A PRESENTATION OF CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT

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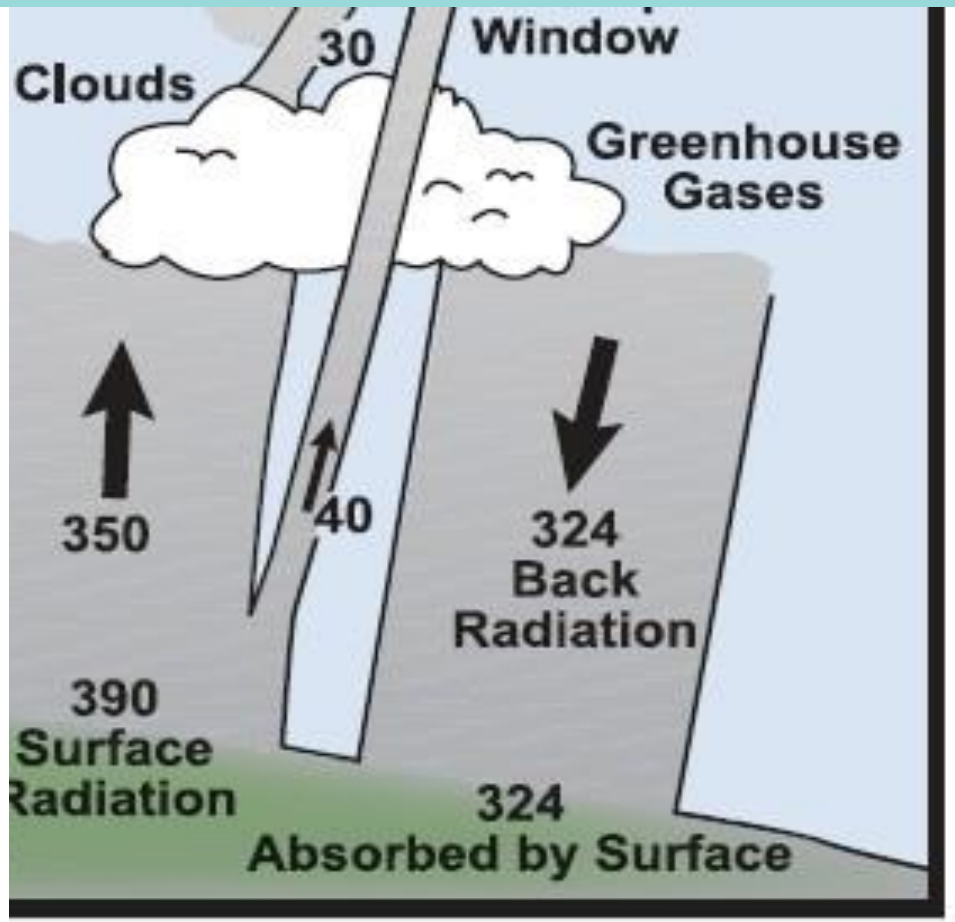
Climate change

– refers to any significant change in the measures of climate lasting for an extended period of time (i.e., decades to millions of years).

– climate change (CC) includes major changes in temperature, precipitation, or wind patterns, among other effects, that occur over several decades or longer



Climate Change Skepticism

‘Climate change is a natural phenomenon’

“Climate change is a natural phenomenon that has occurred many times in the past”

“the warming.. is likely to do more good than harm.”

‘This has been the worst winter in years…and they talk about global warming!’

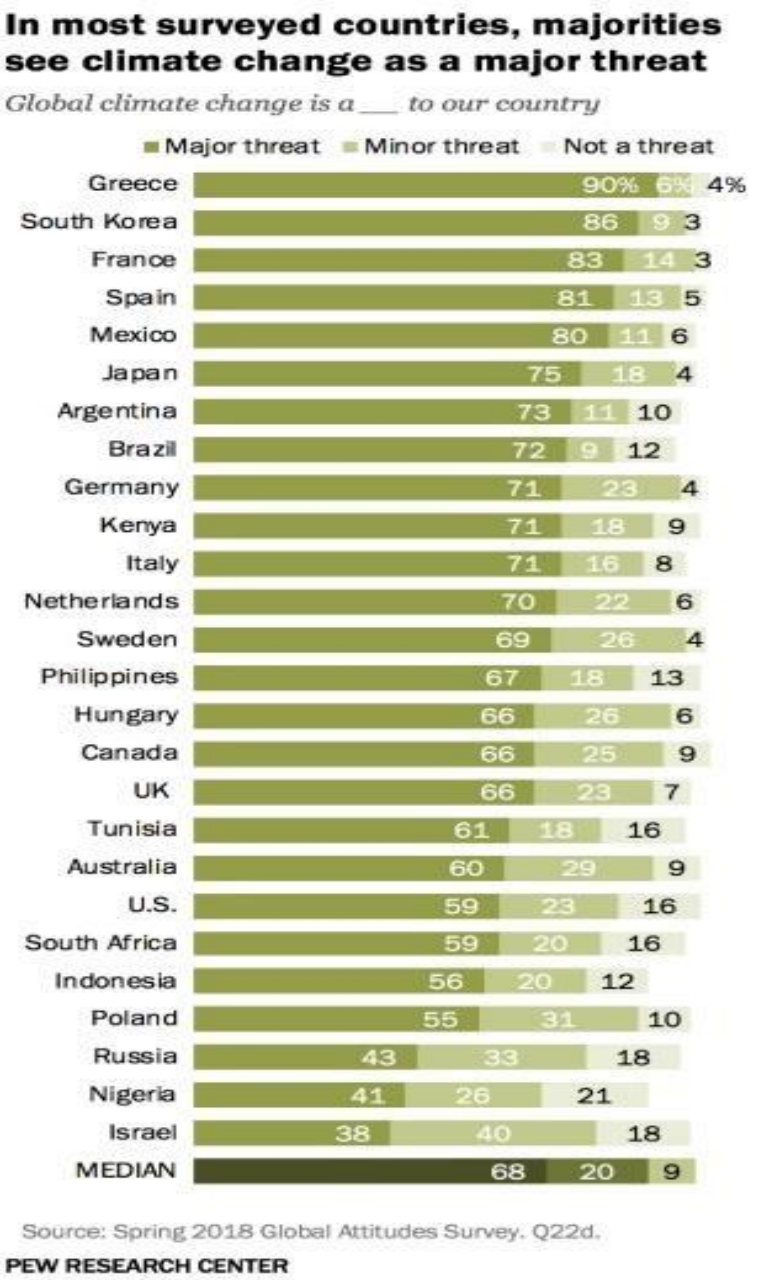
‘Our climate is very unpredictable’

‘Models are unreliable’

‘Humans are too insignificant to affect global climate’

‘CO_2 limits will harm the economy’

‘Future climate cannot be predicted by computers’



Climate Change Skepticism

Climate change Skepticism is holding of doubts about climate change (due to humans)

Type of skepticism arguments

- Conspiracy theories
- Fake experts
- Impossible expectations
- Misrepresentations and logical fallacies
- Cherry picking

The types are either relating to doubts about

- the status of climate change as a scientific and physical phenomenon - **Epistemic skepticism** or
- the efficacy of action taken to address climate change - **Response skepticism.**

CNN politics

Two former Trump officials to be investigated for posting papers denying climate change

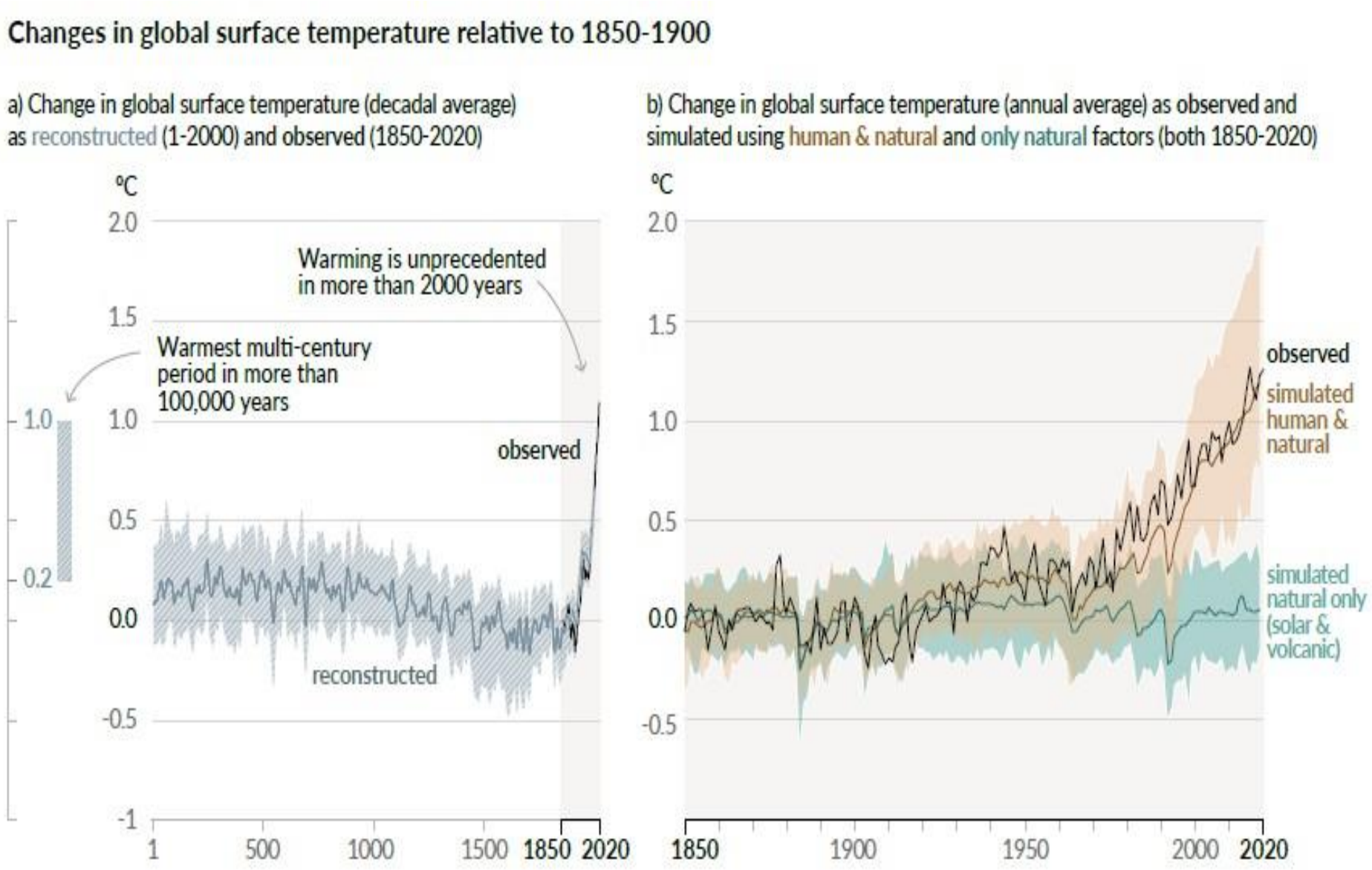
By Daniella Diaz, CNN

Updated 0021 GMT (0821 HKT) January 24, 2021

David Legates is pictured.

