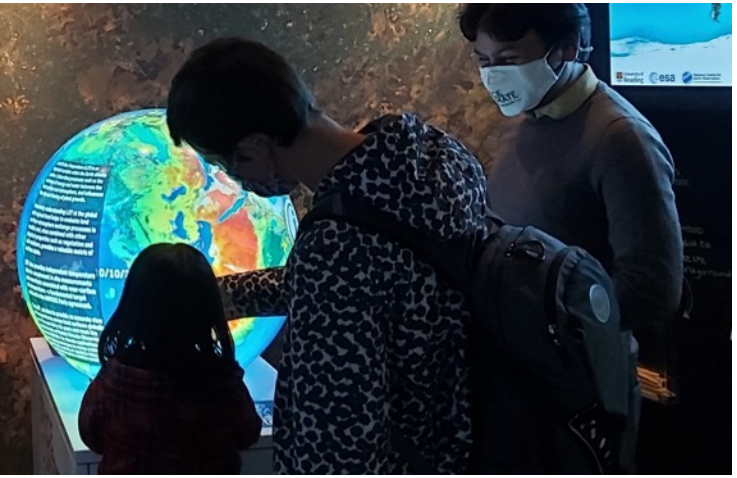

Space4Climate PufferTouch App COP28 Training Workbook

Version 1

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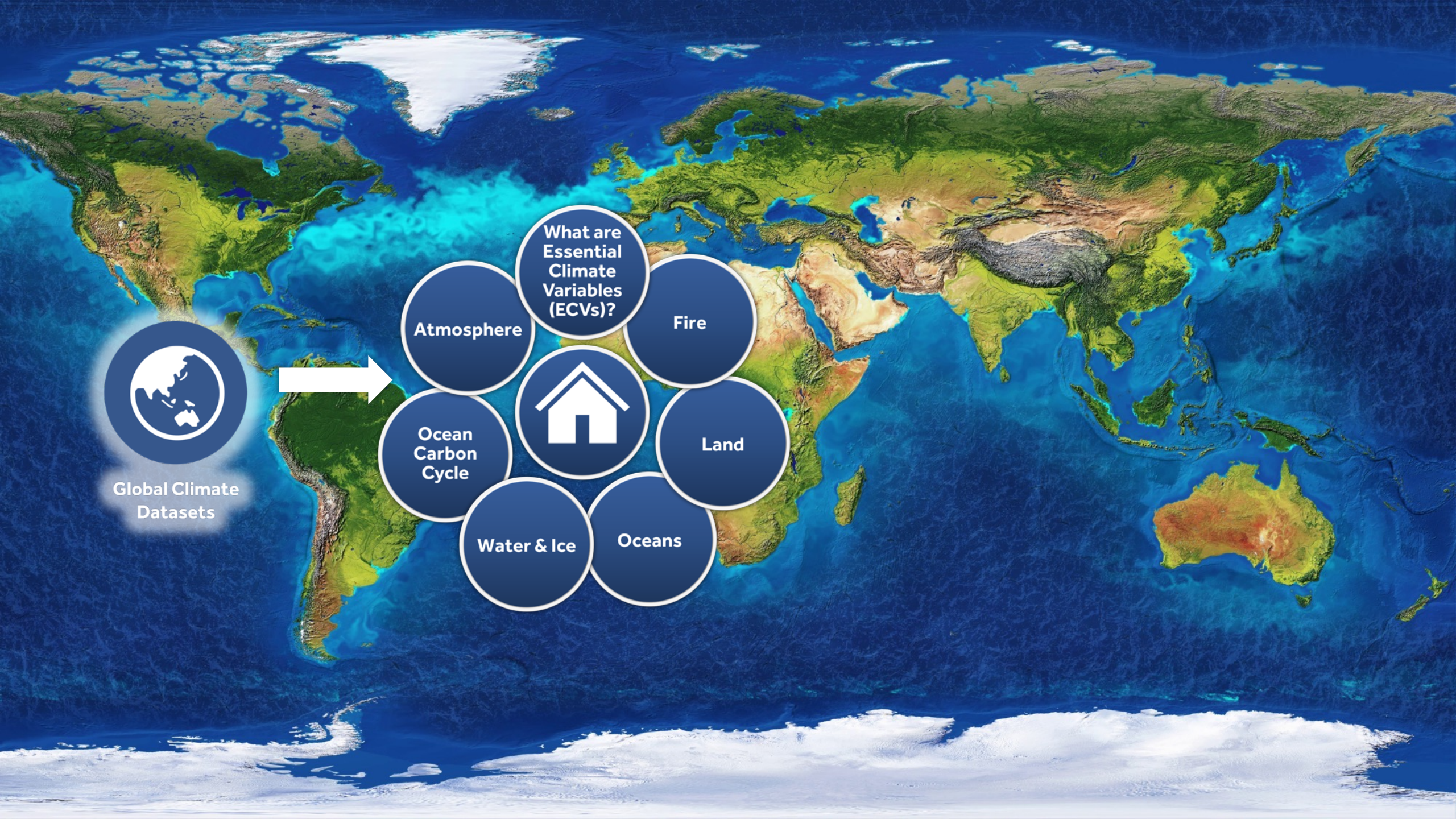
Case Studies by Theme
UK Earth Observation
Case Studies by Location
Future Climate Scenarios


Global Climate Datasets
What are Essential Climate Variables (ECVs)?
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Global Datasets

What are Essential Climate Variables (ECVs)?

What are Essential Climate Variables?

Essential Climate Variables are the key indicators of how Earth is changing and many of them can only be measured by satellite.

They are accepted and used around the world to monitor the impacts that climate change is having on our environment, and they are used to support evidence-based decisions for climate action.

There are 55 ECVs in total and UK expertise is involved in many of these.

ECVs are used by the united Nations Framework Convention on Climate Change (UNFCCC) and the Intergovernmental Panel on Climate Change (IPCC) in monitoring our climate and projecting what the future holds.

* Explore these datasets created with UK involvement on this app.

ATMOSPHERE

SURFACE
- Precipitation
- Pressure
- Radiation Budget
- Temperature
- Water Vapour
- Wind speed and direction

UPPER-AIR
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- Temperature
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- Groundwater
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- Evaporation from land
- *Fire
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- Sea ice
- *Sea level
- *Sea state
- Sea surface currents
- *Sea surface salinity
- Sea surface stress
- *Sea surface temperature
- Subsurface currents
- Subsurface salinity
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- *Inorganic carbon
- Nitrous oxide
- *Nutrients
- *Ocean colour
- Oxygen
- Transient tracers

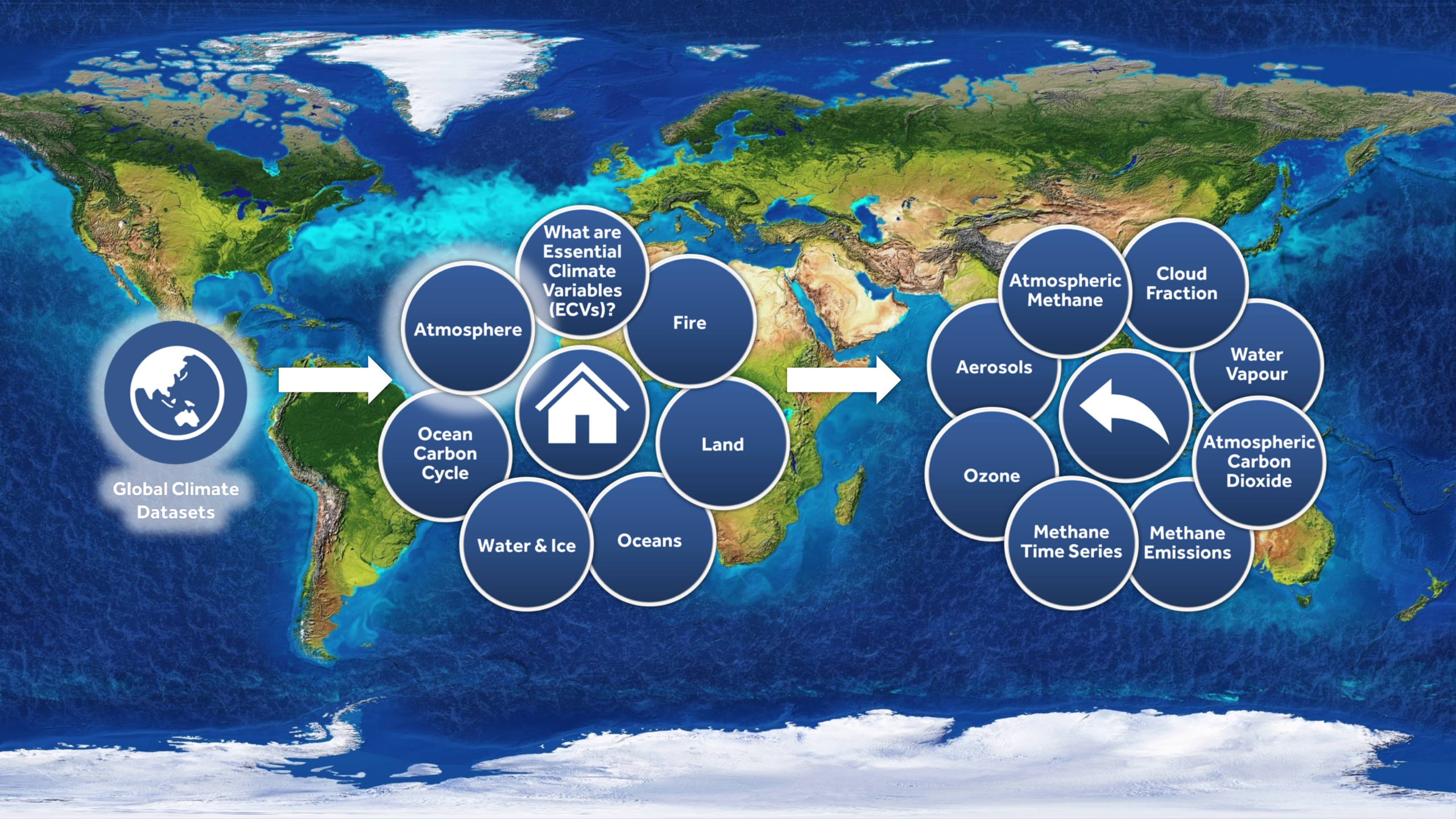
BIOLOGICAL / ECOSYSTEMS
- Marine habitats
- *Plankton

55 Essential Climate Variables

GCOS

Image reproduced courtesy of The Global Climate Observing System (GCOS)

Find out more on the Global Climate Observing System (GCOS) website.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Cloud Fraction
Aerosols
Water Vapour
Ozone
Atmospheric Carbon Dioxide
Methane Time Series
Methane Emissions

Global Climate Datasets

Atmosphere

Aerosols

Aerosols

Why is this important?

Interactions between aerosols, clouds and radiation are one of the largest sources of uncertainty in modelling efforts to quantify current climate and project climate change. This dataset contributes to reducing these uncertainties.

This dataset indicates the density of aerosols across the globe, by measuring the amount of sunlight blocked by aerosol particles, known as optical depth.

Data from 1978 to 2015.

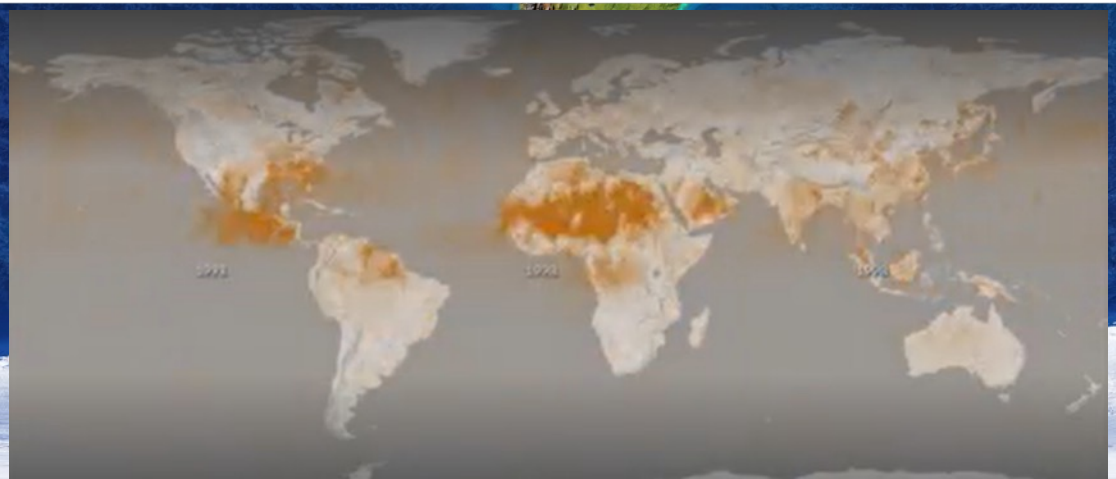
Researchers from **Swansea University** contributed to the retrieval, development and validation of this data. The **London Metropolitan University**, **University of Oxford**, **University of Derby** and **Rutherford Appleton Laboratory** also contributed.

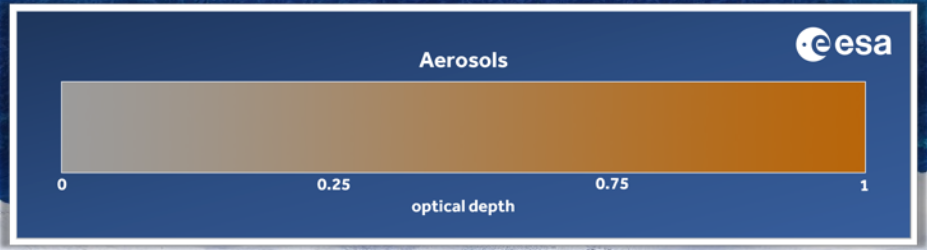
For more information

Visit the ESA CCI website

Where did this data come from?

The data was produced using observations from multiple radiometers on the Sentinel-3A and Sentinel-3B satellites.





Atmospheric Carbon Dioxide

Why is this important?

The atmospheric abundance of carbon dioxide has increased by about 50% since pre-industrial times due to the huge increase in fossil fuel use by humans. When combined with climate models, this dataset improves our knowledge of carbon dioxide sources and sinks for better future climate projections.

This dataset shows the column-averaged fraction of carbon dioxide (CO_2) in the atmosphere.

Data from 2003 to 2018.

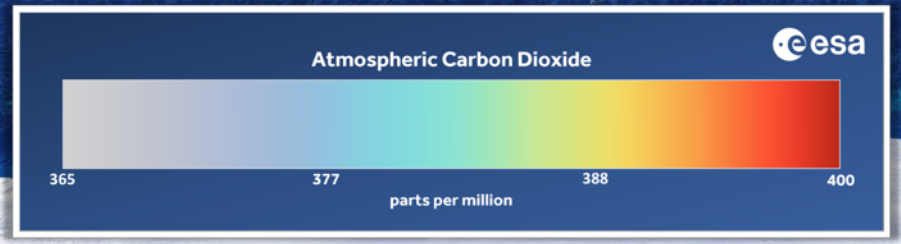
The European Space Agency Greenhouse Gases Climate Change Initiative project includes contributions from the **University of Leicester**.

For more information

Visit the ESA CCI website

Where did this data come from?

This dataset was created by merging observations from the SCIAMACHY sensor on the Envisat satellite, the TANSO-FTS instrument on the GOSAT satellite and the Orbiting Carbon Observatory 2 satellite.



Global Climate Datasets

Atmosphere

Ozone

SPACE CLIMATE Ozone SPACE CLIMATE

Why is this important?

The creation of this dataset revealed an acceleration of ozone recovery and improved our understanding of seasonal and regional trends to support ozone recovery predictions.

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BIRA-IASB

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Universität Bremen

DLR

FINNISH METEOROLOGICAL INSTITUTE

Royal Netherlands Meteorological Institute
Ministry of Infrastructure and the Environment

ARISTOTLE UNIVERSITY OF THESSALONIKI

This multi-decadal time series is used to investigate long-term variability and changes in atmospheric ozone and monitor signs of ozone layer recovery.

Data from 1979 to 2021.

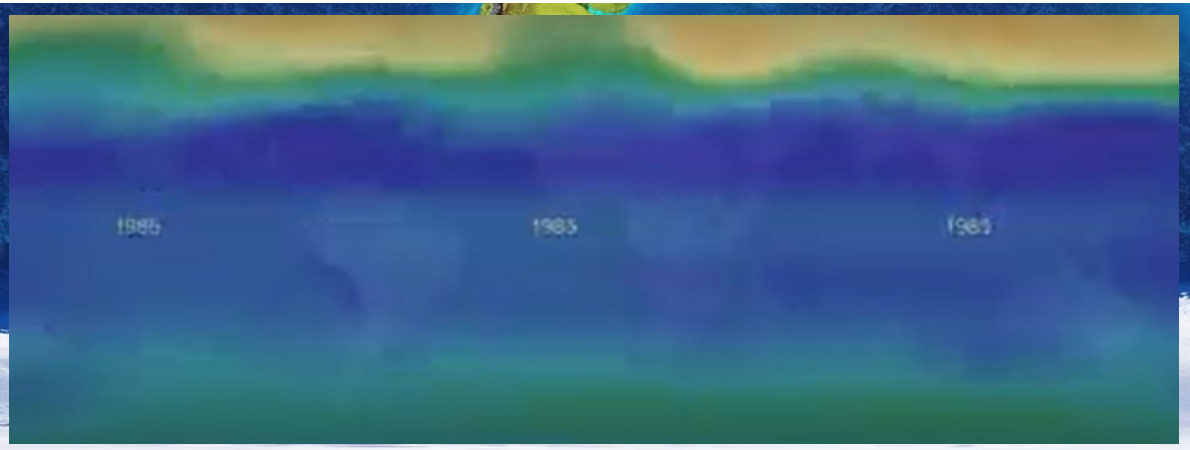
The **STFC Rutherford Appleton Laboratory** contributed expertise to produce this dataset.

For more information

Visit the ESA CCI website

Where did this data come from?

This data record was created by merging observations from a wide range of instruments on a variety of satellites. These include the Stratospheric and Aerosol Gas Experiment II, the Optical, Spectroscopic and Infrared Remote Imaging System and the Ozone Mapping and Profiler Suite.



Water Vapour

Why is this important?

Water vapour influences how heat moves through the atmosphere and is thought to play a role in the intensification of storms, extreme precipitation, and flooding. It is a greenhouse gas which, due to its positive feedback loop, amplifies the warming effects of human-caused emissions. This dataset supports scientific understanding and validates climate model projections.

This data record shows the total water vapour content in the column above each grid point.

Data from 2002 to 2017.

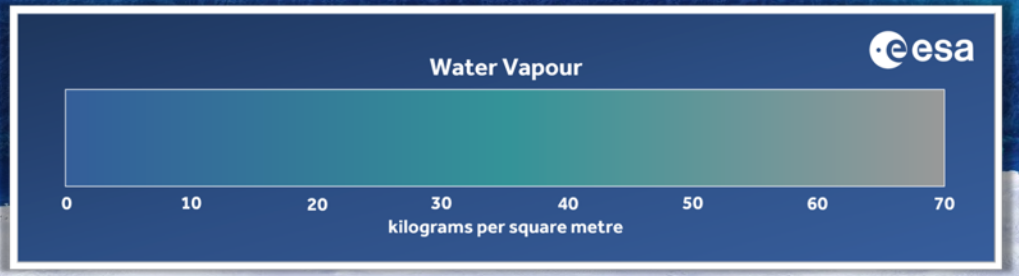
The ESA Climate Change Initiative Water Vapour project is led by the **University of Reading** (science) and **Telespazio UK** (project management), with expertise from the **STFC Rutherford Appleton Laboratory** and the **University of Leicester.**

For more information

Visit the ESA CCI website

Where did this data come from?

This data record was created using microwave and near-infrared data from instruments on board the Tropical Rainfall Measuring Mission, Defense Meteorological Satellite Program F-15, Aqua and Envisat satellites. The data was retrieved by Spectral Earth and EUMETSAT. ESA funded the processing and combining of the two datasets by Brockmann Consult.



Cloud Fraction

Why is this important?

Clouds play a complex and important role in the Earth's climate system by reflecting incoming solar radiation and damping the outgoing thermal radiation. Global warming is expected to cause changes in cloud height, thickness and cover. Observation records like these help to better represent clouds in climate models, improving future climate projections.

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DWD

UNIVERSITY OF OXFORD

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This dataset shows the fraction of the Earth covered by cloud.

The complete dataset is available online, and includes many other properties including cloud top pressure, height and temperature.

Data from 1982 to 2016.

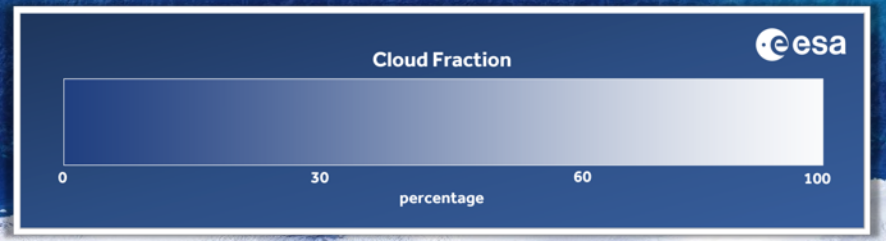
The Science and Technology Facilities Council (STFC) **Rutherford Appleton Laboratory** and the **University of Oxford** contributed expertise to produce this dataset.

For more information

Visit the ESA CCI website

Where did this data come from?

This data record shows monthly cloud fraction at 1x1km resolution and is based on passive-imager satellite measurements from the Advanced Very-High-Resolution Radiometer on board the National Oceanic and Atmospheric Administration's family of polar orbiting satellites.



Atmospheric Methane

Why is this important?

The atmospheric abundance of methane, a greenhouse gas, has more than doubled since the pre-industrial era because of human activities. When combined with climate models, this dataset improves our knowledge of carbon dioxide sources and sinks for better future climate projections.

This dataset shows the column-averaged fraction of methane (CH_4) in the atmosphere.

Data from 2003 to 2018.

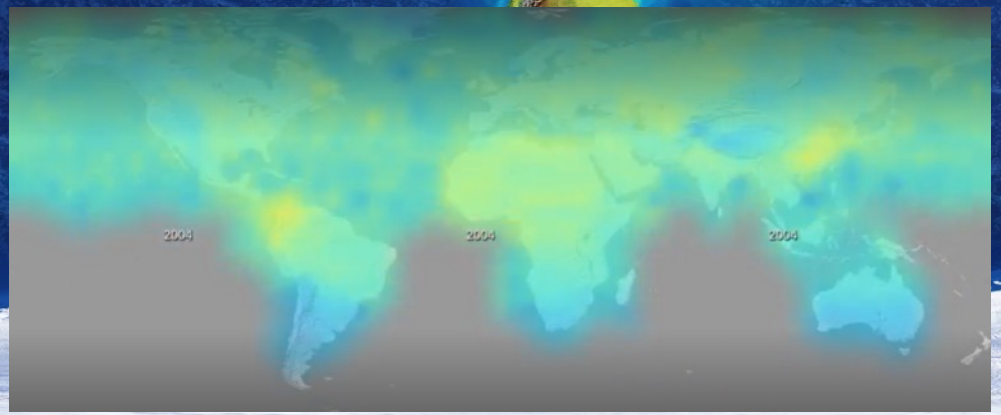
The European Space Agency Greenhouse Gases Climate Change Initiative project includes contributions from the **University of Leicester**.

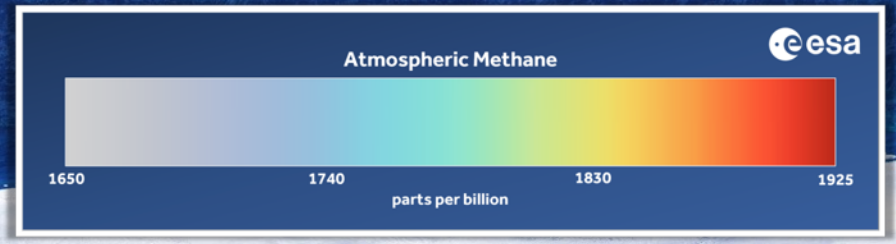
For more information

Visit the ESA CCI website

Where did this data come from?

