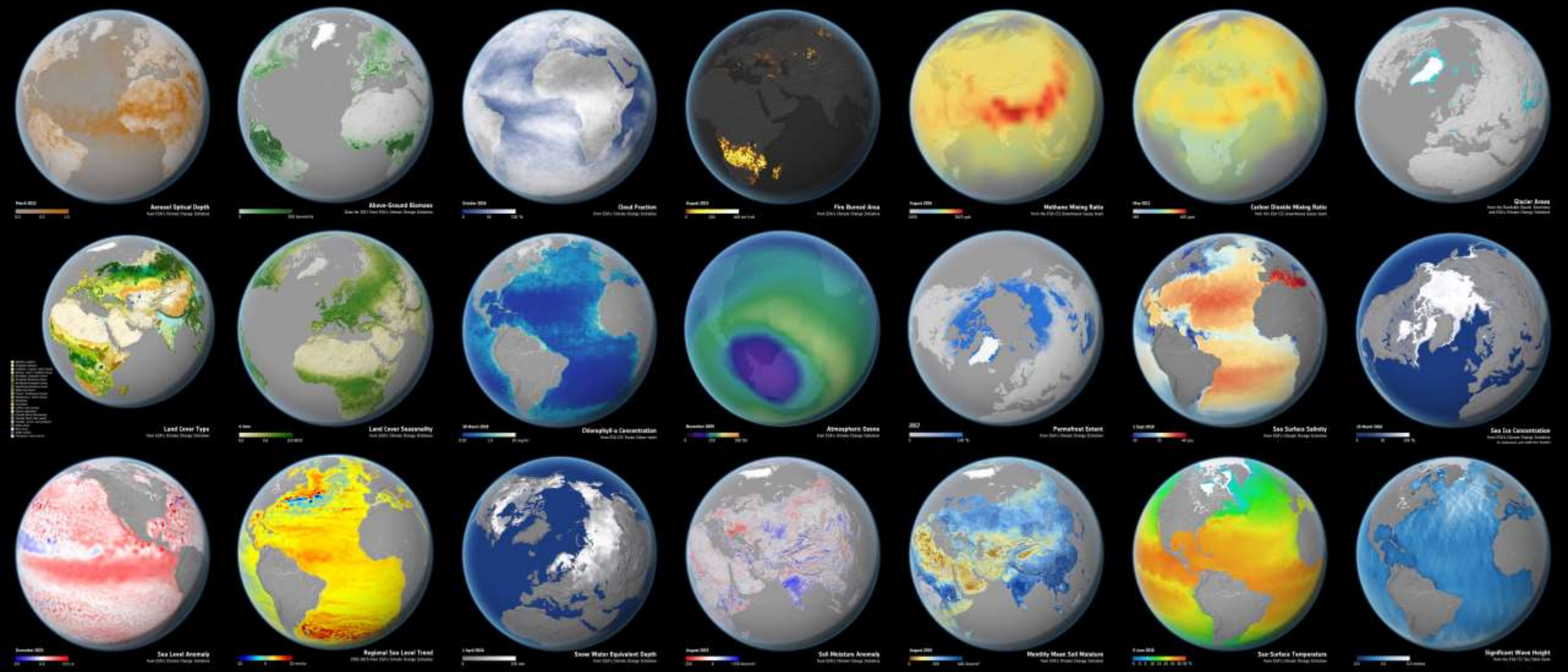
CLIMATE DATA RECORDS

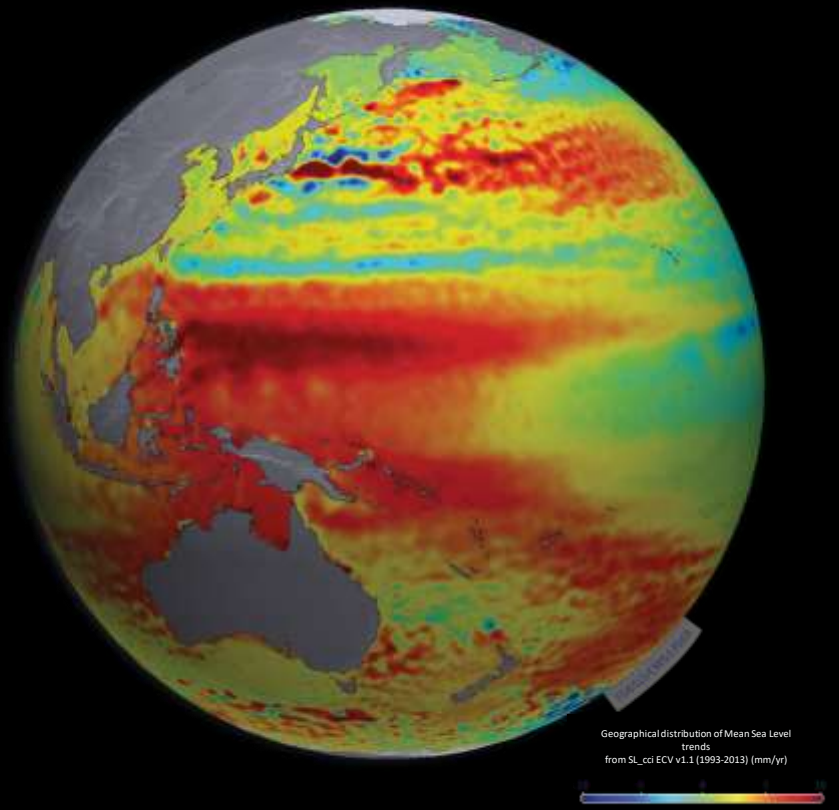


SHRINKING CRYOSPHERE

esa

→ THE EUROPEAN SPACE AGENCY

SEA LEVEL BUDGET

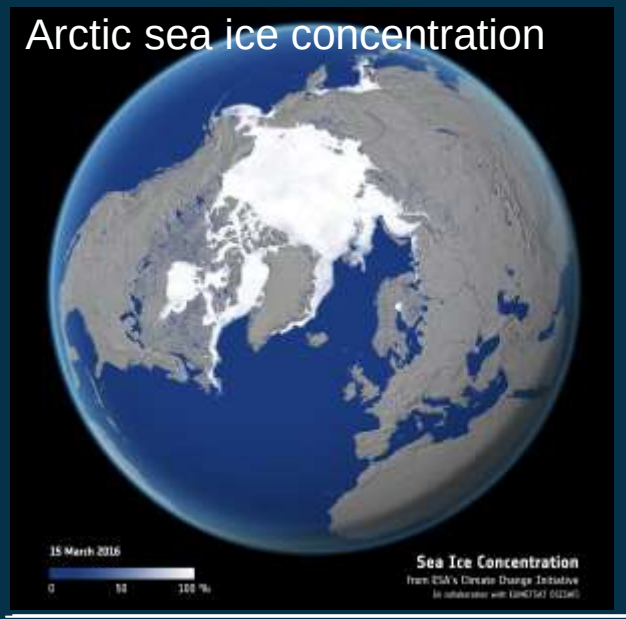


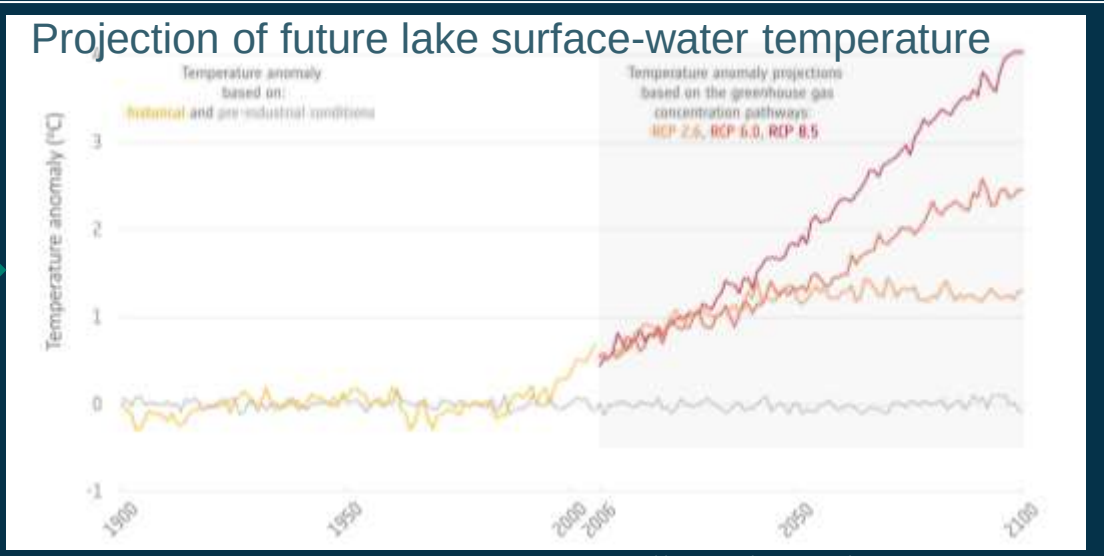
Horwath M et al (2022) Global sea-level budget and ocean-mass budget, with a focus on advanced data products and uncertainty characterisation . Earth Syst. Sci. Data, 14, 411–447, 2022. https://doi.org/10.5194/essd-14-411-2022

Planetary Visions (credit: ESA CCI Sea Level Budget Closure Project/Planetary Visions)