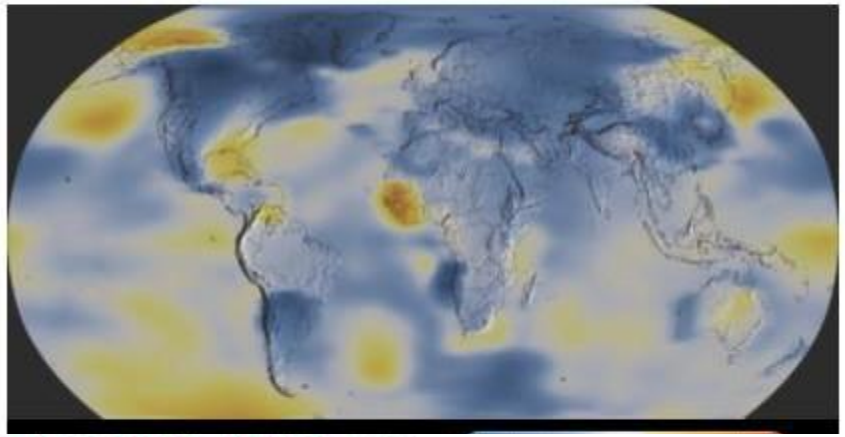
(CNN) — The Commerce Department's Office of Inspector General said it will investigate how two former Trump officials posted dubious papers questioning man-made climate change using government logos but without the approval of the Trump administration.

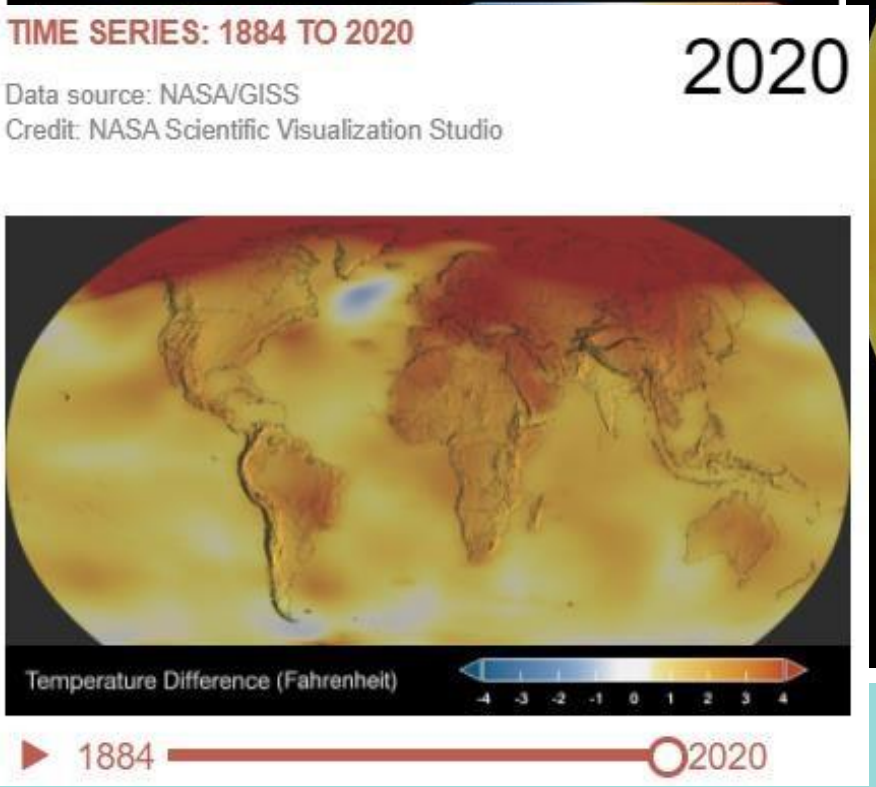
Climate warming at unprecedented rate in at least the last 2000 years due to human influence

