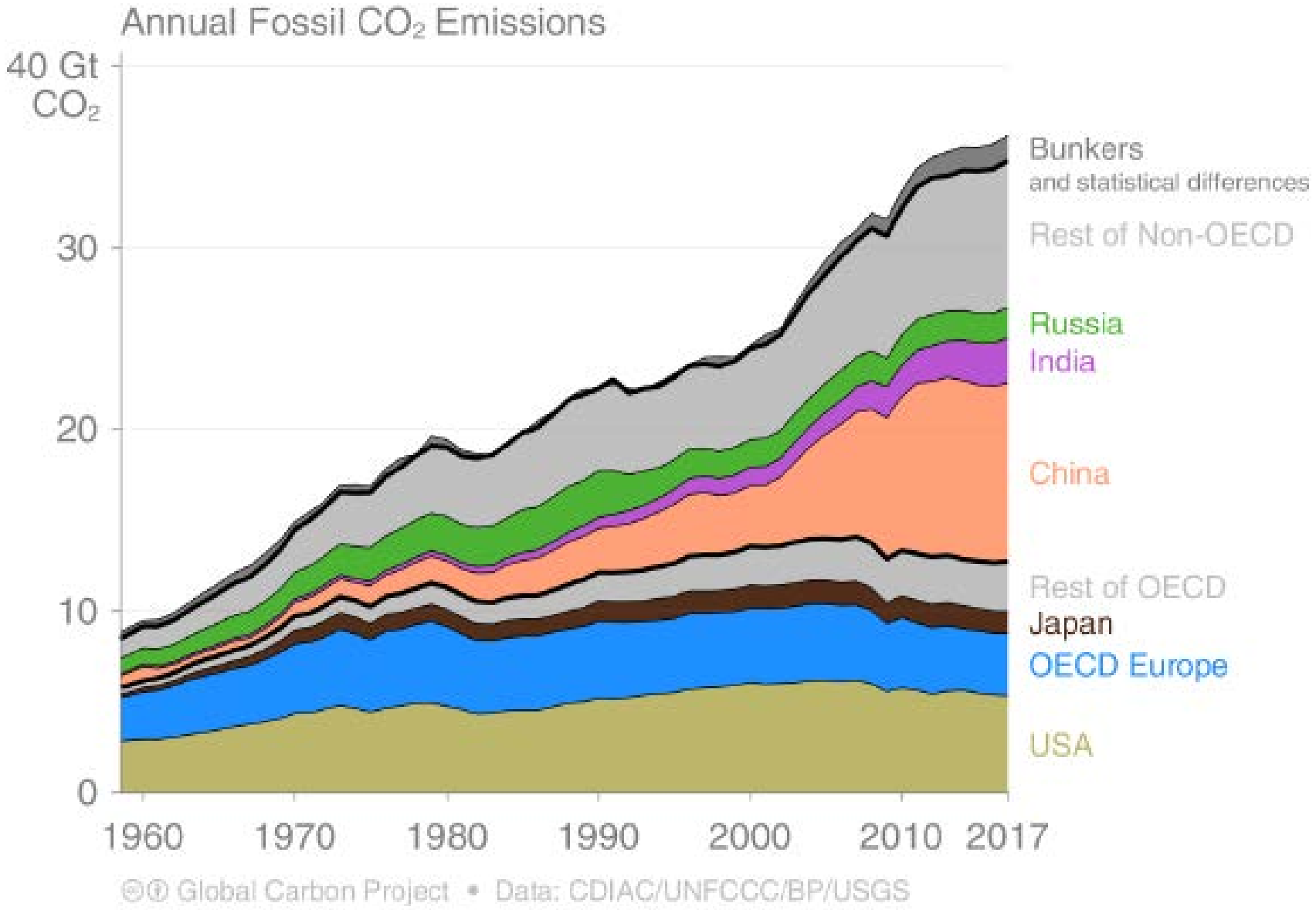
CO_2 emissions 1960-2017



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