ESA UNCLASSIFIED – For Official Use

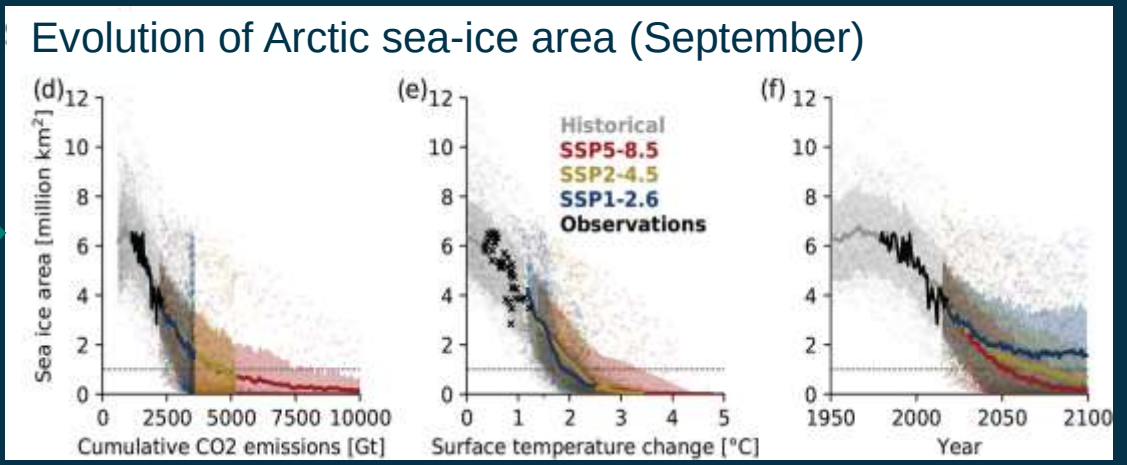
OBSERVATION & MODELLING





Grant, L et al (2021). https://doi.org/10.1038/s41561-021-00833-x

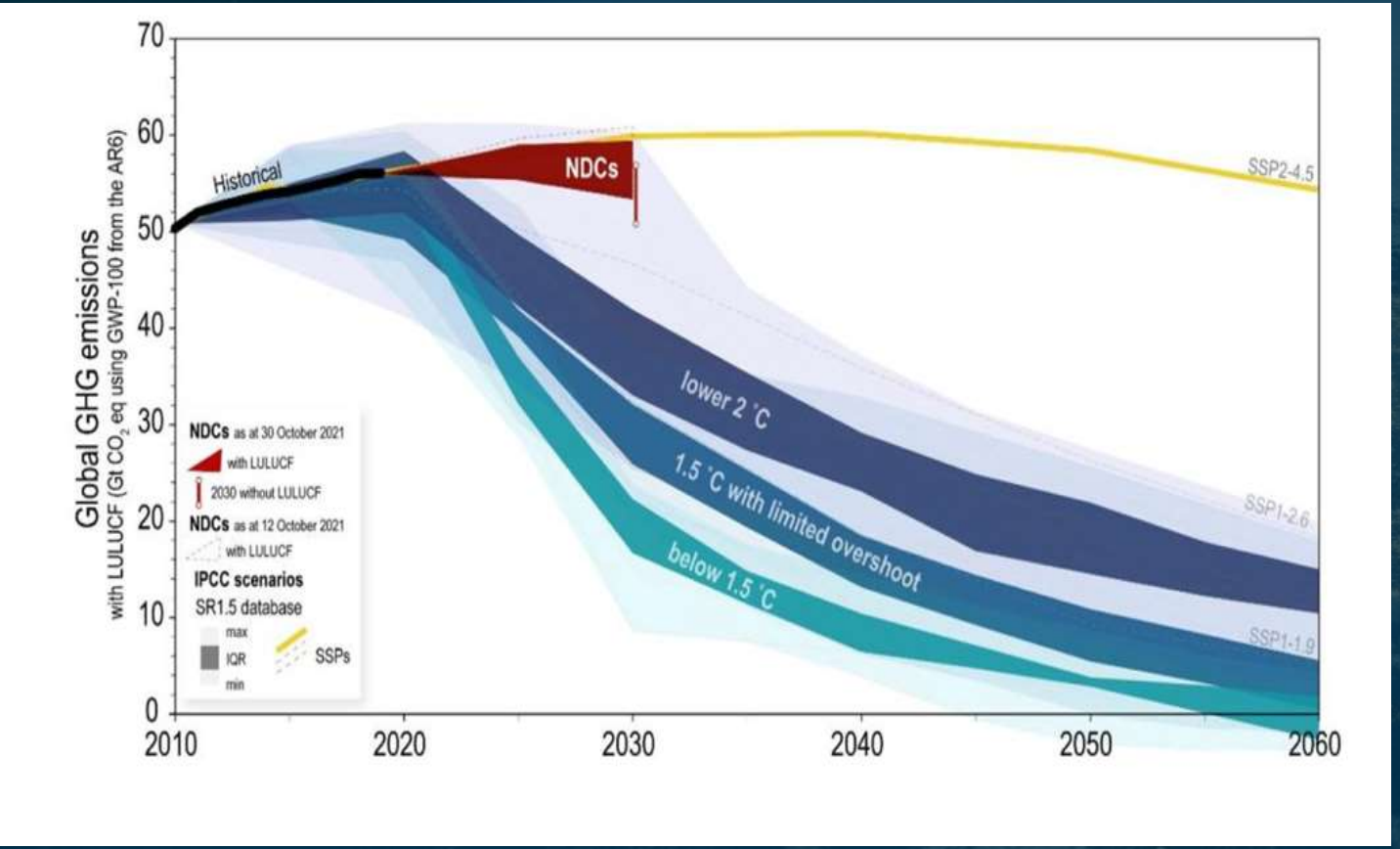
Rising lake surface temperatures across C 21st