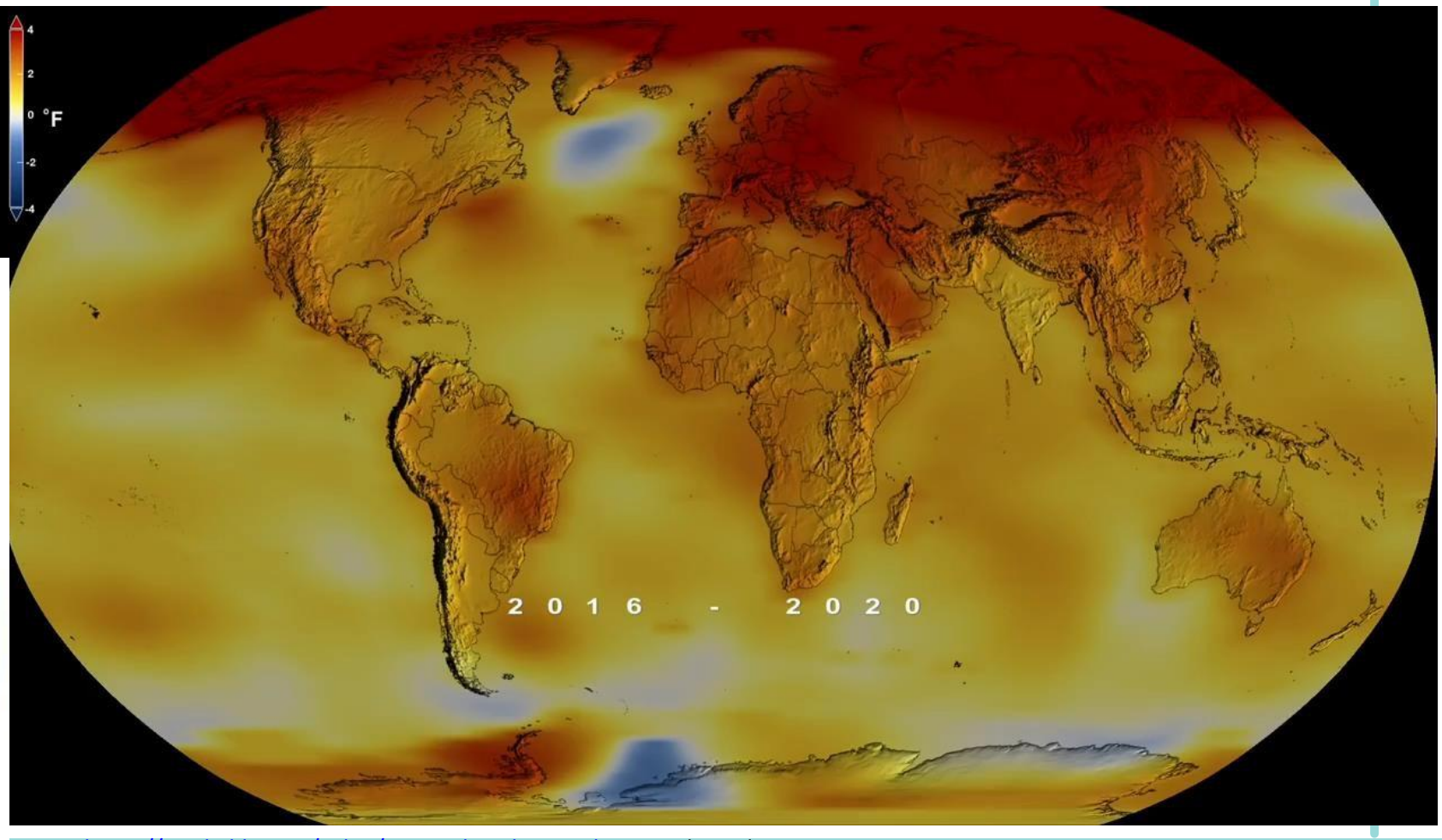


https://www.ipcc.ch/report/ar6/wg1/#FullReport

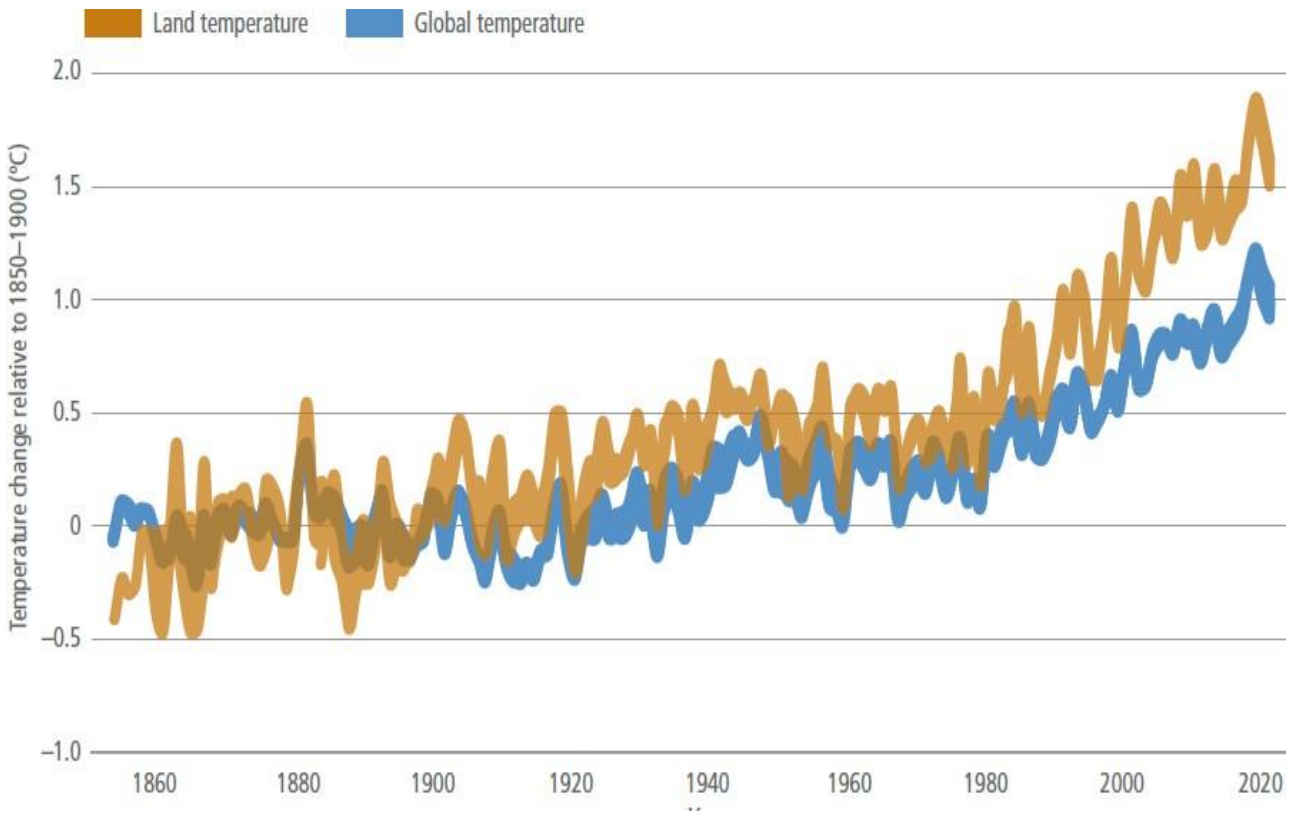
Global Temperature Trend
[1880-2020]





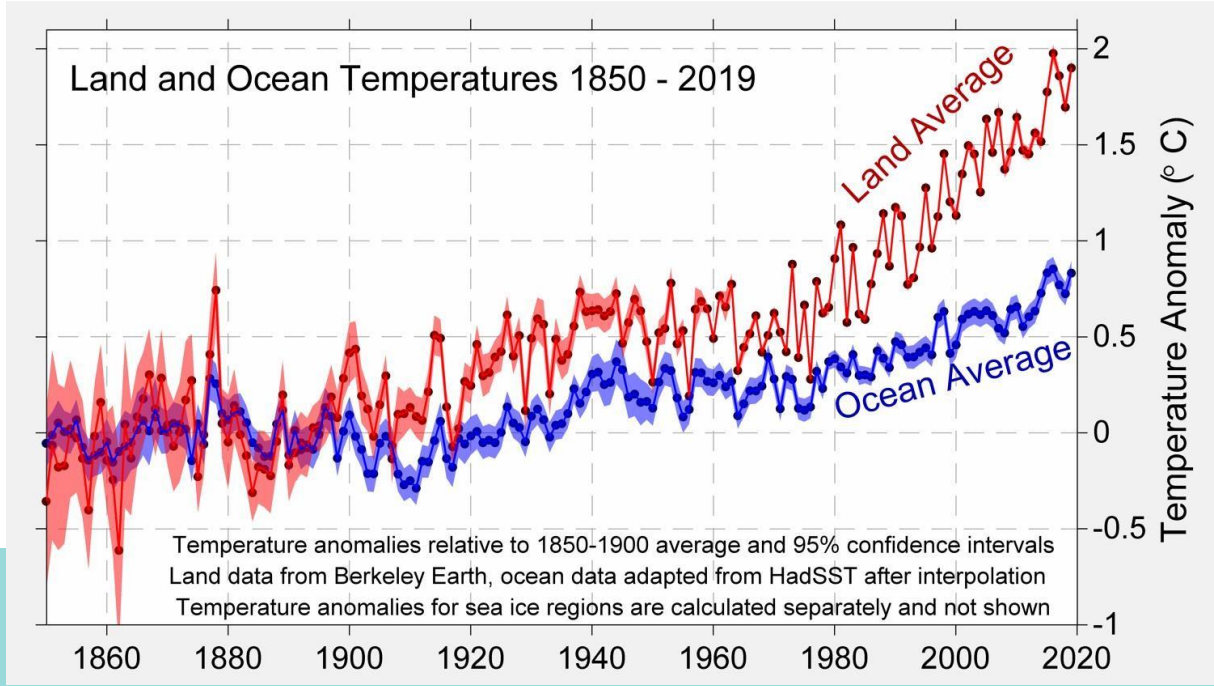


https://mashable.com/video/nasa-video-climate-change, released Jan 2021



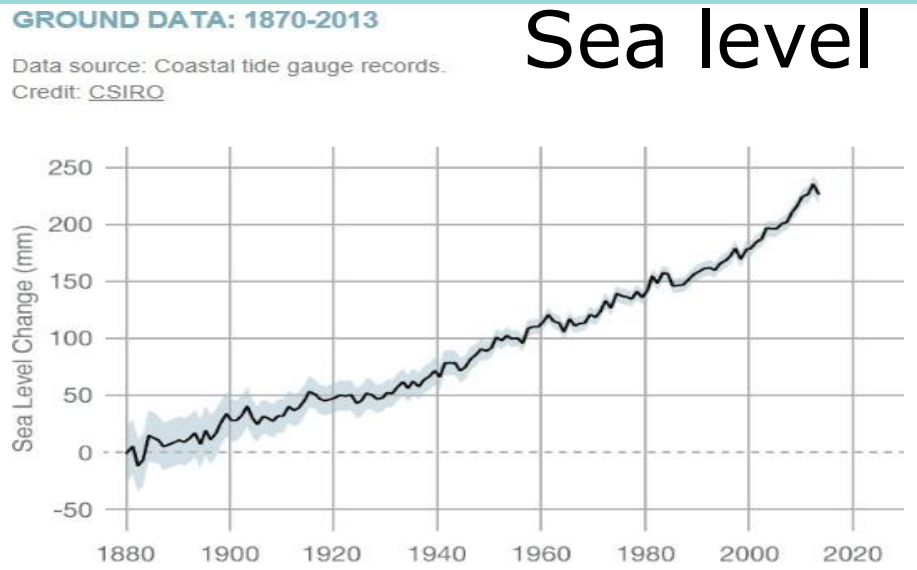
Globally averaged LSAT has risen faster (1.53°C) than the global mean surface temperature (0.87°C) from the preindustrial period (1850–1900) to the present day (1999–2018).

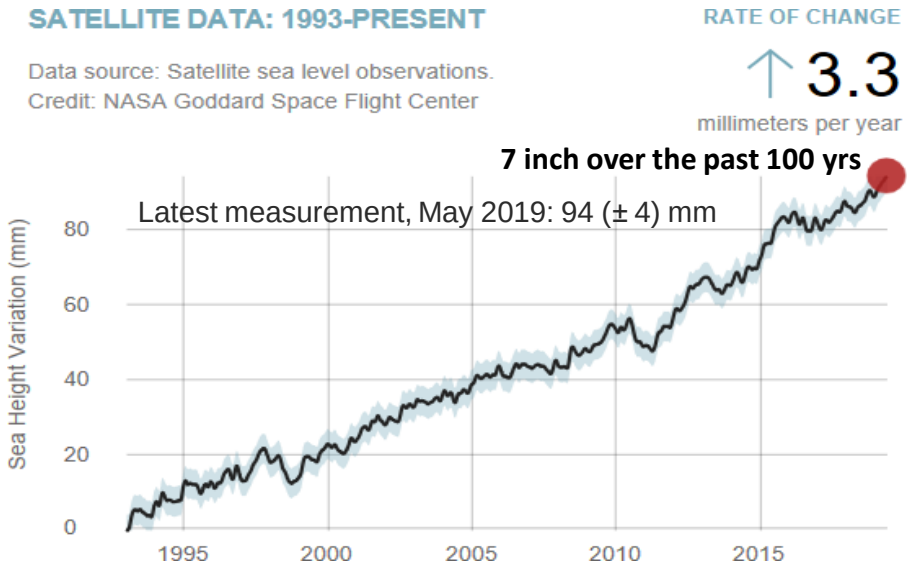
Evolution of land surface air temperature (LSAT), Global mean surface temperature (GMST), and Ocean average