This dataset was created by merging observations from the SCIAMACHY sensor on the Envisat satellite and the TANSO-FTS instrument on the GOSAT satellite.





Global Climate Datasets

Atmosphere

Methane Time Series

Methane Time Series

This time series shows the change in the concentrations of methane across the world observed by the Infrared Atmospheric Sounding Interferometer on the MetOp satellite.

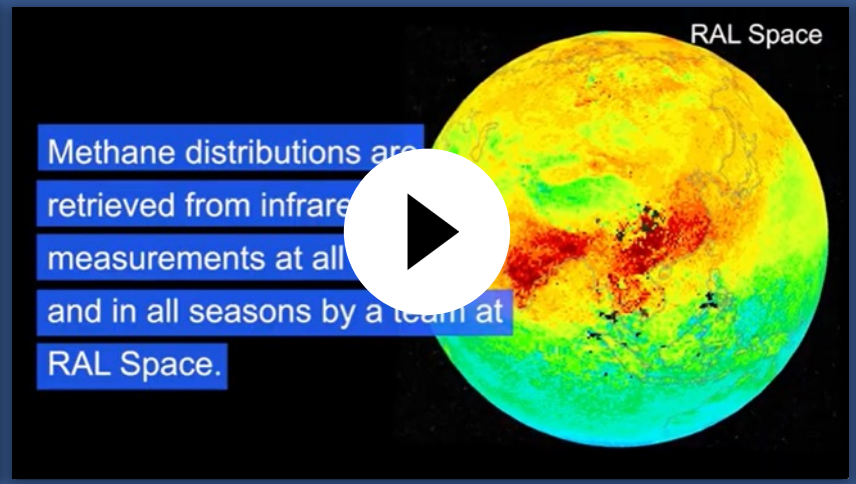
Spin the globe to see how the methane concentrations change from 2007 to 2021.

Science and Technology Facilities Council

RAL Space

National Centre for Earth Observation

NATURAL ENVIRONMENT RESEARCH COUNCIL



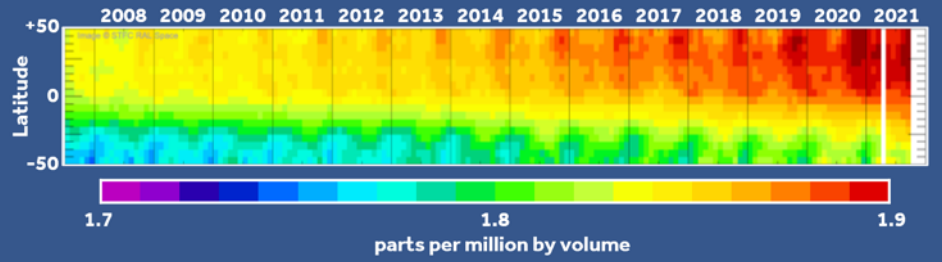
For more information

Access the Remote Sensing Group Data Visualisation Portal

Why is this important?

Methane is an extremely powerful greenhouse gas that comes from both natural and human sources. Satellite observations show that, since 2007, methane concentrations have increased across the world, including in the Arctic – a region which is very sensitive to small changes in climate.

Methane Concentrations



Science and Technology Facilities Council | RAL Space

National Centre for Earth Observation

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SPACE CLIMATE Emissions Monitoring from Space SPACE CLIMATE

Why is this important?

GHGSat's data empowers industries to pinpoint and address methane emissions. With unprecedented coverage and frequency of revisit, the insight generated is directly actionable, leading to more effective emission reduction strategies and timely interventions. This data is integrated into the International Methane Emissions and has been used in the International Energy Agency Methane Tracker report.

GHGSAT

This interactive experience showcases industrial methane emissions from the last year.

Watch to see methane emissions at locations across the globe or click on a pin to see high-resolution facility-level industrial emissions.

GHGSat UK is undergoing rapid expansion, fuelled by increasing demand for high quality, trustworthy emission data to meet the rising needs of climate finance, industrial operators and governments.

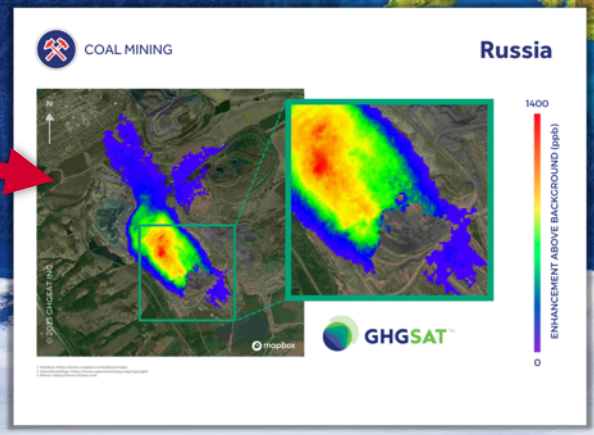
For more information

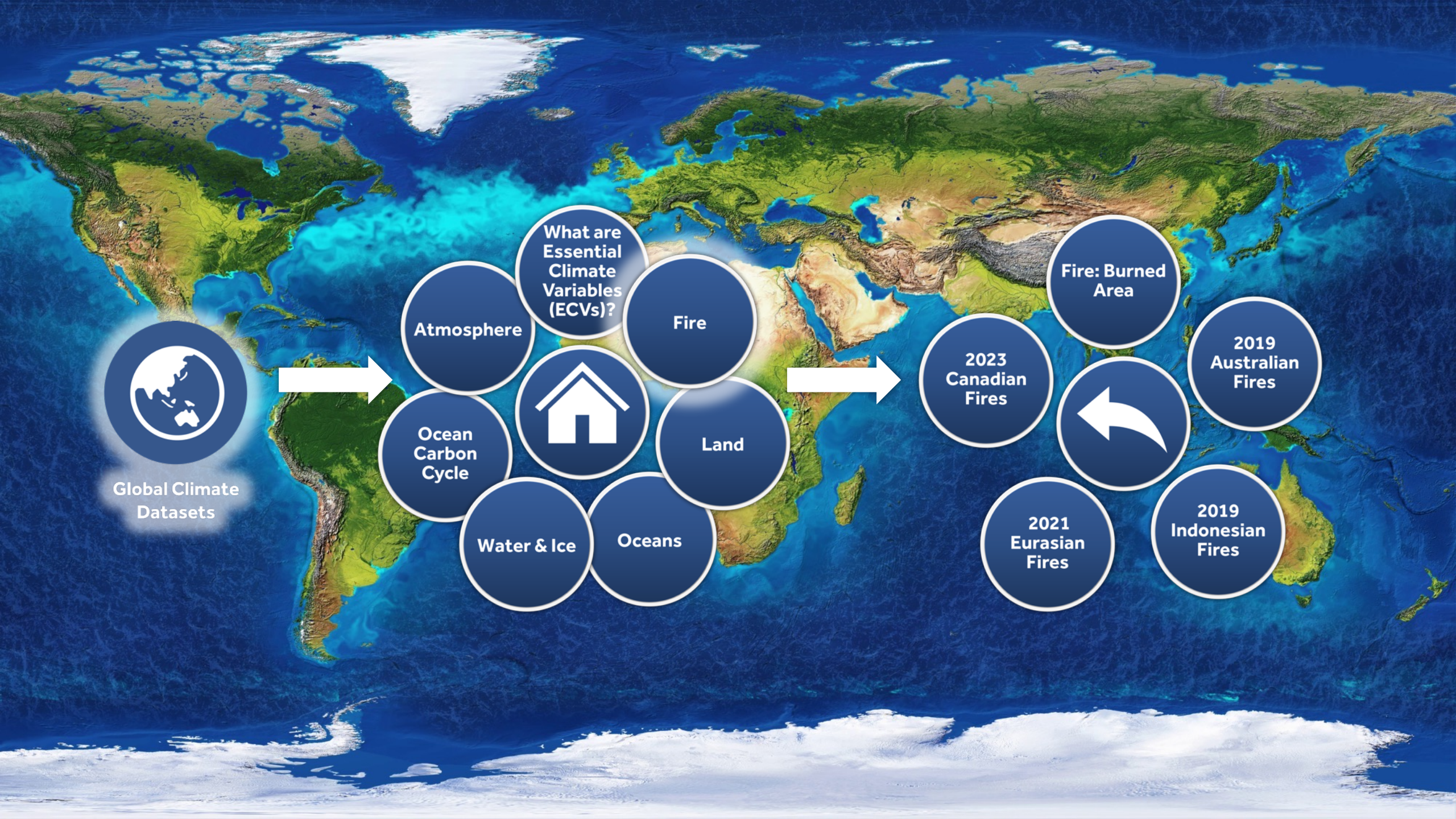
Website

Video

Where did this data come from?

GHGSat satellites measure methane emissions daily at the facility level, focusing on industrial sectors like oil & gas, waste management and coal mining.

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Water & Ice
Oceans
Fire: Burned Area
2023 Canadian Fires
2019 Australian Fires
2021 Eurasian Fires
2019 Indonesian Fires

Fire Burned Area

Why is this important?

Globally fires burn an area comparable to Europe each year. Fires are considered an Essential Climate Variable due to the huge volumes of greenhouse gases released.

This global dataset shows the area of land burned by fire, and is available at 50 m and 1 km resolutions.

Data from 2001 to 2020.

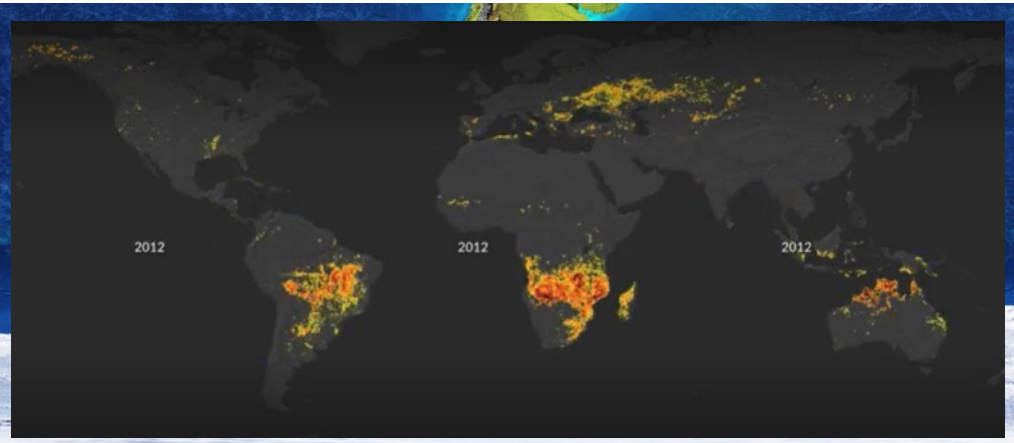
The ESA Climate Change Initiative Fire project includes contributions from the **University of Leicester** and **University College London**.

For more information

Visit the ESA CCI website

Where did this data come from?

This dataset uses surface reflectance data from Earth Observation satellites including Copernicus Sentinel-2 and -3, which have improved our ability to detect small fires.



Global Climate Datasets

Fire

2019 Australian Fires

SPACE CLIMATE 2019/20 Australian Wildfires SPACE CLIMATE

This animation shows how the carbon monoxide from the 2019-2020 Australian wildfires travelled around the globe.

Data shown from 1st December 2019 to 31st January 2020.

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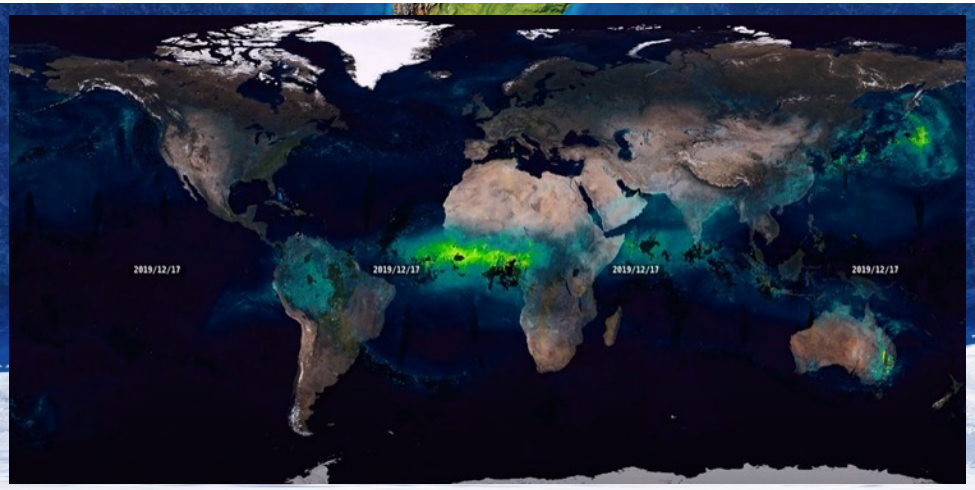
NATURAL ENVIRONMENT RESEARCH COUNCIL

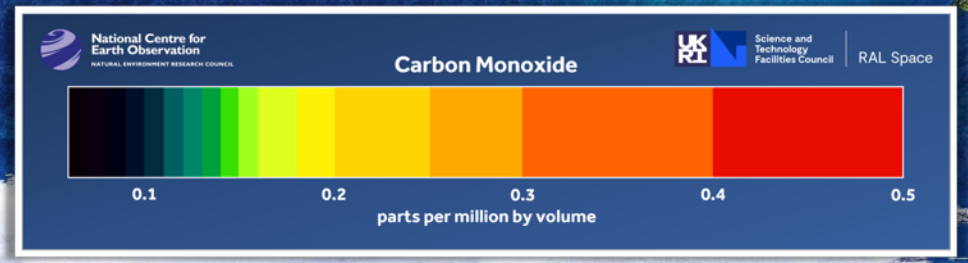
For more information

Access the Remote Sensing Group Data Visualisation Portal

Why is this important?

Satellite data like this improves our understanding of the problems which air pollution can cause. This can help governments decide what action may be needed when such events happen in the future.





SPACE CLIMATE 2019 Indonesian Wildfires SPACE CLIMATE

This animation shows how the carbon monoxide from 2019 Indonesian wildfires travelled around the globe.

Data shown from 1st September to 31st October 2019.

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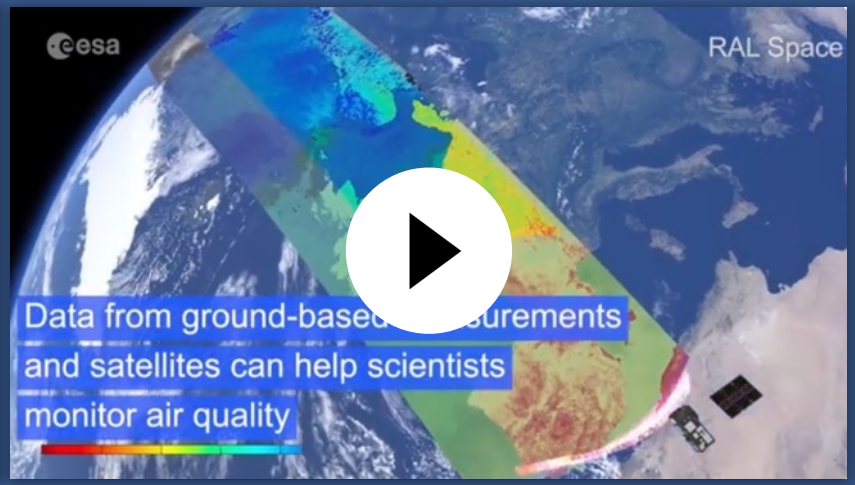
National Centre for Earth Observation
NATURAL ENVIRONMENT RESEARCH COUNCIL

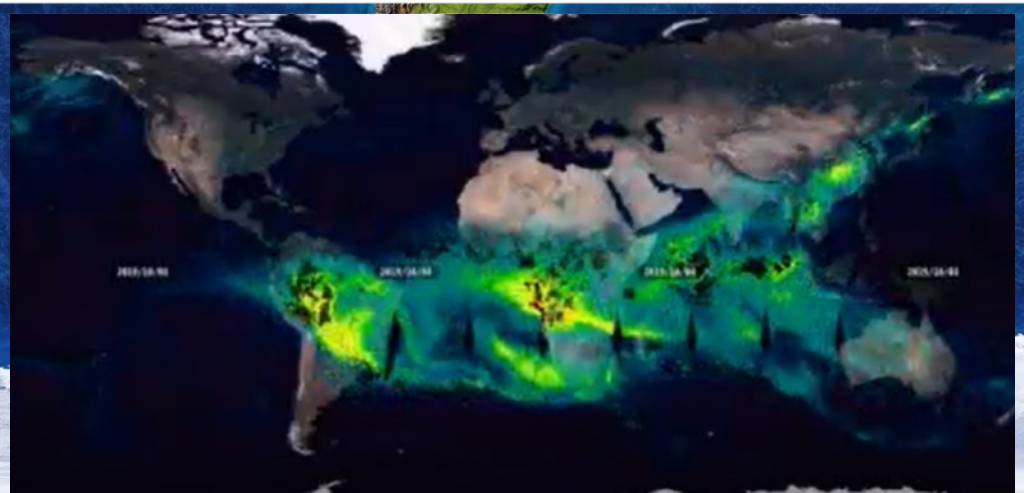


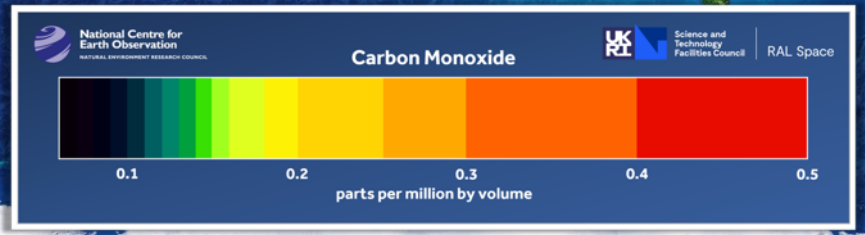
For more information

Access the Remote Sensing Group Data Visualisation Portal

Why is this important?

Agricultural burning and wildfires in Indonesia have a severe effect on the health of local people. Combining satellite data with measurements taken on the ground improved the monitoring of air quality.





SPACE CLIMATE 2021 Eurasian Wildfires SPACE CLIMATE

Why is this important?

Satellite data like this improves our understanding of the problems which air pollution can cause. This can help governments decide what action may be needed when such events happen in the future.

UKRI Science and Technology Facilities Council
RAL Space

National Centre for Earth Observation
NATURAL ENVIRONMENT RESEARCH COUNCIL

This animation shows how the carbon monoxide from wildfires in Europe and Asia in 2021 travelled around the globe.

Data shown from 1st July to 31st August 2021.

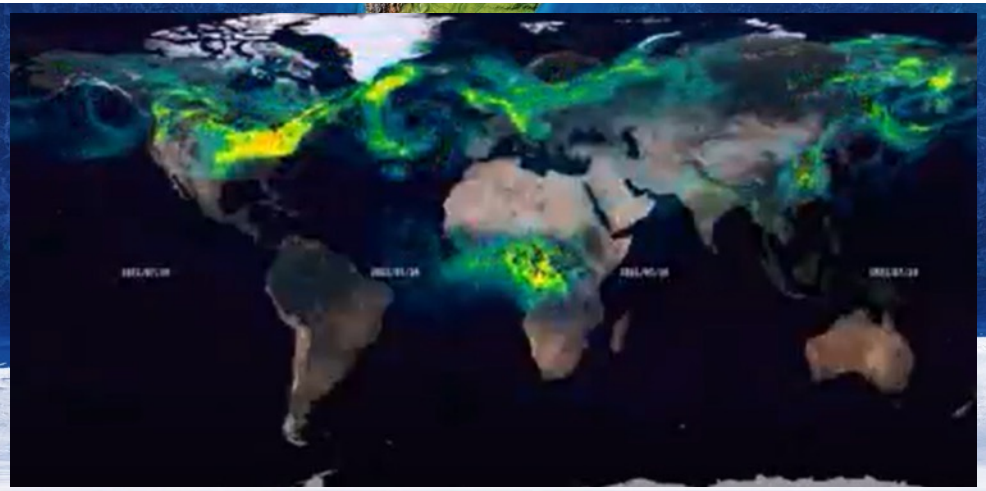
The Remote Sensing Group at **RAL Space** has international standing in satellite sounding of atmospheric composition, founded on core expertise in radiative transfer modelling and retrieval scheme development.

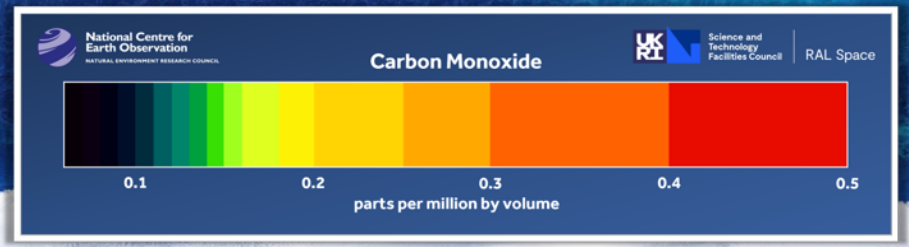
For more information

Access the Remote Sensing Group Data Visualisation Portal

Where did this data come from?

This dataset was produced from satellite observations combined with measurements taken on the ground.





Global Climate Datasets

Fire

2023 Canadian Fires

SPACE CLIMATE 2023 Canadian Fires SPACE CLIMATE

Why is this important?

Satellite data like this improves our understanding of the problems which air pollution can cause. This can help governments decide what action may be needed when such events happen in the future.

UKRI Science and Technology Facilities Council

RAL Space

National Centre for Earth Observation

NATURAL ENVIRONMENT RESEARCH COUNCIL

This animation shows how the carbon monoxide from the 2023 wildfires in Canada travelled around the globe.

Data shown from 1st May to 14th October 2023.

The Remote Sensing Group at **RAL Space** has international standing in satellite sounding of atmospheric composition, founded on core expertise in radiative transfer modelling and retrieval scheme development.