Notz (2020) Arctic Sea Ice in CMIP6 https://doi.org/10.1029/2019GL086749

2050
The first
Ice-free
Arctic summer

SUPPORTING THE PARIS AGREEMENT

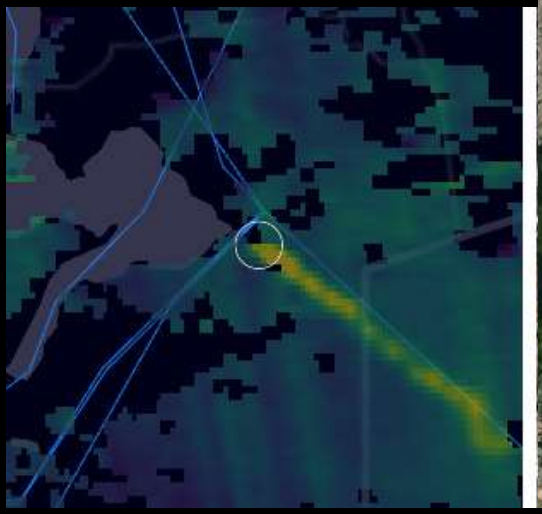


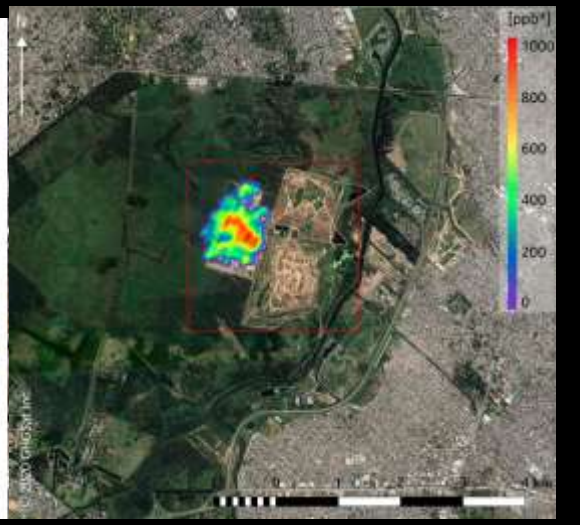
https://unfccc.int/sites/default/files/resource/message_to_parties_and_observers_on_ndc_numbers.pdf

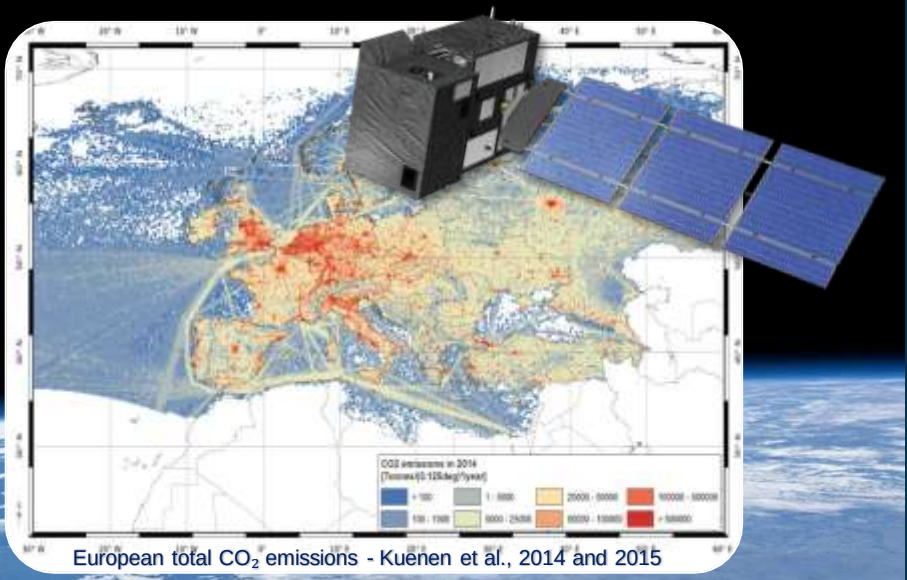
Glasgow Climate Pact recognises need for ‘rapid, deep and sustained reductions in global greenhouse gas emissions, based on the best available science’