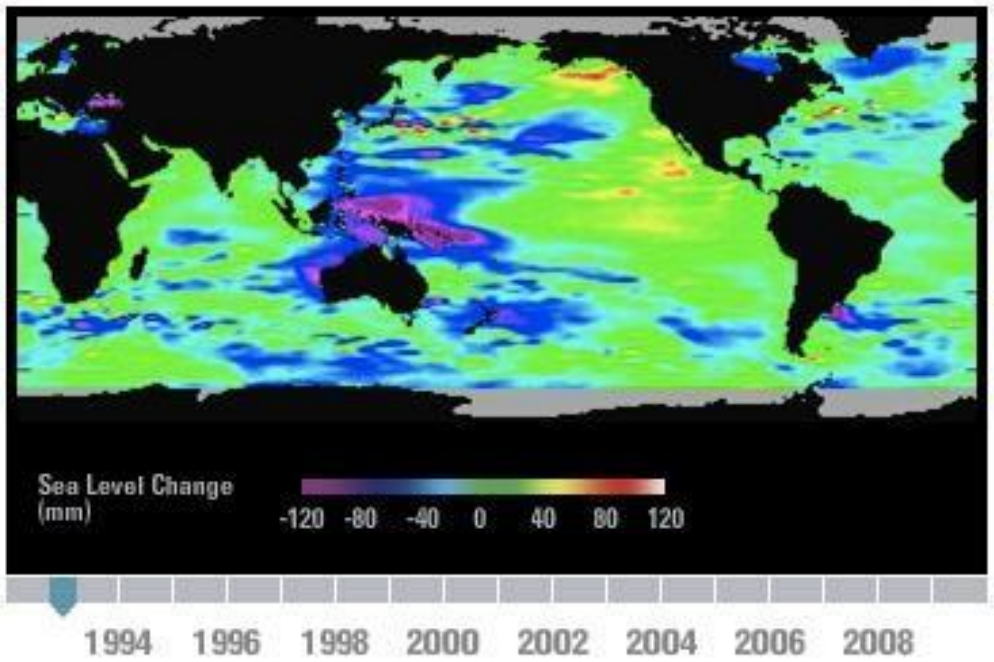


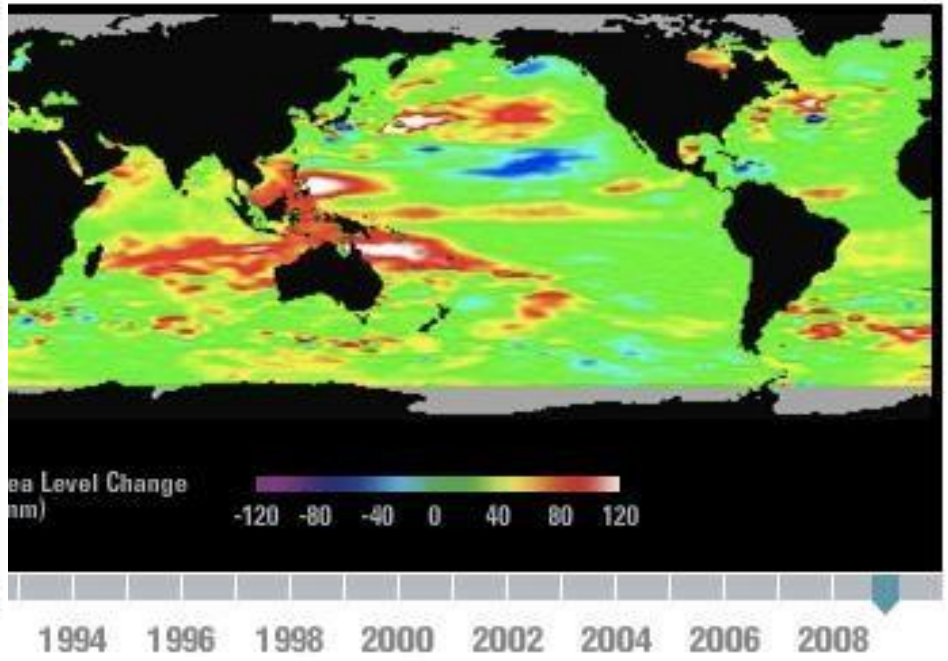
http://berkeleyearth.org/2019-temperatures/

Sea level

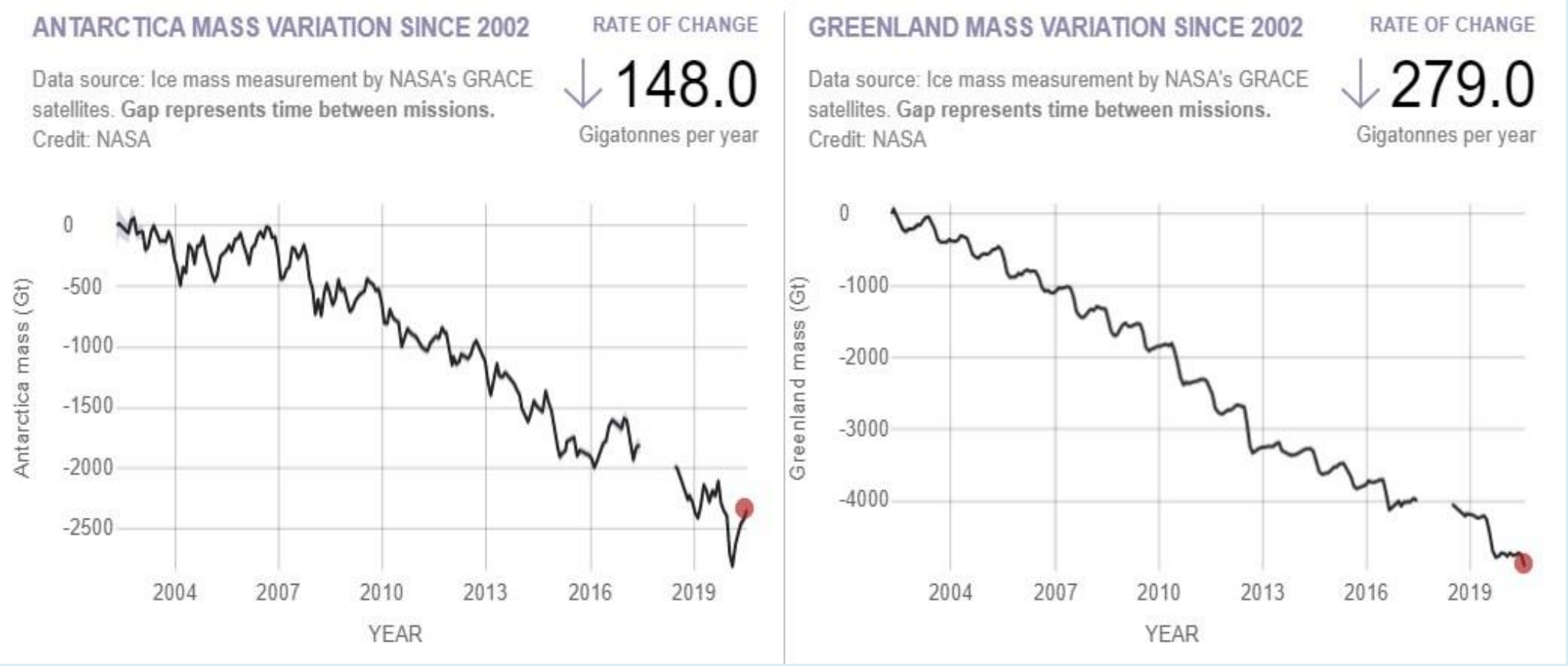

GROUND DATA: 1870-2013
Data source: Coastal tide gauge records.
Credit: CSIRO
Sea Level Change (mm)
250
200
150
100
50
0
-50
1880
1900
1920
1940
1960
1980
2000
2020


SATELLITE DATA: 1993-PRESENT
Data source: Satellite sea level observations.
Credit: NASA Goddard Space Flight Center
RATE OF CHANGE
3.3
millimeters per year
7 inch over the past 100 yrs
Latest measurement, May 2019: 94 (± 4) mm
Sea Height Variation (mm)
80
60
40
20
0
1995
2000
2005
2010
2015

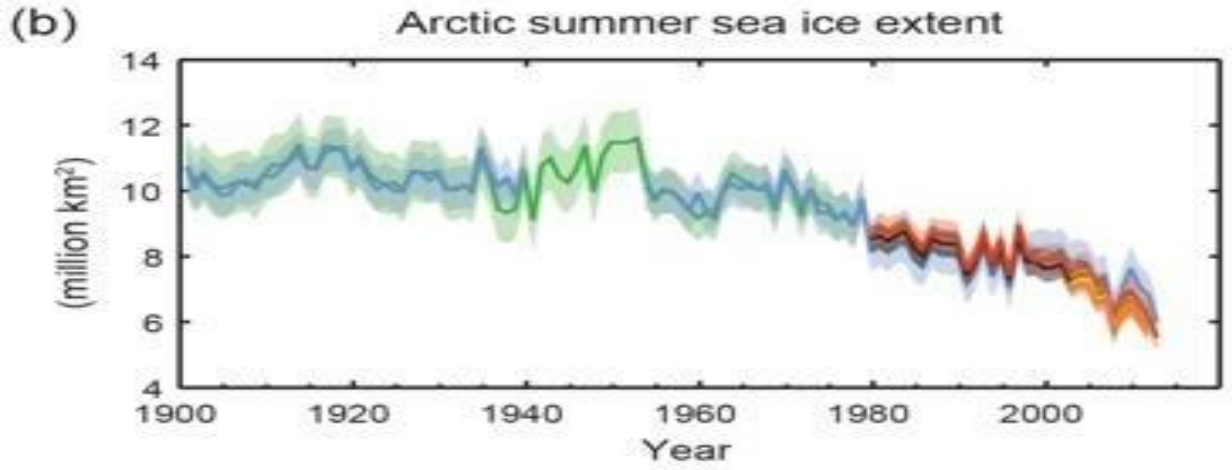

Sea Level Change
(mm)
-120 -80 -40 0 40 80 120
1994 1996 1998 2000 2002 2004 2006 2008


ea Level Change
nm)
-120 -80 -40 0 40 80 120
1994 1996 1998 2000 2002 2004 2006 2008

Ice Sheets


ANTARCTICA MASS VARIATION SINCE 2002
RATE OF CHANGE
Data source: Ice mass measurement by NASA's GRACE satellites. Gap represents time between missions.
Credit: NASA
148.0
Gigatonnes per year
Antarctica mass (Gt)
0
-500
-1000
-1500
-2000
-2500
2004
2007
2010
2013
2016
2019
YEAR
GREENLAND MASS VARIATION SINCE 2002
RATE OF CHANGE
Data source: Ice mass measurement by NASA's GRACE satellites. Gap represents time between missions.
Credit: NASA
279.0
Gigatonnes per year
Greenland mass (Gt)
0
-1000
-2000
-3000
-4000
2004
2007
2010
2013
2016
2019
YEAR