For more information

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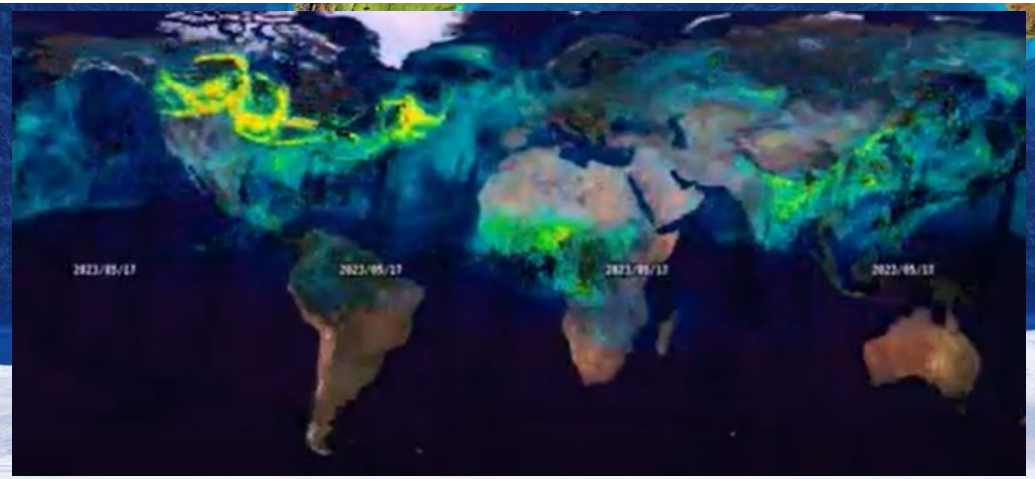
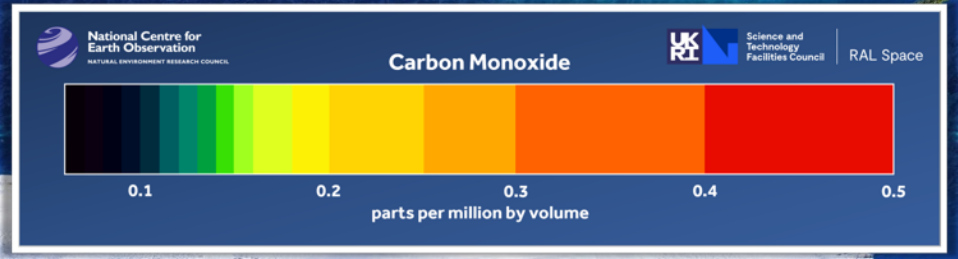
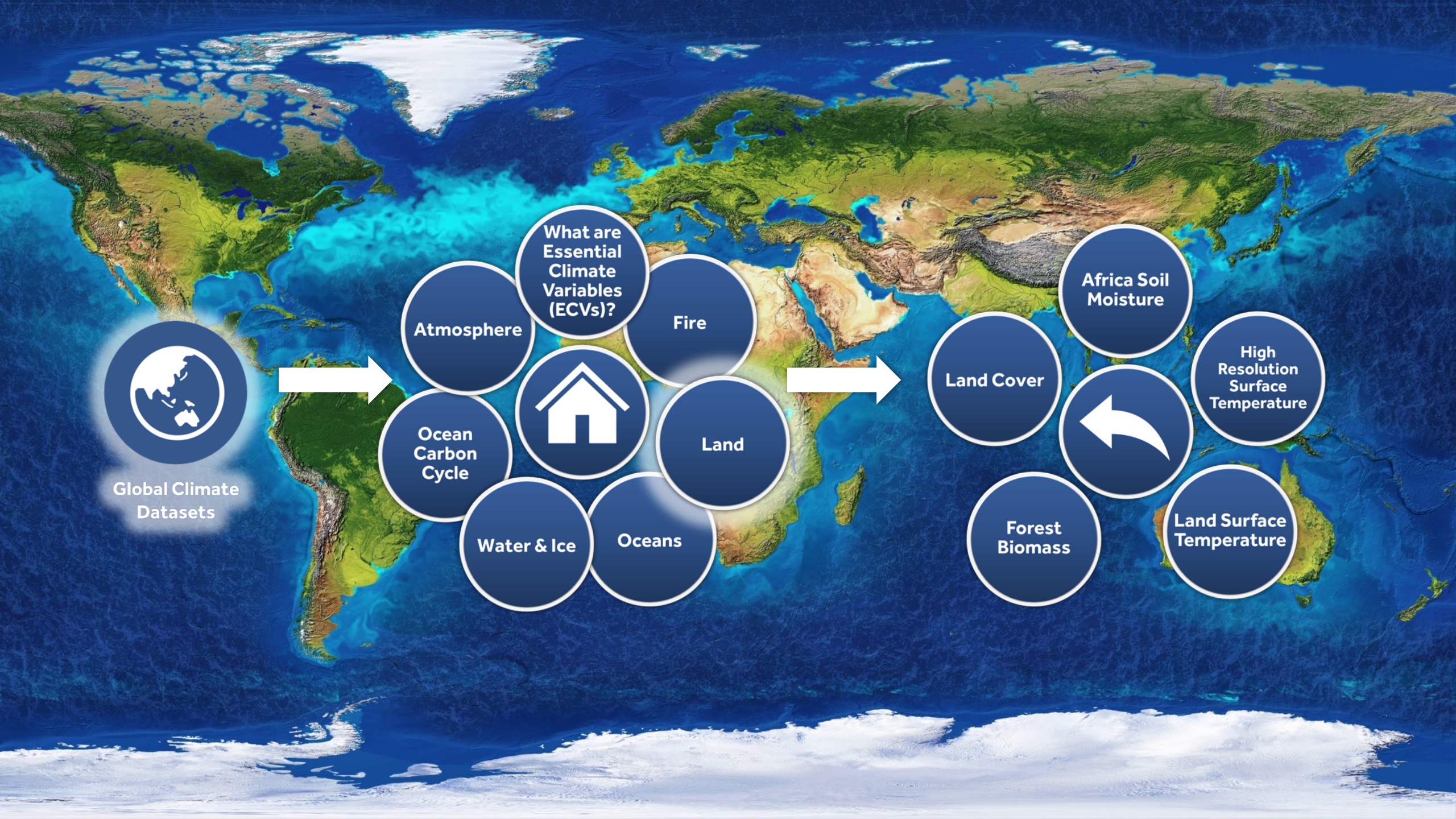
Where did this data come from?

This dataset was produced from satellite observations combined with measurements taken on the ground.



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Land Cover
Africa Soil Moisture
High Resolution Surface Temperature
Forest Biomass
Land Surface Temperature

Global Climate Datasets

Land

Forest Biomass

Forest Aboveground Biomass

Why is this important?

The biomass dataset makes it possible to robustly monitor fluctuations in the global forest carbon stock at an annual and decadal interval. It will help monitor changes in forest carbon which contribute to national efforts towards achieving net zero; inform carbon cycle models and future projections; and act as input to the UN Global Stocktake.

This dataset shows the amount of biomass above ground level in forests, globally.

Data from 2010, 2017, 2018, 2019 and 2020.

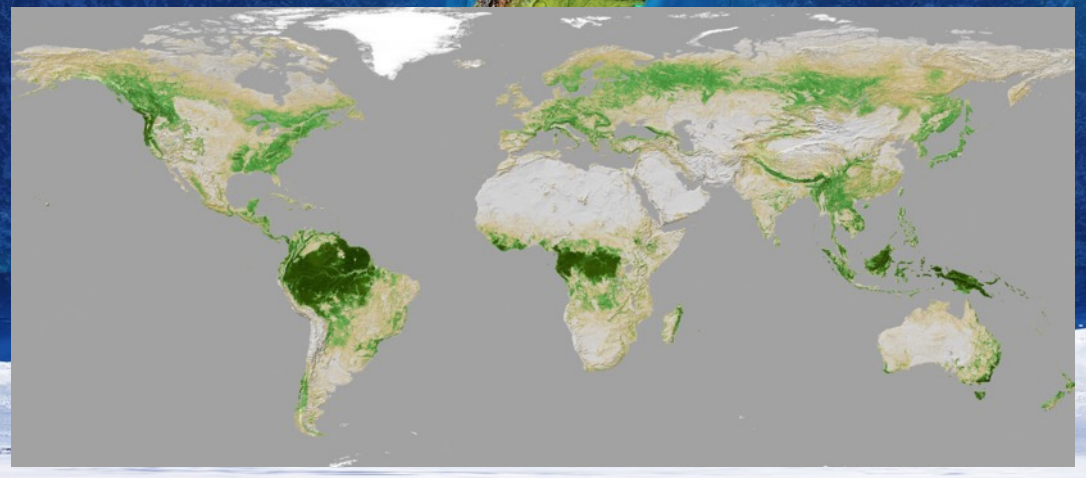
The project was led by Prof Shaun Quegan, **National Centre for Earth Observation** and **Sheffield University** and managed by Prof Richard Lucas at the **University of Aberystwyth**. Additional expertise was provided by the **University of Leeds** and the **University of Leicester.**

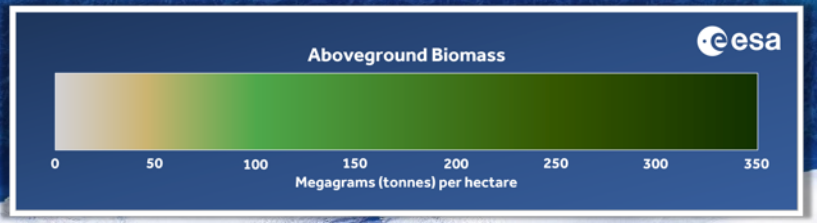
For more information

Visit the ESA CCI website

Where did this data come from?

The dataset is derived from instruments on a combination of Earth Observation satellites including Copernicus Sentinel-1, Envisat, JAXA's Advanced Land Observing Satellites, ICESat-2 and the International Space Station.





Global Climate Datasets

Land

Land Cover

Land Cover

Why is this important?

Observing changes in land cover is crucial for many aspects of climate science. These land cover maps are used: as an input to climate models; to monitor global natural assets; to develop agri-environmental indicators; and to monitor progress towards the United Nations Sustainable Development Goal 15.3 on land degradation neutrality.

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Brockmann Consult

LSCE

UCLouvain

Met Office

This dataset shows the predominant land cover type across the globe.

Data from 1992 to 2015.

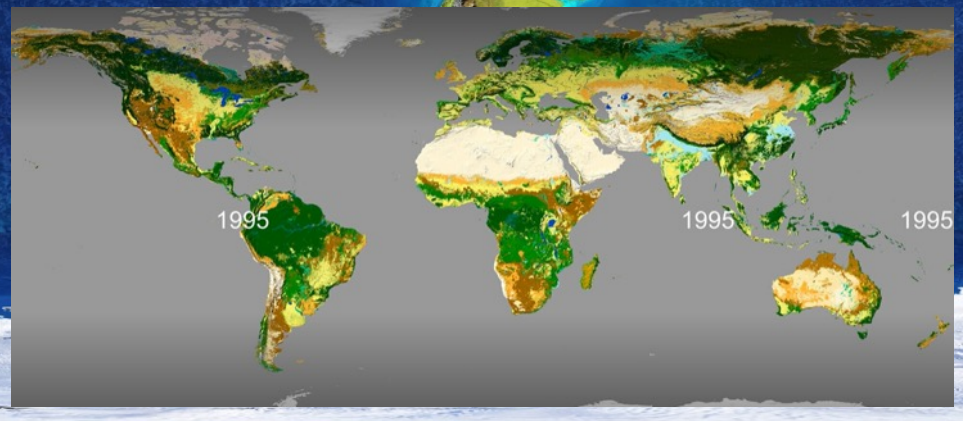
The **Met Office** - Hadley Centre provides research advice and input as a key representative user from the modelling community.

For more information

Visit the ESA CCI website

Where did this data come from?

These annual land cover maps build on the Food and Agriculture Organization of the United Nations Environment Programme (FAO/UNEP) Land Cover Classification System, and are derived from observations from multiple satellites including Sentinel-3, SPOT-Vegetation and PROBA-V.



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- Rainfed Cropland
- Irrigated Cropland
- Cropland / Natural Vegetation Mosaic
- Natural Vegetation / Cropland Mosaic
- Broadleaf Evergreen Forest
- Broadleaf Deciduous Forest
- Needleleaf Evergreen Forest
- Needleleaf Deciduous Forest
- Mixed Lead Forest
- Forest / Herbaceous Mosaic
- Herbaceous / Forest Mosaic
- Shrubland
- Grassland
- Lichens and Mosses
- Sparse Vegetation
- Flooded Forest (Freshwater)
- Flooded Forest (Saltwater)
- Flooded Shrub and Grassland
- Urban Areas
- Bare Areas
- Water Bodies
- Permanent Snow and Ice

Land Surface Temperature

Why is this important?

Accurately understanding land surface temperatures at global and regional levels helps to evaluate land surface–atmosphere exchange processes in models. This data is also suitable for regional to local applications such as urban planning, agriculture or natural hazard management.

This dataset provides land surface temperatures and their uncertainty estimates. These are ground surface temperatures in bare soil areas, canopy temperatures over forests, and a mix of soil and leaf temperatures over sparse vegetation.

Data from 1996 to 2020.

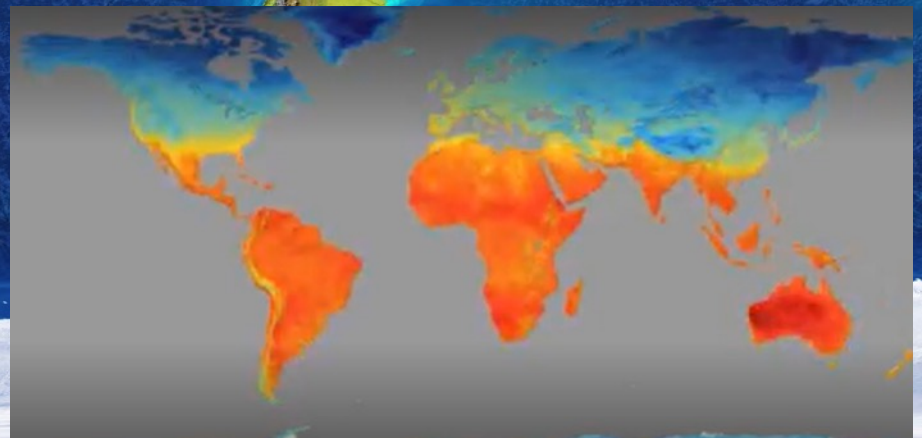
The ESA Land Surface Temperature Climate Change Initiative's science is led by the **National Centre for Earth Observation** at the **University of Leicester**. Expertise is also provided by the **Met Office** and the **University of Reading**.

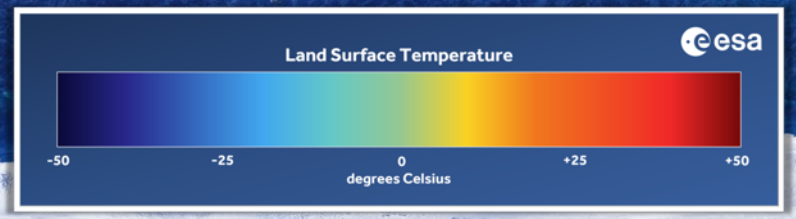
For more information

Visit the ESA CCI website

Where did this data come from?

The dataset merges infrared observations from a series of instruments on the Sentinel-3A and Terra satellites. These were cross-calibrated with the Infrared Atmospheric Sounding Interferometer instruments on meteorological operational satellites.





Global Climate Datasets

Land

High Resolution Surface Temperature

High Resolution Surface Temperature

Why is this important?

This dataset: informs planning and 'climate-adaptive' building design to deal with heatwaves; plays a crucial roles in food security assessments and drought forecasting; and is increasingly important for evaluating models of the Earth system.

National Centre for Earth Observation
NATURAL ENVIRONMENT RESEARCH COUNCIL

UNIVERSITY OF LEICESTER

EOCIS
EARTH OBSERVATION CLIMATE INFORMATION SERVICE

These images show land surface temperatures at various locations across the globe.

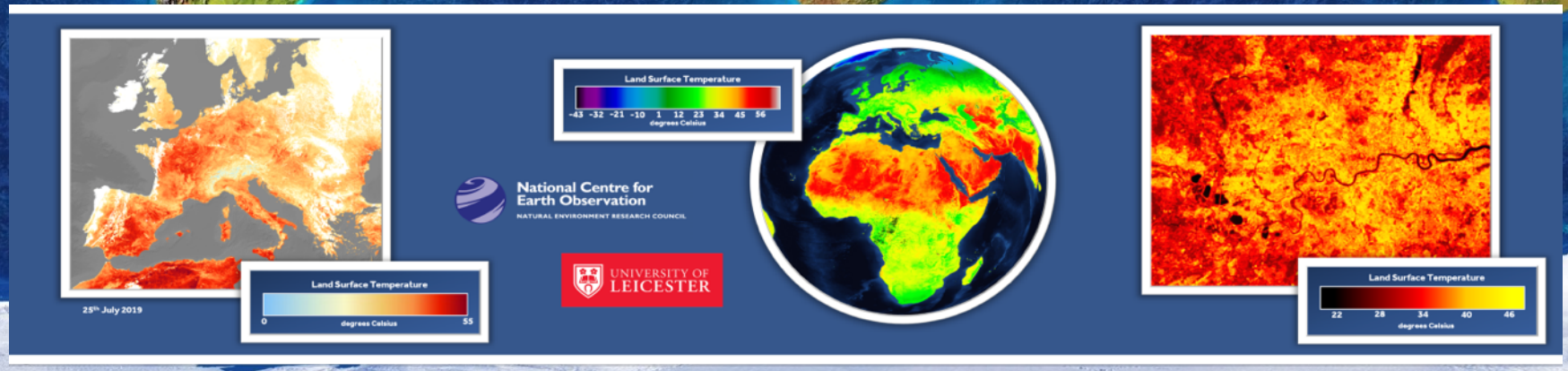
The **National Centre for Earth Observation** at the **University of Leicester** leads the science of ESA's Climate Change Initiative Land Surface Temperature. This expertise is being used within the UK **Earth Observation Climate Information Service**.

For more information

EOCIS

Where did this data come from?

This dataset was created using observations from the Sea and Land Surface Temperature Radiometer on the Sentinel-3 satellite. To understand local changes at a city level, these same techniques have been utilised to produce data from the Landsat-8 satellite at the higher spatial resolution necessary to resolve urban features.



Africa Soil Moisture

Why is this important?

Soil moisture is an indicator of agricultural drought, which frequently affects Africa. TAMSAT's new soil moisture dataset provides 40+ years (since 1983) of daily soil moisture information that are updated in near-real time, making it a highly valuable resource for drought risk assessment and monitoring across Africa.

TAMSAT

EOCIS
EARTH OBSERVATION CLIMATE INFORMATION SERVICE

University of Reading

National Centre for Earth Observation
NATURAL ENVIRONMENT RESEARCH COUNCIL

National Centre for Atmospheric Science
NATURAL ENVIRONMENT RESEARCH COUNCIL

TAMSAT: Tropical Applications of Meteorology using Satellite and Ground-Based Observations

This TAMSAT soil moisture dataset shows daily anomalies in the soil moisture availability factor, which indicates how much plant growth is restricted by the available soil moisture.

Areas in red have a soil moisture deficit whereas areas shown in blue have a soil moisture surplus.

Data is from 2018 to 2019.

The TAMSAT Group, based at the **University of Reading**, have over 40 years' experience in developing and supporting satellite-based climate services for Africa.

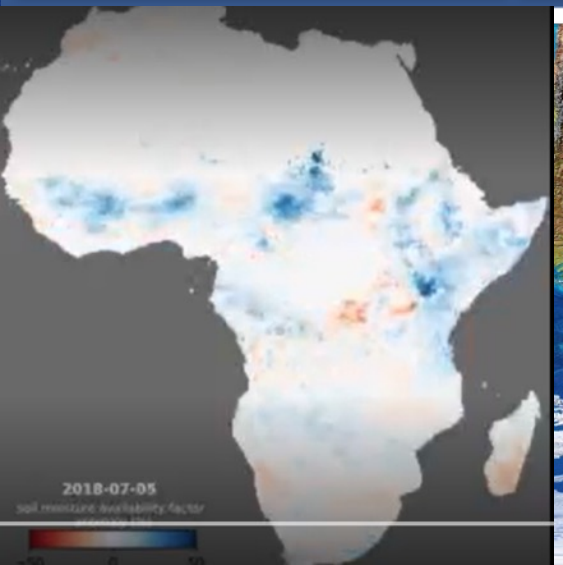
For more information

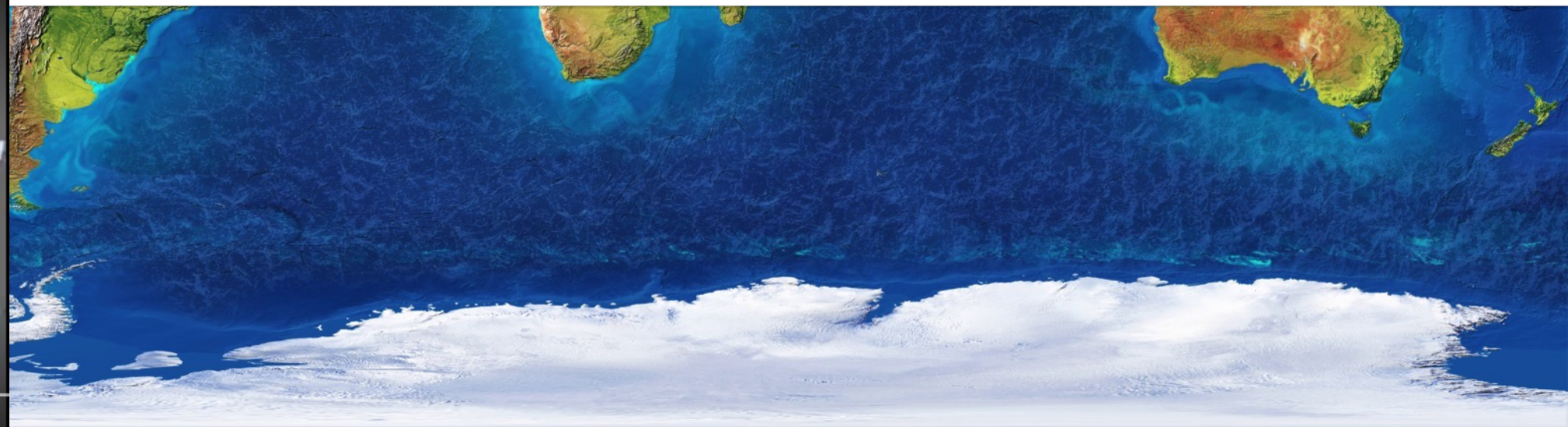
TAMSAT

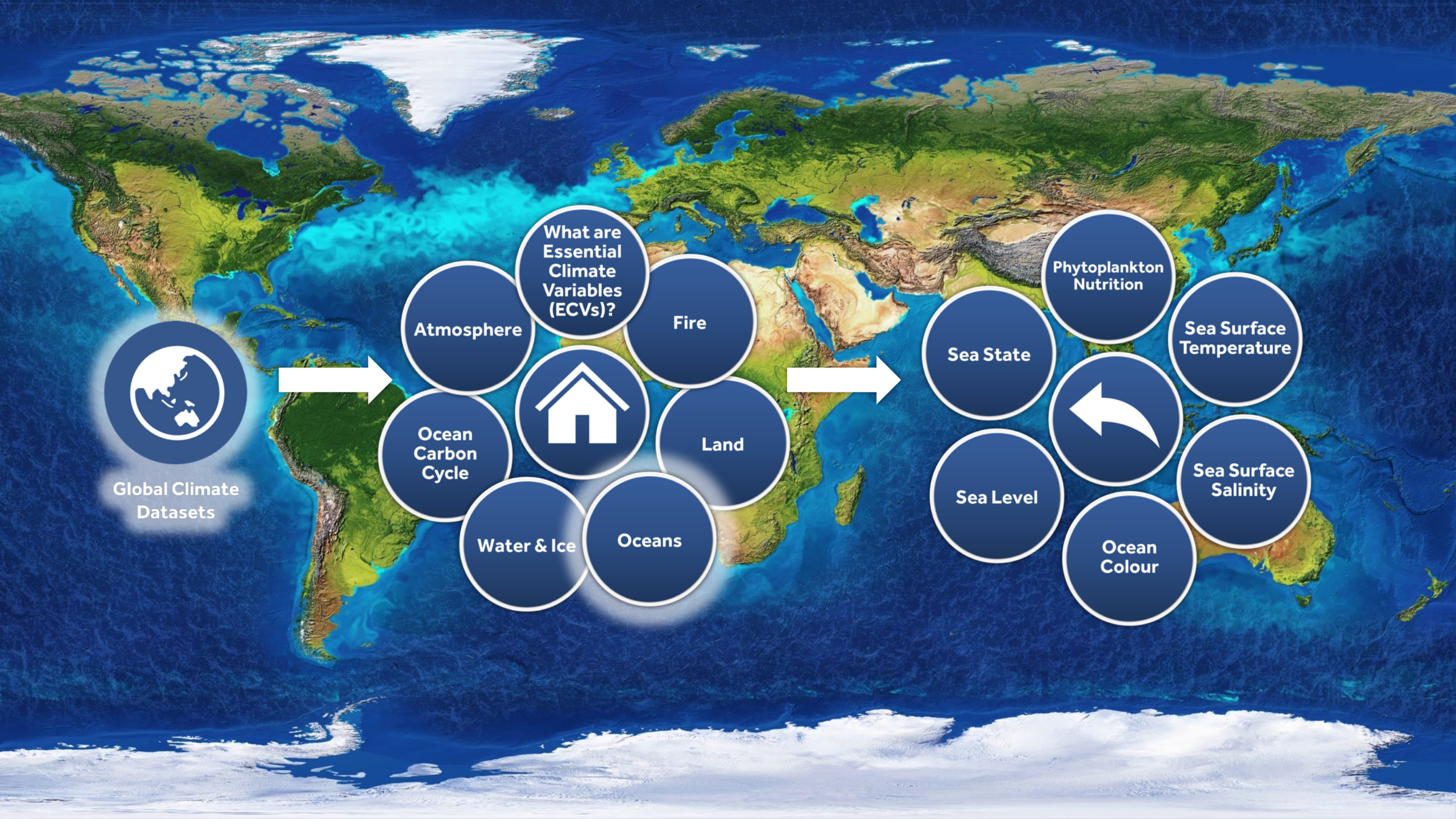
EOCIS

Where did this data come from?

