Climate change & mitigation

Prof. Petteri Taalas
Secretary-General

WEATHER CLIMATE WATER
TEMPS CLIMAT EAU

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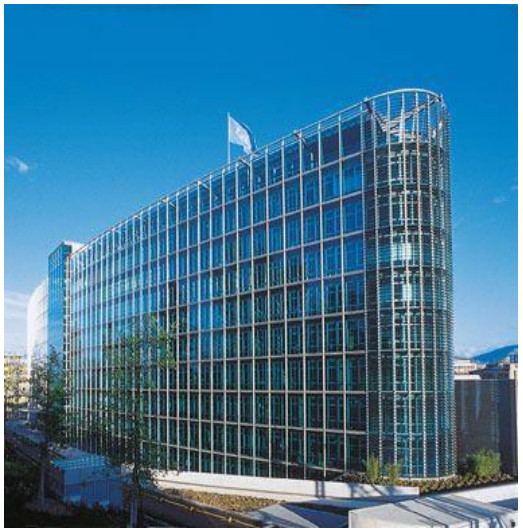
World Meteorological Organization
Organisation météorologique mondiale

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 (1/3)

- 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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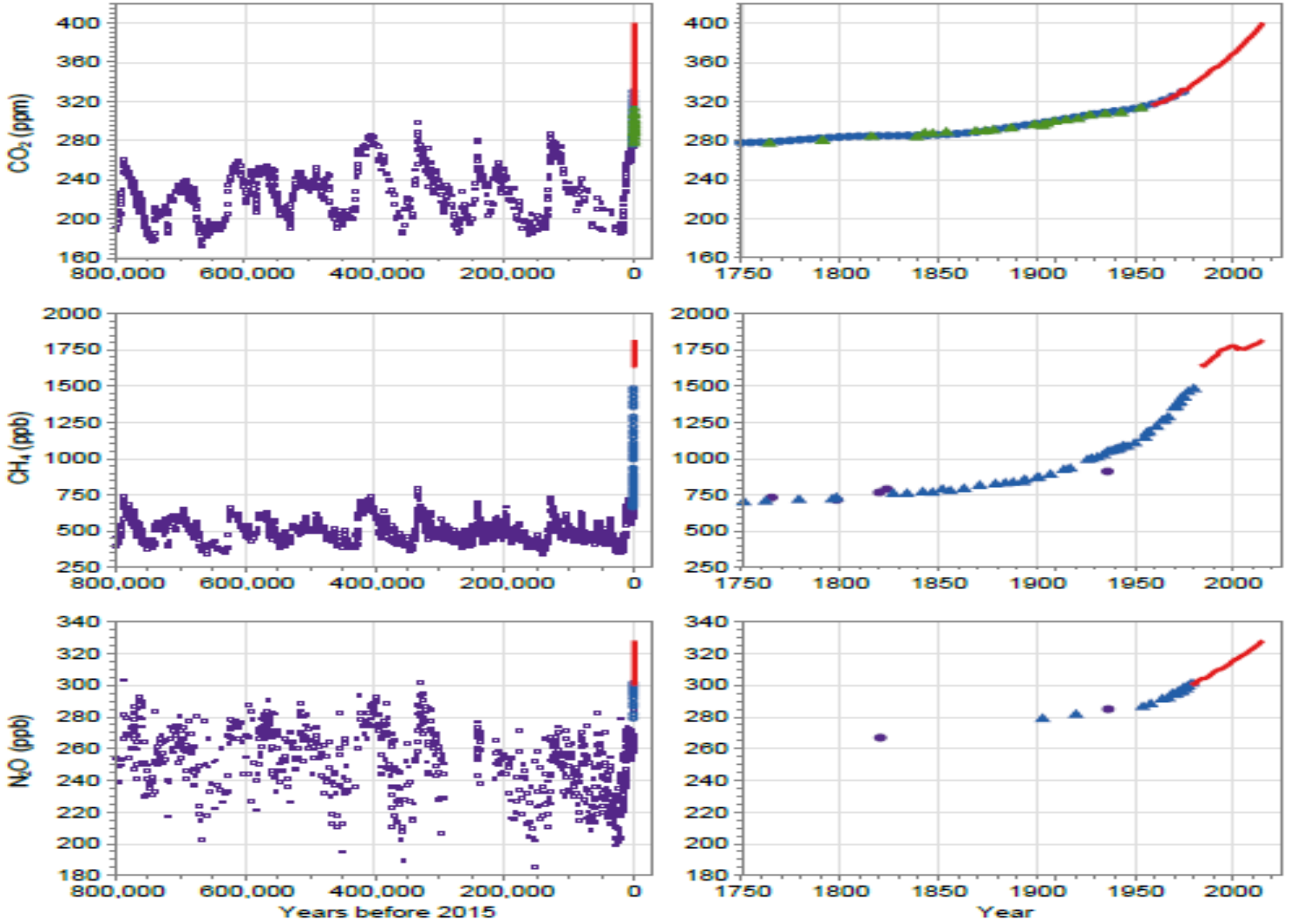
CO_2, CH_4 & N_2O 800 000 BC-2016 AD



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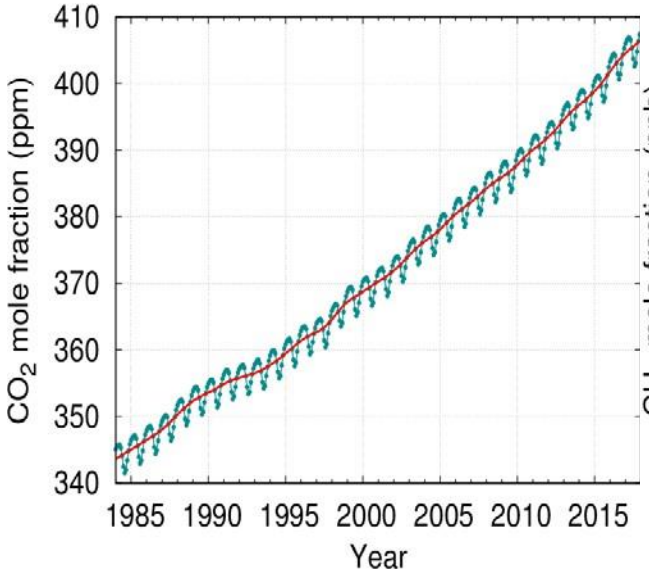
Carbon dioxide level highest in 3 million years

CO_2

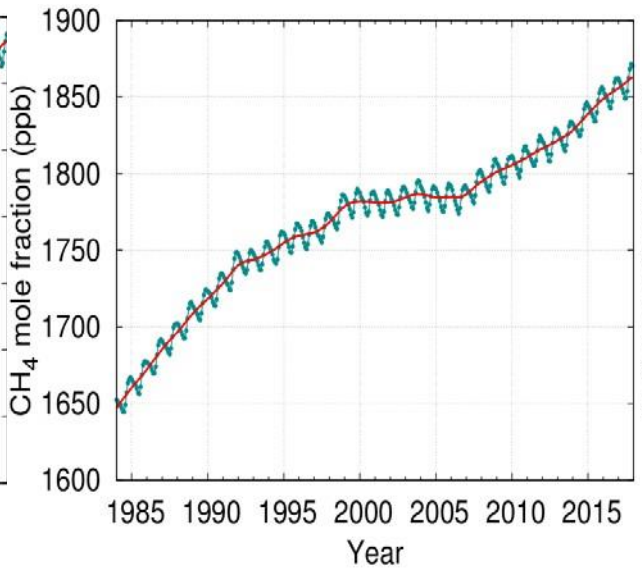


Increase 146 %
(since 18th century)

Lifetime several hundreds years

Contribution to warming 66 %

CH_4

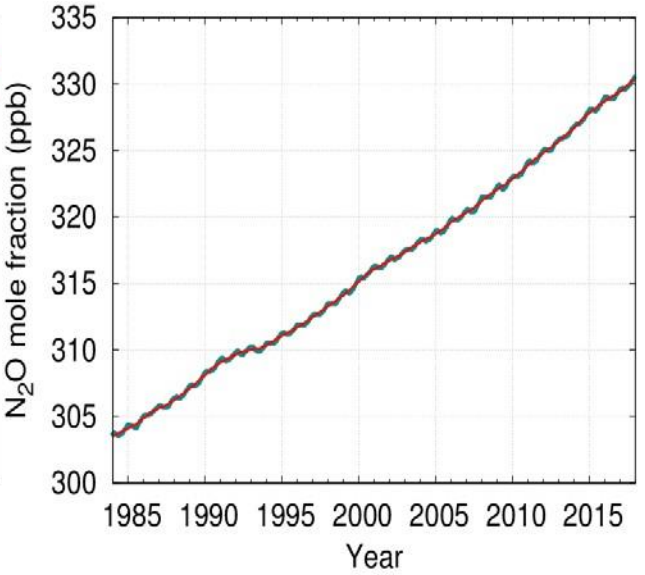


Increase 257 %

Lifetime 12 years

Contribution to warming 17 %

N_2O



Increase 122%

Lifetime 114 years

Contribution to warming 6 %

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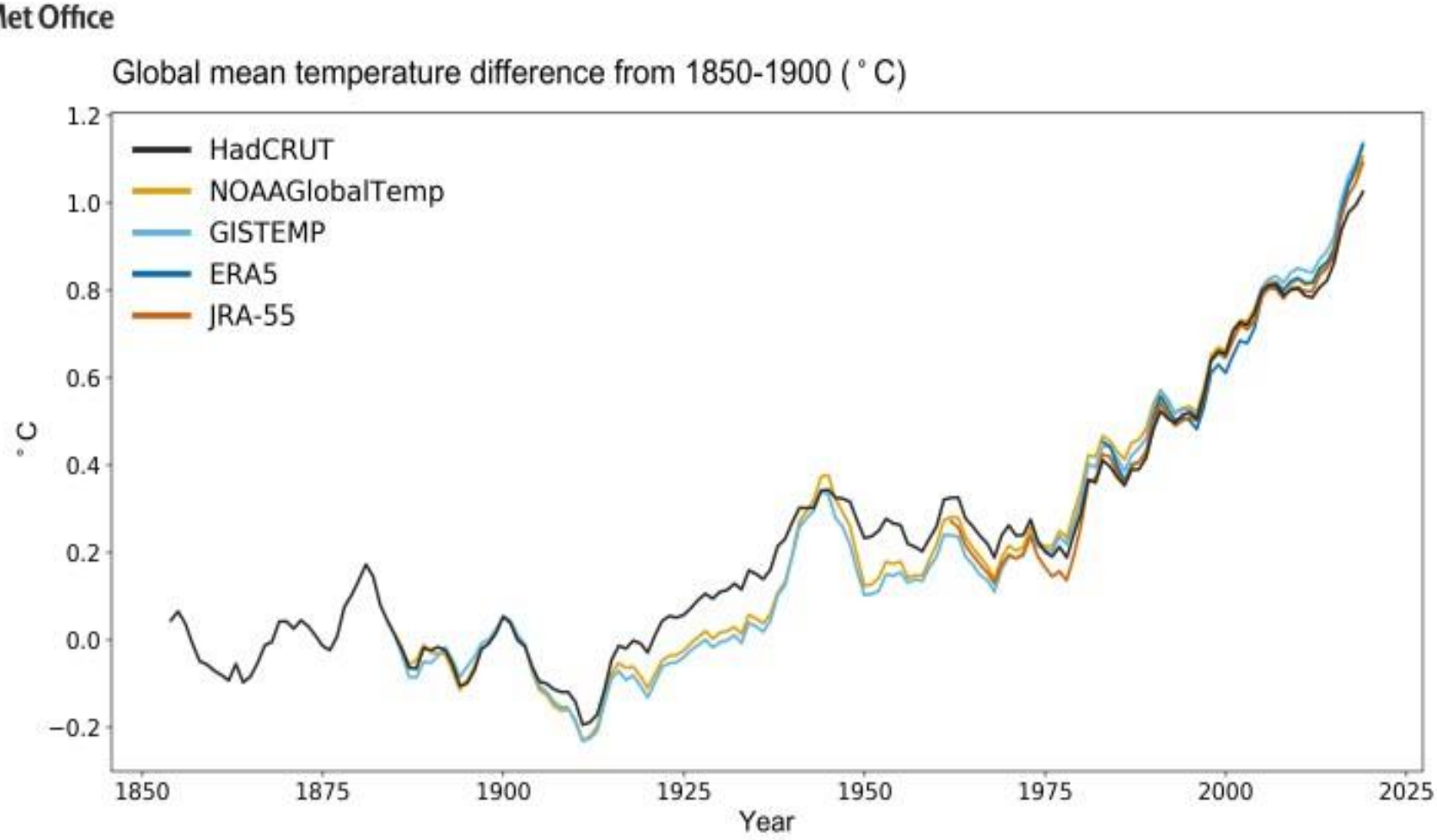
Global temperature 1850-2019, +1.1 ◦C



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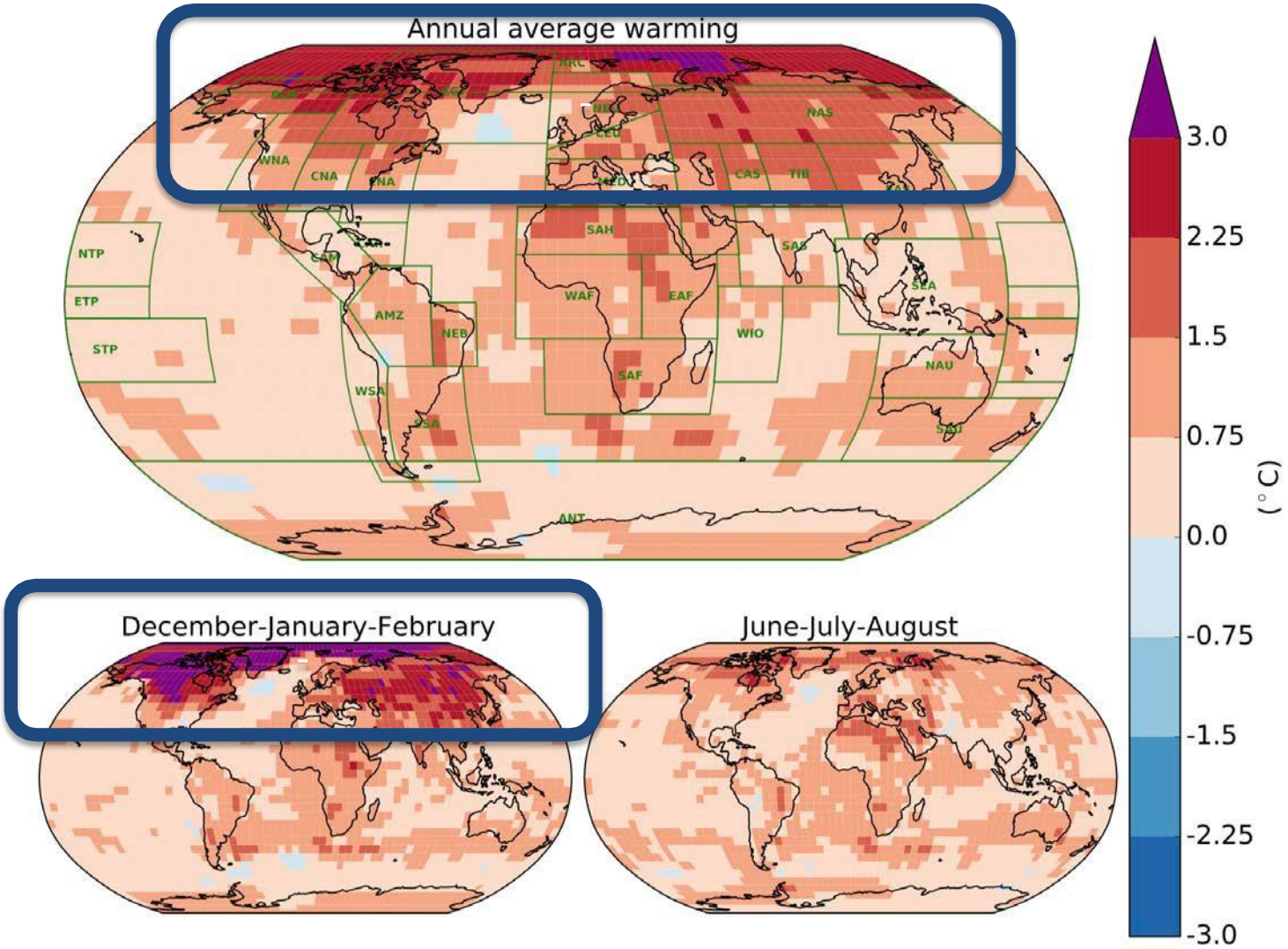
Warming so far