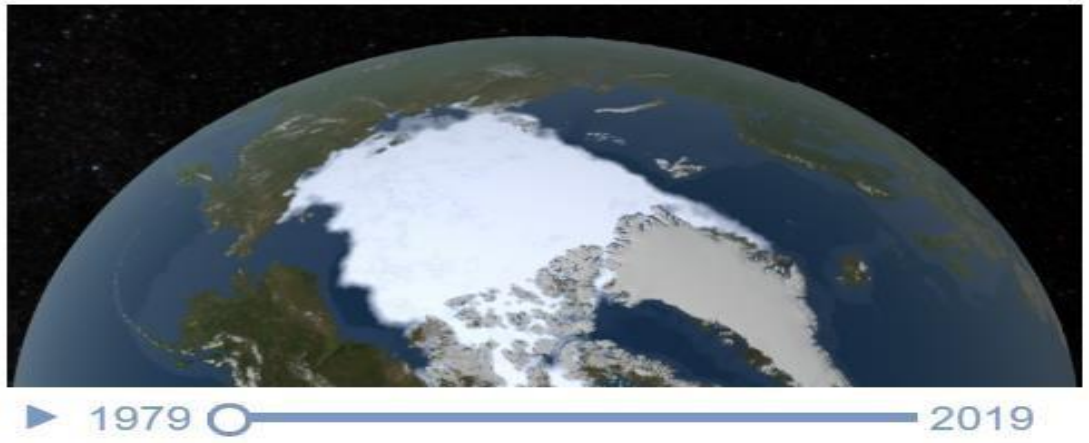
Arctic Sea Ice

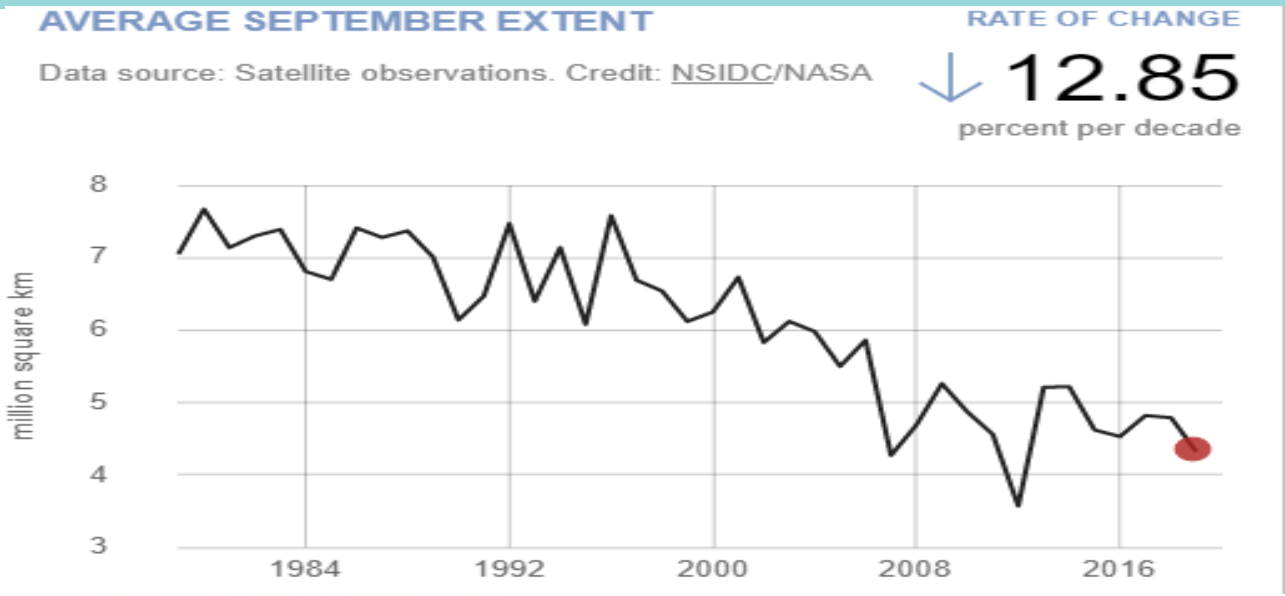


TIME SERIES: 1979-2019

Data source: Satellite observations.
Credit: NASA Scientific Visualization Studio

1979

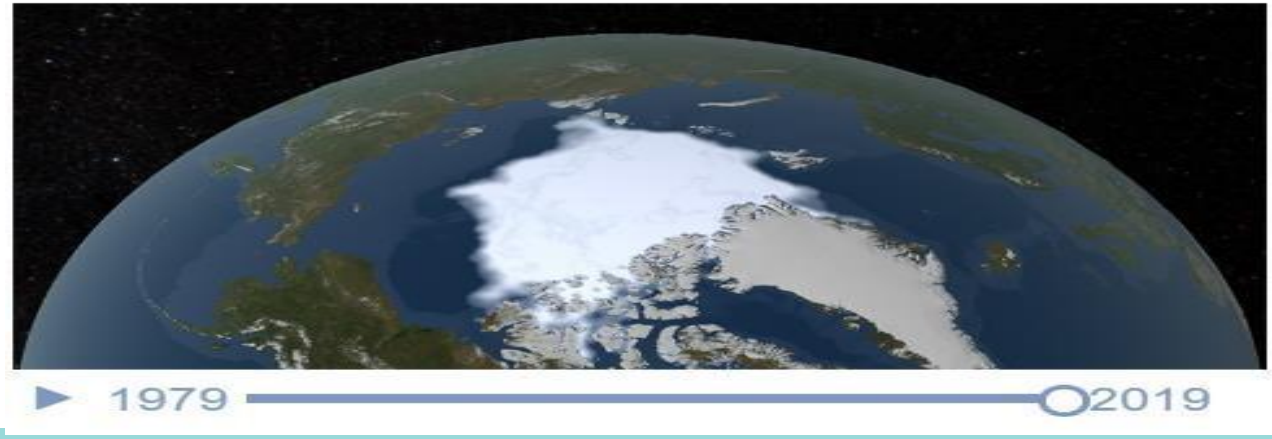




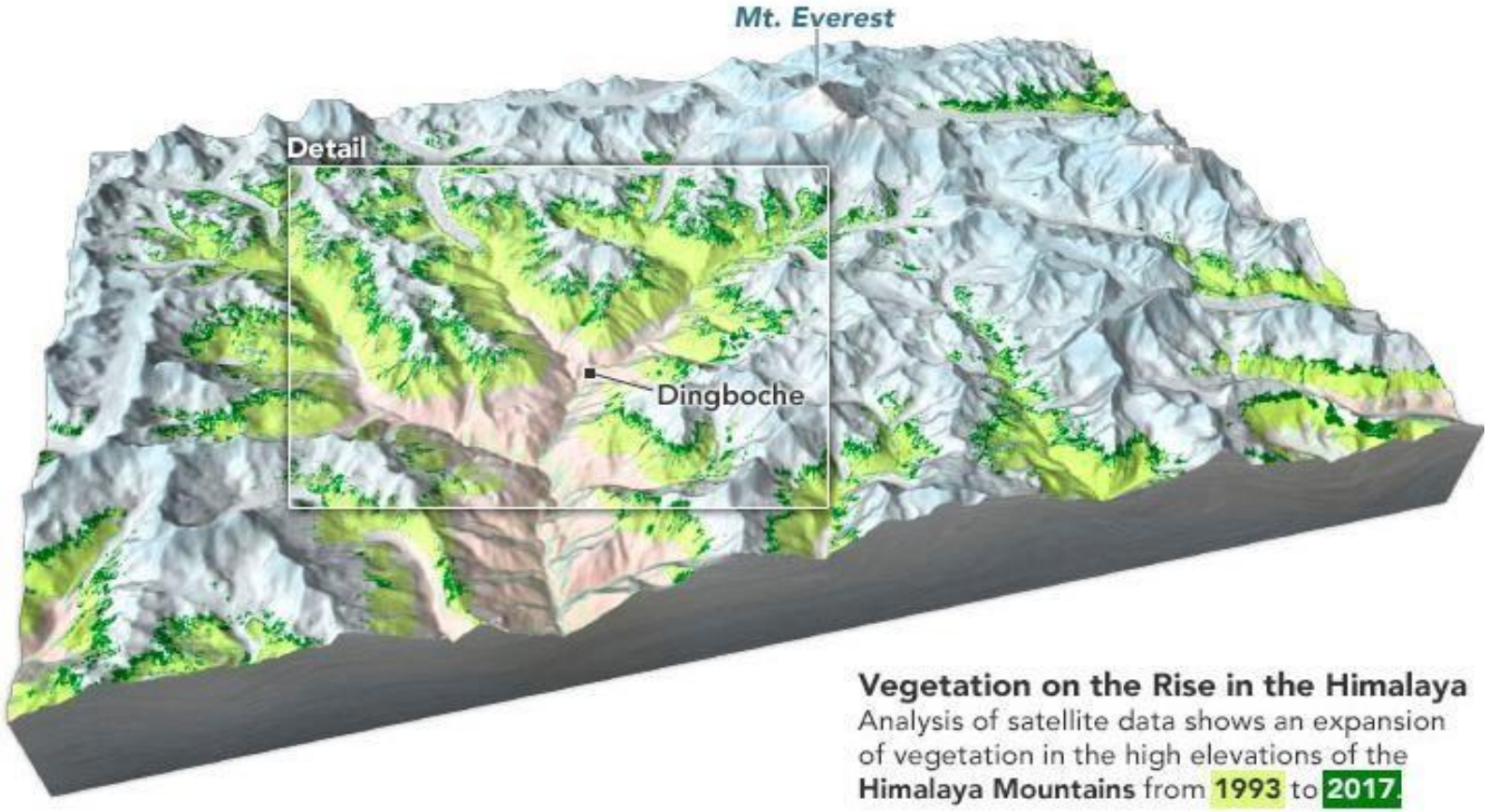
TIME SERIES: 1979-2019

Data source: Satellite observations.
Credit: NASA Scientific Visualization Studio