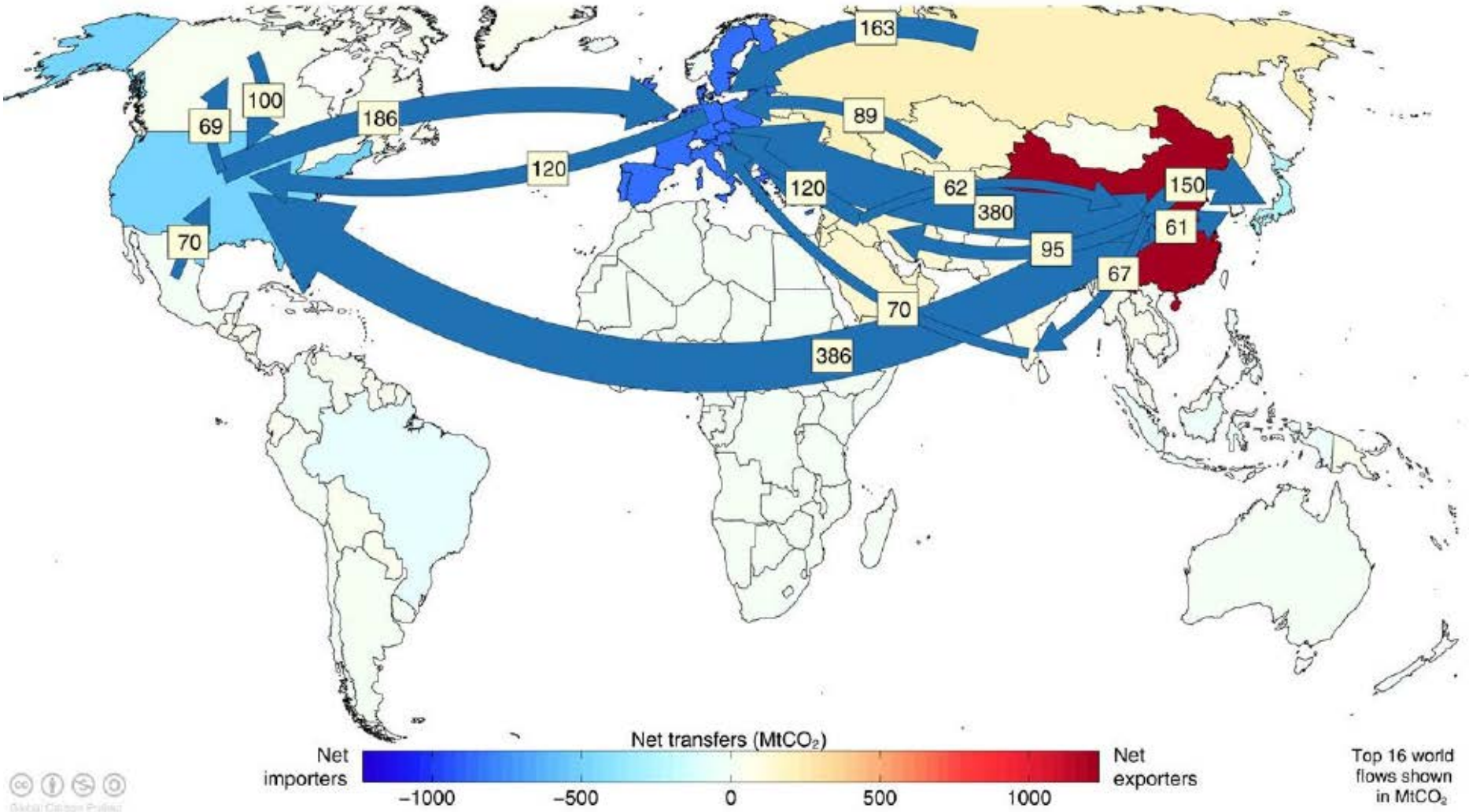
Goods emission flows production/consumption