Regional warming in the decade 2006-2015 relative to preindustrial



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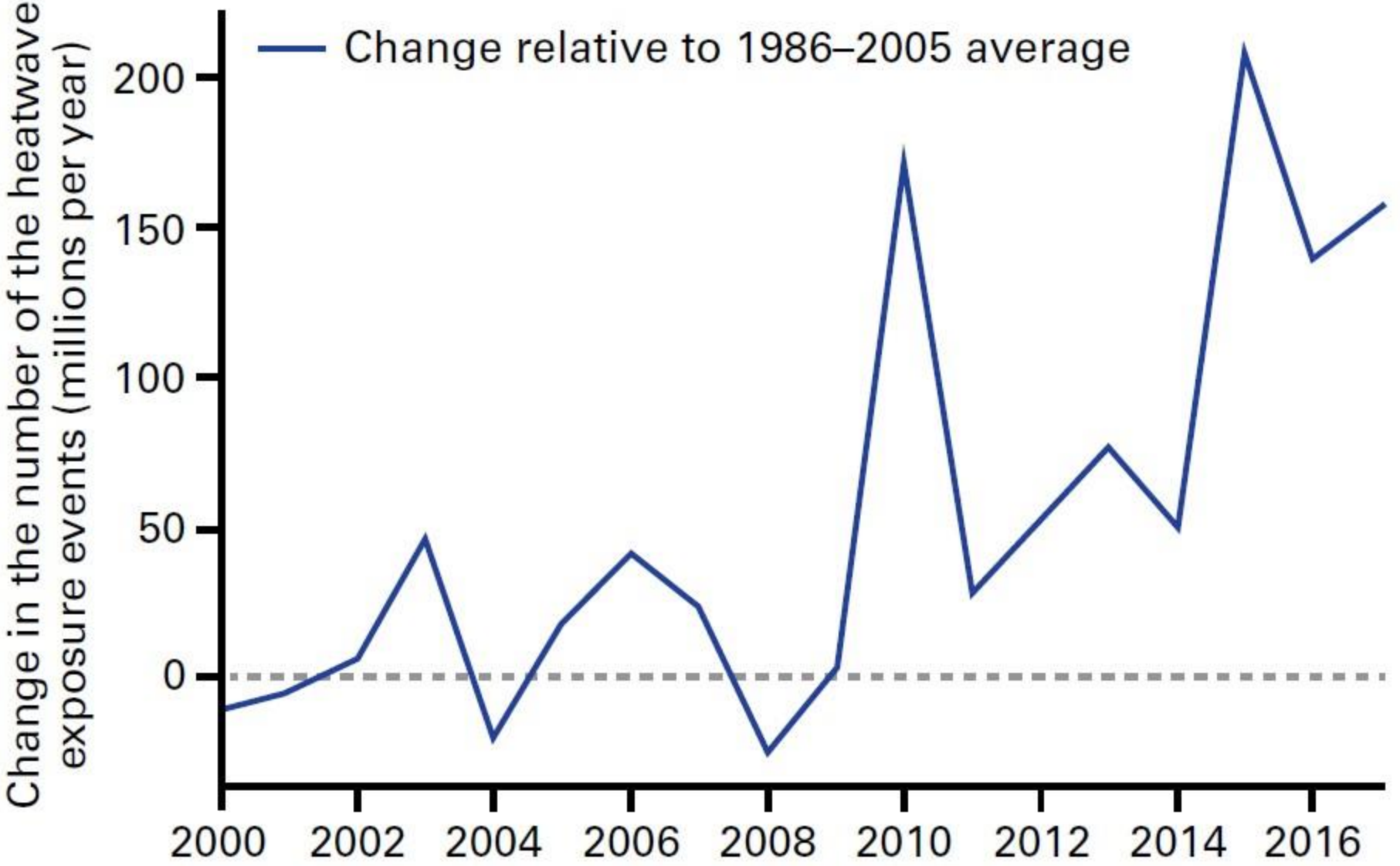
Source: IPCC Special Report on Global Warming of 1.5°C

Heatwave exposure increase 2000-2018



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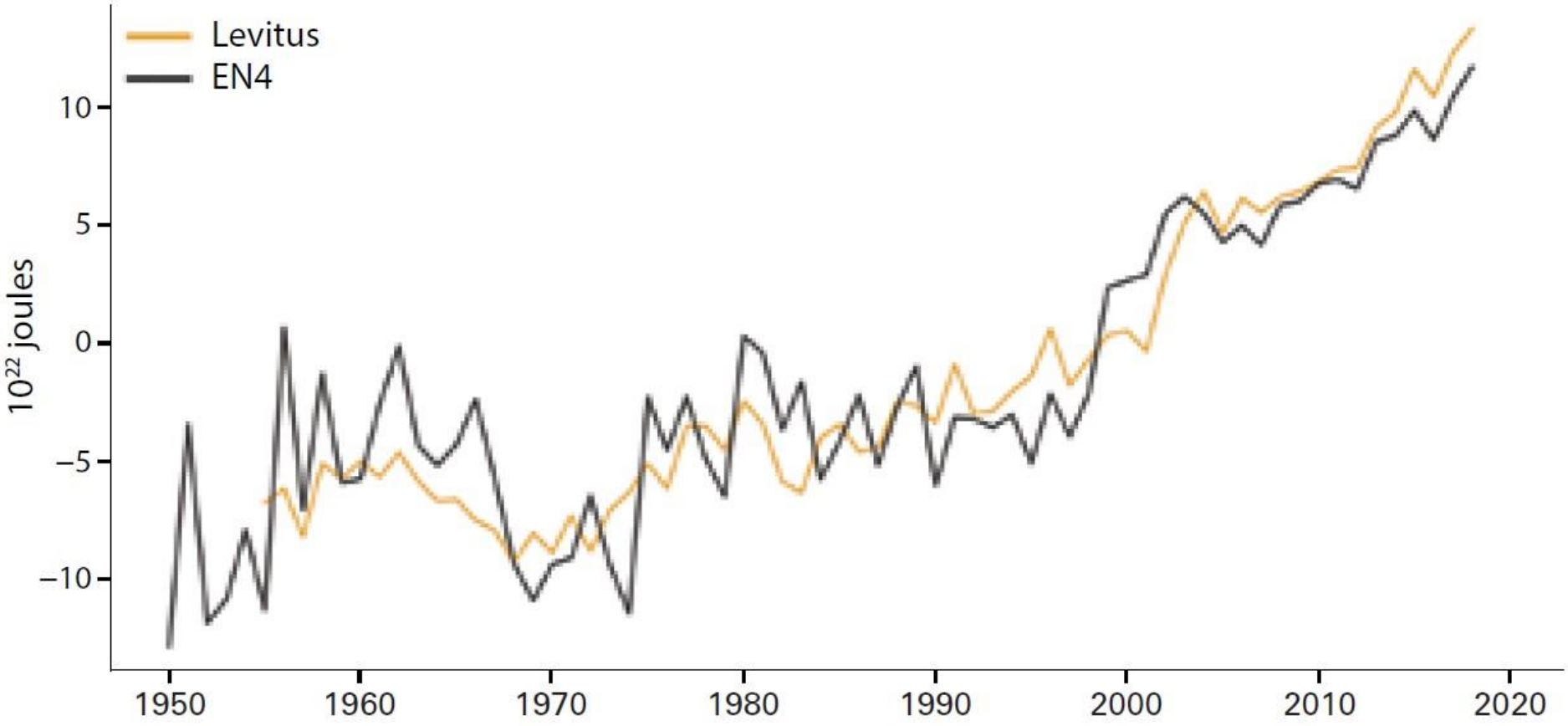
Heat content of the oceans 0-700 m vs. 1981-2010 mean

~93 % of extra heat stored in the oceans



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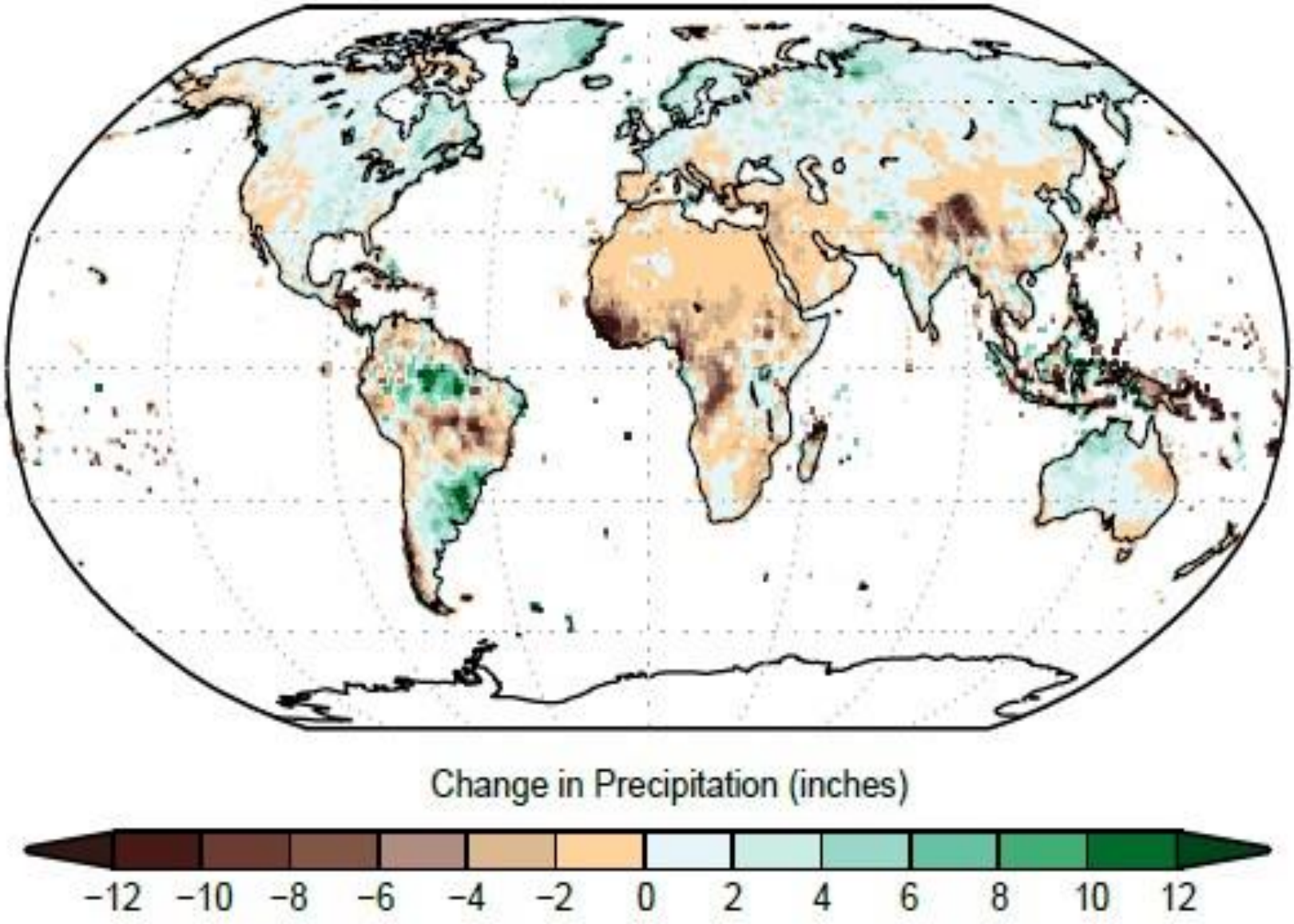
Global precipitation 1986–2015 vs. 1901–1960



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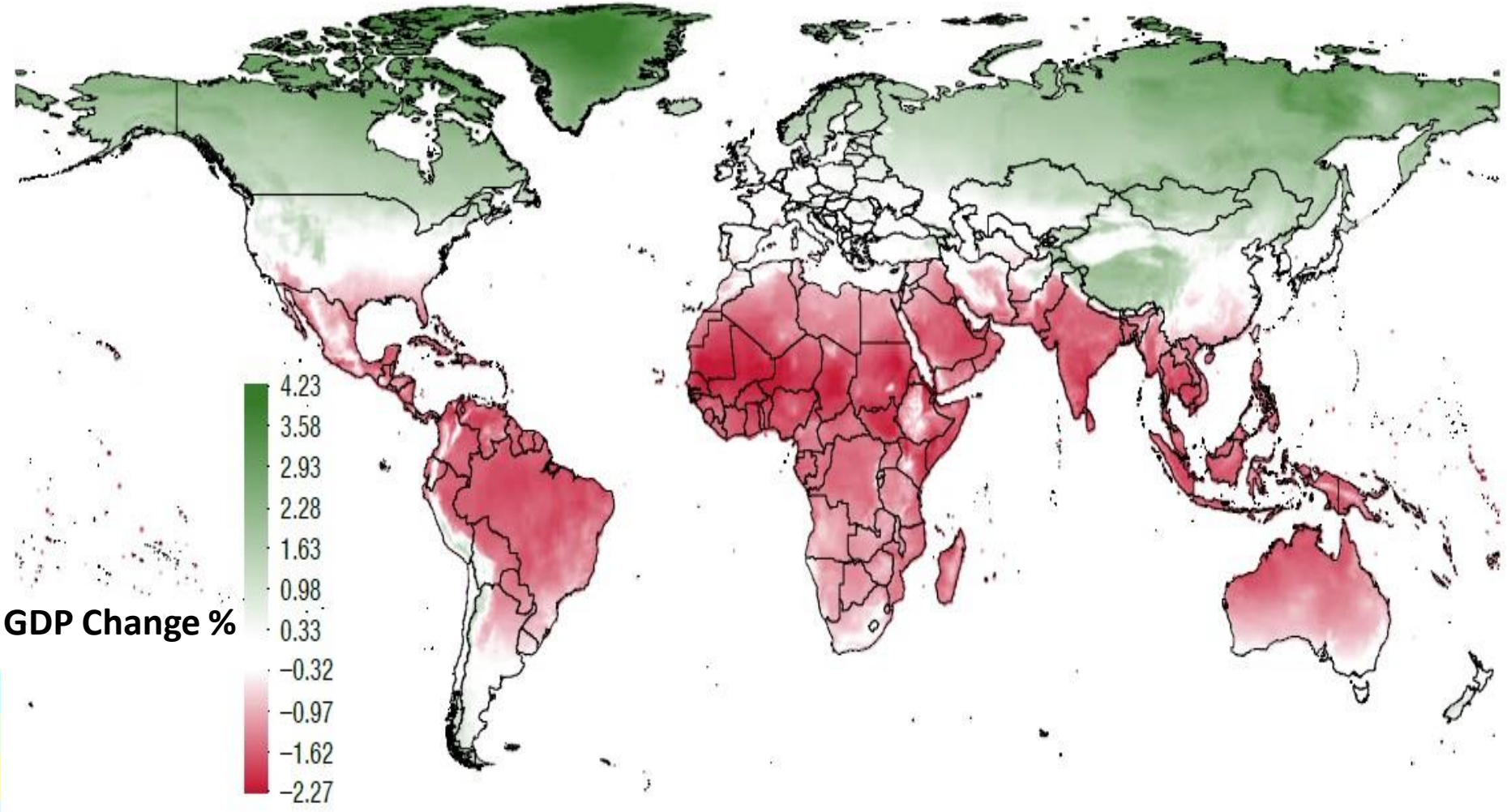
Uneven economic impact of current warming