This dataset was derived using a land surface model, Soil Moisture Active Passive (SMAP) satellite observations, and TAMSAT satellite-derived rainfall estimates.



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Phytoplankton Nutrition
Sea Surface Temperature
Sea Level
Sea Surface Salinity
Ocean Colour

Oceans

Ocean Colour

Global Climate Datasets

SPACE CLIMATE Ocean Colour SPACE CLIMATE

Why is this important?

This ocean colour dataset was cited in the Intergovernmental Panel on Climate Change's (IPCC's) Sixth Assessment Report (AR6) where it was used to 'benchmark' climate model performance against observations.

ipcc INTERGOVERNMENTAL PANEL ON climate change WMO UNEP

esa Brockmann Consult solvo PML Plymouth Marine Laboratory hereon Helmholtz-Zentrum National Research Council of Italy HYGEOS Ciências ULisboa JRC EUROPEAN COMMISSION Pixalytics

This data record, from the European Space Agency's Ocean Colour Climate Change Initiative, shows the chlorophyll-a concentration in seawater.

Data from 1997 to 2022.

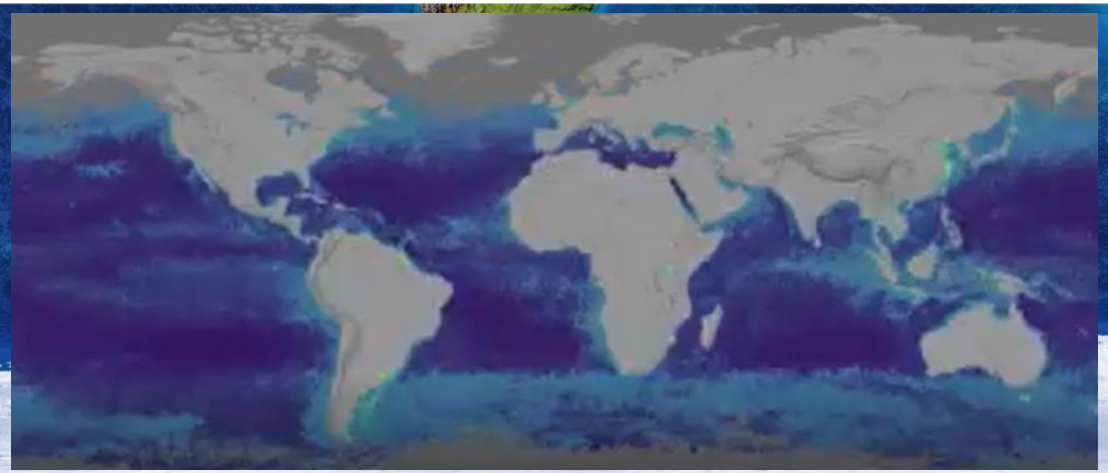
The ESA Ocean Colour Climate Change Initiative is led by **Plymouth Marine Laboratory** with expertise from **Pixalytics**.

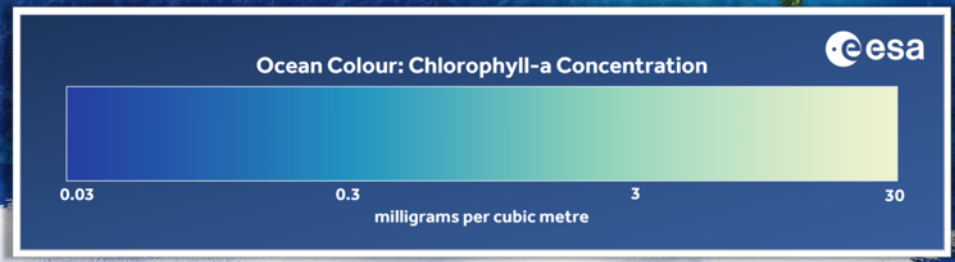
For more information

Visit the ESA CCI website

Where did this data come from?

This dataset merges observations from satellite borne sensors including: the Medium Resolution Imaging Spectrometer, the Sea-viewing Wide Field-of-view Sensor, Moderate Resolution Imaging Spectroradiometer and Visible Infrared Imaging Radiometer Suite.





Oceans

Sea Level

Global Climate Datasets

Sea Level Anomaly

Why is this important?

Precise monitoring of changes in the mean level of the oceans is vitally important for protecting the lives of those in low-lying regions at risk. By 2050, around one billion people are expected to be living in the coastal zone, at less than 10 metres above sea level.

esa

PML Plymouth Marine Laboratory

National Oceanography Centre

LEGOS

CLS COLLECTE LOCALISATION SATELLITES

Technische Universität München

This data record shows monthly sea level anomalies.

Data from 1993 to 2015.

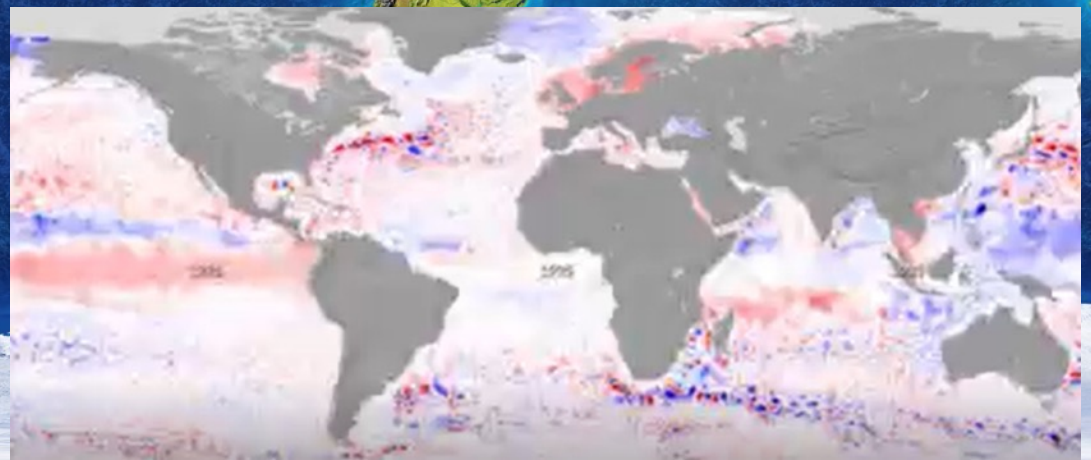
The **National Oceanography Centre** and the **Plymouth Marine Laboratory** have contributed expertise to production of this dataset.

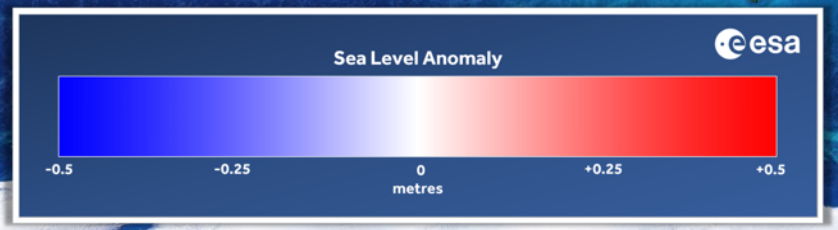
For more information

Visit the ESA CCI website

Where did this data come from?

This data is derived from a series of altimeters on-board the ERS-1, ERS-2, Envisat, Cryosat, Jason -1 and Jason-2 satellites. The Copernicus Sentinel-6 mission will extend the legacy of sea-surface height measurements until at least 2030.





Sea State

Why is this important?

Understanding global sea state is crucial because ocean waves affect sediment transport, coastal extreme sea levels and sea ice evolution. Moreover, sea state varies with large-scale climate patterns like El Niño and so requires continuous observation.

Sea state describes wind-generated ocean wave properties. This dataset shows significant wave height at approximately 6 km spatial resolution.

Data from 2001 to 2020.

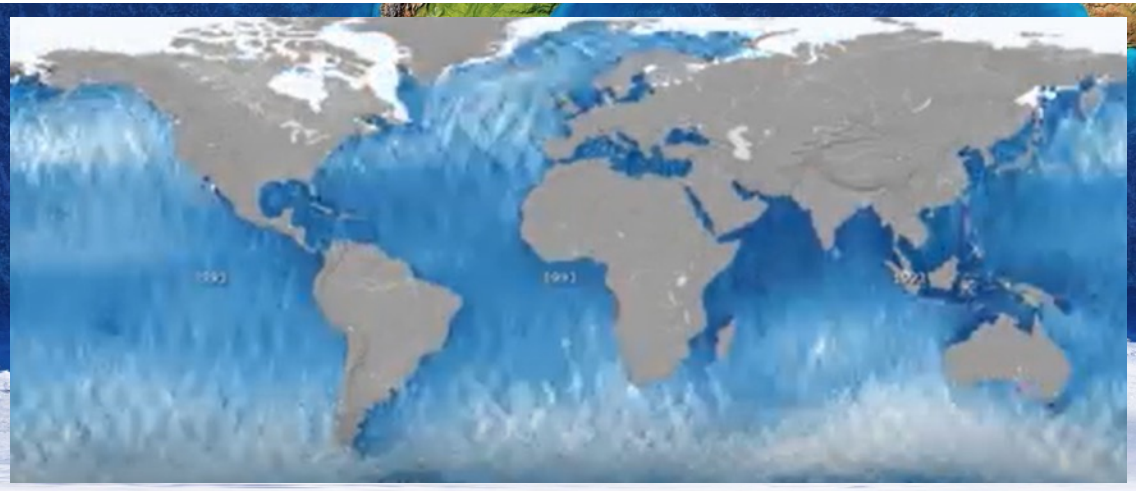
UK expertise is provided by **Plymouth Marine Laboratory**, the **National Oceanography Centre** and **Satellite Oceanography Consultants.**

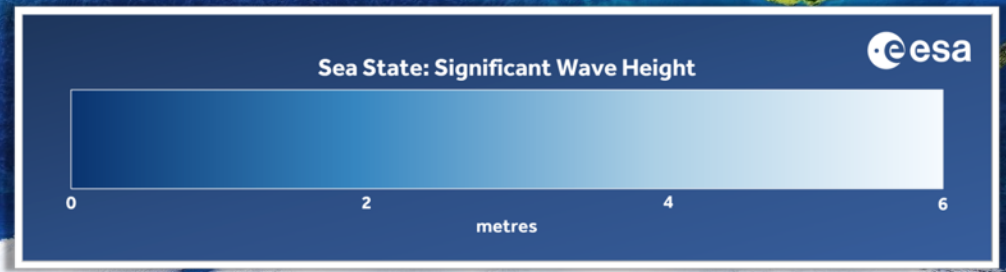
For more information

Visit the ESA CCI website

Where did this data come from?

This dataset was derived from Synthetic Aperture Radar data observations from multiple satellite missions including Envisat, CryoSat-2, Jason-1, Jason-2, Jason-3, SARAL and Sentinel-3.





Sea Surface Salinity

Why is this important?

Sea surface salinity plays a fundamental role in global climate and the water cycle, as well as the global ocean circulation, which is driven by density. The creation of this dataset led to new findings concerning the El Nino-Southern Oscillation, ocean circulation and ocean exchange processes.

Sea surface salinity is the amount of salt dissolved in seawater. These maps are available with a spatial resolution of 50 km and a time resolution of one week or one month, with information about errors.

Data from 2010 to 2020.

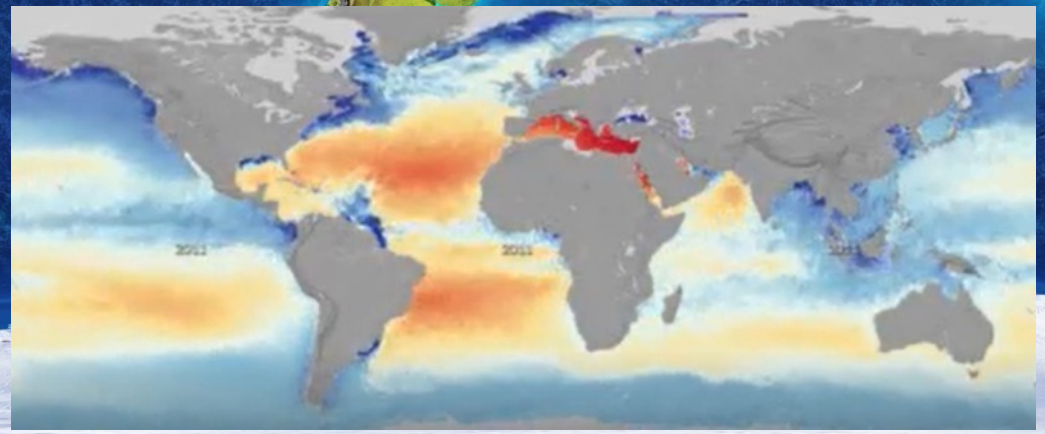
The ESA Climate Change Initiative's Sea Surface Salinity consortium is led by **ARGANS**, with contributions from the **Met Office** and the **National Oceanography Centre.**

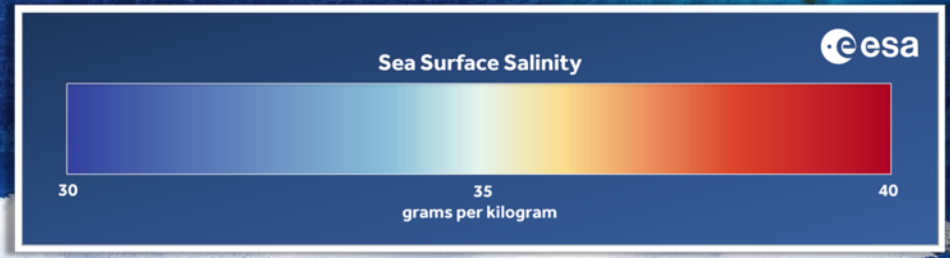
For more information

Visit the ESA CCI website

Where did this data come from?

This dataset combines data from L- and C-band radiometers onboard the Soil Moisture and Ocean Salinity (SMOS), Aquarius and Soil Moisture Active Passive (SMAP) missions.





SPACE CLIMATE Sea Surface Temperature SPACE CLIMATE

Why is this important?

Sea surface temperature is closely linked to the heat stored in the upper ocean and has a strong influence on global weather patterns. This data is used by scientists to quantify climate change and variability, evaluate ocean and climate simulations and forecast the weather, as well as by fisheries, tourism and transport.

University of Reading

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NATURAL ENVIRONMENT RESEARCH COUNCIL

Met Office

This dataset shows the difference between the sea surface temperature and the average temperature at each latitude.

Data from 2010 to 2023.

Watch out for: Seasonal changes, as each hemisphere warms during summer, and the polar ice caps grow and shrink; fast changes in sea surface temperature caused by the effect of weather on the ocean; and tropical cyclones from the cold wakes they leave.

UK Expertise

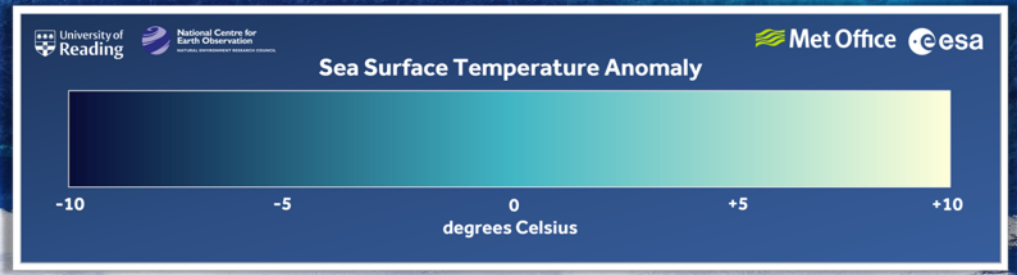
The **University of Reading** has world-class expertise in thermal remote sensing and leads the ESA Sea Surface Temperature Climate Change Initiative. The Reading team obtains sea surface temperatures from satellite imagery, and the **Met Office** merges these data to give a global, gap-free analysis.

For more information

Visit the ESA CCI website

Where did this data come from?

This dataset merges data from 22 satellites using four series of sensors: 15 Advanced Very High Resolution Radiometers, three Along-Track Scanning Radiometers, two Sea and Land Surface Temperature Radiometers, and two Advanced Microwave Scanning Radiometers. The methods used make this record highly suitable for applications related to climate and climate change.



Global Climate Datasets

Oceans

Phytoplankton Nutrition

Nutritional Quality of Phytoplankton

Why is this important?

These maps can be used to assess changes in the nutritional quality of phytoplankton and the production of fish which feed on them due to climate change. They also enable fisheries and aquacultures to report the near real-time state of habitats and associated risks to their businesses due to climate change.

University of Reading

This dataset monitors the quality and quantity of microscopic plants, known as phytoplankton.

Annually averaged data.

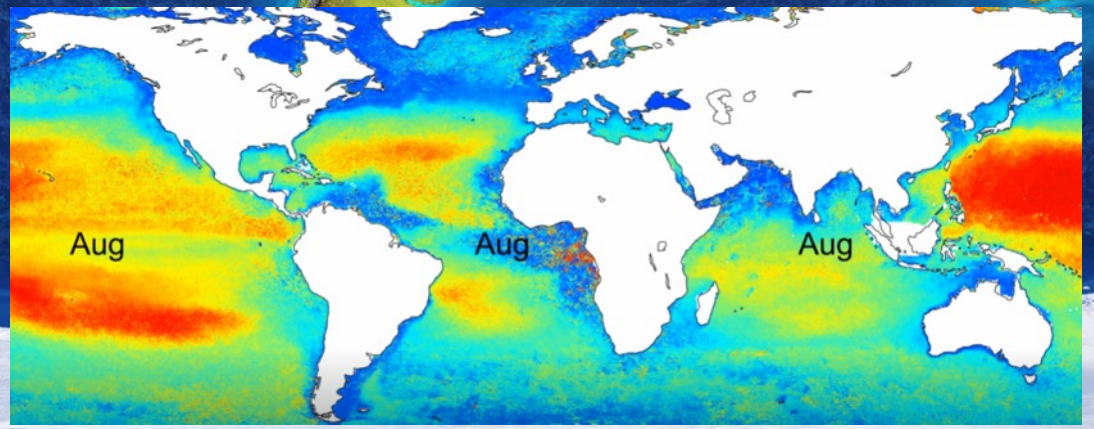
This project was led and delivered by the **University of Reading**. The early development was based on the UK-led Climate Change Initiative Ocean Colour data.

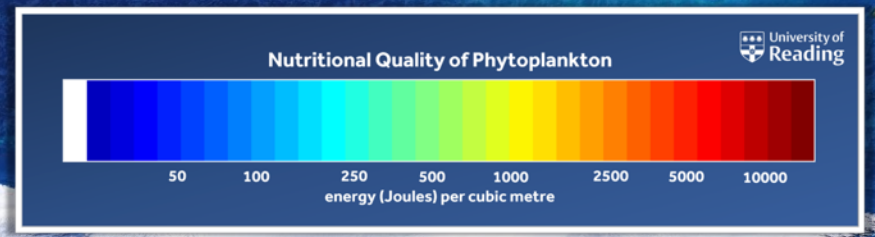
For more information

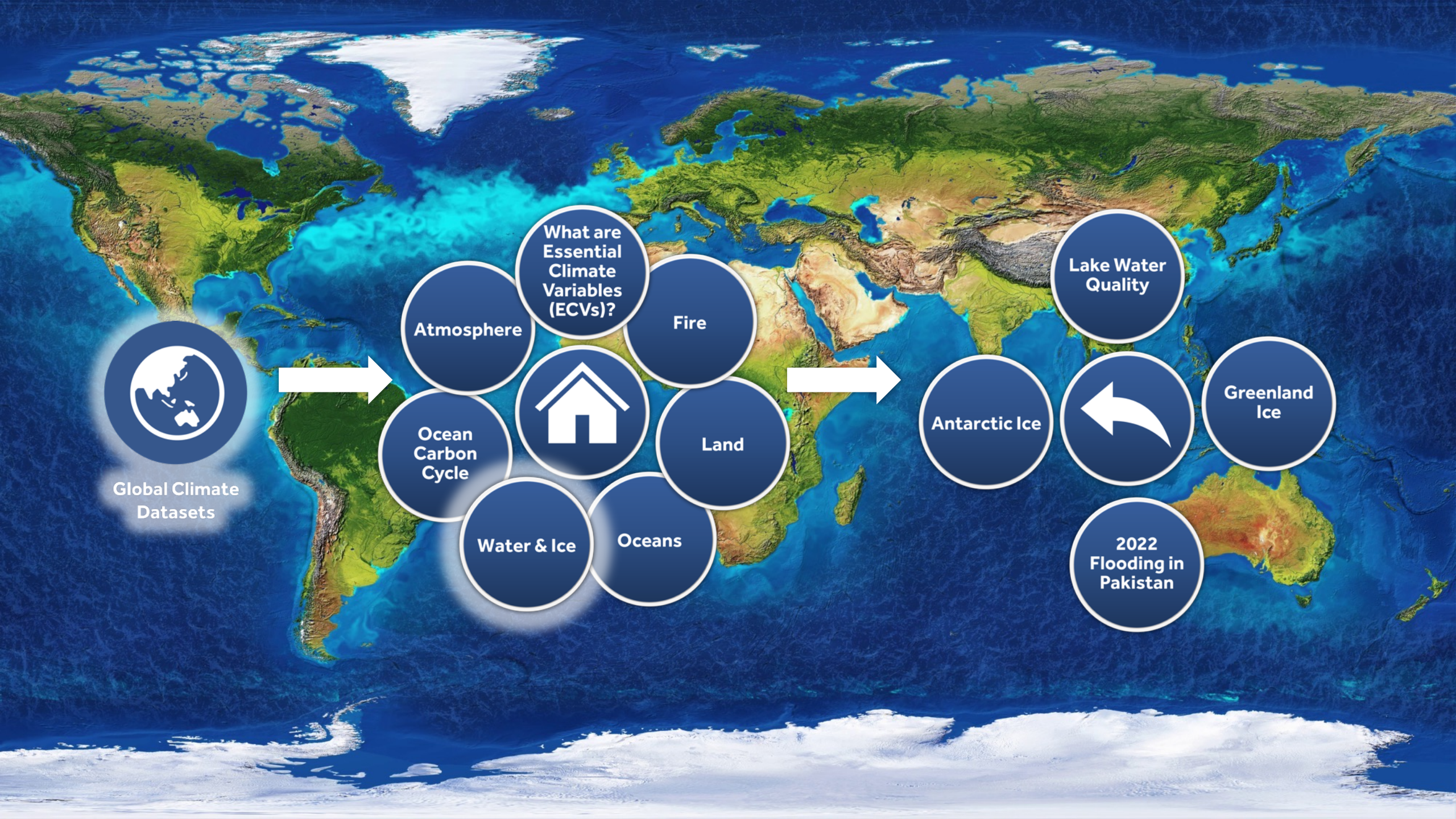
Read the research paper

Where did this data come from?

This dataset is derived from the ESA Climate Change Initiative Ocean Colour dataset, which was created from Earth Observation satellite data.



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Oceans
Lake Water Quality
Antarctic Ice
Greenland Ice
2022 Flooding in Pakistan

Global Climate Datasets

Water & Ice

Antarctic Ice

Antarctica Surface Elevation Changes

Why is this important?

Changes in Antarctic ice sheet surface elevation are directly linked to climate change, and accelerating mass losses across both the Antarctica and Greenland ice sheets is a dominant contributor to average global average sea level rise.

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Swansea University Prifysgol Abertawe

The University of Edinburgh

Northumbria University Newcastle

University of Leeds

Lancaster University

University of Bristol

UCL

British Antarctic Survey
Natural Environment Research Council

This dataset shows changes in surface elevation, i.e. the height of ice above mean sea level, of ice in Antarctica.

Data from 1991 to 2021.