Earth observation has existing or near-term plans to support the ‘ambition cycle’

MITIGATION
COPERNCIUS SENTINEL 5P





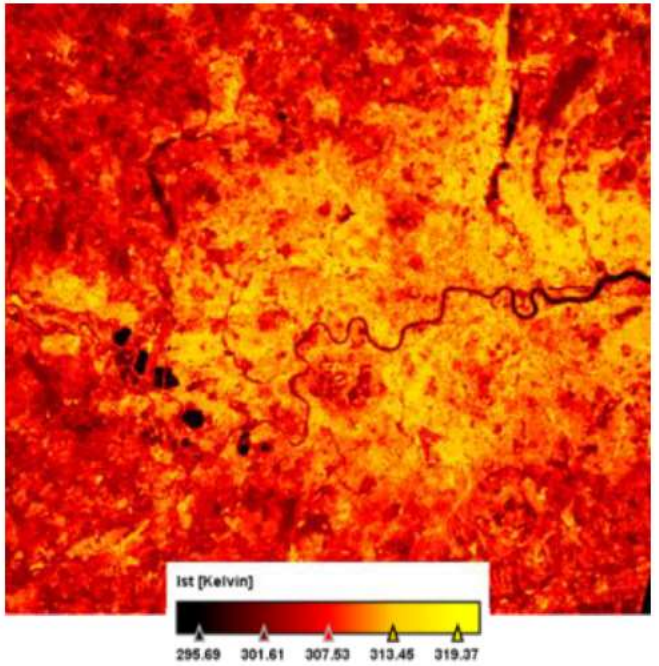


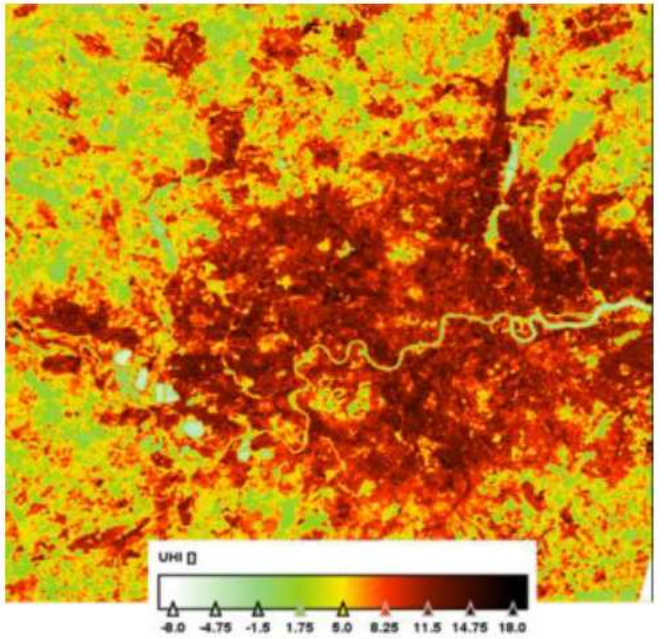
European total CO_2 emissions - Kuenen et al., 2014 and 2015

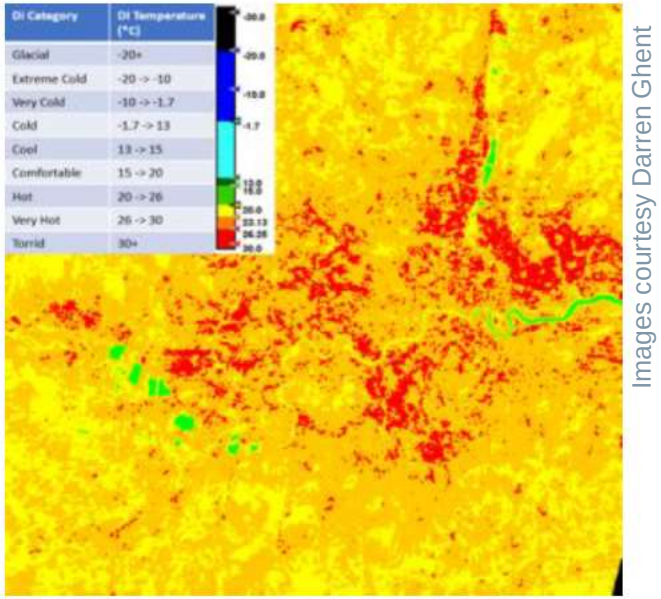
ADAPTATION

- No global target & common indicators are lacking since it is dependent on location specific economic, social, and environmental conditions
- EO can help answer this question by providing information on observable adaptation measures

Urban heat island effect and implications for human wellbeing – tracking effectiveness of urban greening?