Effect of 1°C temperature increase on per capita output



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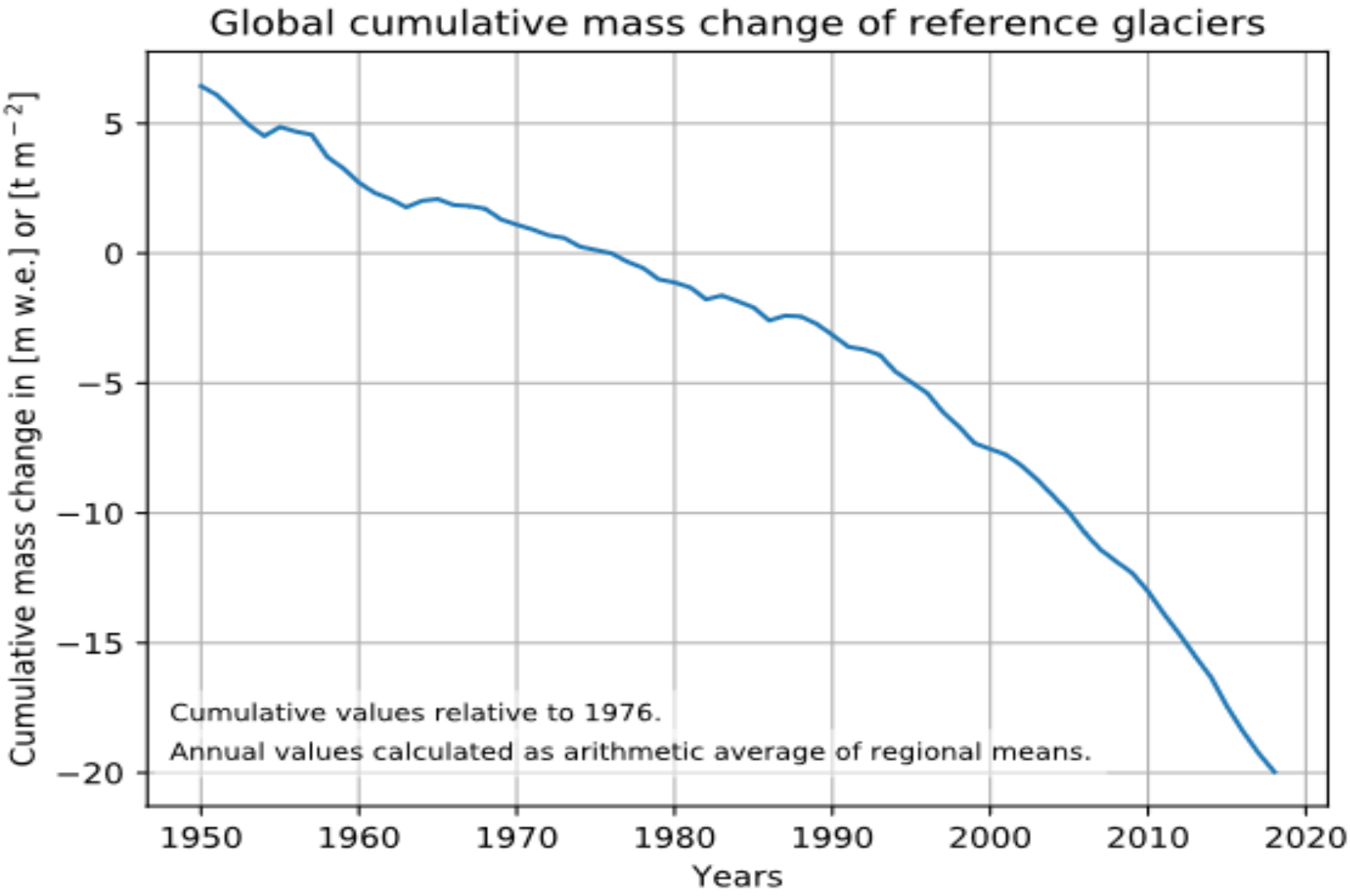
Source: International Monetary Fund (IMF) World Economic Outlook

Melting of global 31 glaciers 1950-2018



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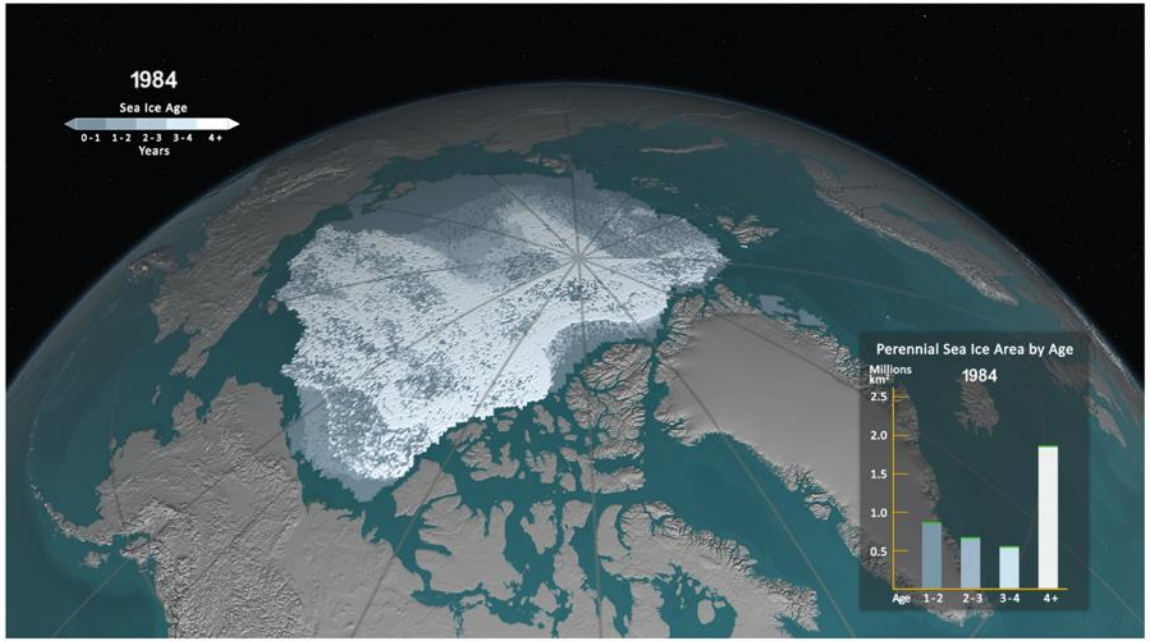
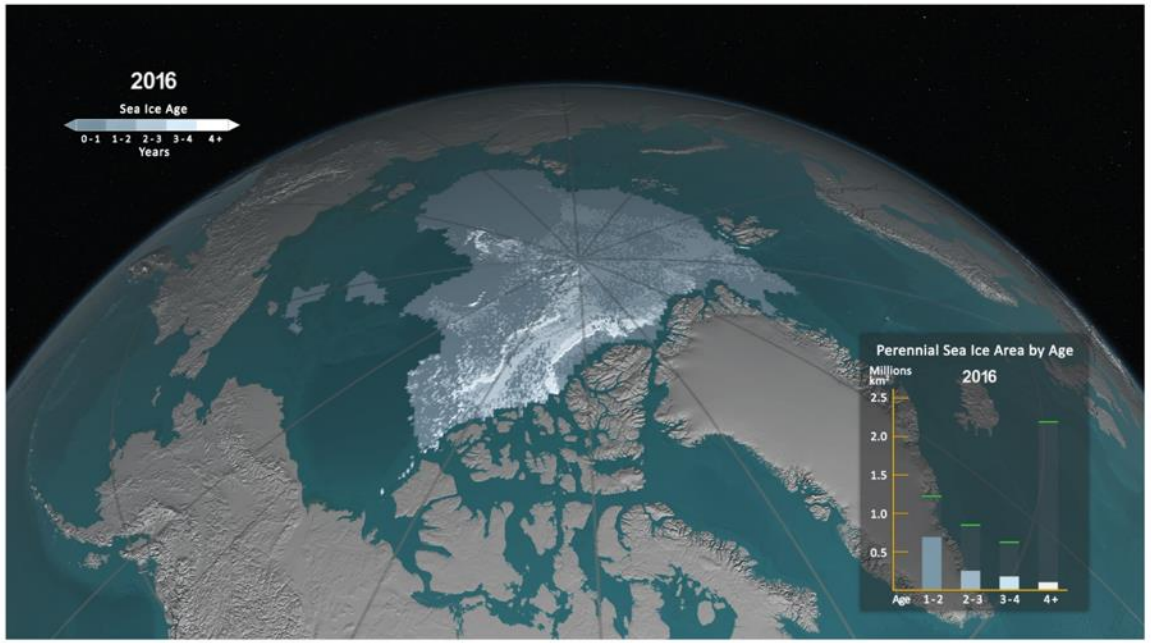
Largest changes in the Arctic

Multi-year ice

1984



2016



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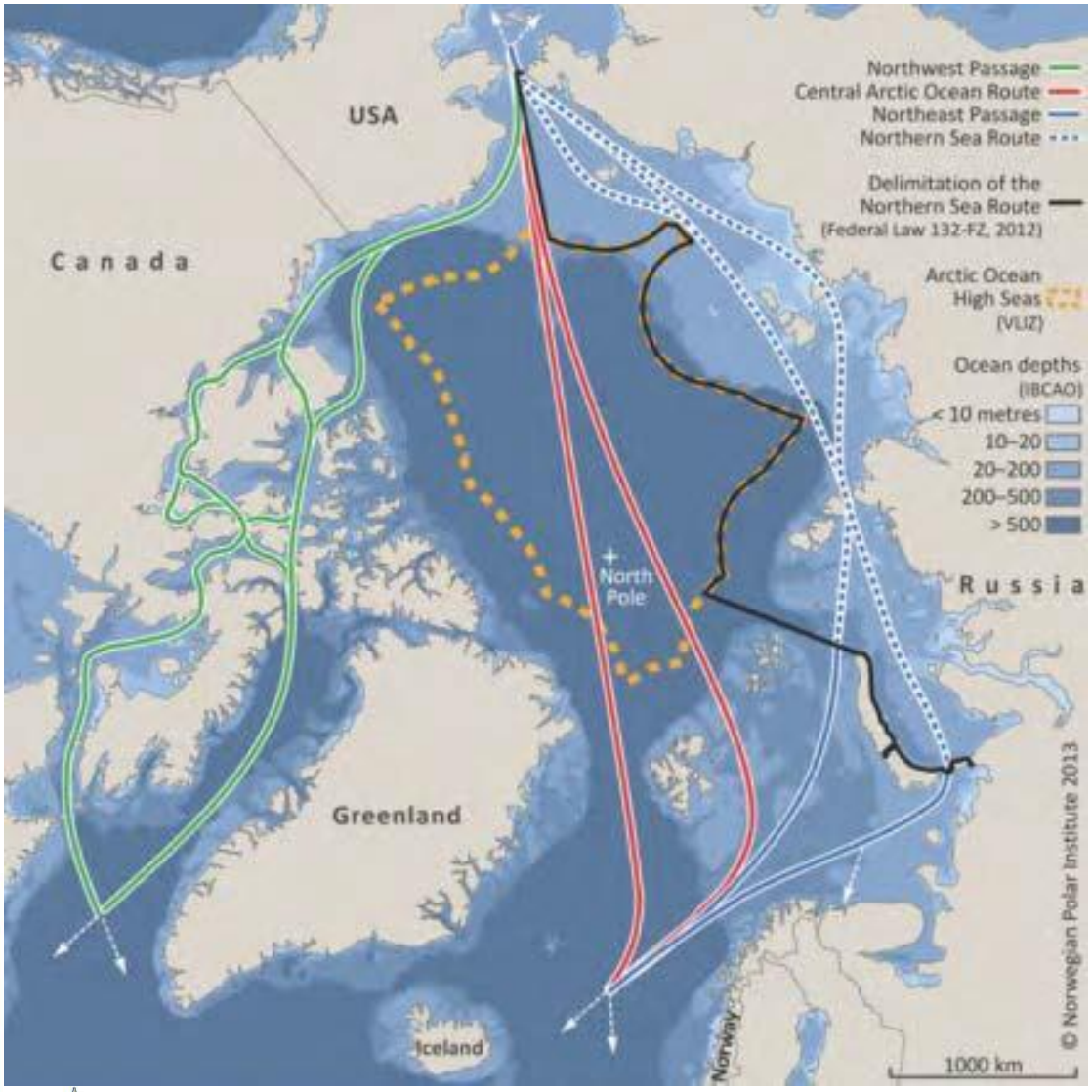
The Northern sea routes