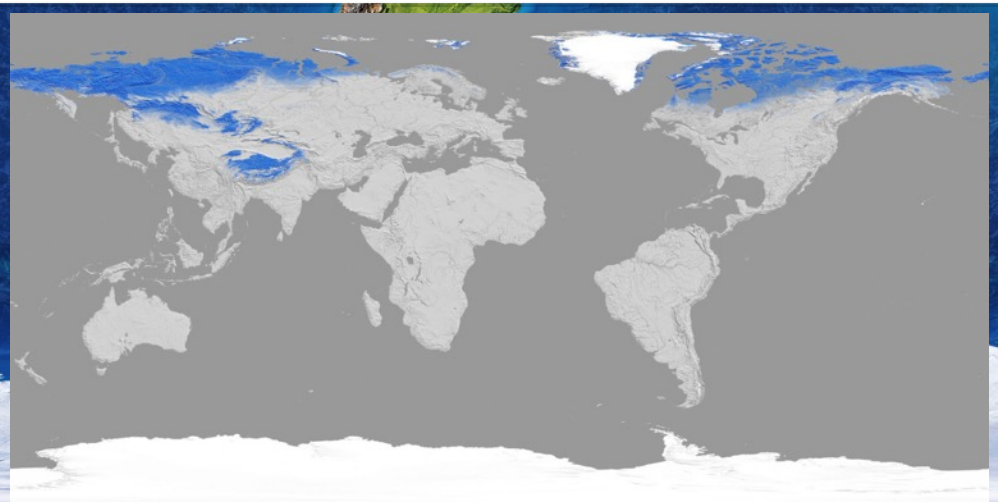
The ESA Climate Change Initiative Antarctica Ice Sheet project's science is led by the **University of Northumbria,** with contributions from the **Universities of Leeds, Bristol, Edinburgh, Lancaster, Swansea and University College London** and the **British Antarctic Survey.**

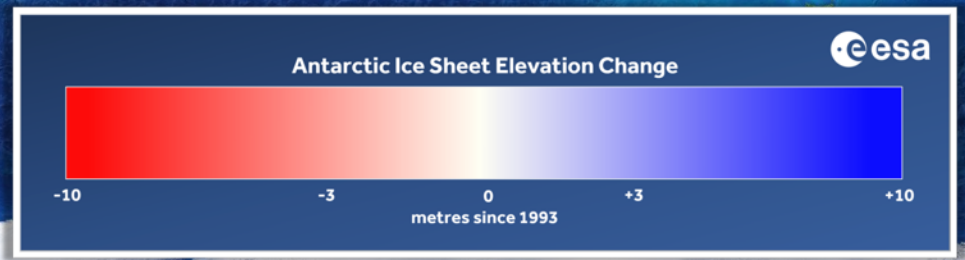
For more information

Visit the ESA CCI website

Where did this data come from?

This dataset was created by merging data from radar altimetry satellites including ERS-1, ERS-2, ENVISAT, CryoSat-2, Sentinel-3A and Sentinel-3B.





Greenland Surface Elevation Changes

Why is this important?

Changes in Greenland surface elevation are linked to climate change, and accelerating mass losses across both the Antarctica and Greenland ice sheets is a dominant contributor to average global average sea level rise.

This dataset shows changes in surface elevation, i.e. the height of ice above mean sea level, of ice in Greenland.

Data from 1991 to 2021.

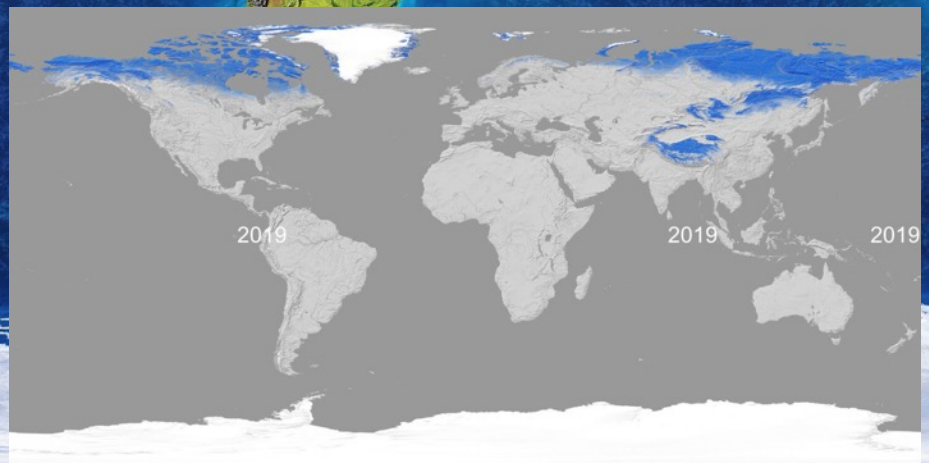
This dataset was created with contributions from the **University of Leeds** and the **University of Northumbria**.

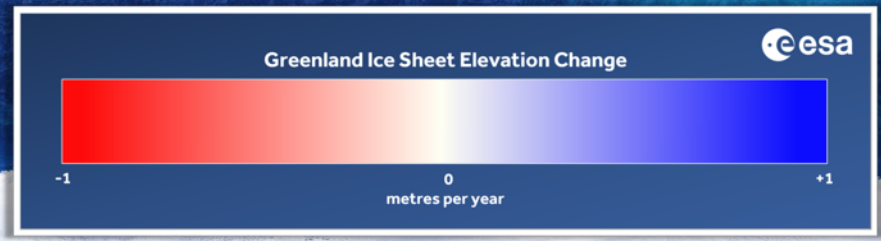
For more information

Visit the ESA CCI website

Where did this data come from?

This dataset was created by merging data from radar altimetry satellites including ERS-1, ERS-2, ENVISAT, CryoSat-2, Sentinel-3A and Sentinel-3B.





Global Climate Datasets

Water & Ice

Lake Water Quality

Lake Water Quality

Why is this important?

This dataset can be used alongside model projections to provide clear evidence of the impact of human-induced climate change on lakes. For every 1°C increase in global air temperature, lakes are estimated to warm by 0.9°C and lose 9.7 days of ice cover, according to research cited in the latest IPCC Assessment Report.

Water quality describes the suitability of water for human consumption.

This dataset provides globally consistent water quality observations from satellites for over 2,000 inland water bodies.

Data from 1992 to 2020.

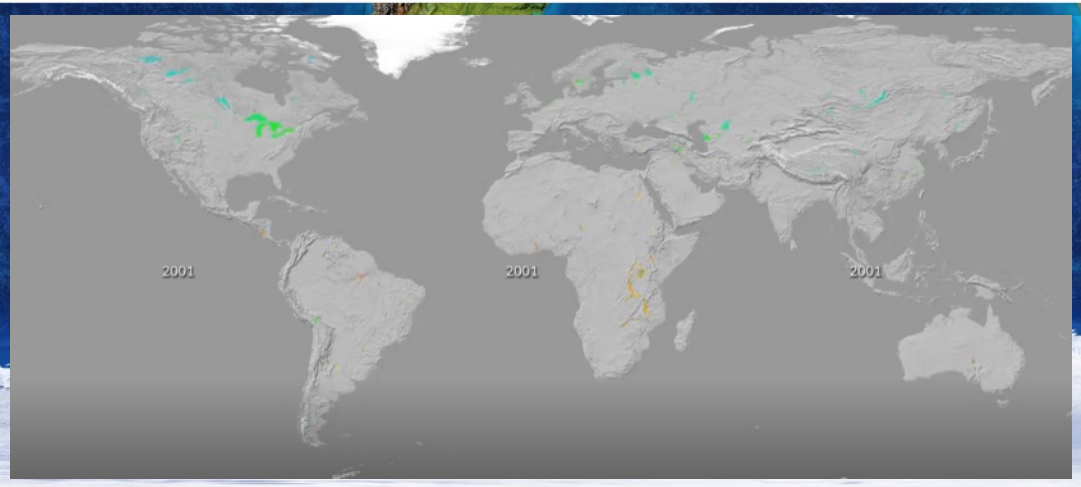
The ESA Climate Change Initiative's Lakes project is led by Dr Stefan Simis of the **Plymouth Marine Laboratory**, with contributions from the **University of Reading** and **University of Stirling**.

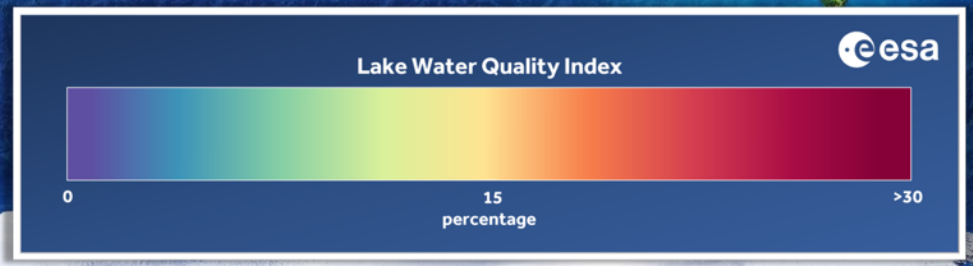
For more information

Visit the ESA CCI website

Where did this data come from?

The dataset is derived from multiple sensors on the TOPEX/Poseidon, Jason, Envisat, Satellite with ARGOS and ALTIKA (SARAL), Sentinel-2, Sentinel-3, Landsat OLI, European Remote Sensing (ERS), Terra, Aqua and Metop satellite missions.





Global Climate Datasets

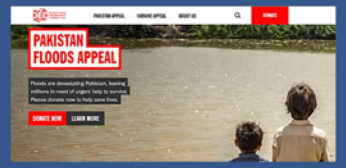
Water & Ice

2022 Flooding in Pakistan

2022 Flooding in Pakistan

Why is this important?

The impacts of the flooding were so bad, they were reported on the Disaster Emergency Committee's website. 33 million people were affected.



UKRI Science and Technology Facilities Council

RAL Space

National Centre for Earth Observation

NATURAL ENVIRONMENT RESEARCH COUNCIL

These images show the extensive flooding which occurred in the Pakistan region in August and September 2022.

The two images shown are from 1st September 2021 and 2022, to illustrate the changes in 2022.

The Remote Sensing Group at **RAL Space** has international standing in satellite sounding of atmospheric composition, founded on core expertise in radiative transfer modelling and retrieval scheme development.

For more information

Access the Remote Sensing Group Data Visualisation Portal

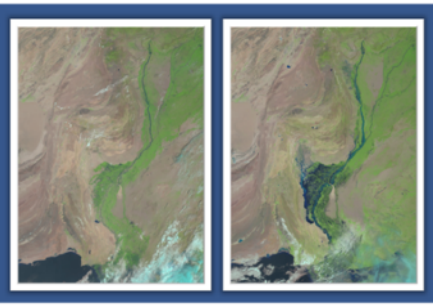
Where did this data come from?

This is a false-colour image, using visible and near-infrared measurements from the Copernicus Sentinel-3 satellite. The white/light blue near the bottom are clouds, with colder/higher clouds having a bluer colouring.

1st September 2021

Flooding in Pakistan

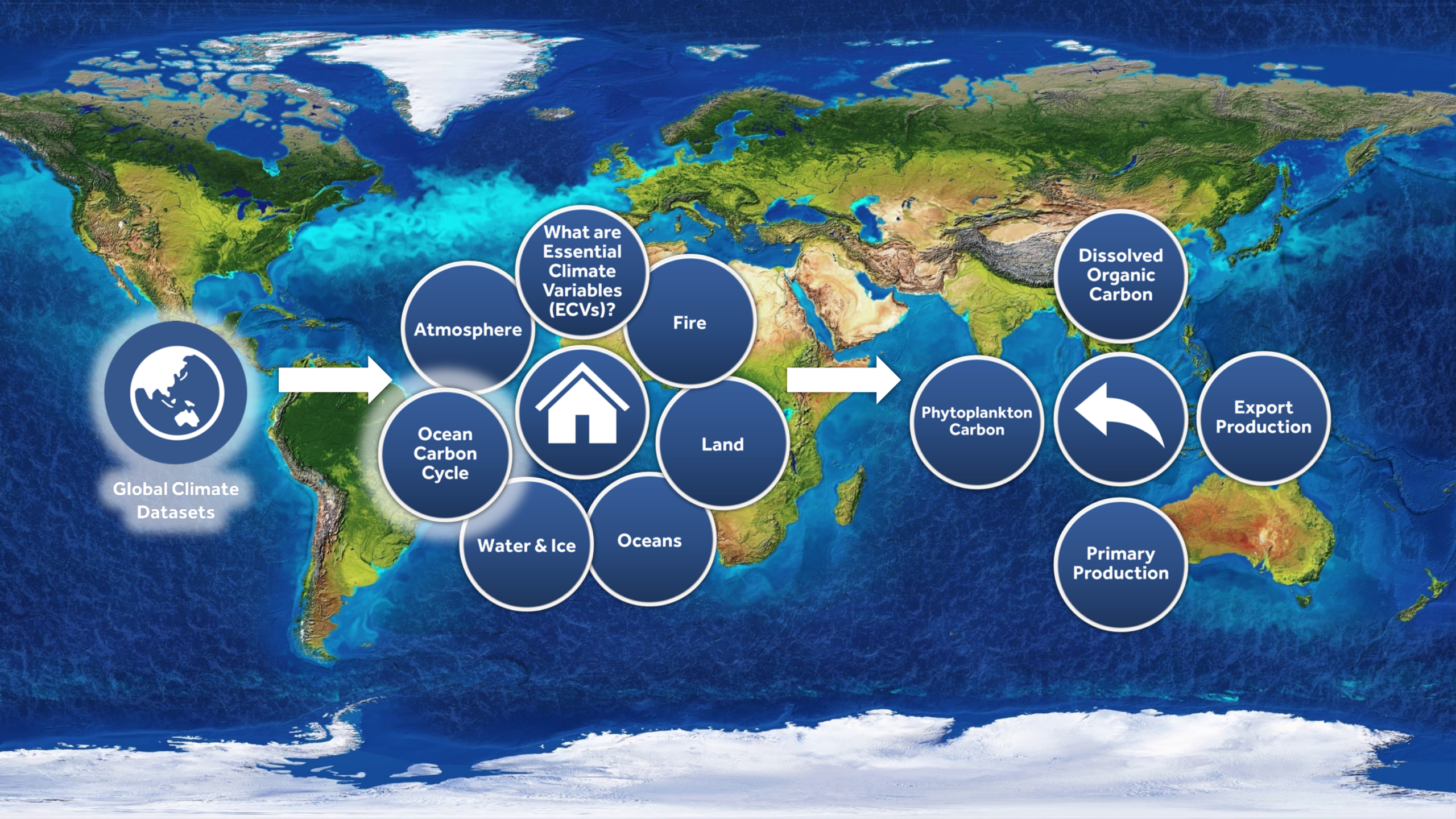
Images from the Copernicus Sentinel-3 satellite



1st September 2022

UKRI Science and Technology Facilities Council | RAL Space

National Centre for Earth Observation
NATURAL ENVIRONMENT RESEARCH COUNCIL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Phytoplankton Carbon
Dissolved Organic Carbon
Export Production
Primary Production

Dissolved Organic Carbon

Why is this important?

This is the first internally consistent dataset of the pools and fluxes of the biological carbon pump in the ocean, based on the same set of input ocean colour variables. The data and associated publications have contributed to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC).

ipcc INTERGOVERNMENTAL PANEL ON climate change

PML | Plymouth Marine Laboratory

Through photosynthesis, marine phytoplankton drive the biological carbon pump in which organic carbon from the surface is transferred to the deep ocean.

Dissolved organic carbon describes the amount of carbon dissolved into the ocean.

Data from 1998 to 2020.

Plymouth Marine Laboratory (PML) has one of the largest aquatic remote sensing groups in the world, undertaking research and operational processing in Earth Observation. PML also has significant experience in ocean carbon research.

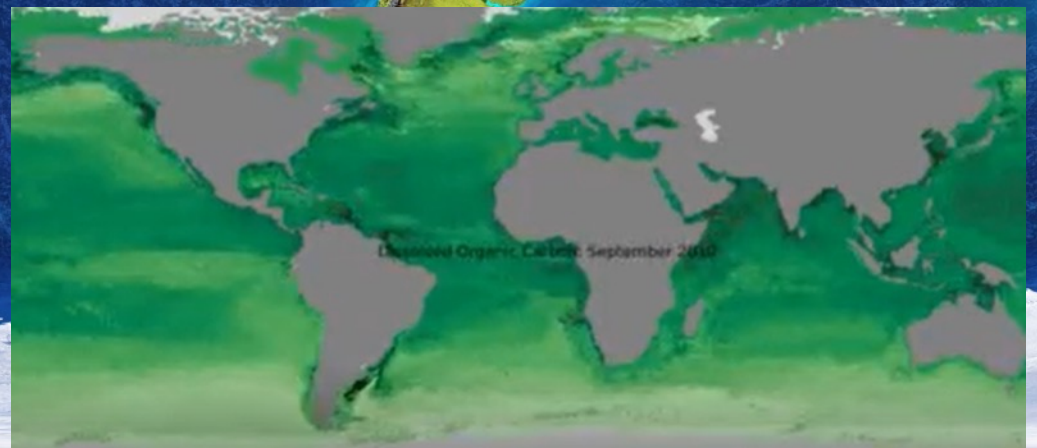
For more information

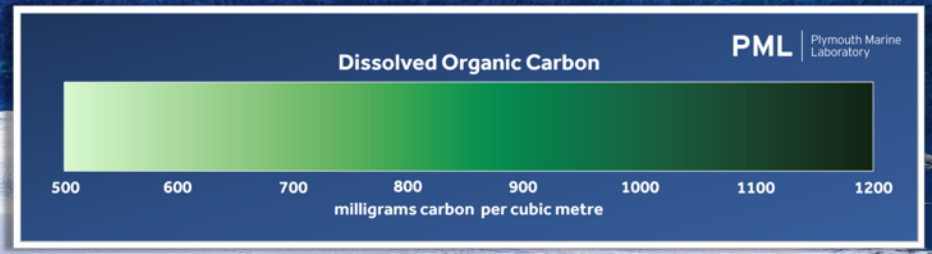
View data

PML

Where did this data come from?

Using the data from the Ocean Colour Climate Change Initiative of the European Space Agency, Plymouth Marine Laboratory, together with international partners, has developed an internally consistent dataset of the pools and fluxes of the ocean biological carbon pump. The length of the time series (1998-2020) allows for the analysis of trends in this important process.





Global Climate Datasets

Ocean Carbon Cycle

Export Production

Export Production

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ipcc INTERGOVERNMENTAL PANEL ON climate change

PML | Plymouth Marine Laboratory

Through photosynthesis, marine phytoplankton drive the biological carbon pump in which organic carbon from the surface is transferred to the deep ocean.

Export production describes the amount of organic matter created through photosynthesis which then sinks into the deep ocean.

Data from 1998 to 2020.

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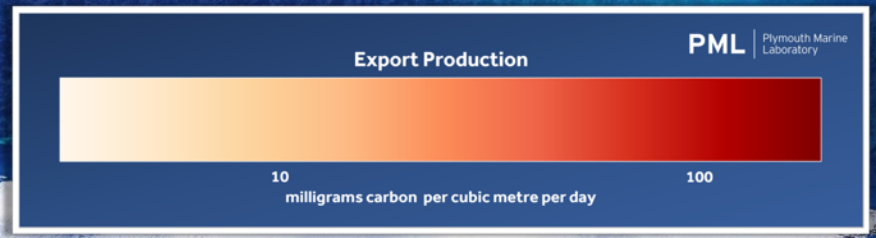
Where did this data come from?

Using the data from the Ocean Colour Climate Change Initiative of the European Space Agency, Plymouth Marine Laboratory, together with international partners, has developed an internally consistent dataset of the pools and fluxes of the ocean biological carbon pump. The length of the time series (1998-2020) allows for the analysis of trends in this important process.



Phytoplankton Carbon

Why is this important?

This is the first internally consistent dataset of the pools and fluxes of the biological carbon pump in the ocean, based on the same set of input ocean colour variables. The data and associated publications have contributed to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC).

ipcc INTERGOVERNMENTAL PANEL ON climate change

PML | Plymouth Marine Laboratory

Through photosynthesis, marine phytoplankton drive the biological carbon pump in which organic carbon from the surface is transferred to the deep ocean.

Phytoplankton carbon describes the amount of carbon stored within phytoplankton.

Data from 1998 to 2020.

Plymouth Marine Laboratory (PML) has one of the largest aquatic remote sensing groups in the world, undertaking research and operational processing in Earth Observation. PML also has significant experience in ocean carbon research.

For more information

View data

PML

Where did this data come from?

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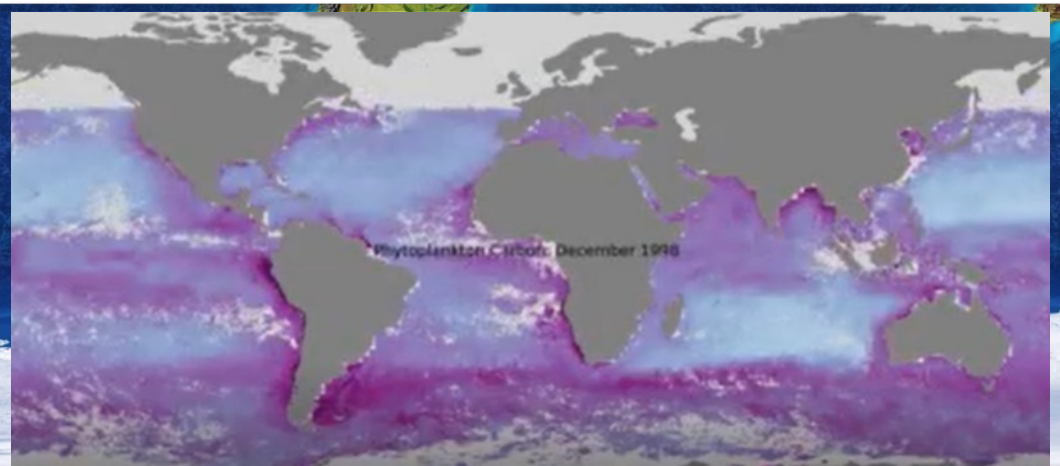

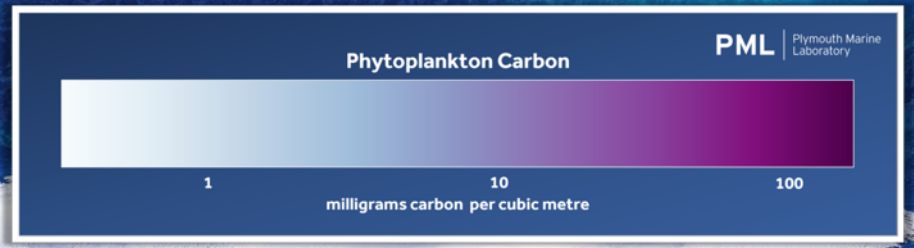

Primary Production

Why is this important?

This is the first internally consistent dataset of the pools and fluxes of the biological carbon pump in the ocean, based on the same set of input ocean colour variables. The data and associated publications have contributed to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC).

ipcc INTERGOVERNMENTAL PANEL ON climate change

PML | Plymouth Marine Laboratory

Through photosynthesis, marine phytoplankton drive the biological carbon pump in which organic carbon from the surface is transferred to the deep ocean.

Primary production describes the amount of new organic matter created by phytoplankton through photosynthesis.

Data from 1998 to 2020.

Plymouth Marine Laboratory (PML) has one of the largest aquatic remote sensing groups in the world, undertaking research and operational processing in Earth Observation. PML also has significant experience in ocean carbon research.

For more information

View data

PML

Where did this data come from?