2019



Ice melting and plant life spreads

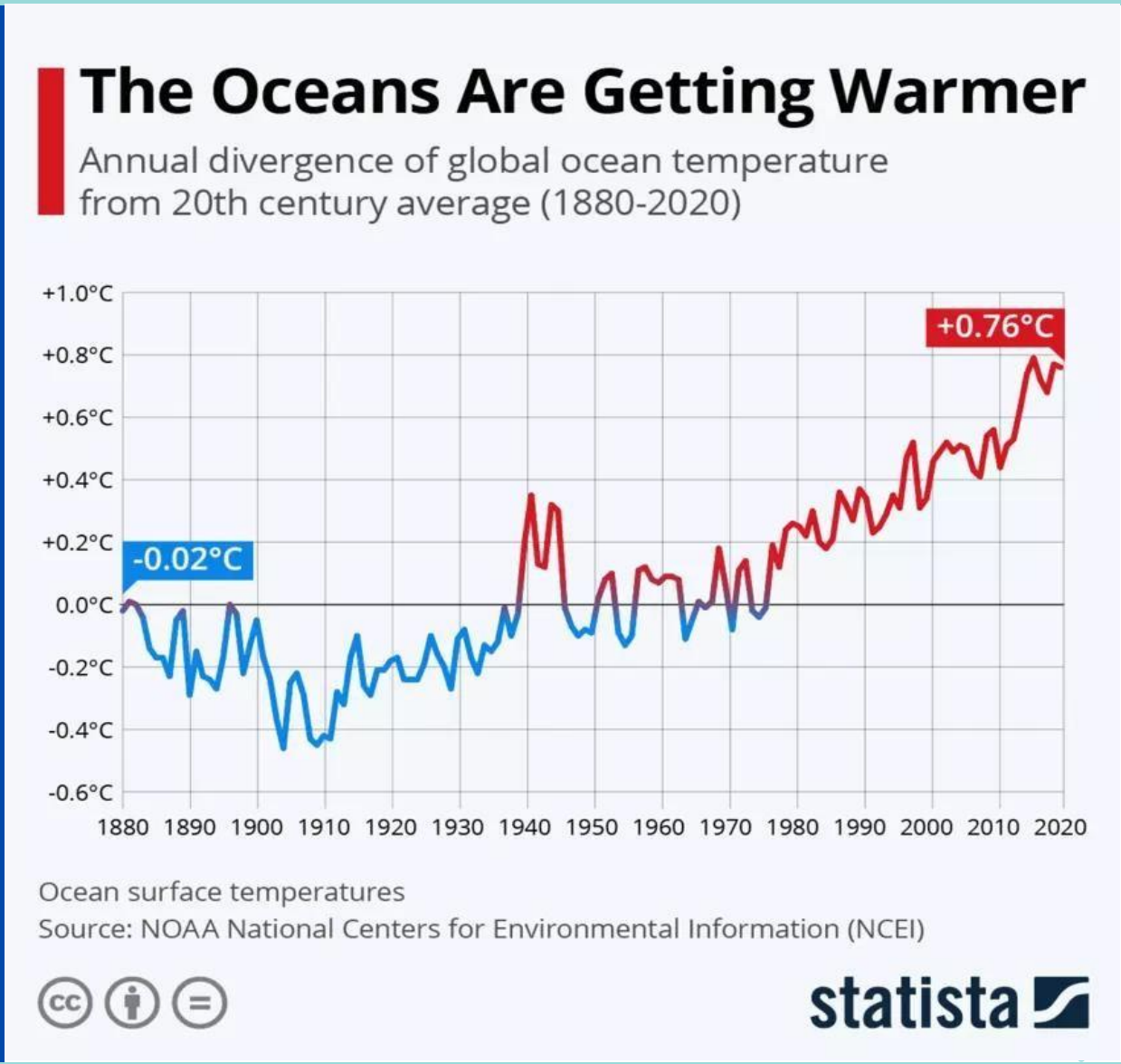


Vegetation on the Rise in the Himalaya
Analysis of satellite data shows an expansion of vegetation in the high elevations of the **Himalaya Mountains** from **1993** to **2017**.

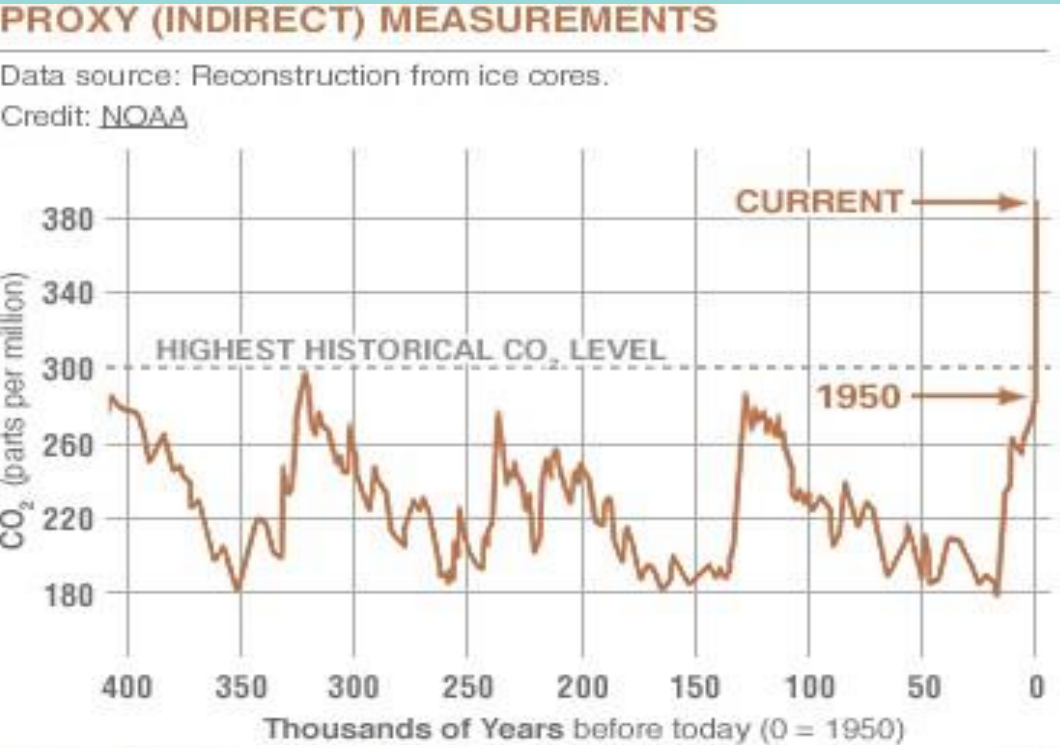
https://earthobservatory.nasa.gov/images/149312/everest-area-plant-life-spreads?src=eoa-iotd