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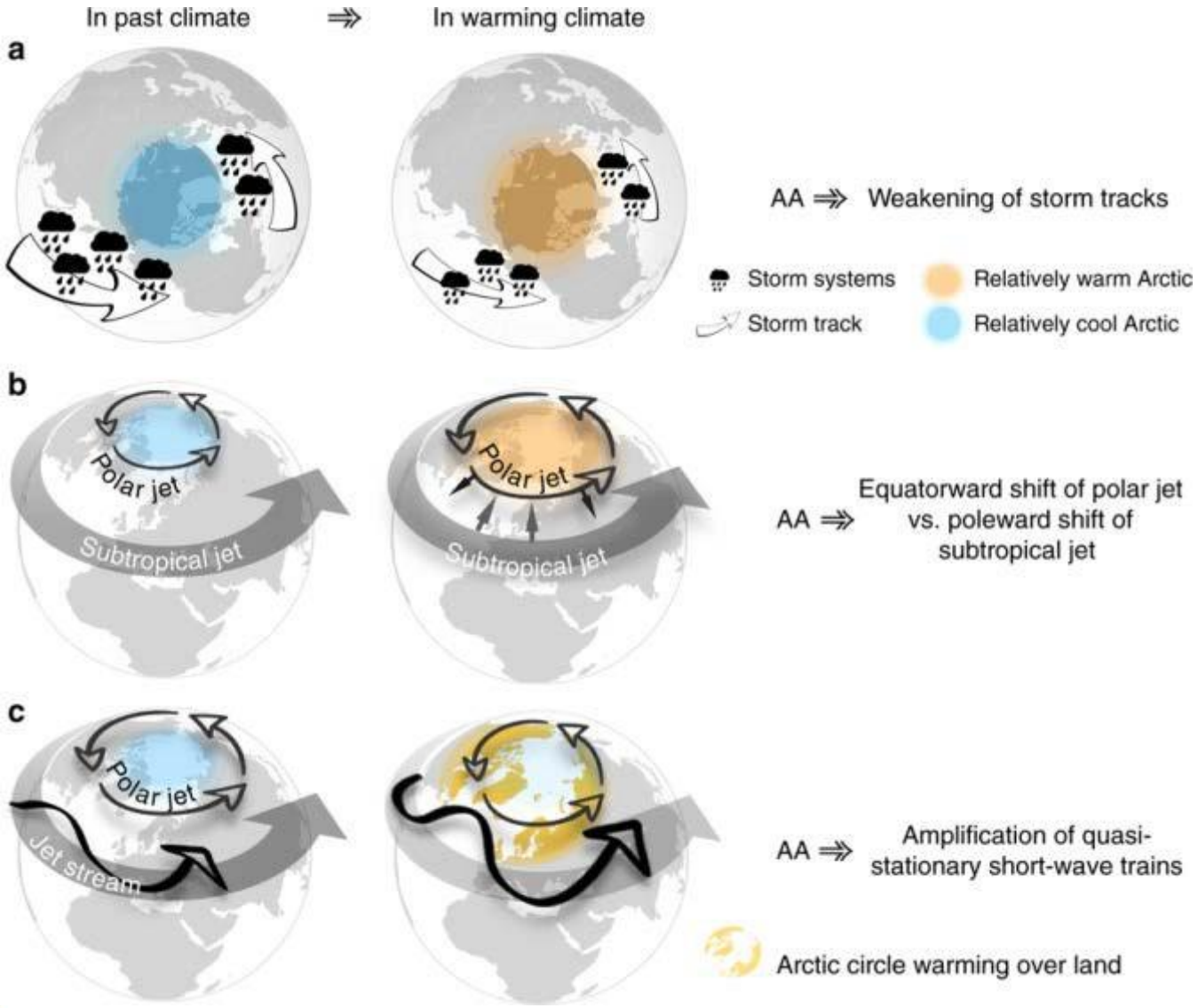
Influence of Arctic on mid-latitude weather



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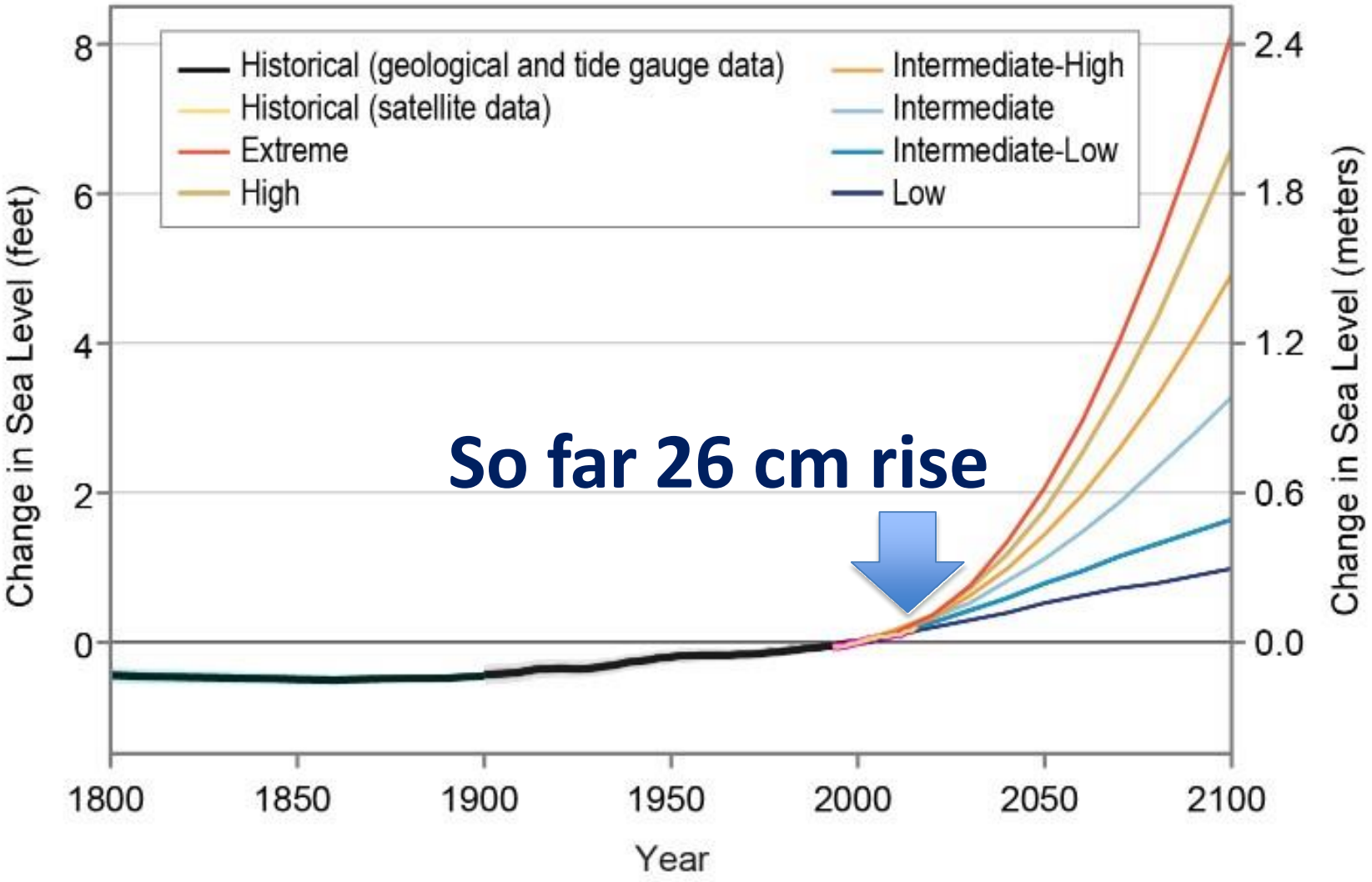
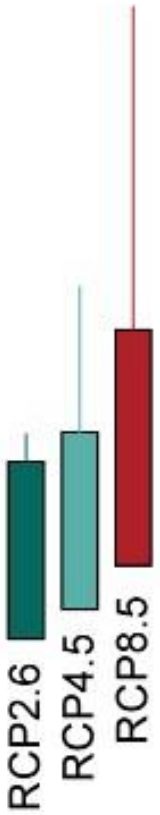
Coumou et al, Nature Communications **volume 9**, Article number: 2959 (2018)

Emissions-sea level rise 1800-2100





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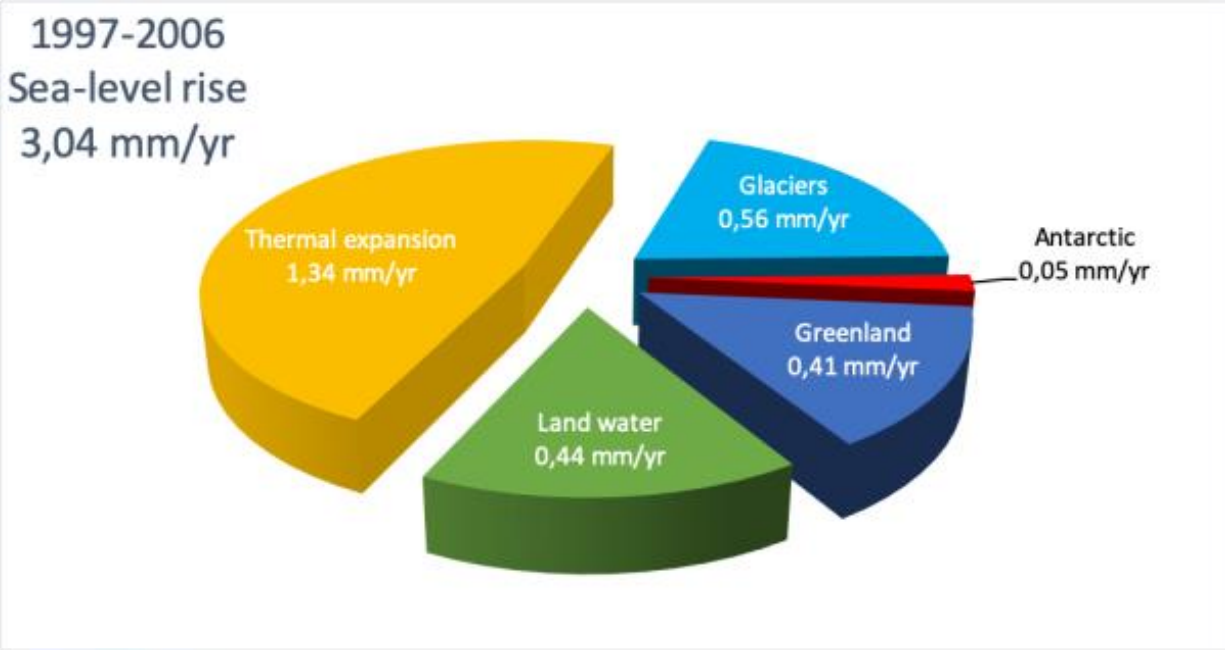
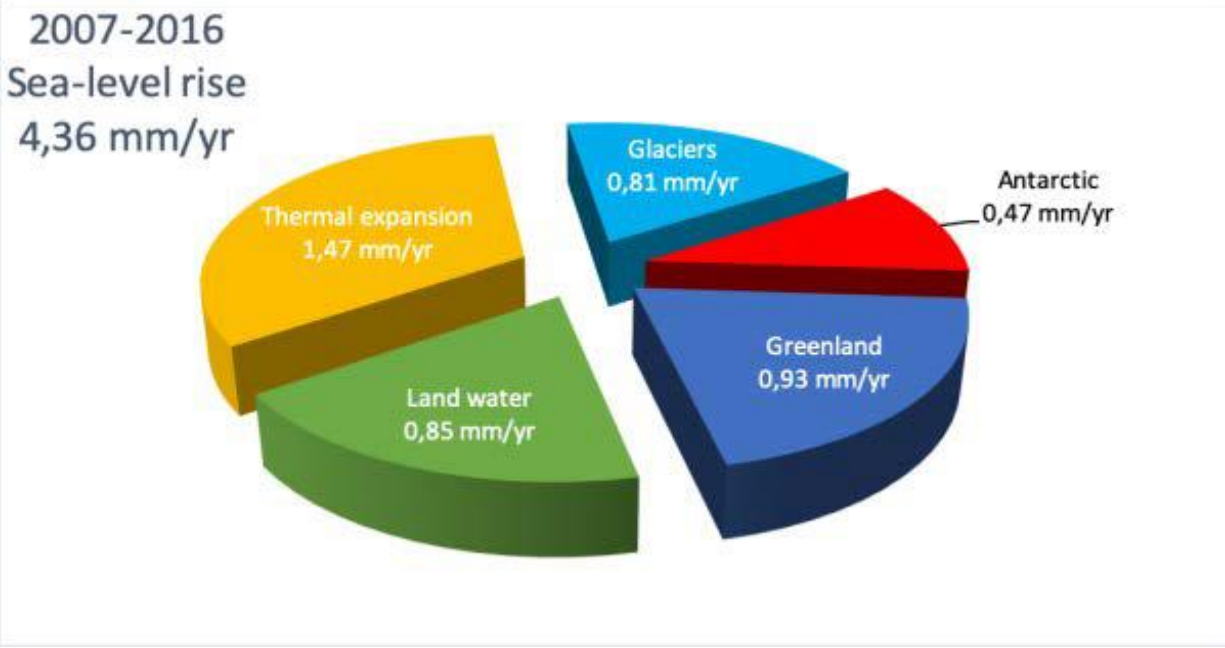
Factors behind sea level rise





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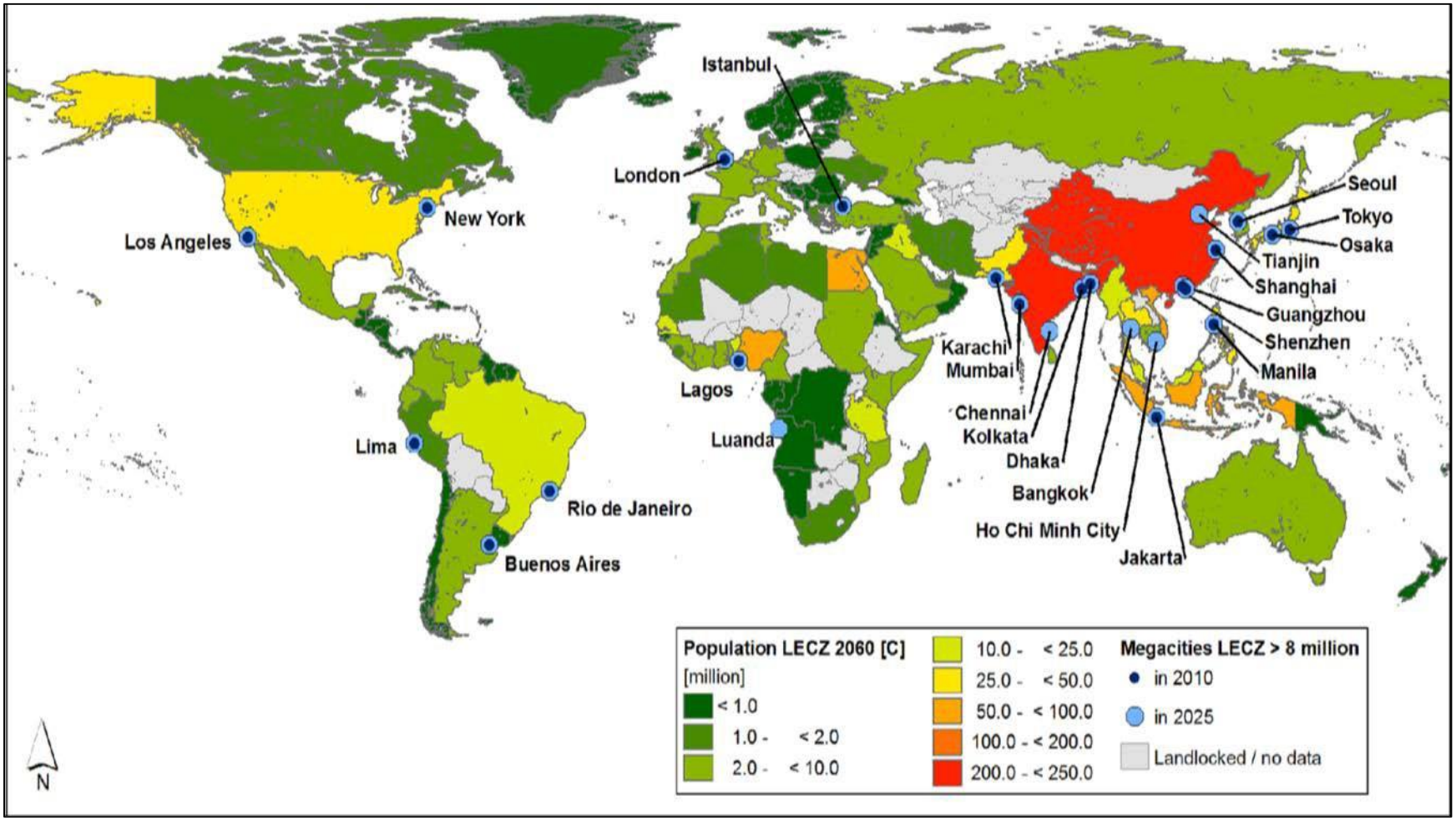
Population in low elevation coastal zones 2060 projections