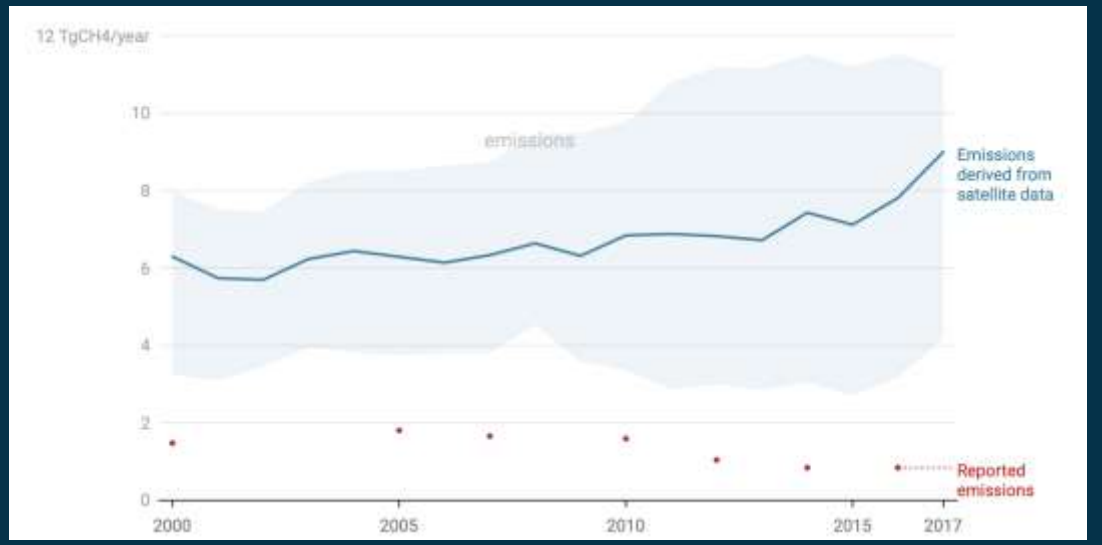


Images courtesy Darren Ghent University of Leicester

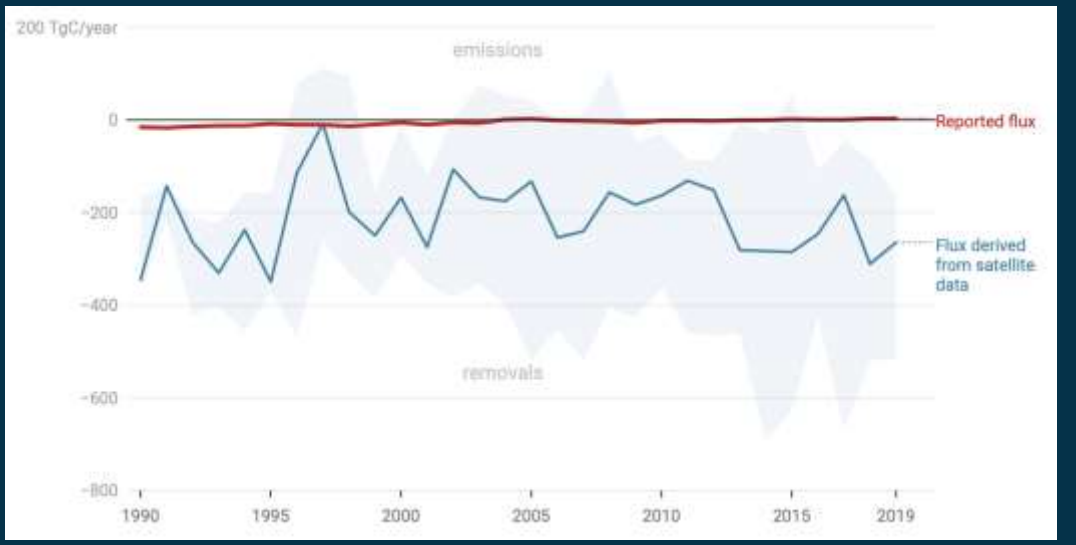
SUPPORTING NATIONAL REPORTING

- National GHG inventories reported to UNFCCC yearly to track collective progress
- Bottom-up approach used: sector-based activities and estimates of emissions (energy, farming, waste etc)
- True picture of net emissions? Transparency? Consistency?
- New methodology (atmospheric inversion constrained with EO data) can evaluate GHG balance at country level
- Improves consistency, identifies sources of uncertainty