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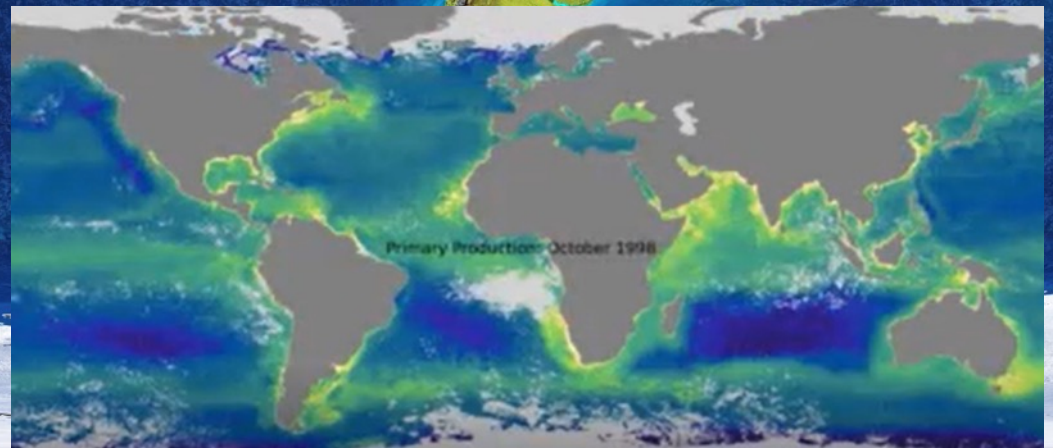
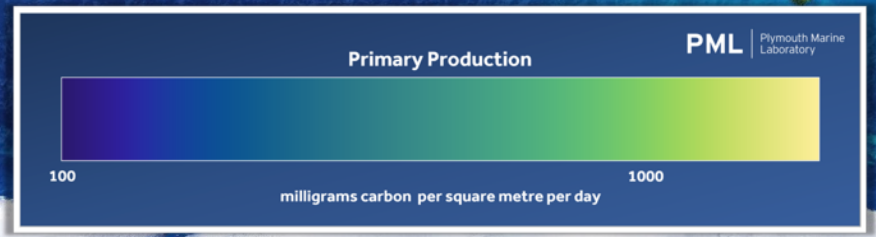





Case Studies by Theme
Agriculture & Water
Finance
Forestry
Nature & Land-use
Urbanisation & Energy
Recovery & Peace
Oceans


Case Studies by Theme
Agriculture & Water
Finance
Forestry
Nature & Land-use
Urbanisation & Energy
Recovery & Peace
Oceans
Rural Payments Agency: Crop Map of England
UK Centre for Ecology and Hydrology: E-Planner
Environment Agency: Pig Detection
Assimila: Agricultural Information Systems
Defra: UK Flood Mapping
Ordnance Survey: SCDP

Case Studies by Theme

Agriculture & Water

Assimila: Agricultural Information Systems

Agriculture Information Systems

UK Expertise

Assimila

Assimila is working with partners in Colombia, China, Ghana, Kenya and Zambia. Innovations include: PestRisk Information Service (PRISE); Modelling Crop Yield using EO Data; and Modelling Crop Pest Risks in China.

For more information

Visit the Assimila website

Impact

Assimila uses Earth Observation, meteorological and in-situ data to provide crop production analytics and risk forecasts and early warnings in an effective time frame for smallholder farmers, strategic and policy decision-makers.

Case Studies by Theme

Agriculture & Water

Rural Payments Agency: Crop Map of England

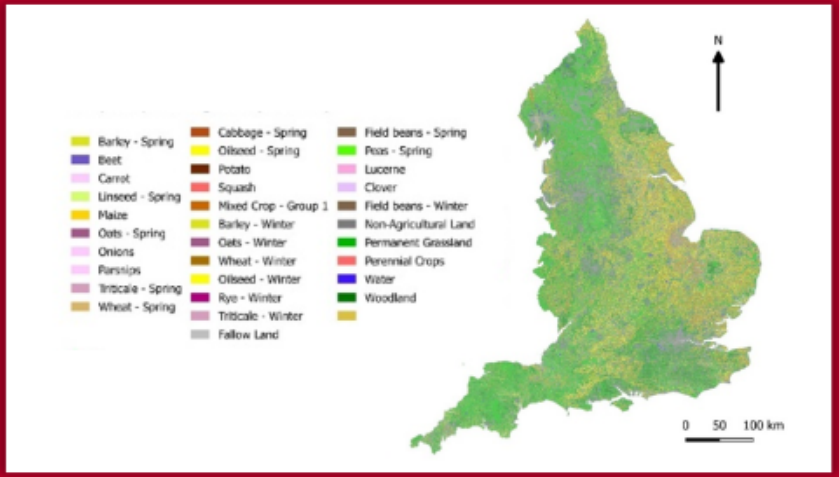
SPACE CLIMATE Crop Map of England (CROME) SPACE CLIMATE

UK Expertise

Department for Environment Food & Rural Affairs

Rural Payments Agency

CROME combines radar and optical data with machine learning to produce an annual crop map of England. It is used to monitor many variables, for example birds, water quality, Basic Payments Scheme, 15 crop types, grassland, and non-agricultural land covers. 95% accuracy in classification.



For more information

Visit the Defra website

Impact

CROME reduced field visits by 32%, which translated to £12.3 million, and is being adapted for further use including agri-environment schemes.

Case Studies by Theme

Agriculture & Water

Defra: UK Flood Mapping

Flood Impact Mapping

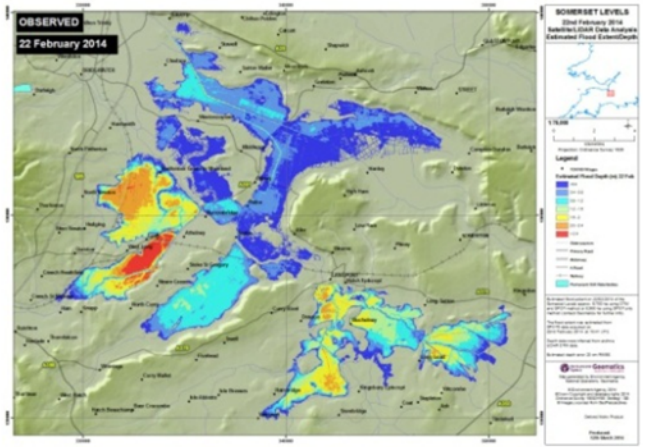
UK Expertise

Environment Agency

Rural Payments Agency

Department for Environment Food & Rural Affairs

A coordinated agency response using Synthetic-Aperture Radar (SAR) imagery and aerial photography provides estimates of flood extents in the UK. The datasets can be created rapidly, allowing calculation of damage and relief.



For more information

Visit the Defra website

Impact

Understanding who is affected by flooding is vital for delivering target aid. This is becoming ever more important as the risk of extreme climate events increases.

Case Studies by Theme

Agriculture & Water

Environment Agency: Pig Detection

Detecting Pig Farms with Earth Observation

UK Expertise

Environment Agency

Department for Environment Food & Rural Affairs

Funded by the UK Government's Department of Environment, Food and Rural Affairs, the Outdoor Pig Detection Project uses Earth Observation data from the Sentinel-2 satellite with LIDAR imagery to identify pig farms across the UK.

For more information

Visit the Environment Agency website

Impact

Pig detection and subsequent interventions increase compliance with agricultural regulations, helping to reduce the environmental impacts of pig farms such as soil erosion, runoff and water pollution.

Case Studies by Theme

Agriculture & Water

UK Centre for Ecology and Hydrology: E-Planner

SPACE CLIMATE

UK Centre for Ecology and Hydrology

E-Planner: Supporting future farming through better decision making

Please view the story here


Agriculture & Water
Ordnance Survey: SCDP
Case Studies by Theme
SPACE CLIMATE
Ordnance Survey
Supply Chain Data Partnership
Please view the story here


Case Studies by Theme
Agriculture & Water
Finance
Forestry
Nature & Land-use
Urbanisation & Energy
Recovery & Peace
Oceans
EarthBlox: Eticwood
Environment Systems: SENCE
GMV: My Sustainable Forest
Trade in Space: Sustainimaps

Case Studies by Theme

Forestry

EarthBlox: Eticwood

SPACE CLIMATE

Earth Blox

Climate data from space tool speeds up forest assessments

Please view the story here

Case Studies by Theme

Forestry

GMV: My Sustainable Forest

SPACE CLIMATE My Sustainable Forest SPACE CLIMATE

UK Expertise

gmv INNOVATING SOLUTIONS

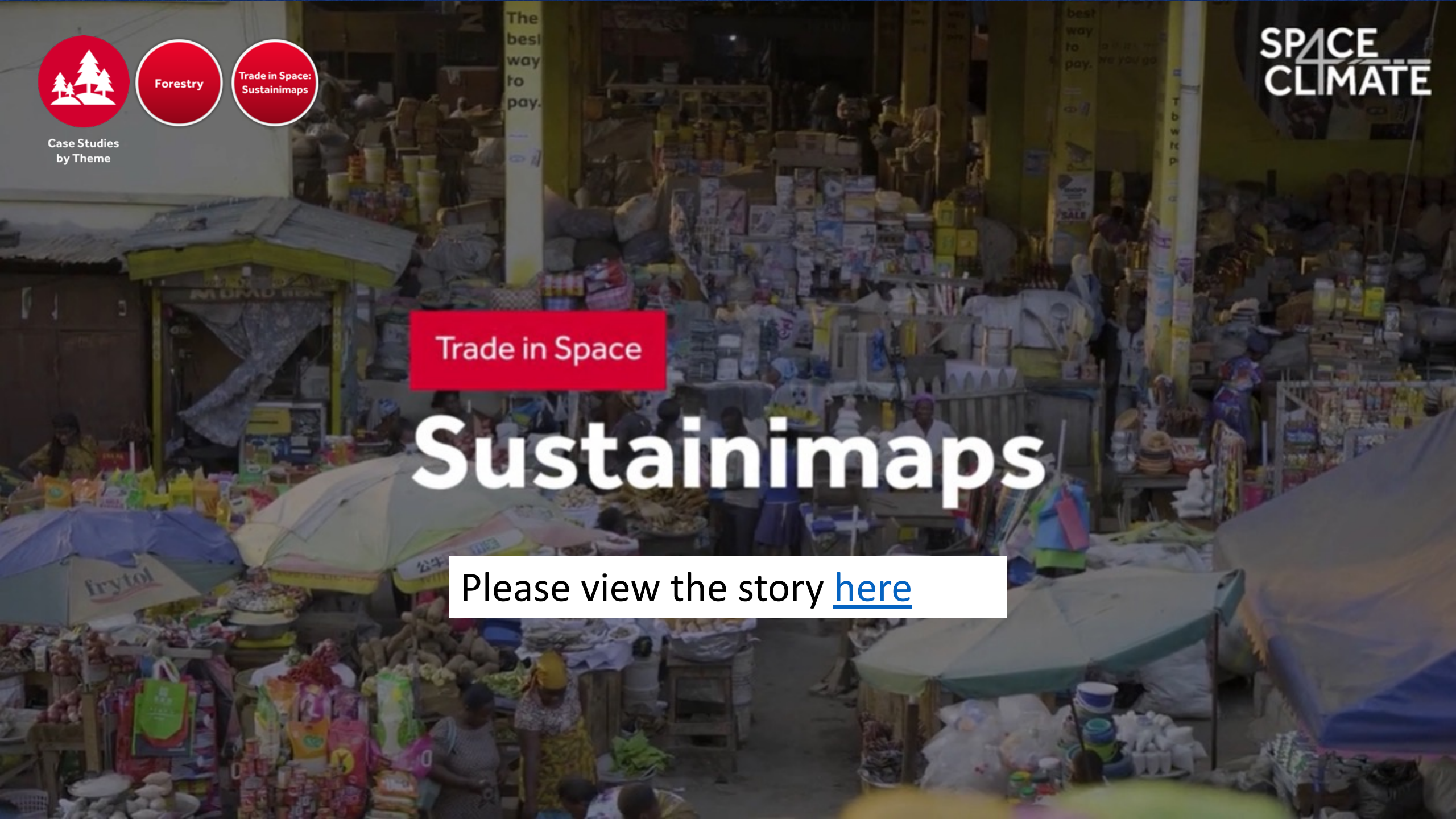
My Sustainable Forest uses Earth Observation data to provide support for forestry operations. The tool is used across 6 European countries and 5 climatic regions.

For more information

Visit the website

Impact

The tool supports: improved forest management provisioning and regulating services; planning for future climate change adaptation; and up-to-date forest inventories with accurate accounting of biomass and CO2 stocks.


Forestry
Trade in Space: Sustainimaps
Case Studies by Theme
SPACE CLIMATE
Trade in Space
Sustainimaps
Please view the story here

Case Studies by Theme

Forestry

Environment Systems: SENCE

SENCE Colombia

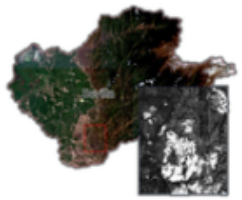
UK Expertise & Partners

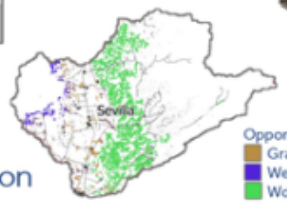
Environment Systems · Bangor University · Aberystwyth University · University of Stirling · ITP · CITE agroindustrial · ASBAMA · Campden BRI · GeoSeren · JNCC · wavehill · EDINA · Gelts · prisma · CampoVivo · Diano Marina

The Spatial Evidence for Natural Capital Evaluation (SENCE) tool was used in Colombia by project stakeholders, WWF and GoodStuffInternational, to inform and evidence the selection of 15 coffee farms to support with habitat restoration projects.

Existing benefits

Monitor assets & risks





Targeted action

Opportunities for:
- Grassland
- Wetland
- Woodland

For more information

View the story map here

Impact

A story map was created showing the farms in locations where tree planting would bring multiple benefits - reducing flooding, whilst strengthening biodiversity corridors, in the coffee belt of the Rio Frio catchment.


Case Studies by Theme
Agriculture & Water
Finance
Forestry
Nature & Land-use
Urbanisation & Energy
Recovery & Peace
Oceans
4 Earth Intelligence: Heat Hazard Mapping
Institute for Environmental Analytics: EnergyMetric
SatelliteVu: High Resolution Infrared
GHGsat: Methane Leak Detection
GHGsat: Oil Field Emissions
4 Earth Intelligence: Air Quality & Traffic Emissions

Case Studies by Theme

Urbanisation & Energy

Institute for Environmental Analytics: EnergyMetric

SPACE CLIMATE EnergyMetric SPACE CLIMATE

UK Expertise

Institute for Environmental Analytics

EnergyMetric

EnergyMetric is a strategic planning solution which enables analysis of solar and wind generation potential.

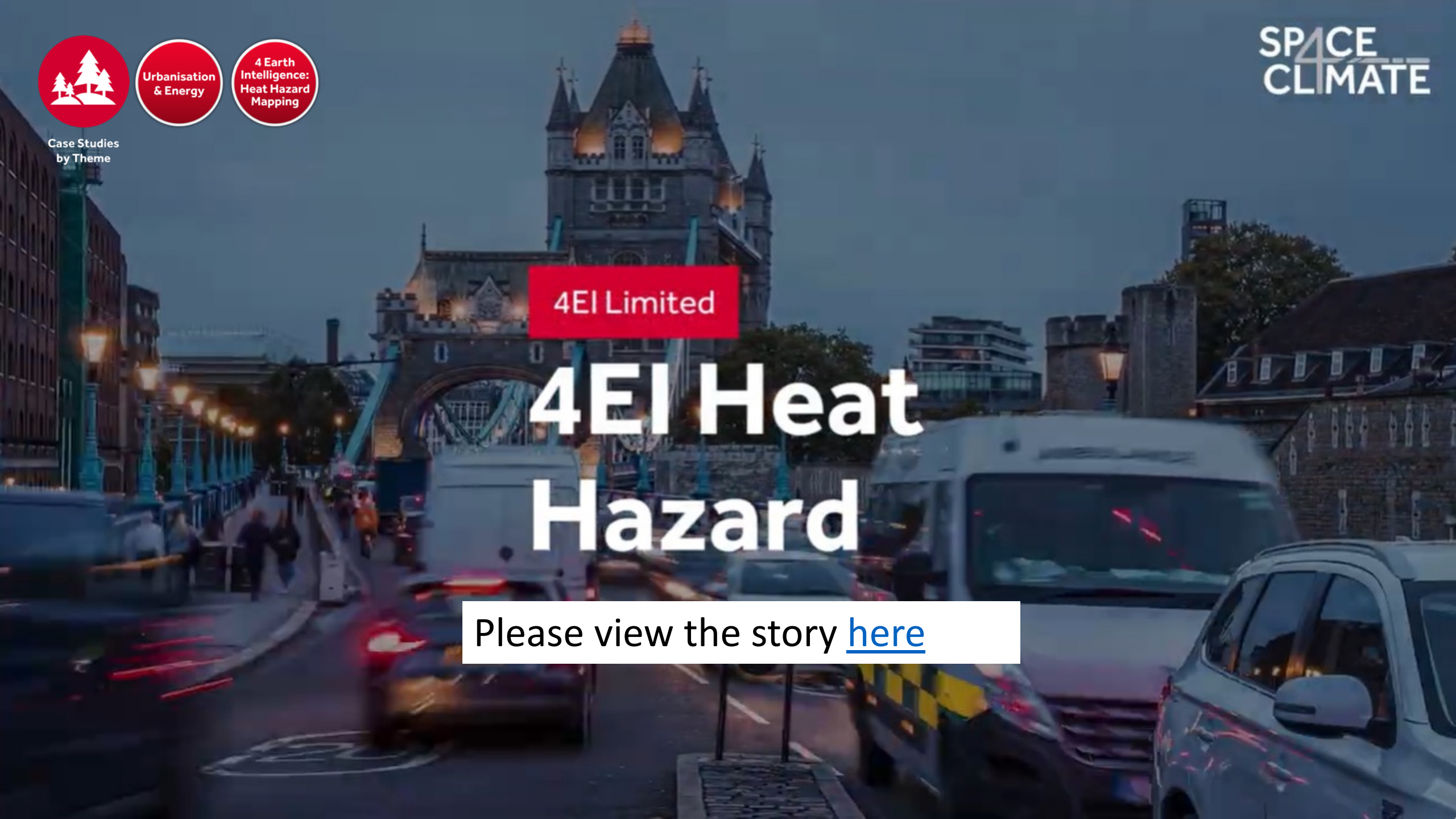
EnergyMetric has been used to assess solar and wind generation potential for locations across the world, including several district municipalities in South Africa and the western Fjordland region of Norway.

For more information

Visit the Energy Metric website

Impact

GLS Consulting used EnergyMetric to provide technical assistance to district municipalities in South Africa, enabling cost-efficient exploration of available resources and quantitative evidence to identify and prioritise strategic options.


Case Studies by Theme
Urbanisation & Energy
4 Earth Intelligence: Heat Hazard Mapping
SPACE CLIMATE
4EI Limited
4EI Heat Hazard
Please view the story here

SPACE CLIMATE Oil Field Emissions in Iraq SPACE CLIMATE

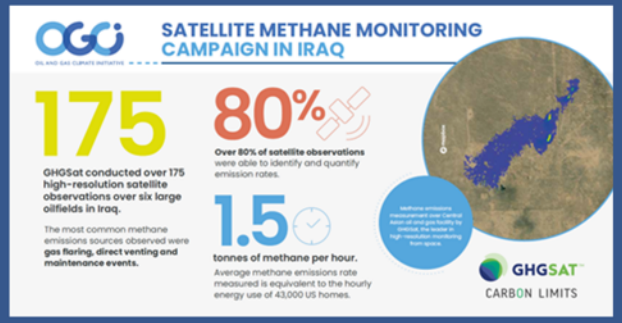
UK Expertise

GHGSAT

Climate Investment
Founded by OGCI

CARBON LIMITS

GHGSat, Carbon Limits and OGCI conducted the initial project in Iraq. Based on the success of this and the scalability of the model developed, the programme has already been expanded to additional sites in Iraq, Kazakhstan, Algeria and Egypt.



By utilizing satellite technology, methane leaks were detected from oil fields in Iraq. This allowed operators on the ground to take action, enhancing emission reduction strategies in the oil and gas sector.

For more information

Visit GHGSat's Spectra Platform

Read the White Paper

Impact

The project showcases satellite-based emissions monitoring as a cost-effective solution, facilitating significant methane emission reductions in oil and gas operations around the world. Sources such as malfunctioning gas flares can easily be repaired.

13 CLIMATE ACTION

Case Studies by Theme

Urbanisation & Energy

GHGsat: Methane Leak Detection

UK Methane Leak Detection Success

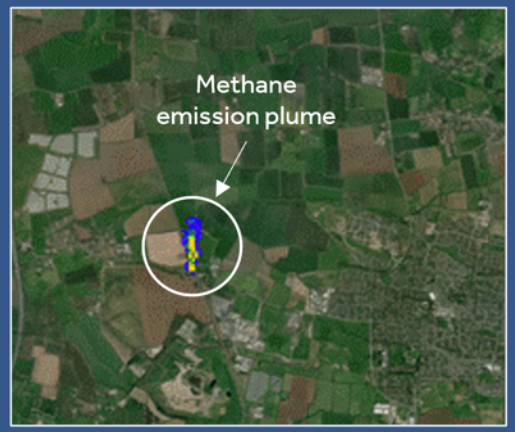
UK Expertise

GHGSAT

esa

UNIVERSITY OF LEEDS

This example from Cheltenham, Gloucestershire, UK, is one of many and shows how GHGSat monitors oil & gas assets worldwide every day, working with operators to initiate mitigation action with accurate data.



Researchers at the University of Leeds discovered methane leaking from a faulty pipe in Cheltenham in observations from GHGSat satellites, the first UK methane emission, identified in space to be mitigated.

For more information

Visit GHGSat's Spectra Platform

Impact

It's estimated that the total volume of methane leaked from the pipe was equivalent to the annual electricity consumption of more than 7,500 average homes. Identification of the leak enabled Wales & West to complete repairs before further emissions.

Case Studies by Theme

Urbanisation & Energy

4 Earth Intelligence: Air Quality & Traffic Emissions

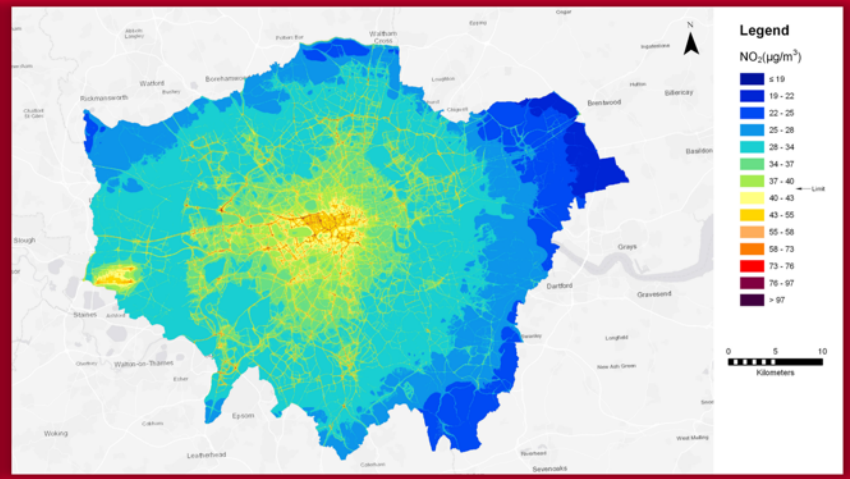
Air Quality & Traffic Emissions

UK Expertise

4EI 4 EARTH INTELLIGENCE

AIRBUS DEFENCE & SPACE

On-demand air quality estimates are provided at a very high level of detail (20m resolution), using pollution models powered by a wide range of data sources, including the detection, counting and classification of vehicles based on satellite imagery.



For more information

Visit the 4EI website

Impact

Applications include:

- forecasting;
- 'what-if' scenario analysis;
- insurance/risk modelling;
- policy and strategy advice;
- air pollution concentrations;
- and data visualisation.

Case Studies by Theme

Urbanisation & Energy

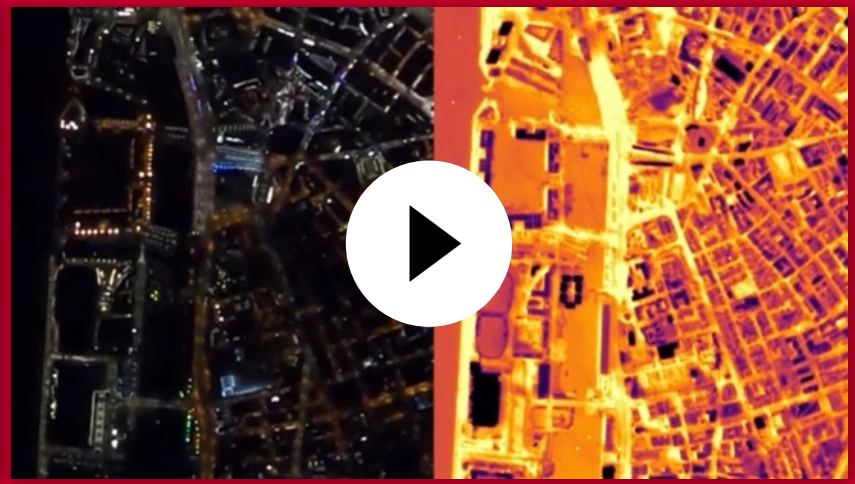
SatelliteVu: High Resolution Infrared

Liverpool in High Resolution Infrared

UK Expertise

SatVu

Satellite Vu is looking at the world in high resolution infrared. The image you can see shows the temperature difference between houses, streets, green spaces and waterways in Liverpool, UK. The data shows the effect of urban heat islands, buildings leaking energy and whether factories are on or off.