Source: Neumann, Vafeidis, Zimmermann, Nicholls 2015

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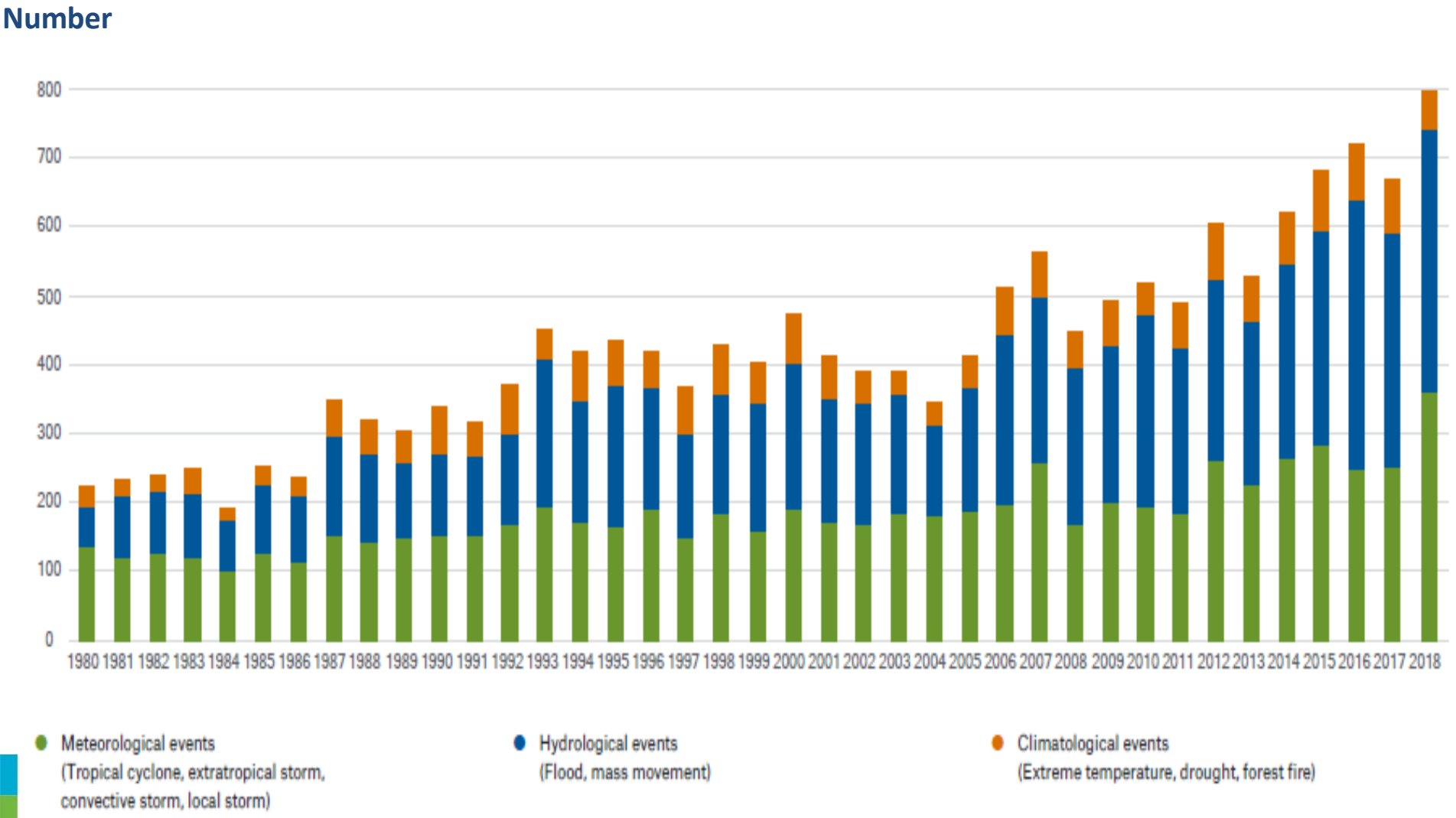
Loss events worldwide 1980 – 2018



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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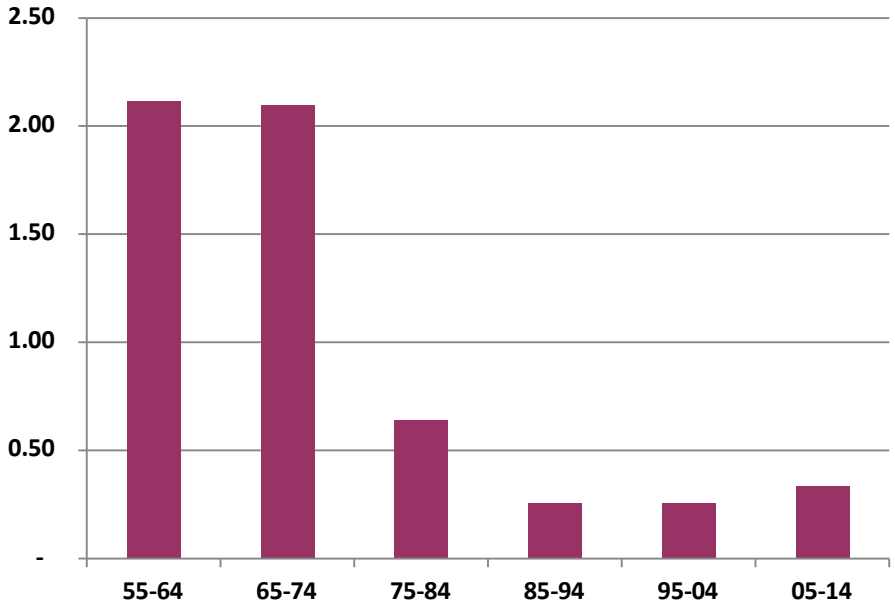
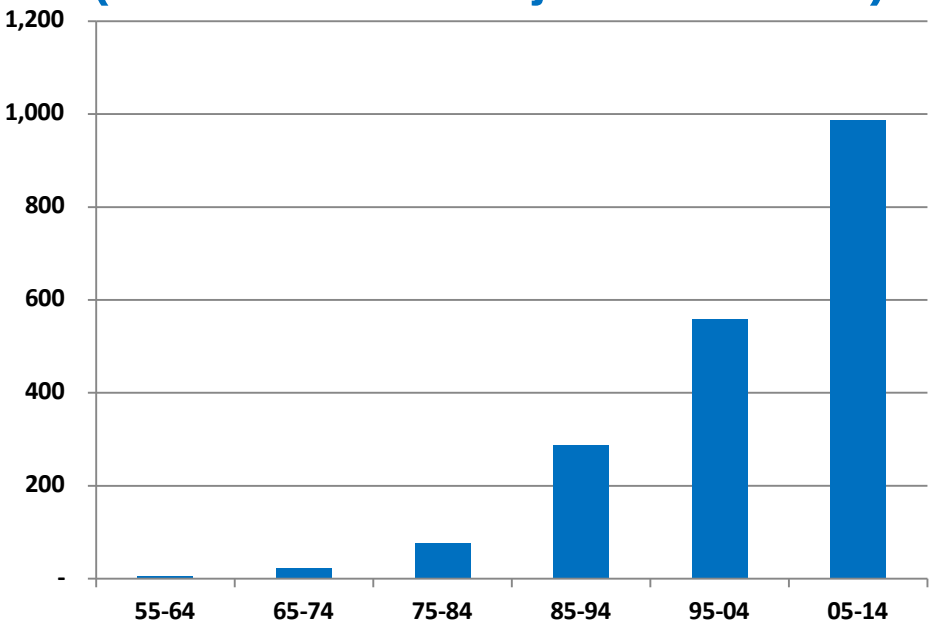
Impacts of hydrometeorological and climatological hazards (1955–2014)

Human losses by decade (millions)



Economic losses by decade (billions of US$ adjusted to 2013)



Reduction of the number of victims thanks to greater effectiveness of early warning systems and prevention measures

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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

GLOBAL CARBON PROJECT

Fate of anthropogenic CO_2 emissions (2007–16)

Sources = **Sinks**

34.4 $GtCO_2$/yr

88%

12%

4.8 $GtCO_2$/yr

17.2 $GtCO_2$/yr

46%

30%

11.0 $GtCO_2$/yr

24%

8.8 $GtCO_2$/yr

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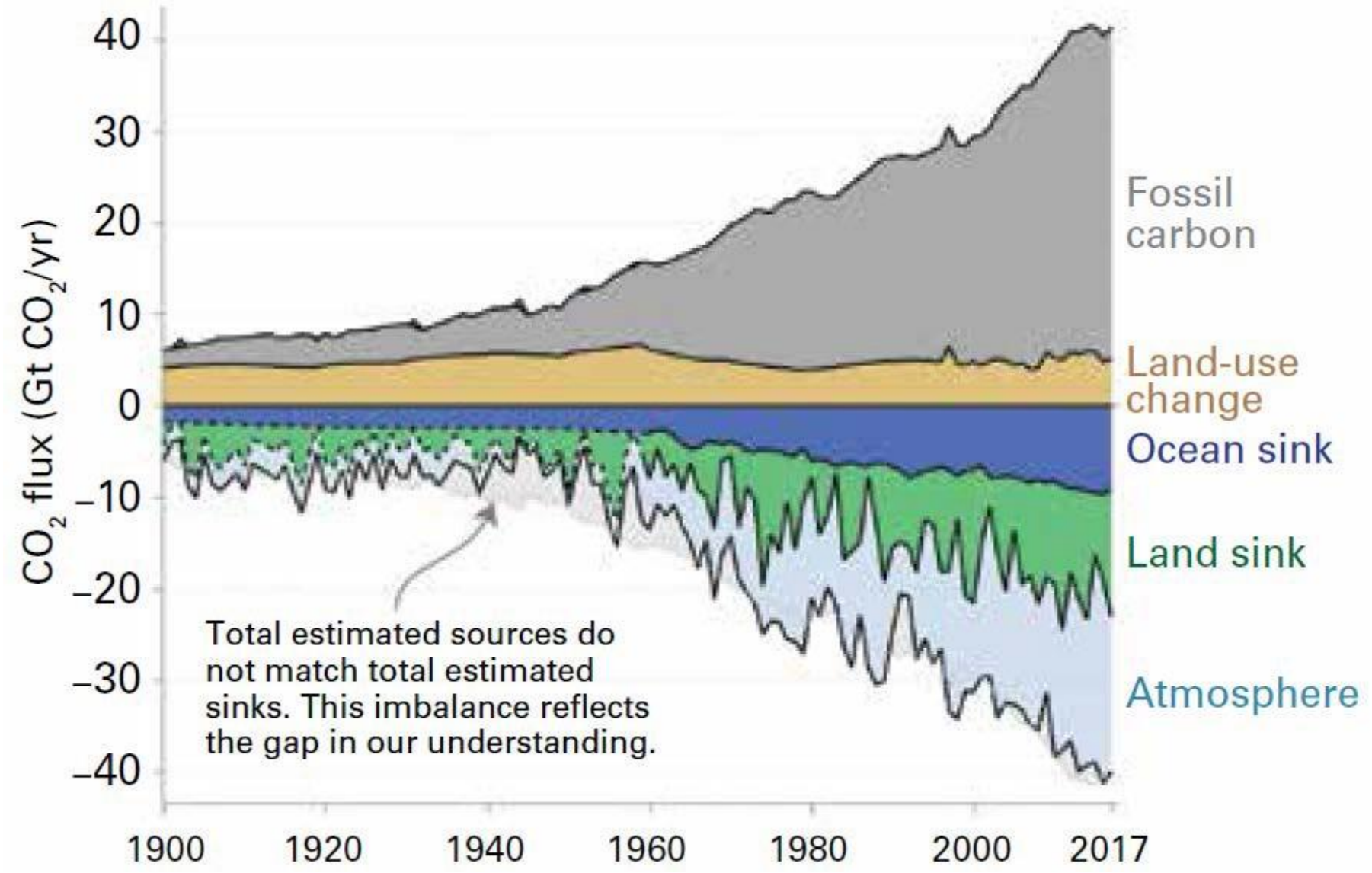
Carbon sinks and sources 1900-2017



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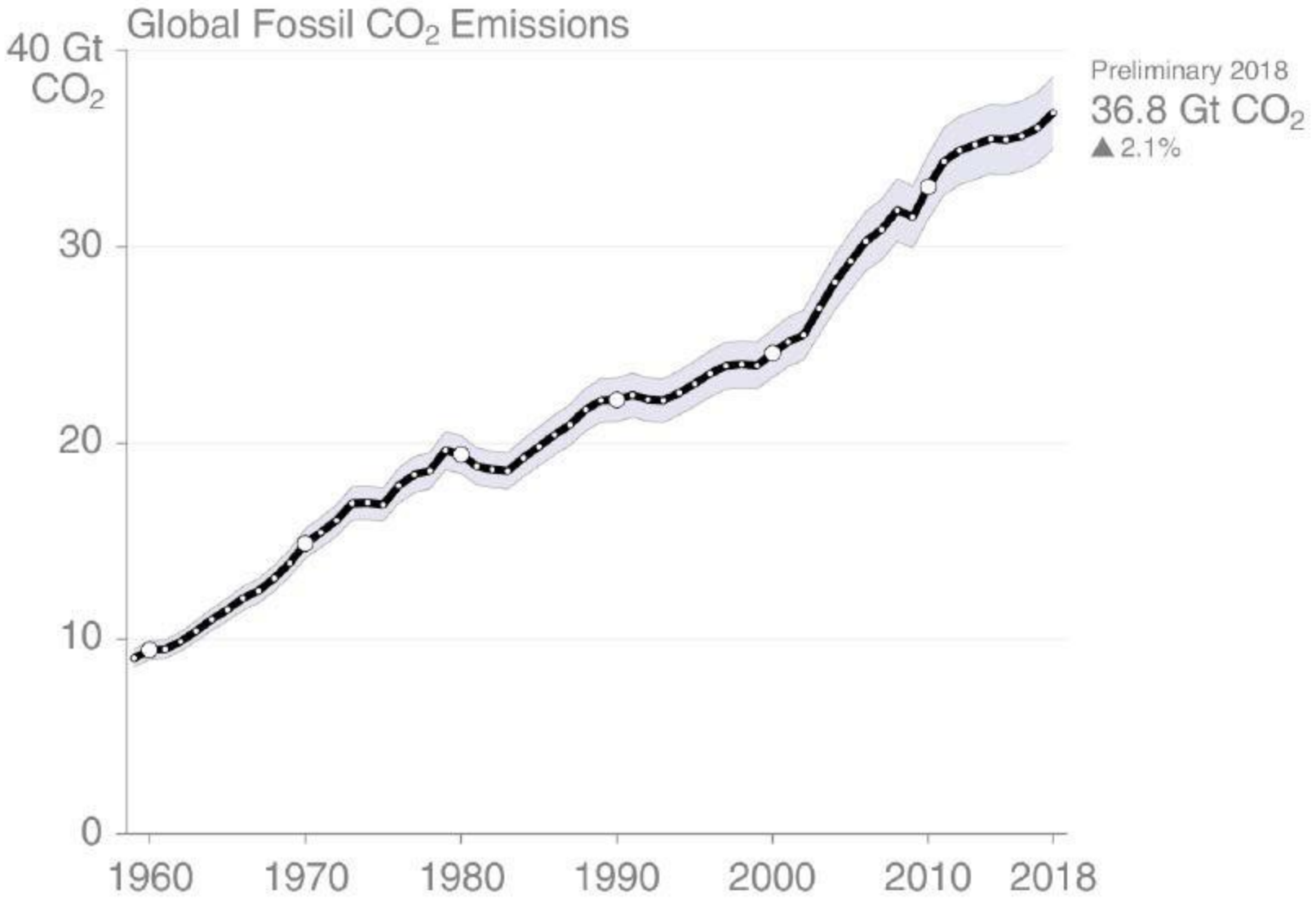
Fossil carbon emissions 1960-2018