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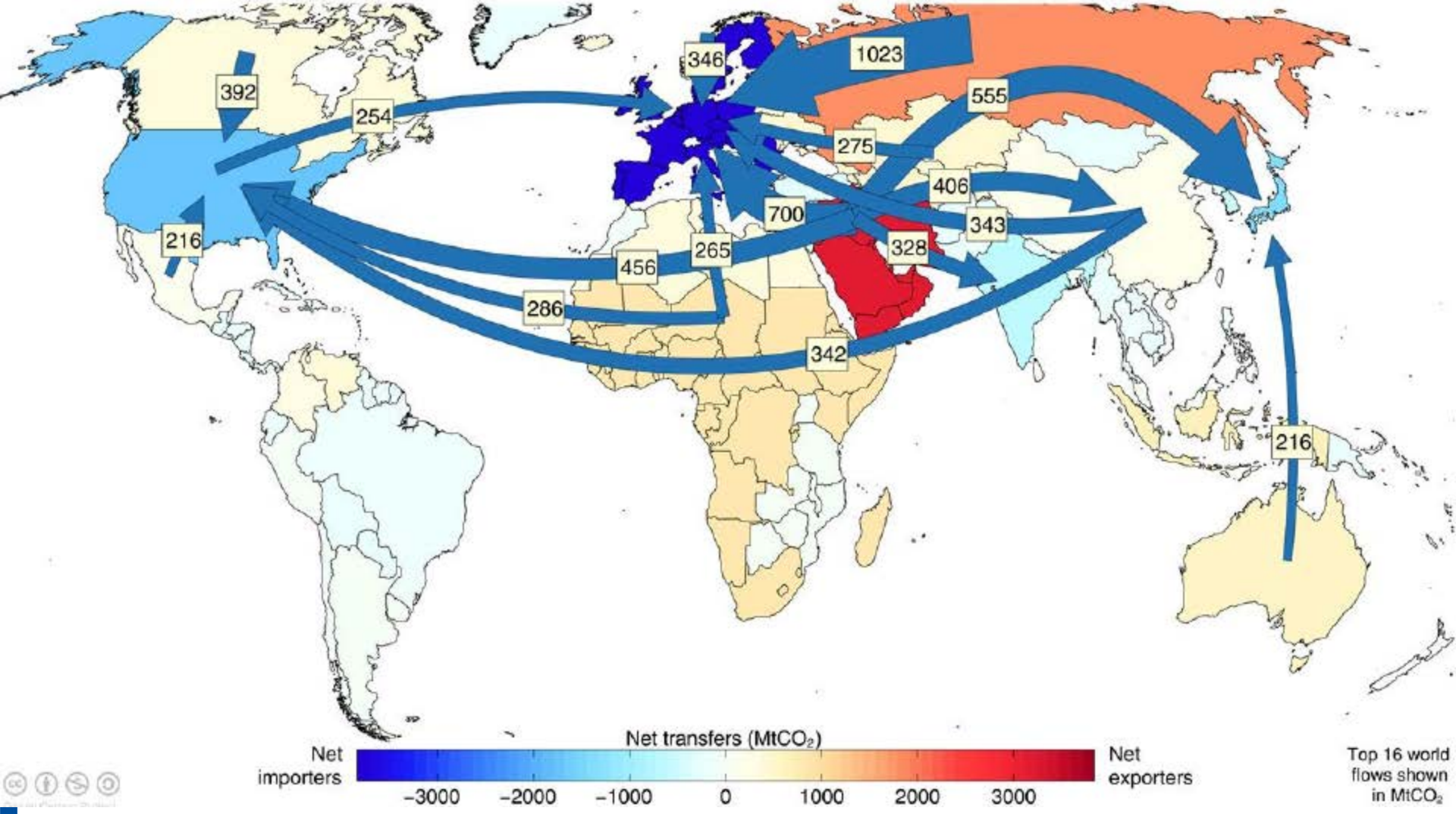