For more information

Visit Satellite Vu's website

Impact

Satellite Vu are developing analytics to support energy efficiency efforts, improving Energy Performance Certificate (EPC) metrics and validating retrofitting efforts using their dataset.


Case Studies by Theme
Agriculture & Water
Finance
Forestry
Nature & Land-use
Urbanisation & Energy
Recovery & Peace
Oceans
Plymouth Marine Laboratory: Atlantic Upwelling
Environment Systems: SENCE
Centre for Environment Fisheries and Aquaculture Science: Marine Pollution Risk Mapping
Plastic-i: Marine Plastic Pollution

Case Studies by Theme

Oceans

Plymouth Marine Laboratory: Atlantic Upwelling

SPACE CLIMATE

Plymouth Marine Laboratory

Primary Production in the Atlantic Upwelling

Please view the story here

Case Studies by Theme

Oceans

Centre for Environment Fisheries and Aquaculture Science: Marine Pollution Risk Mapping

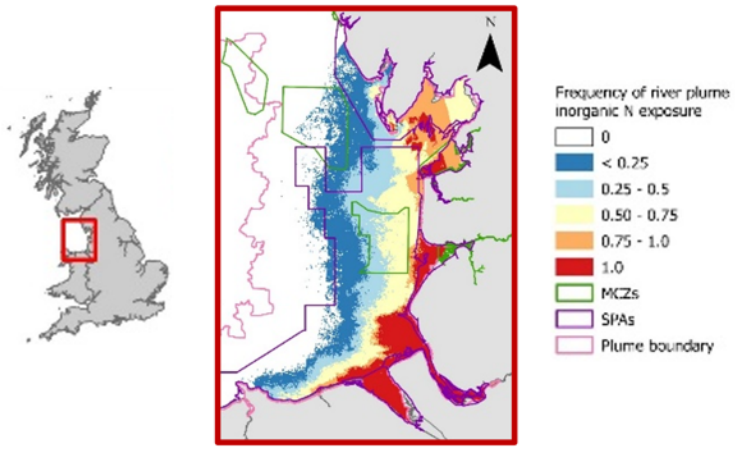
Marine Pollution Risk Mapping

UK Expertise

Department for Environment Food & Rural Affairs

Centre for Environment Fisheries and Aquaculture Science

This approach combines in-situ data with Earth Observation satellite data to map the risk to vulnerable habitats and supports a natural capital approach to environmental monitoring.



For more information

Visit the Defra website

Impact

This tool allows researchers to explore interactions between coastal water quality and habitat extent and conditions, helping to predict the effects of climate change and impacts of water pollution.

Case Studies by Theme

Oceans

Plastic-i: Marine Plastic Pollution

Marine Plastic Pollution

UK Expertise

Plastic-i

The Nature Conservancy

CATAPULT Satellite Applications

SFC

Innovate UK

SEA CLEANERS

Common Seas

THE OCEAN CLEANUP

esa BUSINESS INCUBATION CENTRE United Kingdom

Plastic-i employed cutting-edge forecasting techniques to predict the occurrence of marine debris in Scotland and Northern Ireland, identifying a debris emission hotspot at the River Foyle estuary. They created a heatmap pinpointing areas where interventions would have maximum impact.

For more information

Visit Plastic-i's website

Impact

Plastic-i's analysis helped to plan targeted cleaning efforts after periods of heavy rainfall and identify debris hotspots to tackle pollution at its source, leading to a cleaner and healthier marine environment.

Case Studies by Theme

Oceans

Environment Systems: SENCE

SENCE Union Island

UK Expertise & Partners

CARIBBEAN BIODIVERSITY FUND

Supported by: Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection — based on a decision of the German Bundestag

IKI INTERNATIONAL CLIMATE INITIATIVE

Union Island Environmental Alliance

Fauna & Flora — Saving Nature Together

Environment Systems — evidence and insight

Spatial Evidence for Natural Capital Evaluation (SENCE) tool was used to create a story map showing the likely effects of climate change on Union Island, in St Vincent and the Grenadines. Alongside this, a number of videos were created by the Union Island Environmental Alliance.

Present day sea level

Sea level

Sea level rise by 2080

Sea level New sea level

For more information

View the story map here

Watch the videos here

Impact

The story map and videos helped to help bring awareness to, and understanding of, the impacts of climate change to Union Island, and what Islanders can do to help mitigate against them.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

14 LIFE BELOW WATER


Case Studies by Theme
Finance
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Recovery & Peace
Oceans
Satellite Applications Catapult: Common Sensing
Telespazio: Rainfall Explorer
JNCC: Natural Capital in the Caribbean
CGI: Windstorm Information Service
Plymouth Marine Laboratory: Climate & Health

Case Studies by Theme

Recovery & Peace

Satellite Applications Catapult: Common Sensing

SPACE CLIMATE CommonSensing SPACE CLIMATE

UK Expertise

CATAPULT Satellite Applications

sensonomic

The Commonwealth

Spatial Days

Met Office

University of Portsmouth

devex Do Good. Do It Well.™

unitar United Nations Institute for Training and Research

UNOSAT

Common Sensing uses remote sensing capabilities to support the Governments of Fiji, the Solomon Islands and Vanuatu to build resilience to the devastating impacts of climate change and improve access to climate finance.

For more information

Visit the Common Sensing website

Impact

The project supports new standards for requesting and reporting on climate funds, embeds specialists within government structures and ensures that training is delivered to build capacity in-country to translate data into actionable intelligence for policymaking.

13 CLIMATE ACTION

Case Studies by Theme

Recovery & Peace

CGI: Windstorm Information Service

SPACE CLIMATE Windstorm Information Service SPACE CLIMATE

UK Expertise

CGI

The Windstorm Information Service (WISC) also produced a synthetic event set of 22,980 storms based on recalibrations of 10m wind speed from the Met Office HadGEM3 model for 1985 to 2011.

For more information

Visit the CGI website

Impact

Providing windstorm data in the form of storm tracks and footprints at 1km and 4km, this high-quality dataset can be used by the insurance and reinsurance industry at a range of scales within Europe to better understand the levels of risk from windstorms and to address increasing social and economic cost of severe windstorms.

Case Studies by Theme

Recovery & Peace

Plymouth Marine Laboratory: Climate & Health

SPACE CLIMATE

Plymouth Marine Laboratory

Climate, extreme events & health: Opportunities related to water

Please view the story here

Case Studies by Theme

Recovery & Peace

JNCC: Natural Capital in the Caribbean

Nature Capital in the Caribbean

UK Expertise

JNCC
Joint Nature Conservation Committee

Capacity building activities are carried out in British Overseas Territories including Anguilla, British Virgin Islands, Montserrat and Turks and Caicos.

For more information

Visit the JNCC website

Impact

Satellite imagery is used to map priority natural capital assets; monitor changes through time, including damage assessments from disasters such as hurricanes; model risk; map ecosystem services and establish future scenarios to provide an economic assessment, which can be integrated into planning and policy making.

Case Studies by Theme

Recovery & Peace

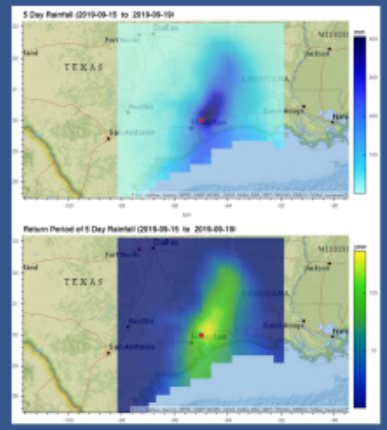
Telespazio: Rainfall Explorer

SPACE CLIMATE Rainfall Explorer SPACE CLIMATE

UK Expertise

TELESPAZIO
a LEONARDO and THALES company

Tropical Storm Imelda was the 4th wettest cyclone recorded to hit Texas, USA, causing devastating and record-breaking floods in September 2019. Rainfall Explorer was used to create the images of Storm Imelda in the next box.



Telespazio UK's Rainfall Explorer allows users in the finance sector to quickly extract information about the rainfall leading up to a flood event and to calculate the return period of that rainfall.

For more information

View the Rainfall Explorer Webpage

Impact

Rainfall Explorer can be used to identify patterns and trends in flood severity and occurrence and predict rainfall levels likely to cause future flooding.

The tool is being used by the Multilateral Investment Guarantee Agency at the World Bank to investigate mitigation strategies to reduce future flood risk.


Case Studies by Theme
Agriculture & Water
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Forestry
Nature & Land-use
Urbanisation & Energy
Recovery & Peace
Oceans
Natural England: Living England
Ordnance Survey: VERIEARTH
Space Intelligence: Environmental Mapping Services
UK Centre for Ecology and Hydrology: Land Cover Maps
Ordnance Survey: Peatlands Observatory
University of Surrey: Space4Nature


Nature & Land-use
UK Centre for Ecology and Hydrology: Land Cover Maps
Case Studies by Theme
SPACE CLIMATE
UK Centre for Ecology and Hydrology
Land Cover Maps
Please view the story here

Case Studies by Theme

Nature & Land-use

Natural England: Living England

Living England: Habitat Probability Map

UK Expertise

NCEA Natural Capital and Ecosystem Assessment

NATURAL ENGLAND

Department for Environment Food & Rural Affairs

The Living England project delivers an open-source satellite derived national habitat probability map every two years, combining expertise in ecology, Earth Observation and data science. The UK Joint Nature Conservation Committee is developing a similar map for Northern Ireland.

For more information

Data download

Website

Impact

Living England is the core resource for quantifying the D1 indicator (habitat quantity, quality and connectivity) for the UK government's 25-year environment plan and provides key information for Environmental Land Management Schemes.

Case Studies by Theme

Nature & Land-use

Ordnance Survey: Peatlands Observatory

SPACE CLIMATE Peatland Observatory SPACE CLIMATE

UK Expertise

Ordnance Survey

Durham University

Assimila

National Centre for Earth Observation
NATURAL ENVIRONMENT RESEARCH COUNCIL

This peatland observatory from Ordnance Survey, Assimila and Durham University uses data from Earth Observation satellites to provide data services for restoration across UK peatlands (~1800000 ha).

Peatland Monitoring from Space

For more information

Read the article

Impact

This observatory helps land managers target future restoration to ensure the UK gains maximum greenhouse gas sinks and to support UK climate resilience. It allows research into role of peatland restoration in combatting the impacts of climate change at a microclimate level.

Nature & Land-use

Space Intelligence: Environmental Mapping Services

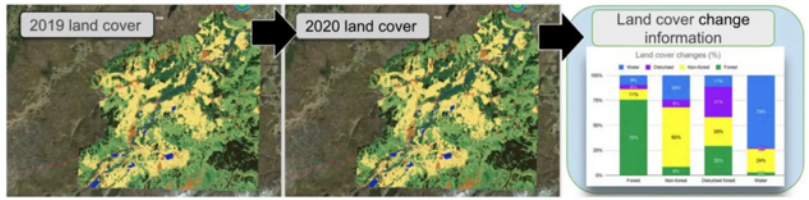
Case Studies by Theme

SPACE CLIMATE Environmental Mapping Services SPACE CLIMATE

UK Expertise

SPACE INTELLIGENCE

Space Intelligence has developed a system that uses artificial intelligence and satellite imagery to identify and track changes in large and remote sites year-on-year, providing evidence of environmental deterioration or recovery, which that confirms whether Scotland is on track to meet its climate change targets.



For more information

Visit the Space Intelligence website

Impact

The use of satellite monitoring and artificial intelligence provides cost-effective monitoring in support of Nature-Based Solutions including carbon stock mapping, habitat mapping and canopy cover mapping.

Nature & Land-use

University of Surrey: Space4Nature

Case Studies by Theme

Space4Nature

UK Expertise

Surrey Wildlife Trust

PAINSHILL

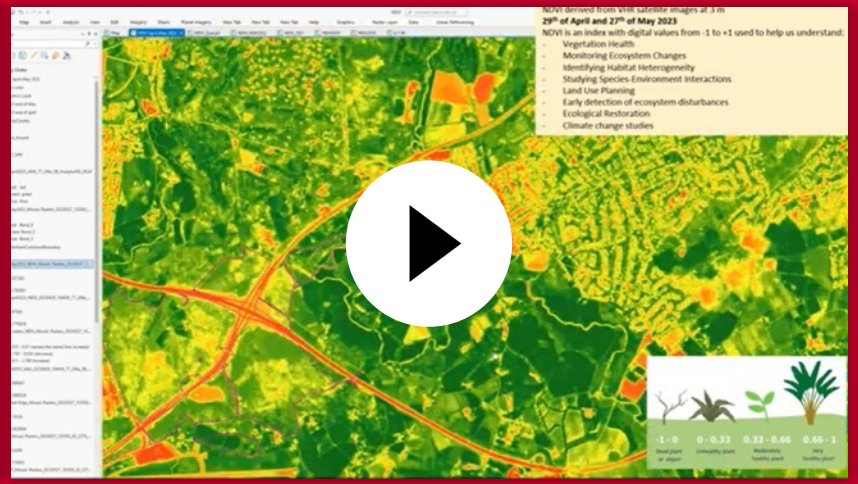
UNIVERSITY OF SURREY

buglife

SPACE 4 NATURE

Space4Nature is mapping different habitats, combining Earth Observation data and a citizen-science approach to help protect and restore nature in the UK, and to understand and address the impacts of climate change.

Space4Nature has had a significant impact on conservation and land management in Surrey, UK, and there is potential to upscale this knowledge and experience via machine learning to have a national and international impact.



For more information

Visit the Webpage

SCO SPACE FOR CLIMATE OBSERVATORY

Impact

Space4Nature has actively engaged with over 2000 volunteers, local communities and experts, and is contributing to the mapping and restoration of 60 hectares of degraded pollinator habitats in Surrey, UK.

Case Studies by Theme

Nature & Land-use

Ordnance Survey: VERIEARTH

OS VeriEarth®

UK Expertise

Ordnance Survey

Durham University

Deloitte.

The VeriEarth team worked with Natural England to support their need for offering high integrity carbon credits for Hatfield moors, in north England. Whilst tested on peatlands, VeriEarth is designed to support any land-based monitoring or verification requirement.

OS VeriEarth® is a land monitoring, reporting, and verification service for nature-based restoration and carbon offsets combining satellite data with location intelligence.

For more information

Video

Webpage

Impact

VeriEarth delivers an independent and verifiable monitoring service for nature-based restoration carbon offsetting which supports international Voluntary Carbon Standards.


Case Studies by Theme
Finance
Agriculture & Water
Forestry
Nature & Land-use
Urbanisation & Energy
Recovery & Peace
Oceans
Airbus: Geospatial Finance Hub
Telespazio: Climate Risk Indicators from Space
Agtelligence: FarmScore
4 Earth Intelligence: UAE Ecosystem Accounting
Satellite Applications Catapult: Geoassets

Case Studies by Theme

Finance

4 Earth Intelligence: UAE Ecosystem Accounting

SPACE CLIMATE

4 Earth Intelligence

Mapping of Ecosystem Accounts in the United Arab Emirates

Please view the story here

Case Studies by Theme

Finance

Airbus: Geospatial Finance Hub

Geospatial Finance Hub

UK Expertise

AIRBUS

A risk analysis tool, combining data from multiple geospatial datasets to enable climate change impacts to be assessed at individual property level for every property in the UK, to test the resilience of banks.

For more information

Visit the Airbus website

Impact

Risk factors such as flooding and subsidence are included in the services enabling lenders and insurers to calculate with greater accuracy and certainty the environmental perils for each property in their portfolio.

Case Studies by Theme

Finance

Satellite Applications Catapult: Geoassets

SPACE CLIMATE

Satellite Applications Catapult

GeoAsset Project

Please view the story here

Case Studies by Theme

Finance

Agtelligence: FarmScore

SPACE CLIMATE FarmScore® SPACE CLIMATE

UK Expertise

Agtelligence

Cranfield University

UK SPACE AGENCY

ROTHAMSTED RESEARCH

esa

UNIVERSITY OF LEICESTER

business incubation centre UK

FarmScore® monitors and assesses farming practices across the UK using a distinctive scoring system, accelerating the adoption of climate-resilient practices. FarmScore® has a scalable business model, with potential for long-term growth.

For more information

Visit the Agtelligence website

Impact

FarmScore® is helping UK farmers reduce their greenhouse gas emissions, increase soil carbon, increase water holding capacity and encourage biodiversity, increasing their profitability and meeting sustainability goals.

Case Studies by Theme

Finance

Telespazio: Climate Risk Indicators from Space

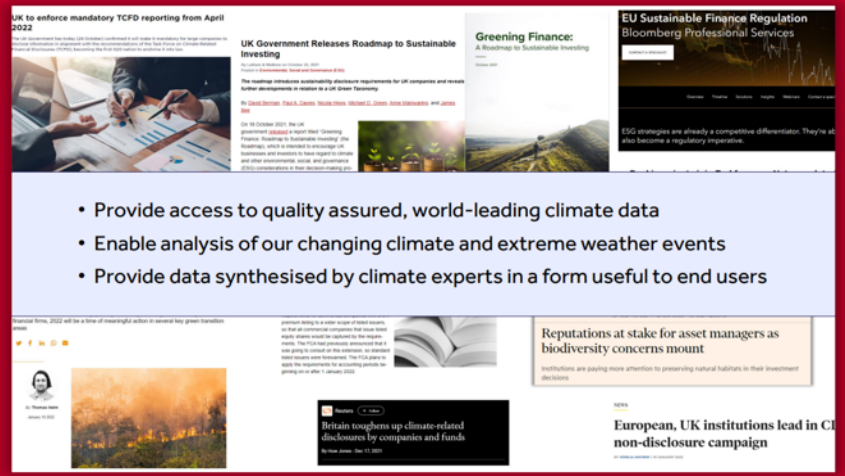
CRISP

UK Expertise

TELESPAZIO a LEONARDO and THALES company

Assimila

The Climate Risk Indicators from Space (CRISP) tool brings together quality-assured Earth Observation, reanalysis and climate projection datasets to generate a range of climate indices including high and low temperature extremes, heavy rainfall, drought, high wind speed and sea level.



- Provide access to quality assured, world-leading climate data
- Enable analysis of our changing climate and extreme weather events
- Provide data synthesised by climate experts in a form useful to end users

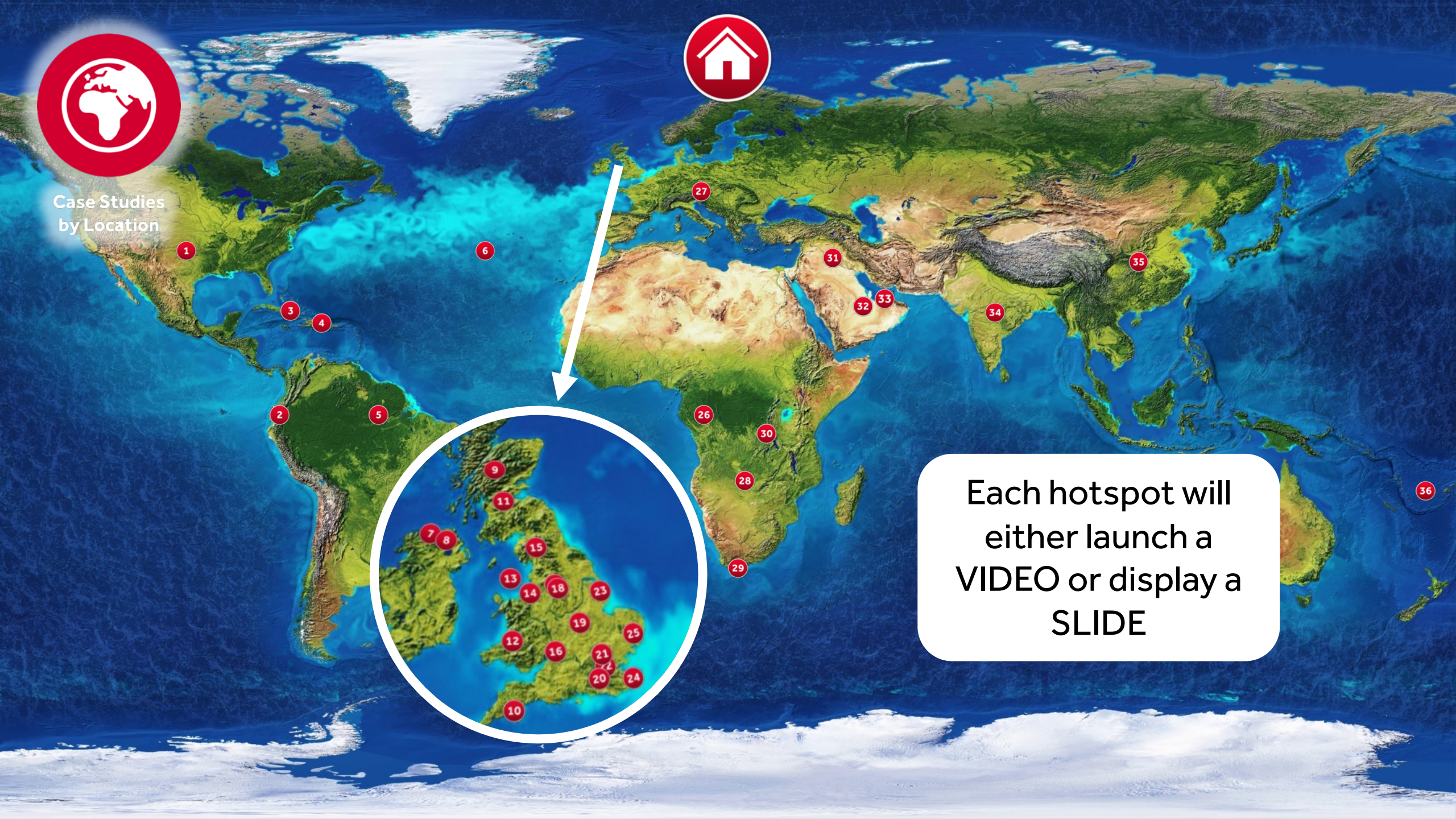
For more information

Visit the CRISP website

Impact

Users select a particular geographic point to discover historic trends and future projections of key climate indices, which can inform climate risk assessments and investment decisions based on extreme weather events and their likely frequency now and under different climate scenarios.