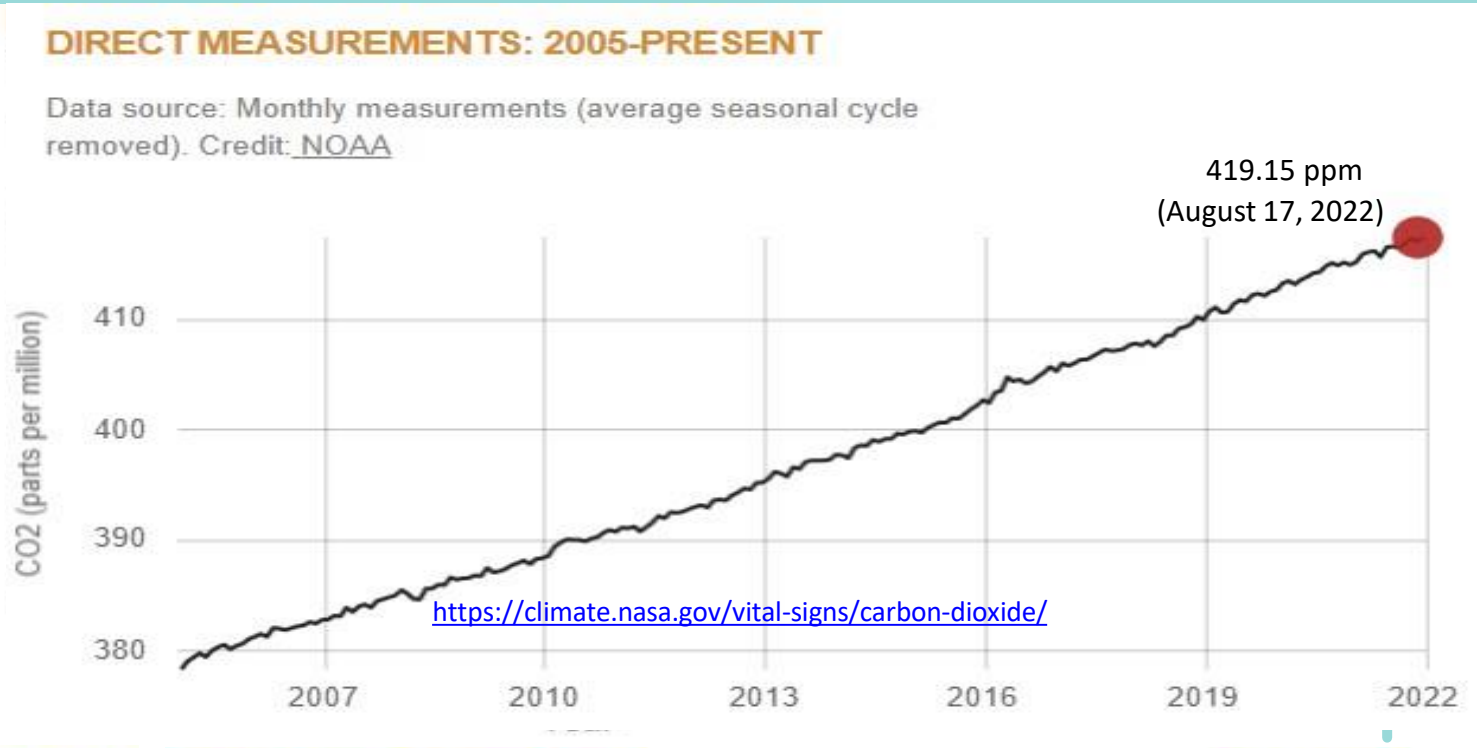
Warming of Oceans

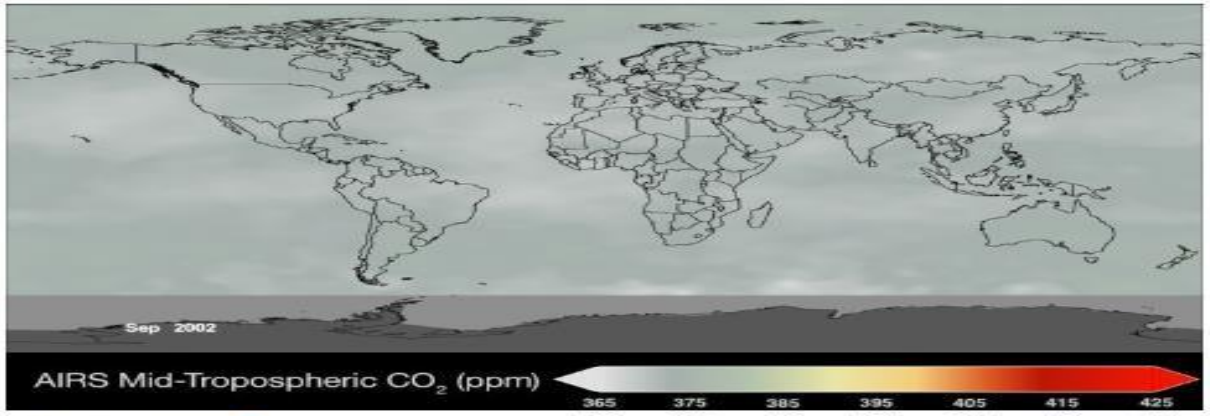
- Ocean warming by 0.302^0 F of top 700 m ocean since 1969
- Ocean warming dominates the increase in energy stored in the climate system, accounting for more than 90% of the energy accumulated between 1971 and 2010.

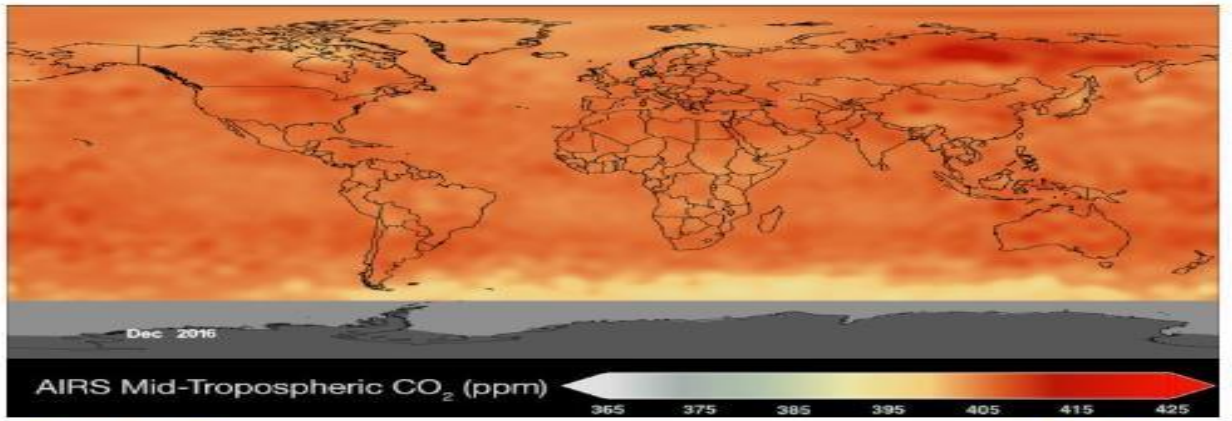


Carbon dioxide concentration

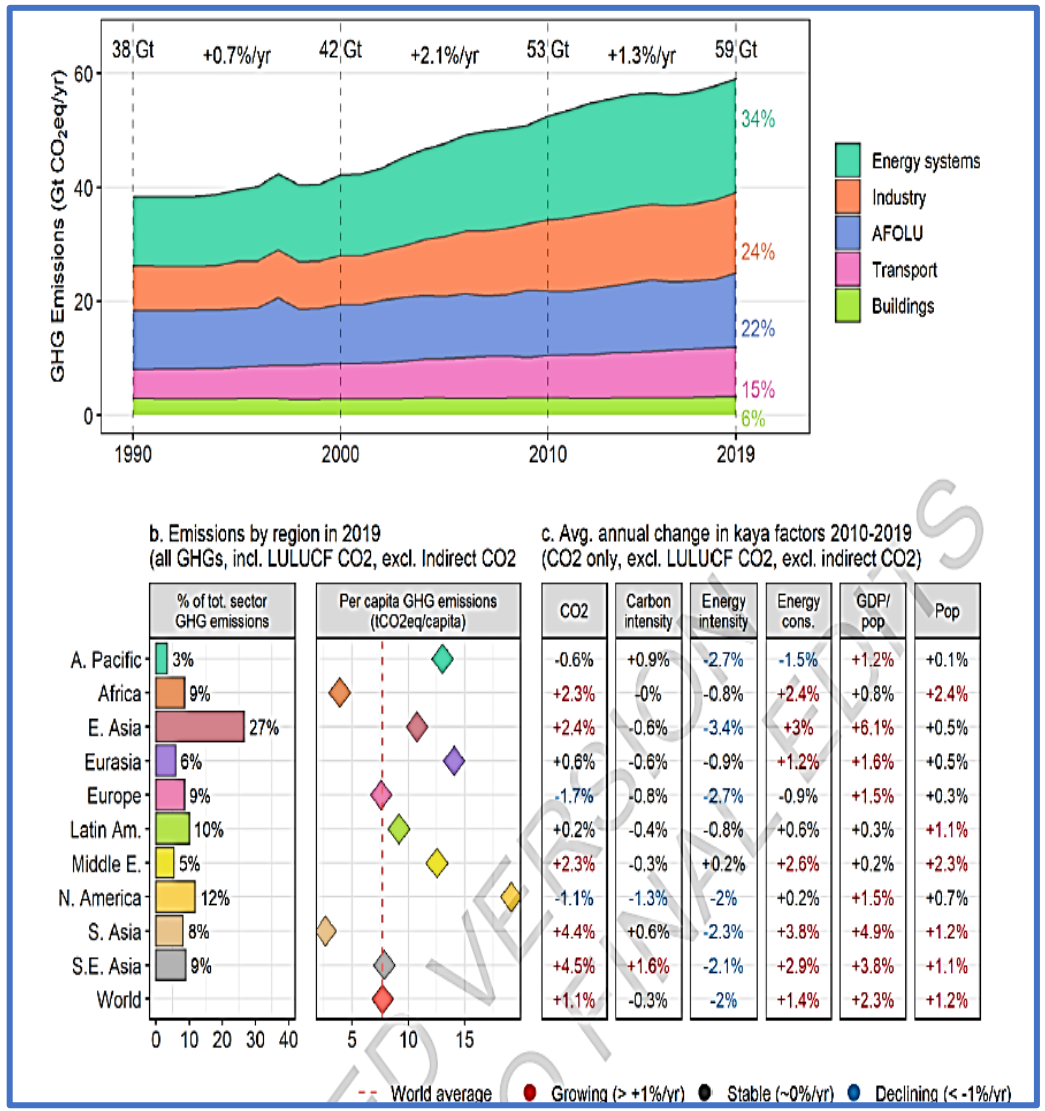








Global and Regional GHGs Levels-2019



Source: IPCC AR6

GLOBAL

- **GHG emission: 59 $GtCO_2eq$** (2010-2019)
- **Energy sector** contribute the largest, **34%** share [20.04 $GtCO_2e$]

REGIONAL

- Region emission: **East Asia highest and A. Pacific lowest**
- **Region per capita GHG emissions**: N. America highest and S. Asia lowest
- **Energy intensity decreased in almost all regions**, -2.0% per year (2010-2019)

- Global population growth **+1.2%/year**(2010-2019)
- **Decarbonization**- N. America, Europe and Eurasia.
- **Economic growth is the main driver** of GHGs emission-China & India
- **Population and economic growth (+), then emission (+)**

History of climate negotiation

- ✓ 1979 — The first World Climate Conference (WCC)
- ✓ 1988 — The Intergovernmental Panel on Climate Change is set up
- ✓ 1990 — IPCC publishes first assessment report. IPCC and second World Climate Conference call for a global treaty on climate change. United Nations General Assembly negotiations on a framework convention begin
- ✓ 1991 — First meeting of the Intergovernmental Negotiating Committee (INC)
- ✓ 1992 — The INC adopts UNFCCC text. At the Earth Summit in Rio, the UNFCCC is opened for signature along with UNCBD and UNCCD
- ✓ 1994 — UNFCCC enters into force
- ✓ 1995 — The first Conference of the Parties (COP 1) in Berlin
- ✓ 1996 — The UNFCCC Secretariat is set up to support the Convention
- ✓ 1997 – Kyoto Protocol adopted

Status of Paris Agreement (2015-2021) Prior COP26

- Signatories of the Paris accord have been **slow to cut back their carbon emissions.**
- While their objectives remain ambitious, concrete action is all too often pushed back.
- As a result, global emissions have continued to grow
- IPCC experts said promises made by the Paris accord signatories would, if kept could still lead to catastrophic 3°C rise in temperatures by 2050
- Failure to implement even those would cause 4°C to 5°C rise, at which point some of the world's most densely populated areas would become uninhabitable.

https://webdoc.france24.com/paris-climate-agreement- cop21-global-warming/

COP 26 ,November 2021 (Five Takeaways)

1. Commitment to Net Zero / Carbon Neutrality by 2050 by most countries (China in 2060 and India (2070). Coal to be phased down (not phase out)

2. Methane emission reduction(100 countries) – to limit to 30 % compared to 2020 level

3.Commitment to end deforestation and reverse deforestation by 2030

4. Adaptation : Greater support for adaptation needs

5. Financing :

- Greater commitment to $ 100 billion /year
- Strong commitment by private sector to invest in clean energy , technology and innovation
- Funding for Gender equality (small/symbolic)
- Funding for Cities (small /symbolic)

- Reasonable success but not fully on all areas (financing , losses and damages etc)

Climate change impacts can be reduced by effective adaptation

Impact

- Increased urban heat waves

Adaptation Measures

- Hard – retrofitting buildings with insulation, cooling stations, air conditioning, street shading, new building codes, green roofs etc.
- Soft – "cool biz" clothing, tree planting, health and safety rules, relocation of vulnerable people etc.
- Note: air conditioning may make climate change worse through increased emissions if the electricity is from fossil fuels.