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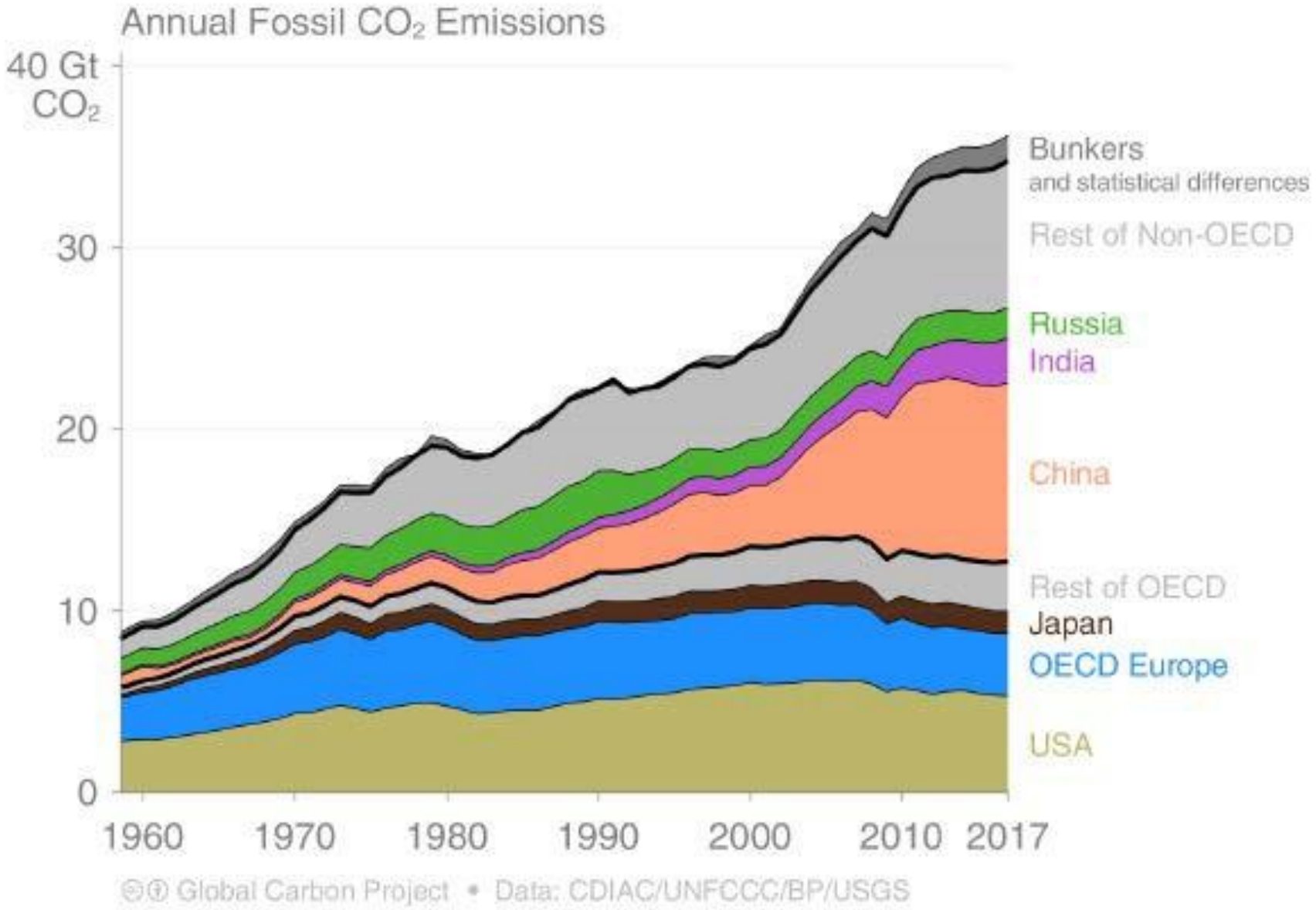
CO_2 emissions 1960-2017



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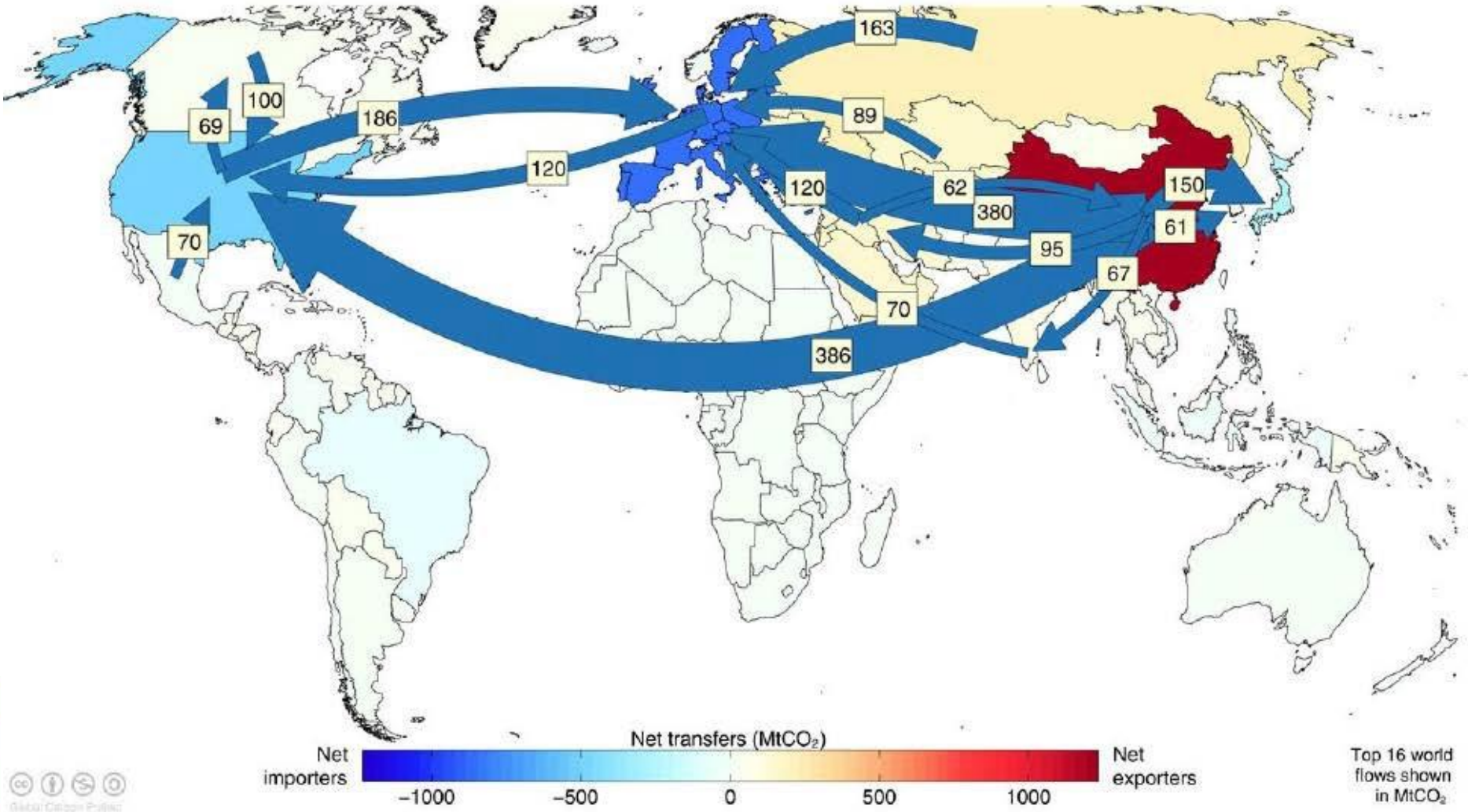
Goods emission flows production/consumption



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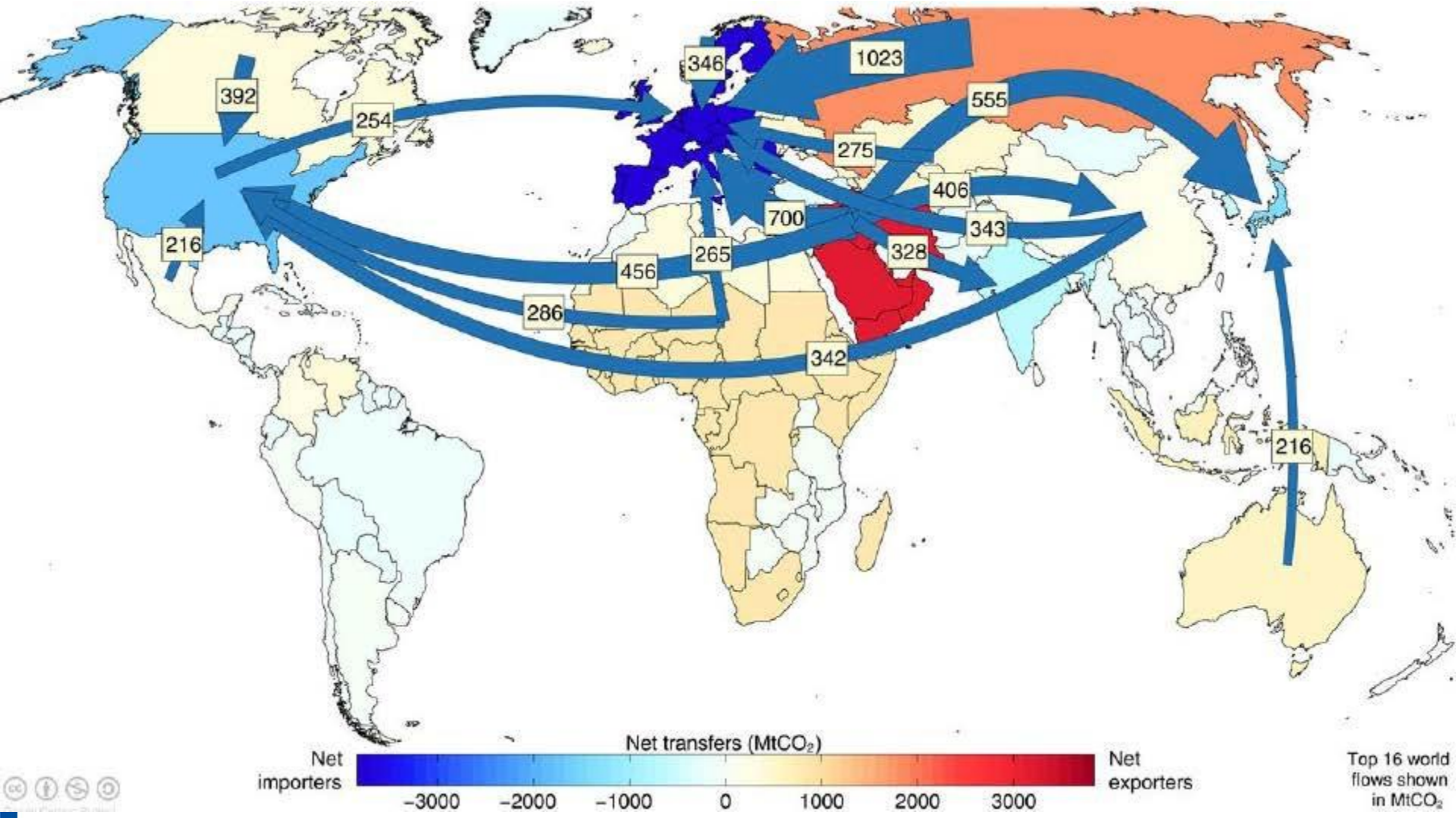
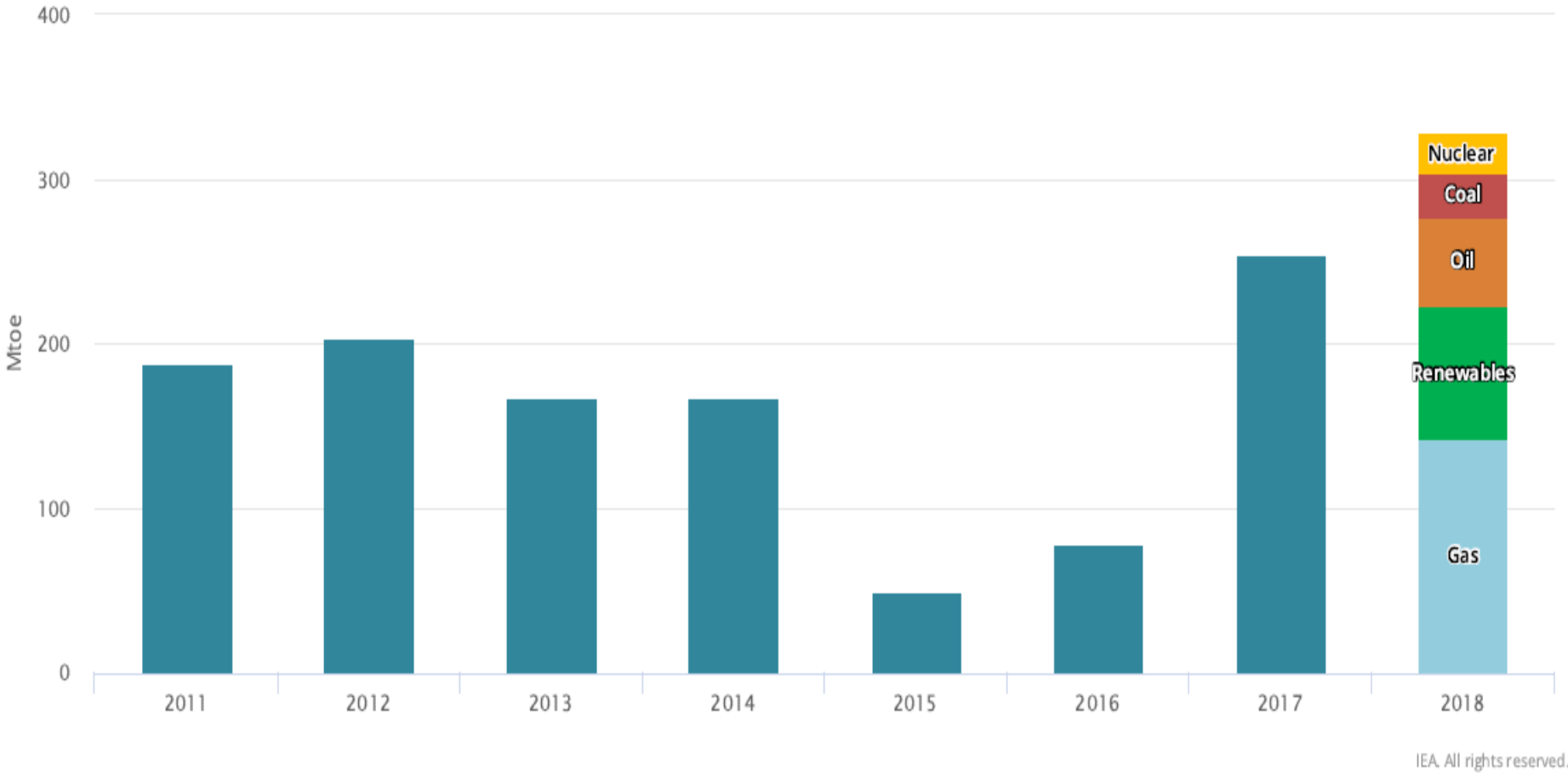
Fossil product flows production/consumption