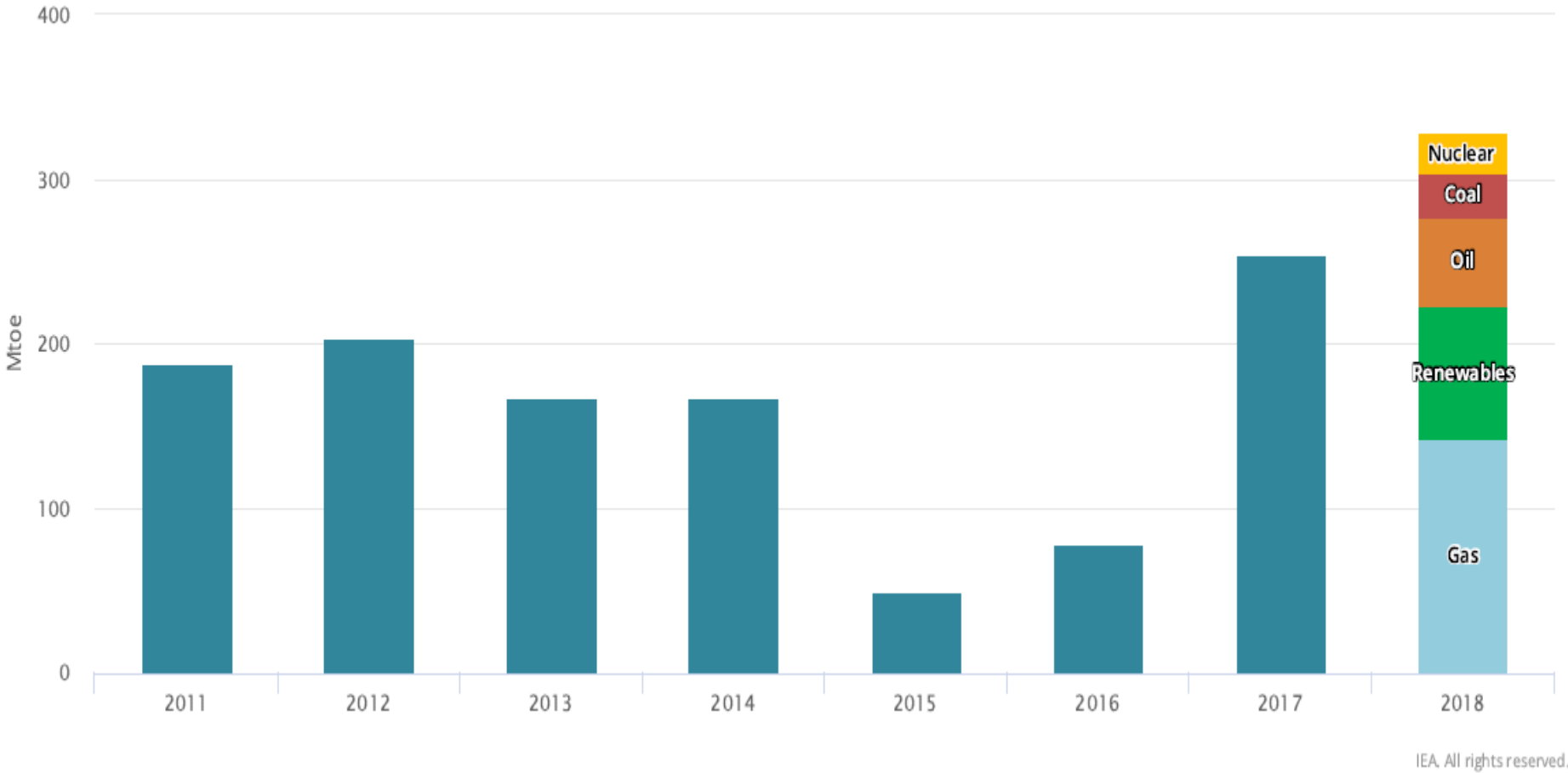
Fossil product flows production/consumption