Climate change impacts can be reduced by effective adaptation (cont.)

Impact

- Limited amounts of sea level rise

Adaptation Measures

- Hard - sea walls, setbacks, higher road elevation, land buyback, stilt or floating housing, landfilling etc.
- Soft - coastal dunes, mangroves, coastal reforestation, beach replenishment, land use zoning etc.

Climate change impacts can be reduced by effective adaptation (cont.)

Impact

- Increased rainfall and flooding

Adaptation Measures

- Hard – flood detention dams, rooftop rainwater storage, flood walls on rivers, elevated infrastructure, flood gates
- Soft – flood insurance, sponge cities, absorptive pavements, increased green space in urban areas, flood zoning, etc.

Climate change impacts can be reduced by effective adaptation (cont.)

Impact

- Extreme climate events – cyclones, hurricanes, droughts, floods, windstorms, sea surge, wildfires

Adaptation Measures

- Hard – Cyclone shelters, water reservoirs, irrigation systems, coast and river embankments, building designs
- Soft – early warning systems, evacuation plans, emergency food reserves, evacuation centres, fuel reduction burning etc.

Climate change impacts can be reduced by effective adaptation (cont.)

Impact

- Loss of forests (due to drought, fire and deforestation) and associated biodiversity loss

Adaptation Measures

- Hard – increased plantations and protected areas, fire-fighting dams in plantation areas, improved equipment for rangers and plantation managers, airborne water tankers
- Soft – controlled fuel burns, anti-poaching and control of wildlife trading, biodiversity inventories, retention of riparian zone forest cover, land use zoning, protected areas, and natural regeneration

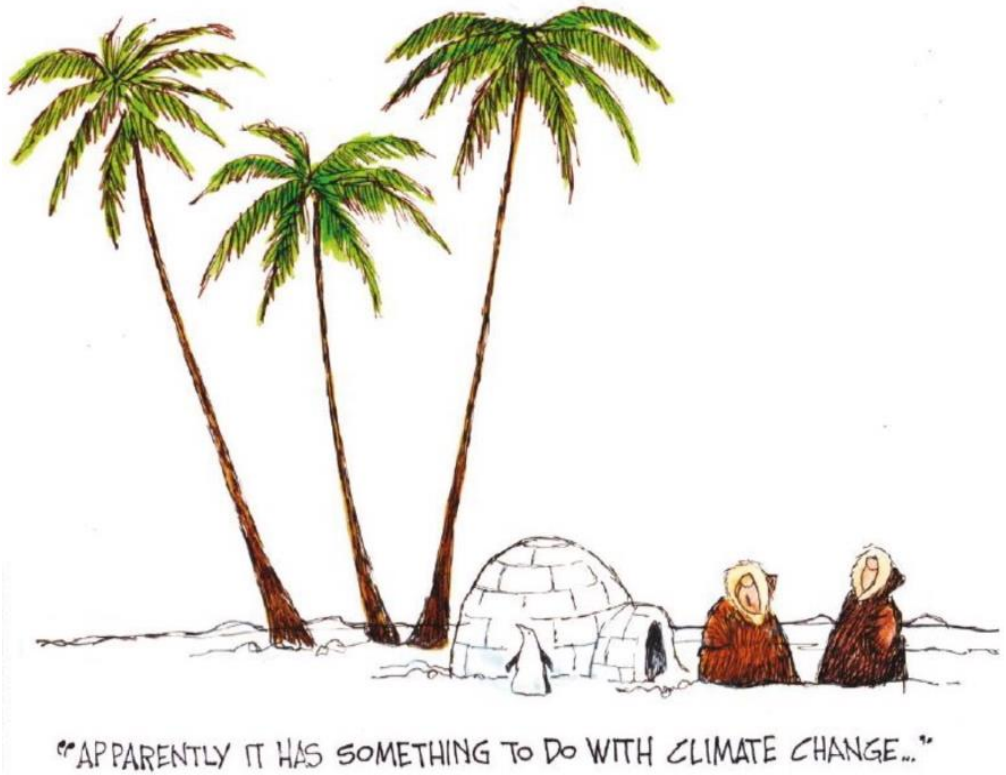
Climate change impacts can be reduced by effective adaptation (cont.)

Impact

- Food security and agricultural productivity

Adaptation Measures

- Hard – Expanded irrigation systems and reservoirs, all weather farm to market roads, lab grown food, hydroponics, greenhouses, etc.
- Soft – development of resilient crop varieties, crop replacement, reduced food waste, diet changes, etc.



Sector Options - Infrastructure

All infrastructure now needs to be **climate-proofed** against future climate conditions. Climate proofing includes options such as
(i) increased bridge and road surface heights;
(ii) increased culvert and drainage dimensions;
(iii) climate resistant road surface materials;
(iv) increased protection against wind shear;
(v) relocation away from hazardous areas like floodplains or coastal zones;
(vi) elevating electrical and control equipment;
(vii) retrofitting infrastructure;
(viii) changing maintenance schedules;
(ix) using, enhancing or recreating natural systems such as wetlands, riparian vegetation, or dune revegetation to protect vital infrastructure; and
(x) physical protection such as seawalls or flood protection bunds

- The Ganges, the Brahmaputra and the Meghna are the three major rivers of Bangladesh.
- These three rivers, when combined within the country form the world's third largest river.
- More than fifty other local rivers also flow within Bangladesh and drain into the Bay of Bengal.
- The lower part of the country adjoining with the sea, commonly known as coastal zone, is the part extending inland as far as typical coastal problems are of primary significance; it does not always extend only to the tidal limit, which, in a flat country like Bangladesh, is very far inland.
- Bangladesh is one of the most vulnerable countries to natural disasters.
- Natural forces like high river floods, high tides, and cyclone surges, are particularly significant and have caused major loss of lives and properties.

- Cyclones in the coastal zone of Bangladesh accounted for several of the world's worst natural disasters. Each year on average, about 22 percent of the country is inundated.
- Over 8,900 square kilometer of the coastal area is identified as high risk zone for such inundation by surge generated floods.
- In the last 200+ years, the coastal zone was affected by at least 70 such storms, and alarmingly, recent decades have seen even higher frequency, with 40 storms since 1948 and 11 severe storms after 1970.
- The super cyclone of November 1970 claimed 300,000 lives; that of 1991 claimed 138,000 lives.
- The cyclone Sidr had a wind speed of 260km/hr but casualties were much less, 3363 only.
- This was due to the fact that government has constructed more than 2000 shelters after the cyclone of 1991.

- Cyclone shelters, though inadequate in some places, provide an effective buffer during the storm surge and wave attack by Cyclone.

- The Local Government Engineering Department (LGED) has been constructing majority of the cyclone shelters between 1991 and 2022 in Bangladesh.

- During non-emergency periods, almost all cyclone shelters are used for various purposes such as an education center, community center, health center, office building, and so on

At a glance, the information of Cyclone Shelter is as follows:

- Number of shelters built before 1991: 443 nos
- Useful: 272 nos
- Unsuitable for use: 161 nos
- After the cyclone of 1991. According to the report of the committee comprising
- Jamilur Reza Chowdhury, the number of required shelters proposed was: 5,000 nos
- Number of shelters constructed till 2010: 3268 nos
- Number of usable shelters constructed till 2010: 3107 nos
- According to the report of the committee formed by the Chief Engineer PWD after
- the cyclone Sidr of 2006, the total number of shelters is required in proportion to

the population. (As of 2015): 2,000 nos

- According to the Study Report (ECRRP, DSSP-1 Study Report) implemented through LGED's ECRRP project with World Bank support (by 2025), the number of required shelters proposed (for 20 districts): 9220 nos

Number of shelters built after 2010:

- Emergency Cyclone Rehabilitation and Restoration Project (ECRRP): LGED 352 nos
- IDB (Fael Khair): LGED 190 nos
- Second Primary Education Development Program (PEDP-II): LGED 399 nos
- JICA supported Construction of Multipurpose Cyclone Shelters Project
- (CMCSP): LGED 36 nos
- USAID support: LGED 25 nos
- Third Primary Education Development Program (PEDP-III): LGED 250 nos
- Multipurpose Disaster Shelter Project (MDSP): LGED 162 nos
- Coastal Towns Environmental Infrastructure Project (CTEIP): LGED 22 nos
- Coastal Climate-Resilient Infrastructure Project (CCRIP): LGED 16 nos

Climate Change Trust Fund: LGED 05 nos

- Department of Relief and Rehabilitation: 583 nos

Total = 2040 nos

Currently running project:

- Multipurpose Disaster Shelter Project (MDSP): LGED 394 nos
- Climate Resilient Infrastructure Mainstreaming project (CRIMP): LGED 45 nos
- Department of Relief and Rehabilitation 220 nos
- Construction, renovation and development of Mujib Killa project (Cyclone Shelter):
- Department of Disaster Management 500 nos
- Construction of Flood Shelters Project in Flood Prone and River Erosion Areas (Phase 3): Department of Disaster Management 423 nos

Total = 1084 nos

Proposed project:

- Resilient Infrastructure for Adaptation & Vulnerability Reduction (RIVER) Project: LGED 500 nos

Total = 500 nos

Number of usable shelters built so far (3107 + 2040): 5147 nos

- All Cyclone shelter designs should follow the building code, wind load, earthquake load, and storm surge.
- Sometimes tube well sink in tidal water during cyclones. Then, drinking water problems are seen in the cyclone shelters. So, every cyclone shelter should set up rainwater harvesting on the top floor of the cyclone shelters.
- Currently, there is a lot of lightning in Bangladesh. Lightning can cause considerable damage to buildings, usually by fire. Therefore, every cyclone shelter should need to install of early streamer emission lightning protection system.
- Every cyclone shelter should provide sufficient toilet facilities and ensure woman's safety.
- Cyclone shelter proper maintenance is a significant problem in the country.

Thank you!