Change in annual global energy demand 2011-18



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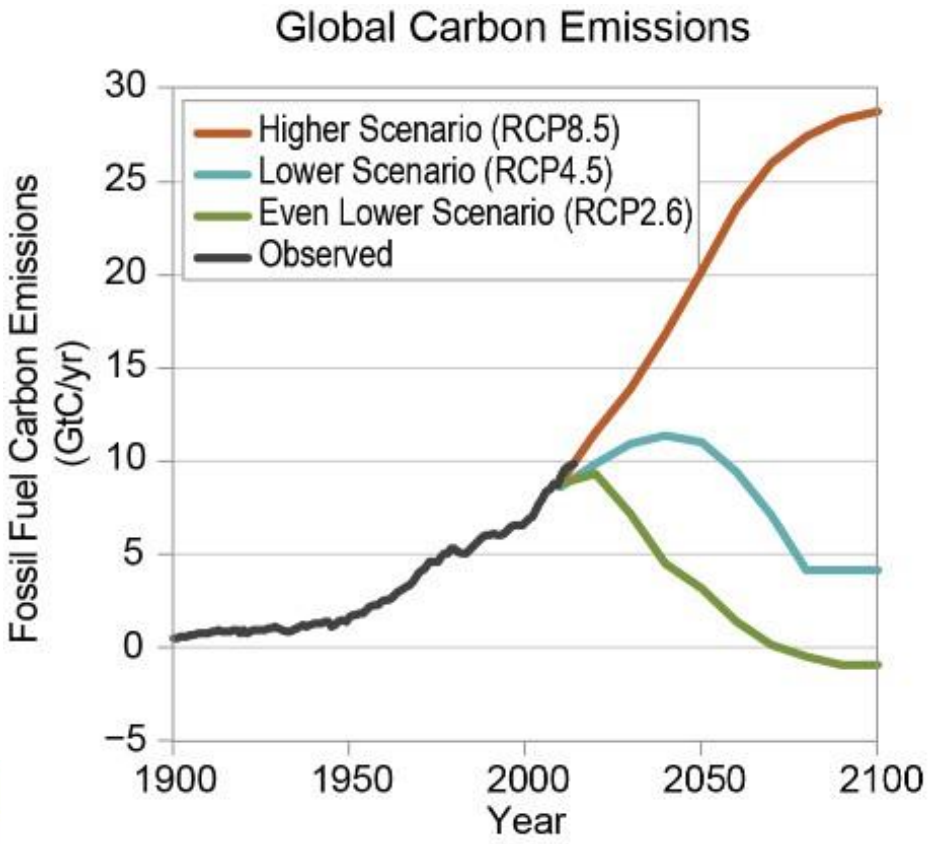
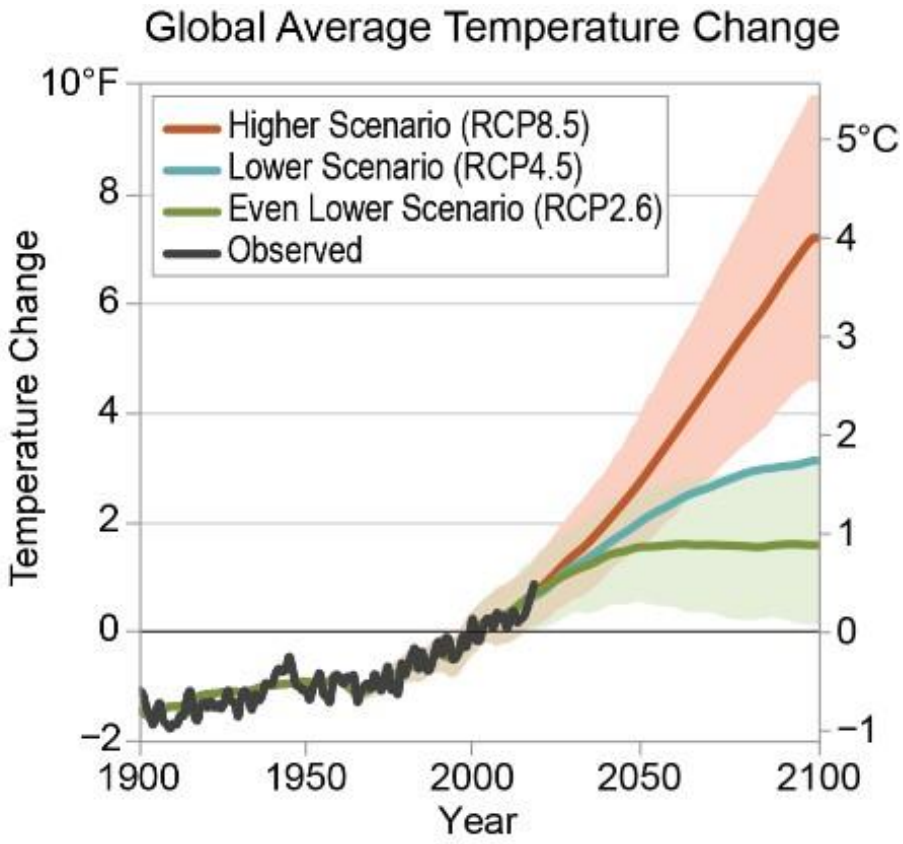
Carbon emissions-temperature





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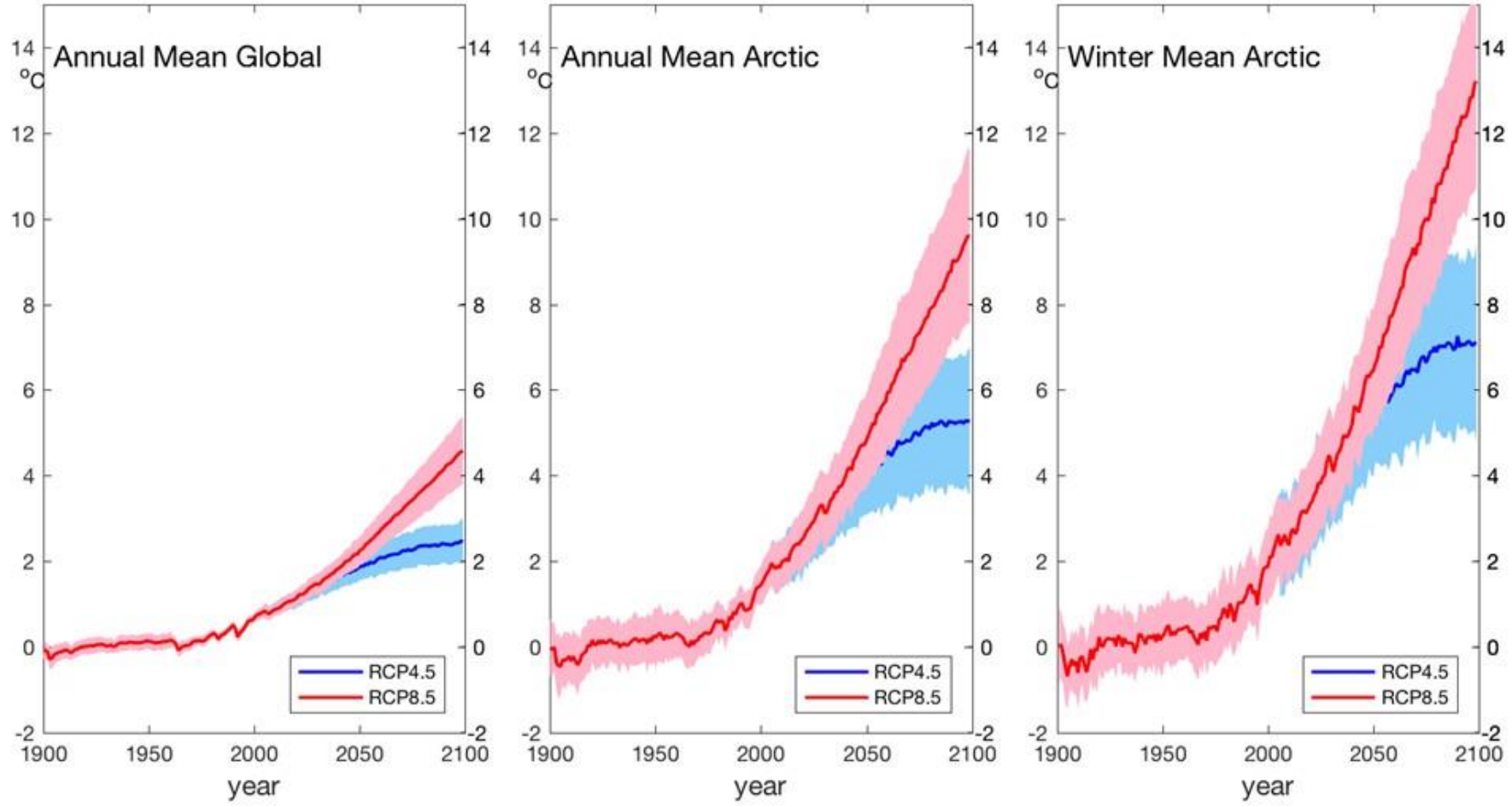
Arctic and global temperatures 1900-2100

Averaged over 36 global climate models
RCP 4.5 (blue)= upper end of Paris COP21 Agreement , RCP 8.5 (red)= business as usual



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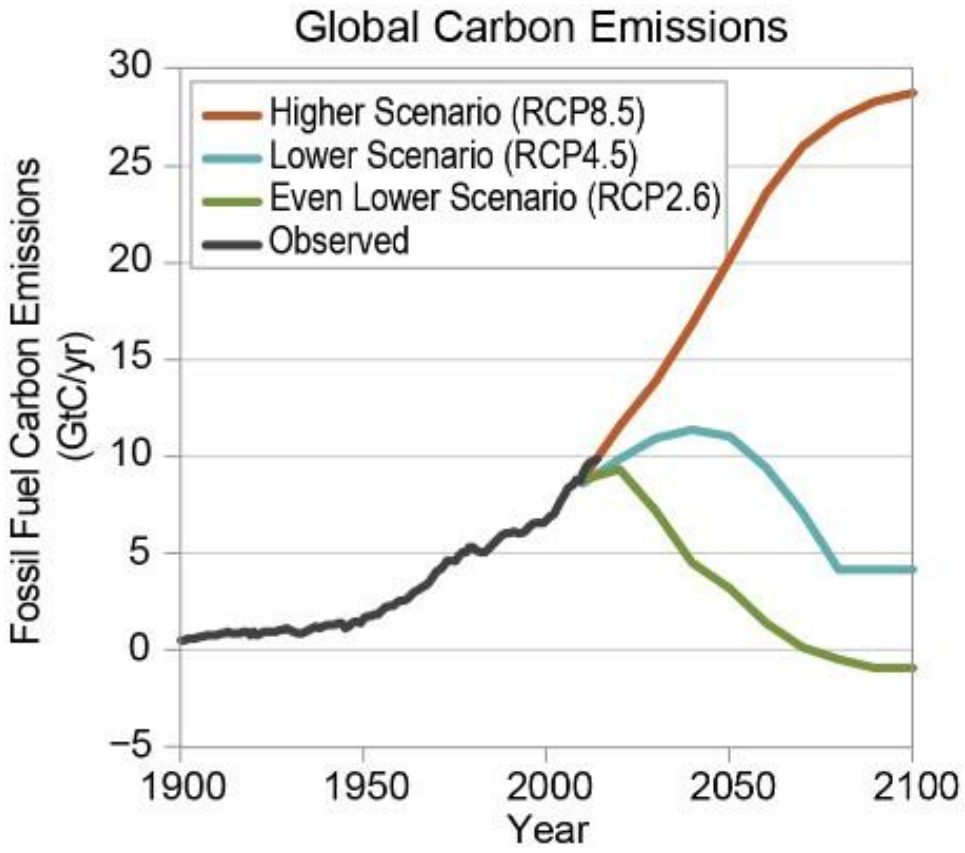
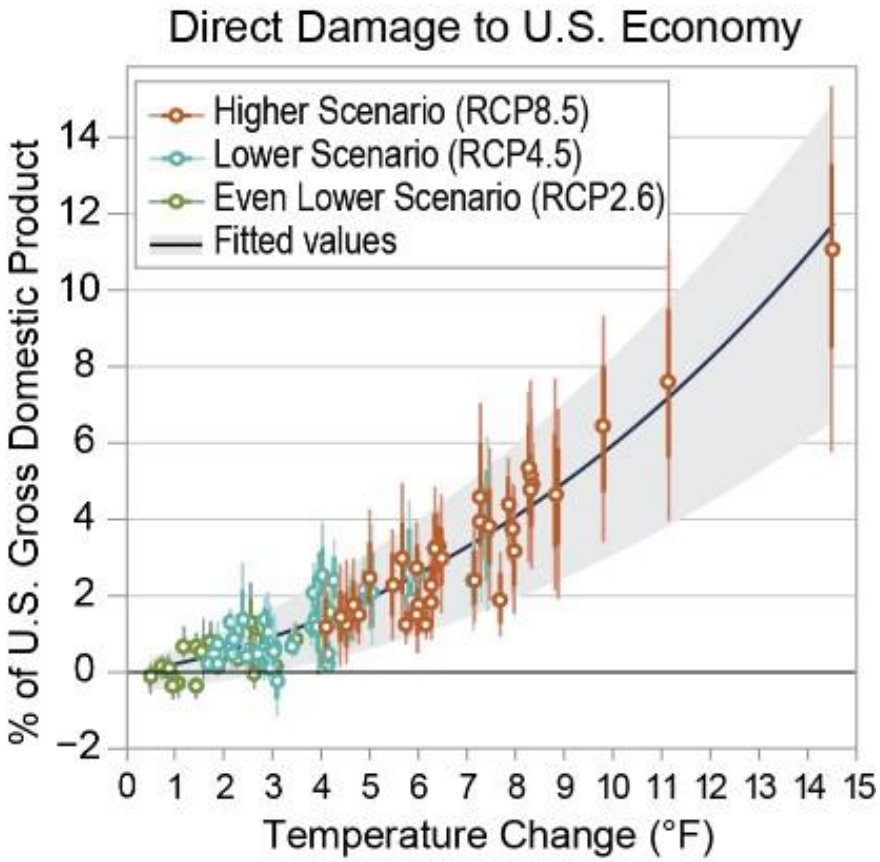
(modified from AMAP/SWIPA2017)