Change in annual global energy demand 2011-18



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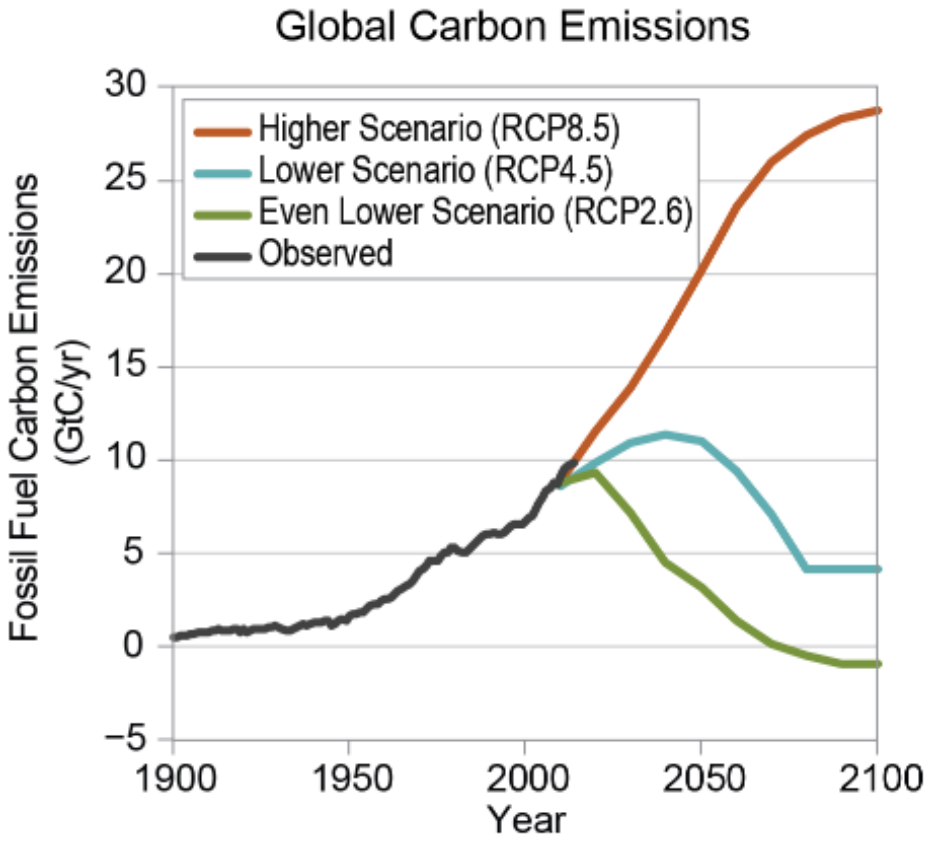
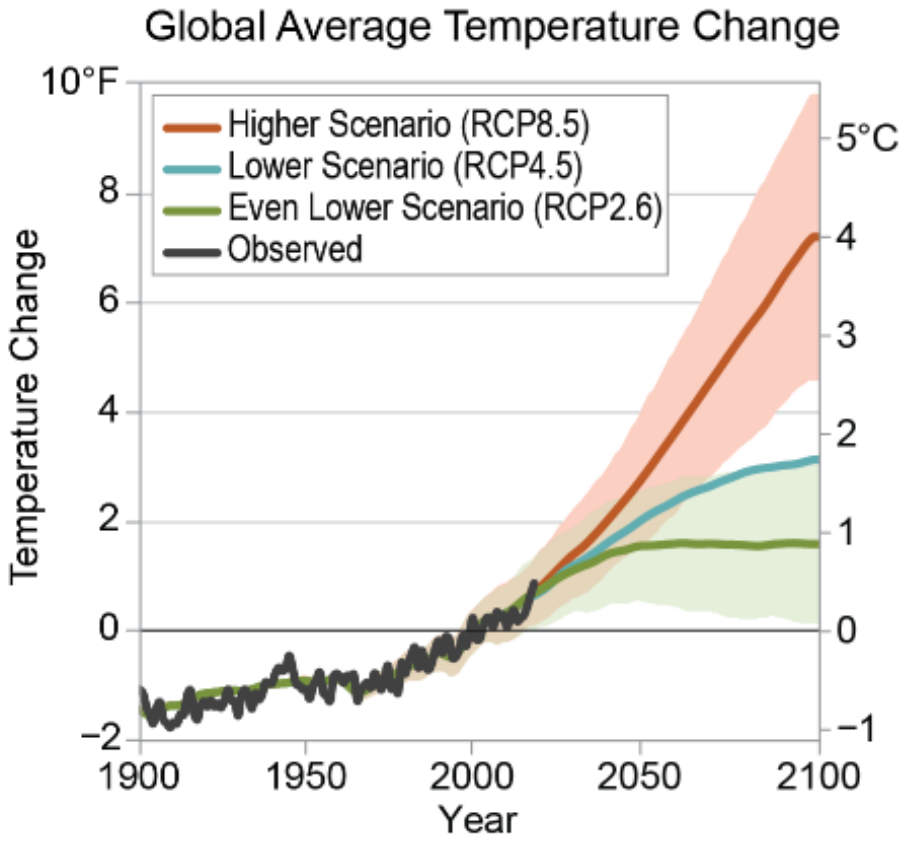
Carbon emissions-temperature