Methane emissions from the fossil fuel sector in Gulf states

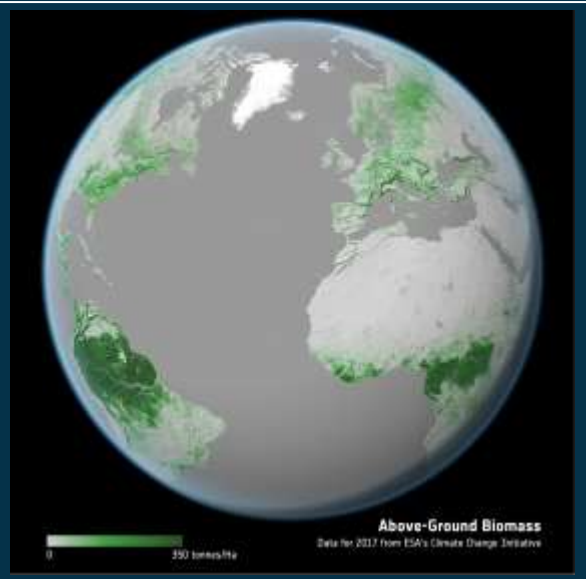


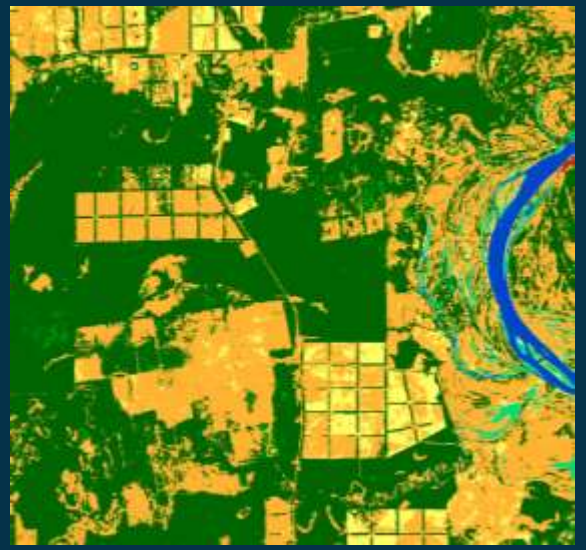
Carbon dioxide flux from managed land in Canada



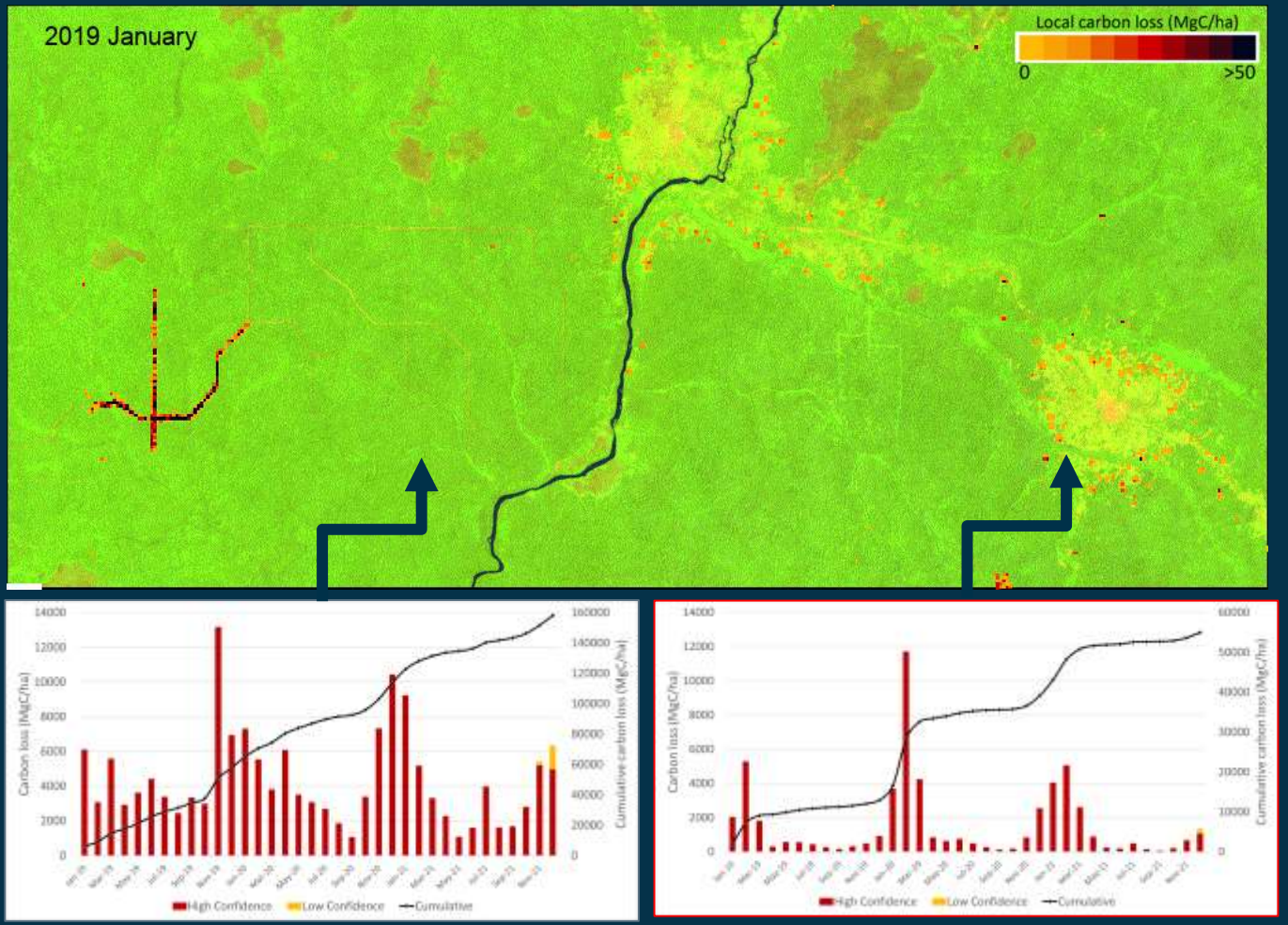
Deng et al (2022), ESSD. https://doi.org/10.5194/essd-14-1639-2022