US economy-carbon emissions





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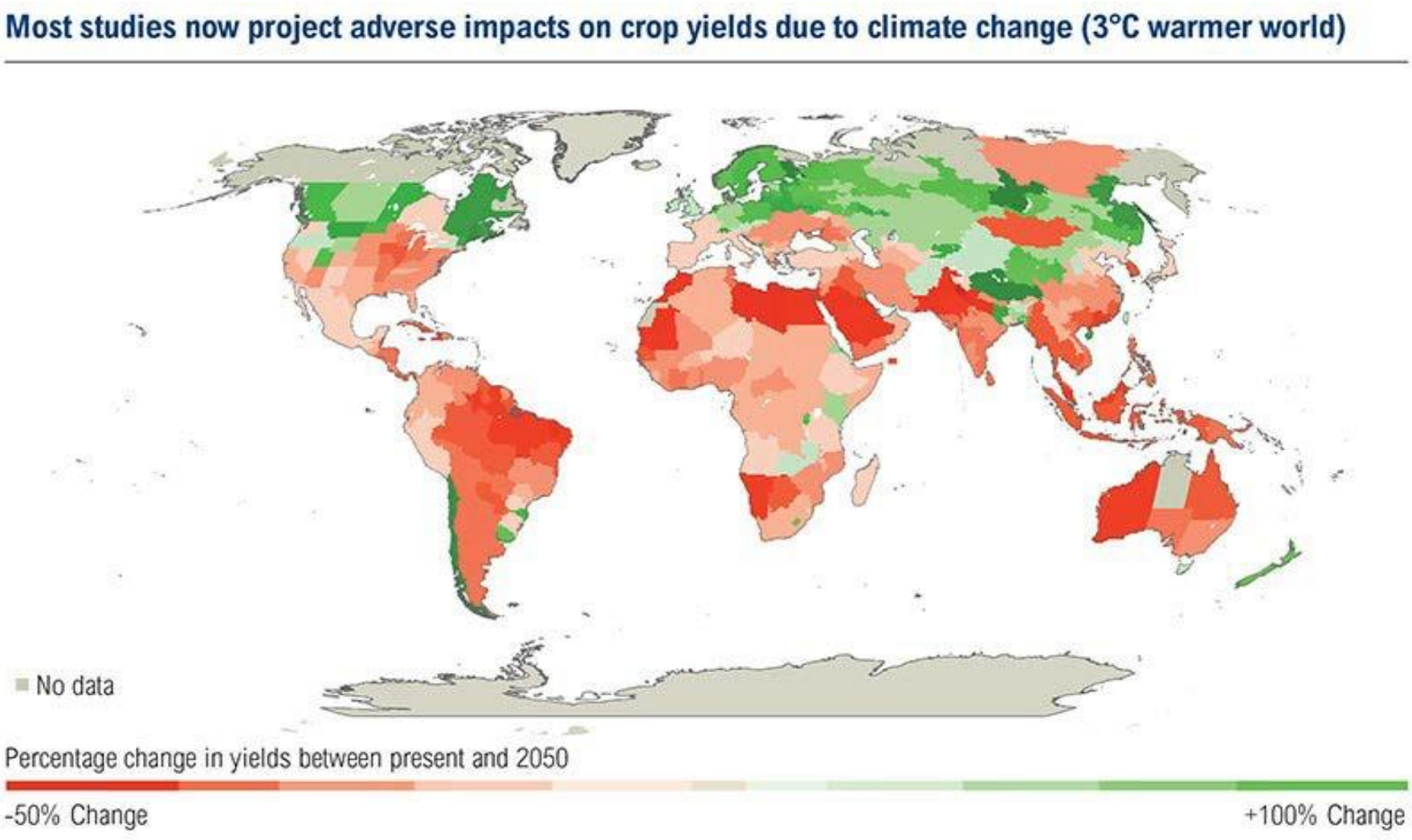
3 C warming major risk for global food security

Loss of crop yield in most parts of the world



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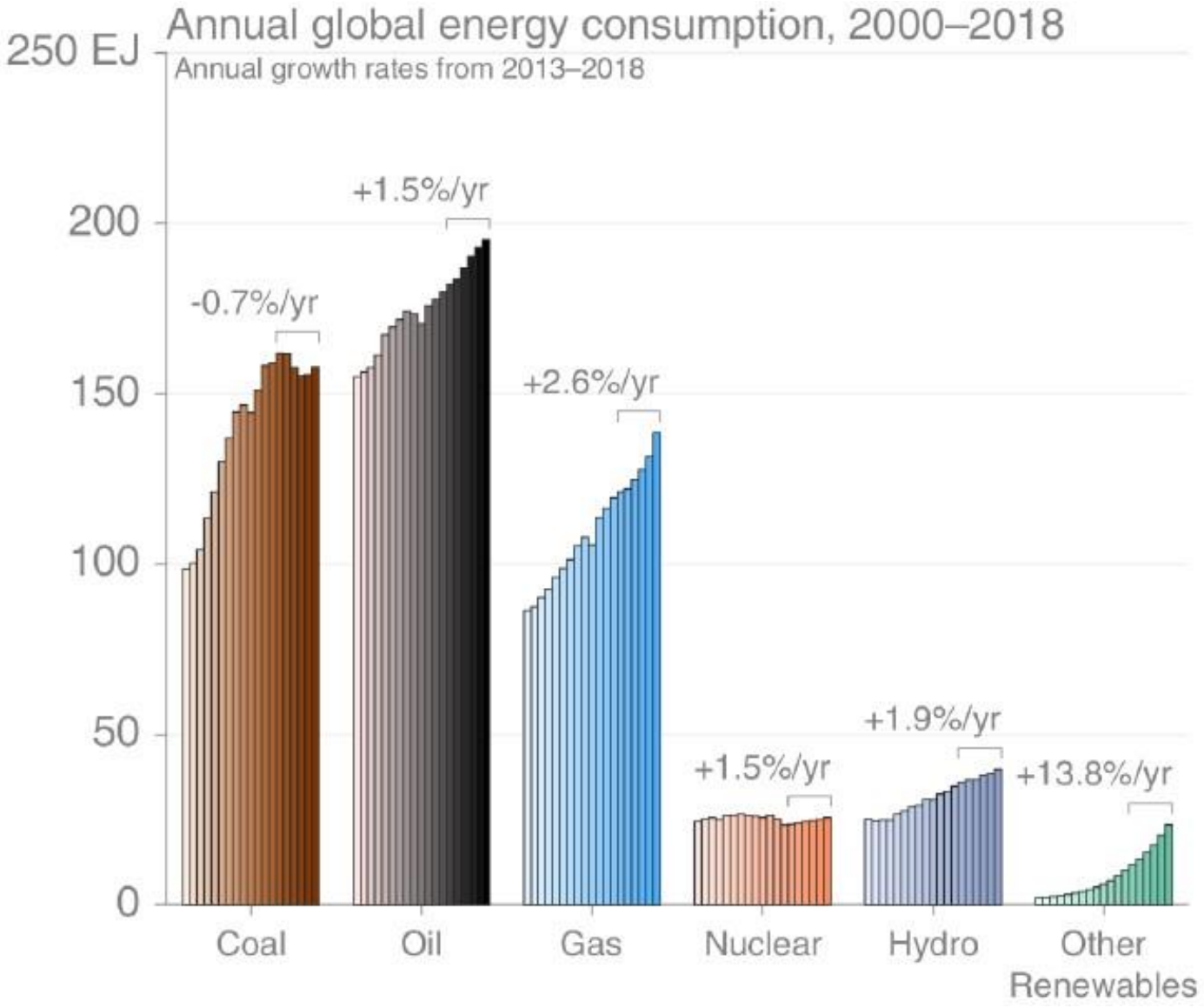
Sources: http://ow.ly/rpfMN

Energy consumption 2000-2018



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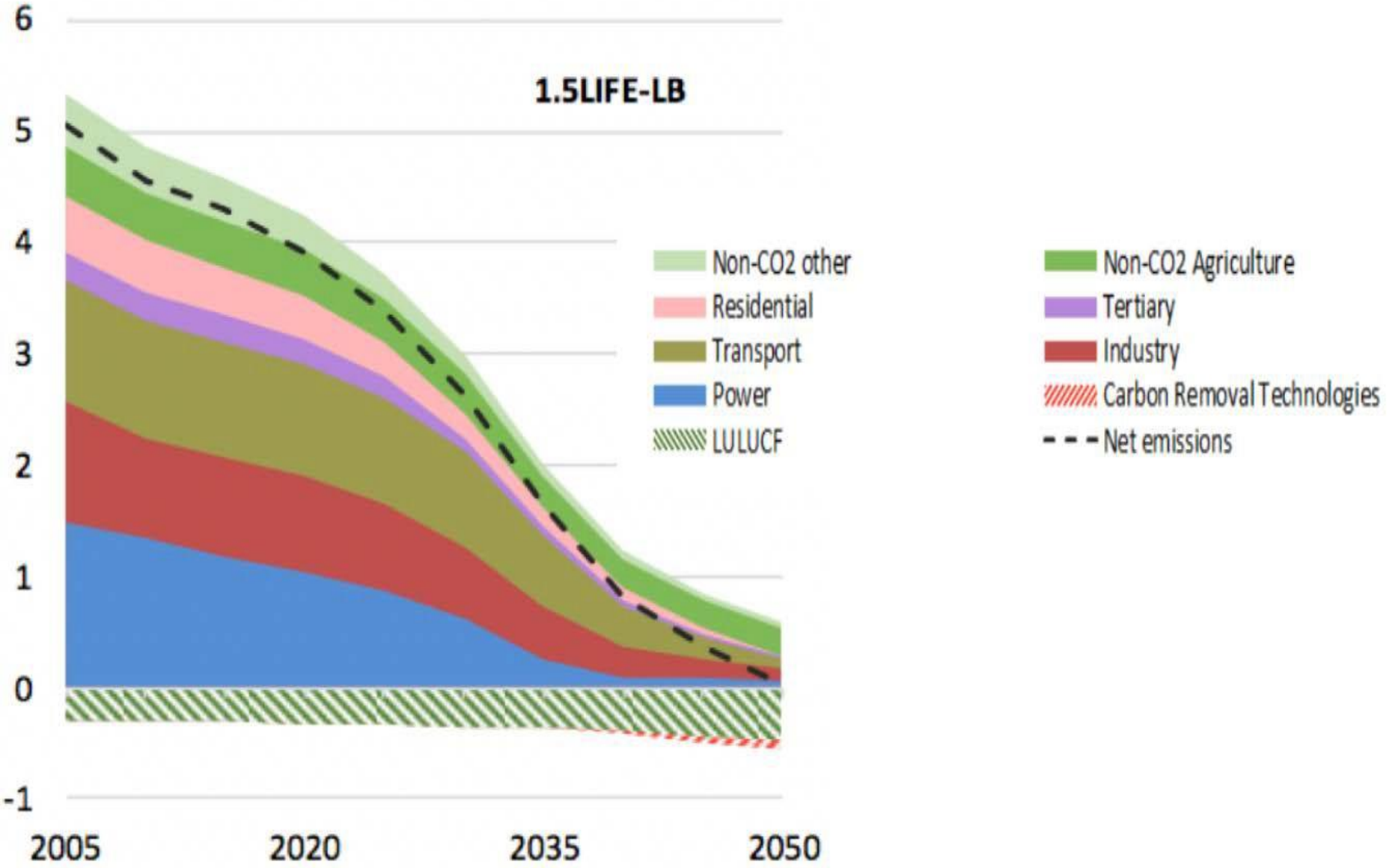
How to be carbon neutral by 2050?



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Climate food for thought

- **Climate is high on the global agenda**: UN, science, disasters, youth, private sector
- **EU has been a key driver** of global mitigation agenda. There is also a trade balance motivation; EU is a fossil energy sparse region, buys it with 260 b€/year
- 27 % of the Climate Action Summit initiatives by EU Countries, 35 % European. Russia ratified Paris Agreement.
- US states/cities & private sector are active. No new initiatives by India nor China.
- There is a risk for a **stagnation of the Paris Agreement implementation**. Further implementation should be agreed at COP-26 late 2020 in UK.

Climate food for thought

- Climate Action Summit/Scientific Advisory Group:
  - Possibility to **engage also Ministers for Finance, Transpport, Trade & Industry** in the COP process?
  - Possibility to offer **mitigation planning support** for UN Members?

- **Adaptation** is also important; e.g. investments in impact-based multi-hazard early warning services. The negative trend continues until 2060's at least.

- Consumer interest growing: **carbon footprint of the goods**?

- **More than 5 % of global GDP is spent on fossil energy subsidies**; the climate problem could be solved with a fraction of that.

- African **population growth** a challenge for African countries & Europe

- **Political acceptance** of mitigation means is a challenge for most governments

Ilmastonmuutos/Suomi

- Keskustelu “ylikierroksilla”, tarve **erottaa oleellinen epäoleellisesta**, globaali perspektiivi myös tärkeää. Koko maailman, ja myös Suomen tärkein kysymys on **fossilienergiasta luopuminen**: öljy, kaasu, kivihiili ja turve.

- Metsänieluissa suurin haaste on **trooppinen metsäkato**. Euroopassa suurin **metsänielujen lisäpotentiaali on entisissä kommunistimaissa**. Jos Suomen metsien hyötykäyttö vähenee, väheneekö ao. tuotteiden kysyntä?

- Pitkällä tähtäimellä eräs ilmastonmuutoksen avainkysymyksiä on **kyky tuottaa ravintoa kasvavalle väestölle. Suomen huoltovarmuus/omavaraisuus?**

- Suomessa kannattaa pohtia myös **Suomen taloudellisia etuja** suhteessa EU-politiikkaan ja Pariisin sopimuksen toimeenpanoon. 1.5 C on erittäin kunnianhimoinen tavoite, samoin 2.0 C. Pariisin sitoumukset tarkoittavat noin 3 astetta, eikä niidenkään toimeenpano ole edennyt odotetusti.

- **Ulko-, kehitys- ja kauppapolitiikan rooli?**

Keinojen poliittinen hyväksyttävyys

- Kuluttajia kiinnostavat **win-win ratkaisut**: kustannukset, terveys & hyvä mieli
- Investoijat odottavat **vakaita pitkän aikavälin perspektiiviejä**: energia, teollisuus, metsä- ja maatalous
- Liikenteessä **sähköistyminen, biokaasu, biodiesel, kevyt liikenne & raiteet**
- Energiassa **tuuli, aurinko, vesivoima, bioenergia, ydinvoima & energian säästö/talteenotto**
- Ruokavaliossa **kasvisten, kalan ja riistan suosiminen** terveydellisistä ja maailman ravintotalouden motiiveilla
- Rakentamisessa **puurakenteet** betonia ja terästä korvaamassa, energiatehokkuus
- Uudet **businessmahdollisuudet** (vs. hevosvaunuista autoihin 100 v sitten)
- **Poliittinen hyväksyttävyys** herkkä asia; ~Keltaliiviliike, populistit

Thank you
Gracias
Merci
Спасибо
谢谢

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