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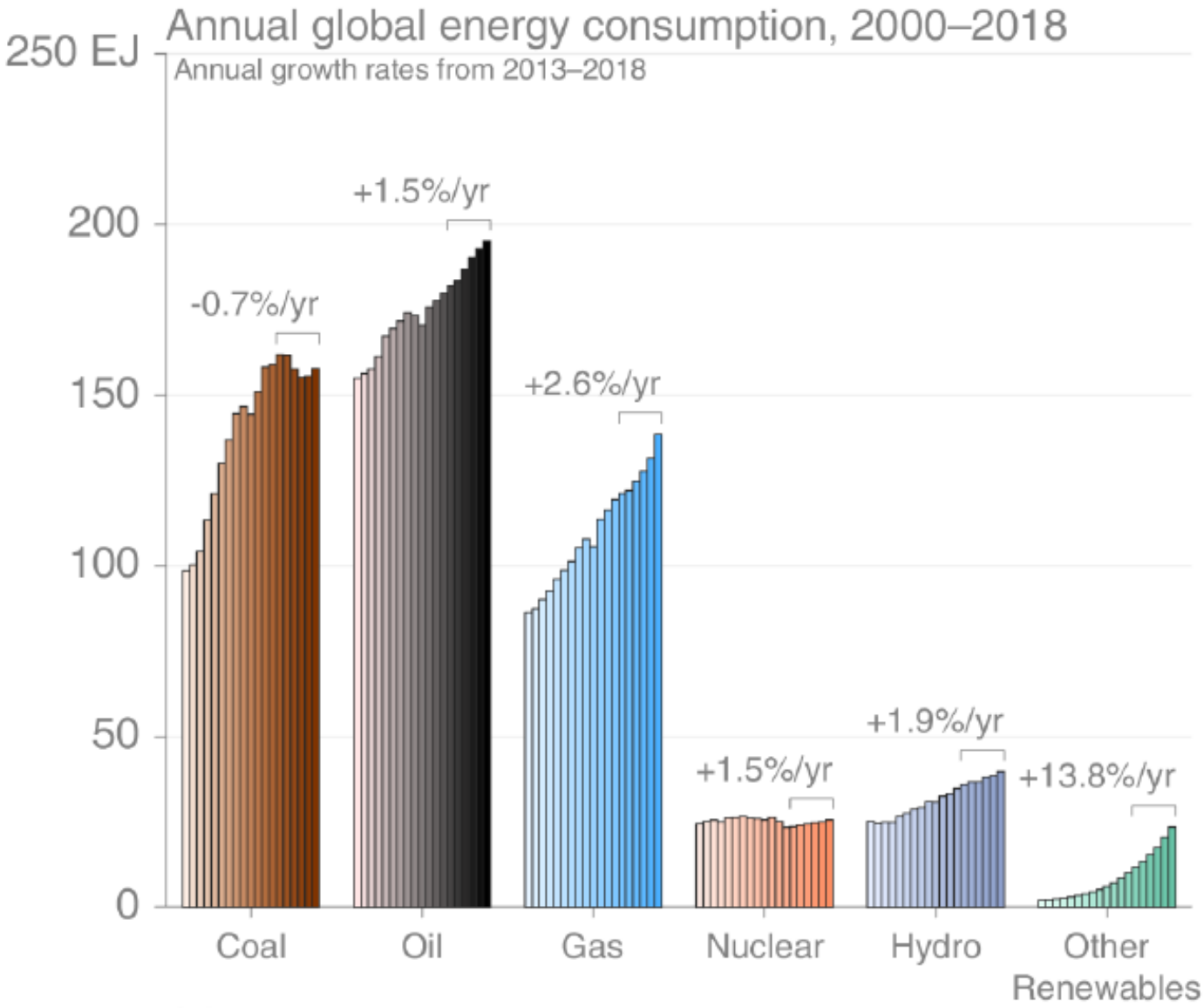
Energy consumption 2000-2018