SUPPORTING AFOLU INVENTORIES





ESA CCI above ground biomass & land cover



Selective logging

Smallholder agriculture

Csillik, O et al (2022) *Commun Earth Environ*https://doi.org/10.1038/s43247-022-00383-z

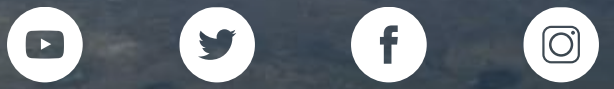
CLIMATE FROM SPACE - WEB APP

- Explore the climate via 40 years of satellite data
- 3D Globes & maps
- Pinch, zoom, scroll
- Select specific aspects e.g. GHG, ice sheets, sea level etc
- ‘Climate stories’
- PC | Mobile |Tablet
- Supporting classroom resources

→ csf.climate.esa.int

Are you ready to discover more?

www.esa.int
E: climate.office@esa.int
Twitter: @esaclimate



AND MORE IF TIME ALLOWS!

EarthCARE: Linking Clouds, Aerosol and Radiation

Science: Impact of Clouds and Aerosols on Radiation

Addressing largest uncertainty in climate projections (for a given emission scenario)

Designed to improve atmospheric (weather and climate) models by providing the most advanced global observations of clouds, aerosols and precipitation ever seen, as well as their interactions with radiation that are crucial for climate

Observations:

- Cloud vertical profiles (ice, liquid, mixed), cloud coverage, precipitation
- Aerosol vertical profiles
- Broad-band Solar & Thermal Radiation

Satellite and Payload

- Low-earth orbit (400 km altitude)
- UV Lidar with high spectral resolution receiver
- W-band Cloud Radar with Doppler (JAXA contribution)
- Imager and Broad-Band Radiometer

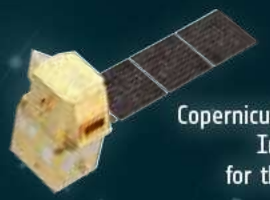
Earth Explorer Mission implemented in

cooperation with JAXA

PROGRAMME OF THE EUROPEAN UNION

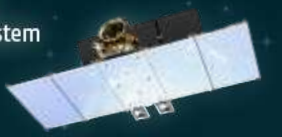
Copernicus
Europe's eyes on Earth

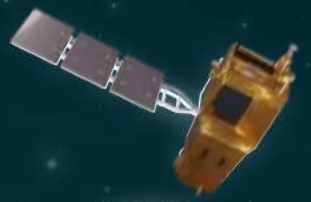
co-funded with esa



CHIME
Copernicus Hyperspectral Imaging Mission for the Environment

ROSE-L
L-band Radar Observing System





LSTM
Land Surface Temperature Monitoring

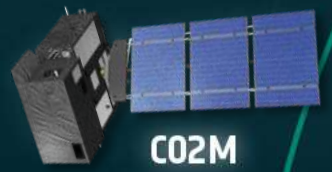
CIMR
Copernicus Imaging Microwave Radiometer

soil properties
crop health
biodiversity
water quality

geohazards
polar ice
forest management
food security
maritime surveillance

sustainable agriculture
water resources management
drought
urban heat islands

sea-ice concentration/extent
global ocean and cryosphere
soil moisture and vegetation



CO2M
Copernicus Anthropogenic Carbon Dioxide Monitoring

carbon dioxide and methane from human activity

CRISTAL
Copernicus Polar Ice and Snow Topography Altimeter

sea-ice thickness
ice sheets and glaciers
snow
polar oceanography
coastal and inland waters

→ THE EUROPEAN SPACE AGENCY