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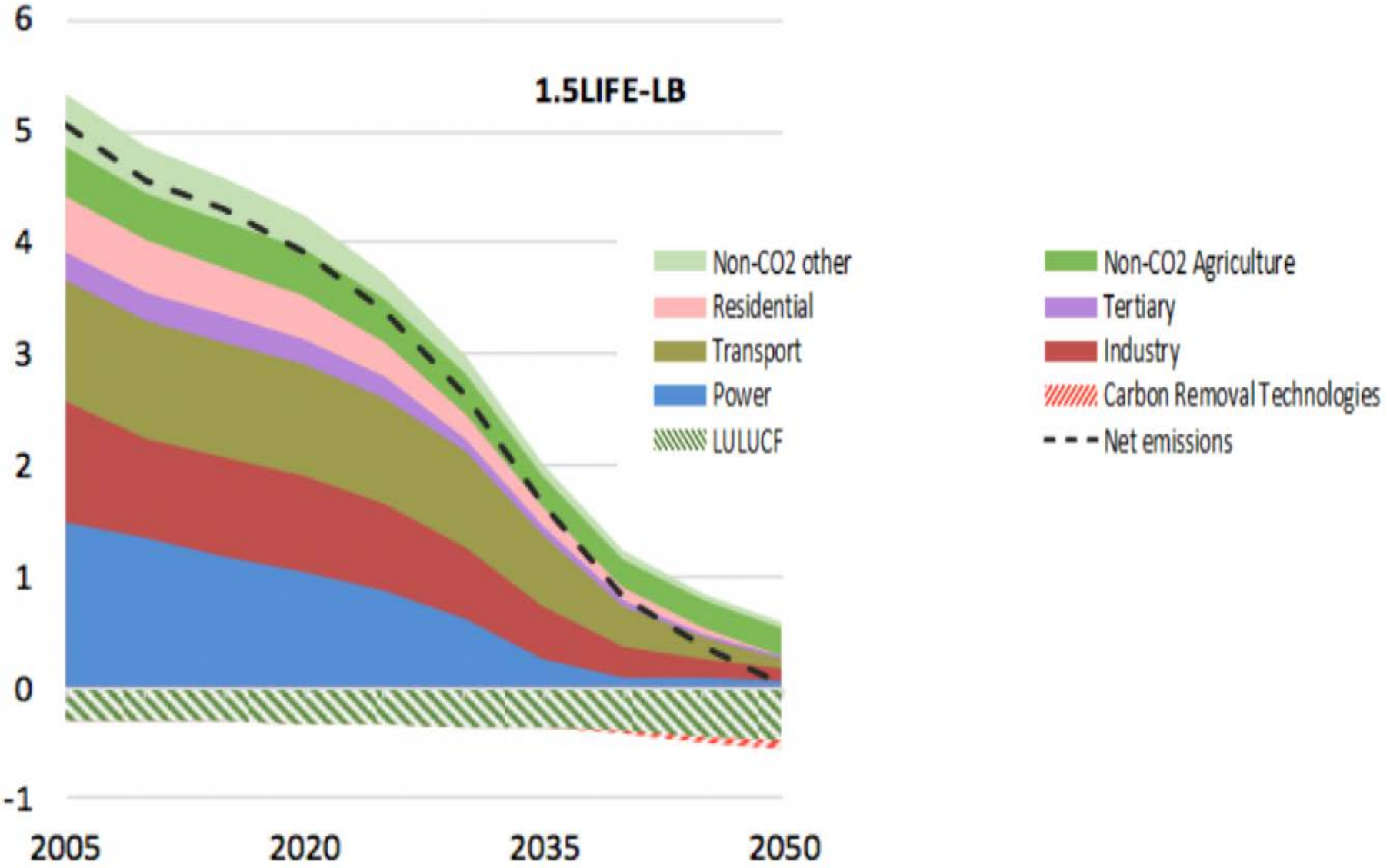
How to be carbon neutral by 2050?



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Conclusions

- Climate change is already **very visible and high on global agenda** (citizens, governments, UN, private sector)
- **Technical and economic means to mitigate climate change exist**: energy, transport, buildings, bio economy
- Transition is a **challenge for fossil businesses** and fossil income related countries
- **Political acceptance** of mitigation means is a challenge; Gilet Jaune movement
- **1.5 C is an extremely challenging target**. Current Paris pledges would mean about 3 C warming.
- Climate change continues at least until 2060's, sea level rise until next century => **investments in climate adaptation are also needed**
- Means to **control population growth** also essential

شكرا لكم

Thank you

Gracias

Merci

Спасибо

谢谢

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