13 CLIMATE ACTION


Case Studies
by Location
1
2
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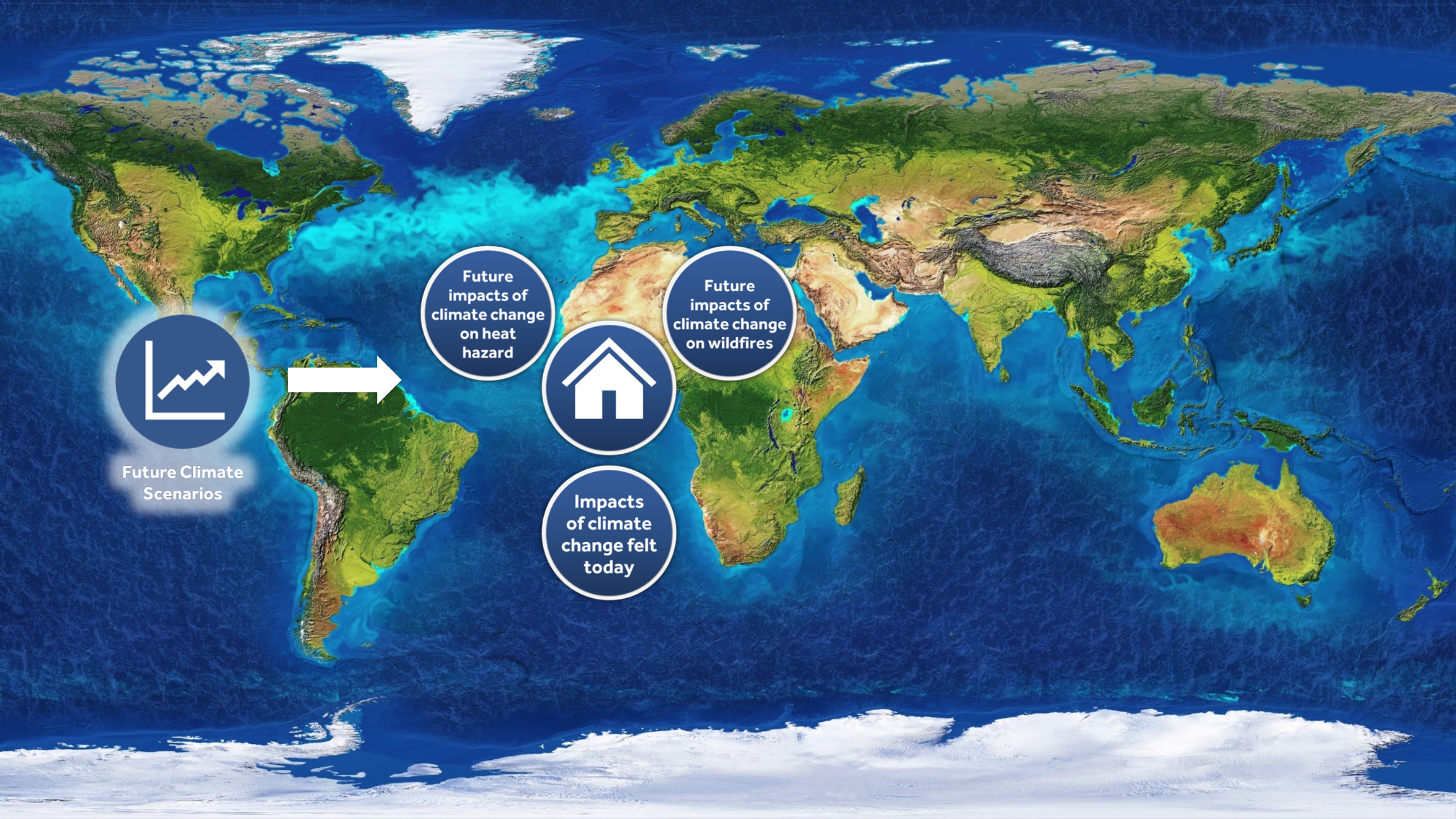
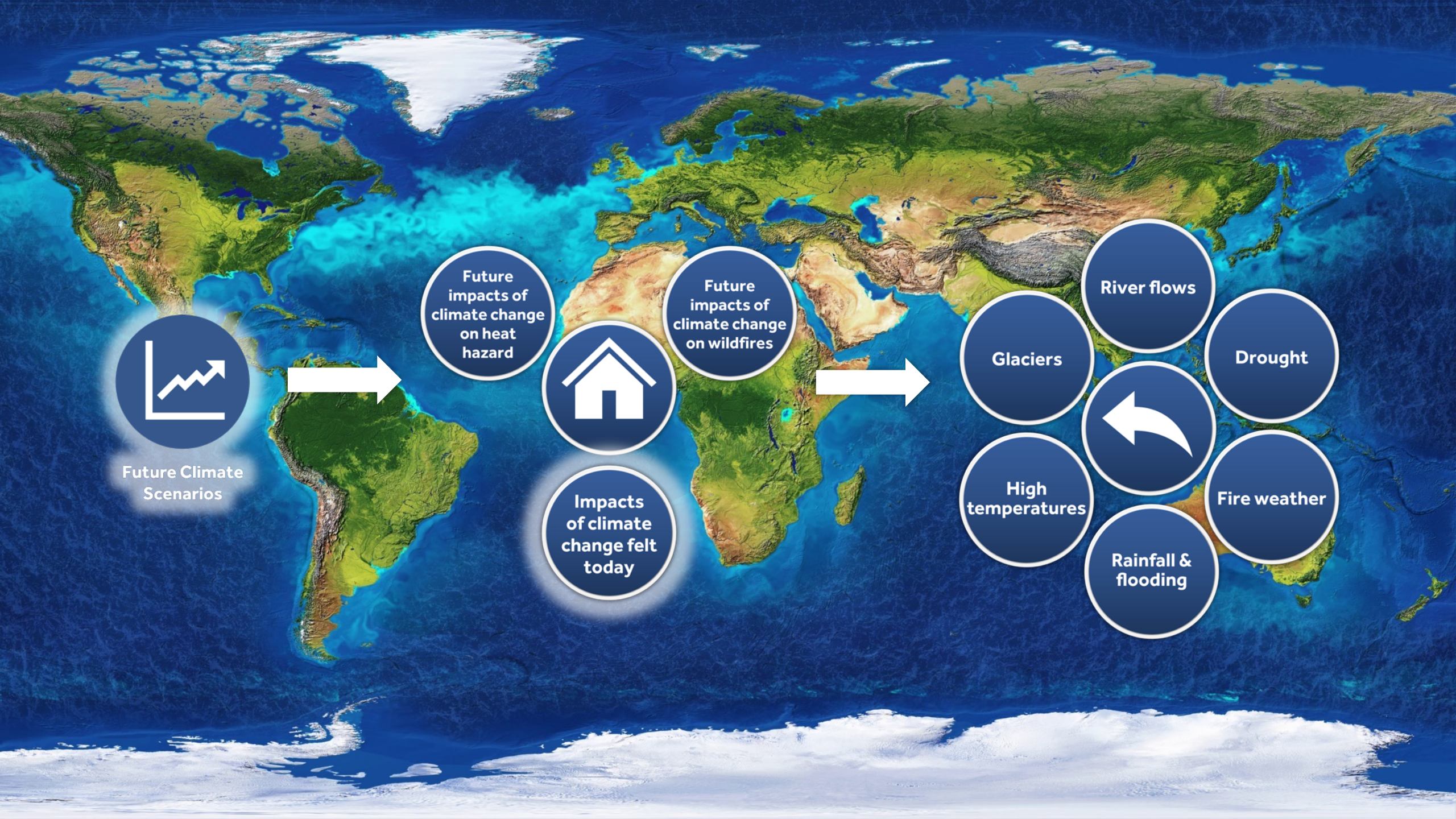
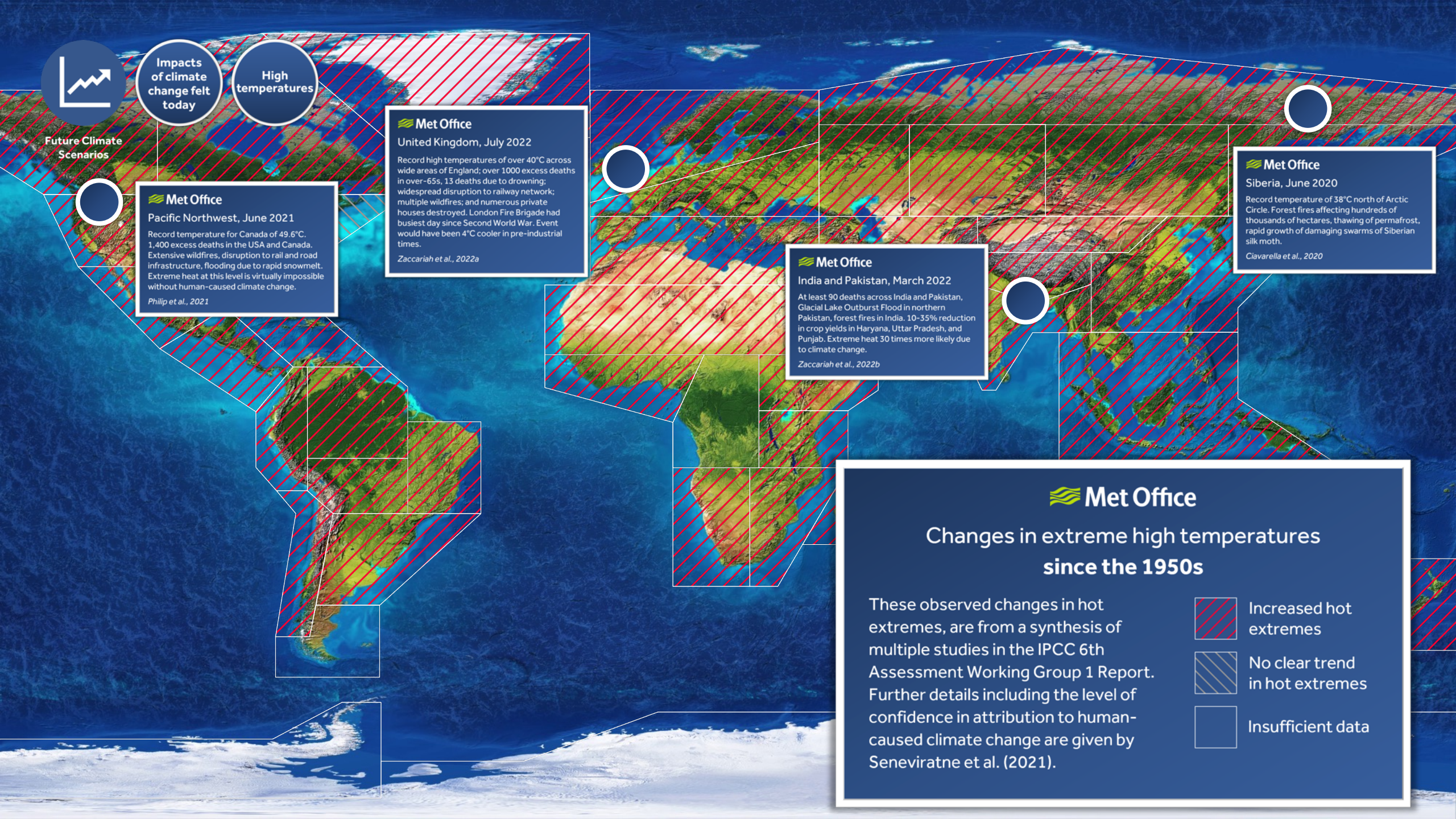
35
36
Each hotspot will either launch a VIDEO or display a SLIDE

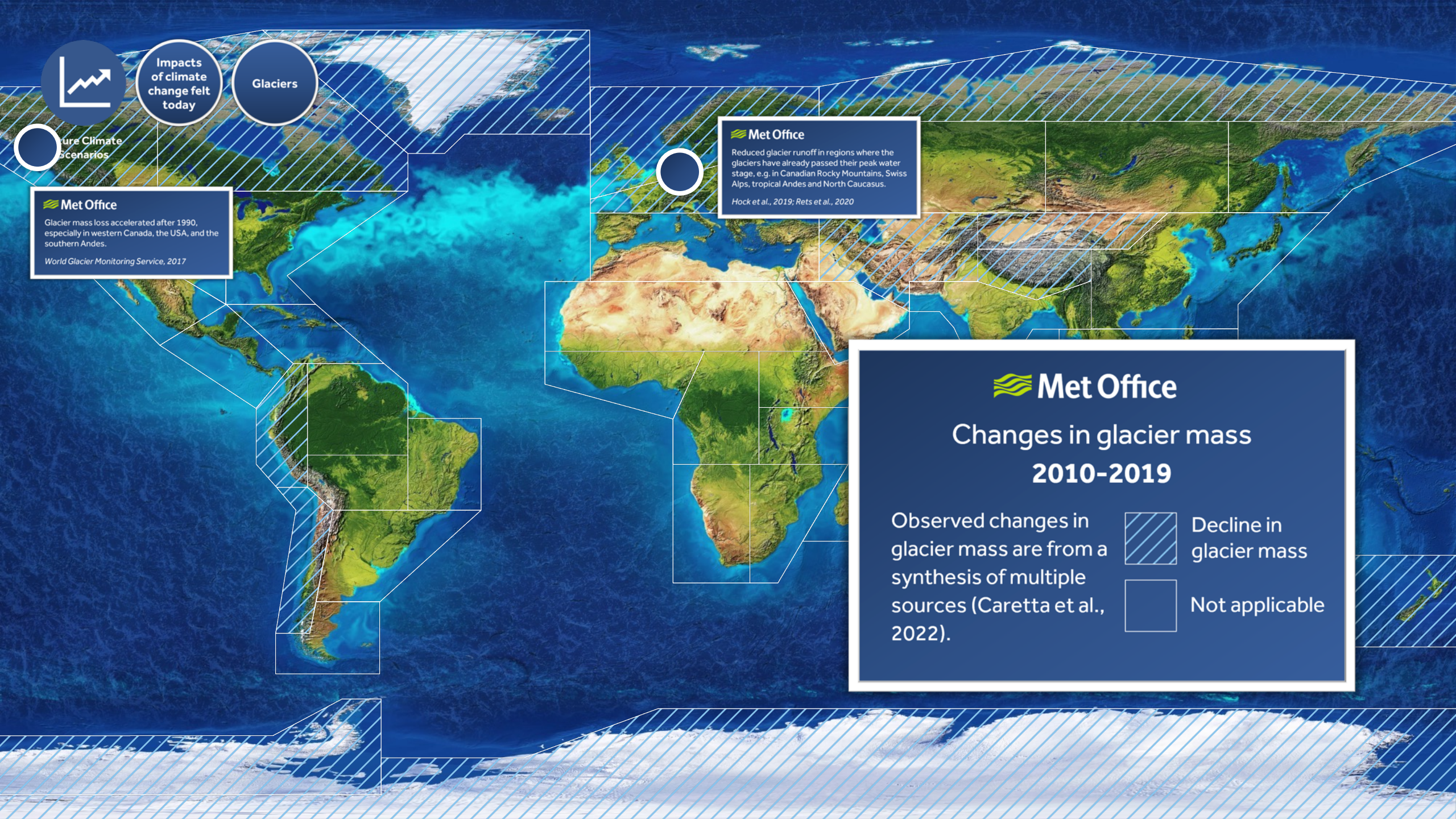
Numbe	Organisation	Case Study	Theme	Pin location
1	Telespazio	Rainfall explorer	Recovery & Peace	North America
2	Environment Systems	SENCE	Forestry	South America
3	JNCC	Nature capital Caribbean	Recovery & Peace	British Virgin Islands (ocean)
4	Environment Systems	SENCE	Forestry	Union Island
5	Ordnance Survey	SCDP	Agriculture & Water	Brazil
6	PML	Atlantic Upwelling	Oceans	Atlantic Ocean
7	Plastic-i	Marine Plastic Pollution	Oceans	UK - Northern Ireland
8	Airbus	Geospatial Finance Hub	Finance	UK - Northern Ireland
9	Space intelligence	Environmental Mapping Services	Nature & Land-use	UK - Scottish Highlands
10	UKCEH	Land cover maps	Nature & Land-use	UK- England
11	UKCEH	E-Planner	Agriculture & Water	UK - Southern Scotland
12	CGI	Windstorm information service	Recovery & Peace	UK - South Wales
13	Defra	marine Pollution risk mapping	Oceans	Irish Sea
14	Satellite Vu	High res infrared	Urbanisation & Energy	UK- England
15	Ordnance Survey	VERIEARTH	Nature & Land-use	UK - Penrith
16	GHGSat	UK Methane Leak	Urbanisation & Energy	UK- England
17	Telespazio	CRII	Finance	UK - North of Saddleworth
18	Ordnance Survey	Peatland Observatory	Nature & Land-use	UK - South of Saddleworth
19	Defra	Living England Habitat Map	Nature & Land-use	UK - Leicester
20	University of Surrey	Space4Nature	Nature & Land-use	UK- England
21	Agtelligence	FarmScore	Finance	UK - above London
22	4EI	Air quality & traffic emissions	Urbanisation & Energy	UK- England
23	Environment Agency	Pig detection	Nature & Land-use	UK - Lincolnshire
24	Defra	Crop Map of England (CROME)	Agriculture & Water	UK - Kent
25	Defra	Flood Impact Mapping	Agriculture & Water	UK - Norfolk
26	Earth Blox	Eticwood	Forestry	Congo
27	GMV	My sustainable forest	Forestry	Czech Republic
28	Assimila	Agricultural information systems	Agriculture & Water	Zambia
29	IEA	EnergyMetric	Urbanisation & Energy	Africa
30	Trade in space	Sustainimaps	Forestry	Africa
31	GHGSat	Iraq Satellite Monitoring	Urbanisation & Energy	Middle East
32	4EI	UAE accounts	Finance	Middle East - UAE
33	4EI	Heat Hazard Map	Urbanisation & Energy	Middle East - UAE
34	PML	Climate & Health in India	Recovery & Peace	India
35	Catapult	Geoassets	Finance	China
36	Catapult	Common Sensing	Recovery & Peace	Fiji

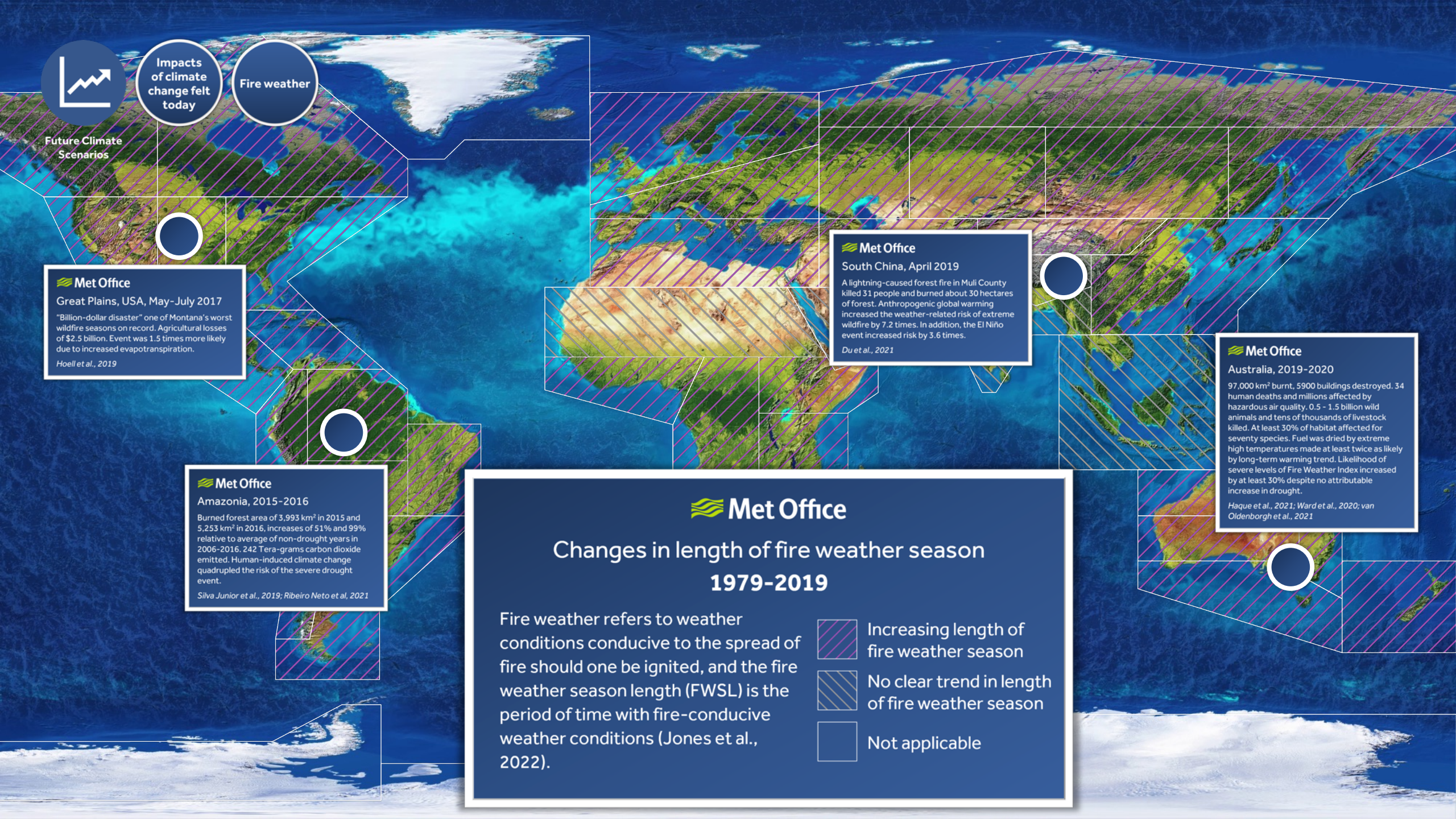
This table will be available on the stand for reference

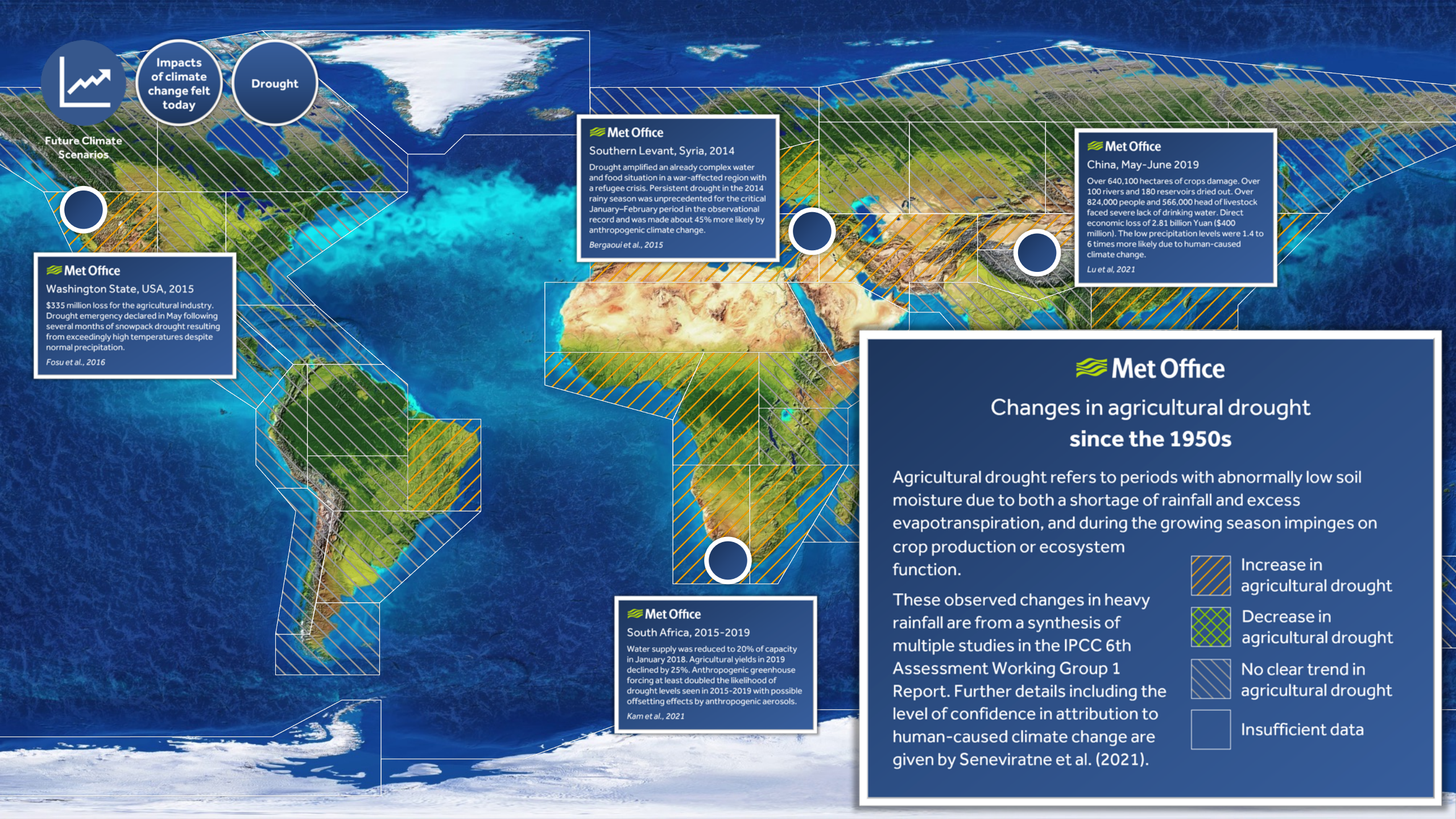

Future Climate Scenarios
Future impacts of climate change on heat hazard
Future impacts of climate change on wildfires
Impacts of climate change felt today

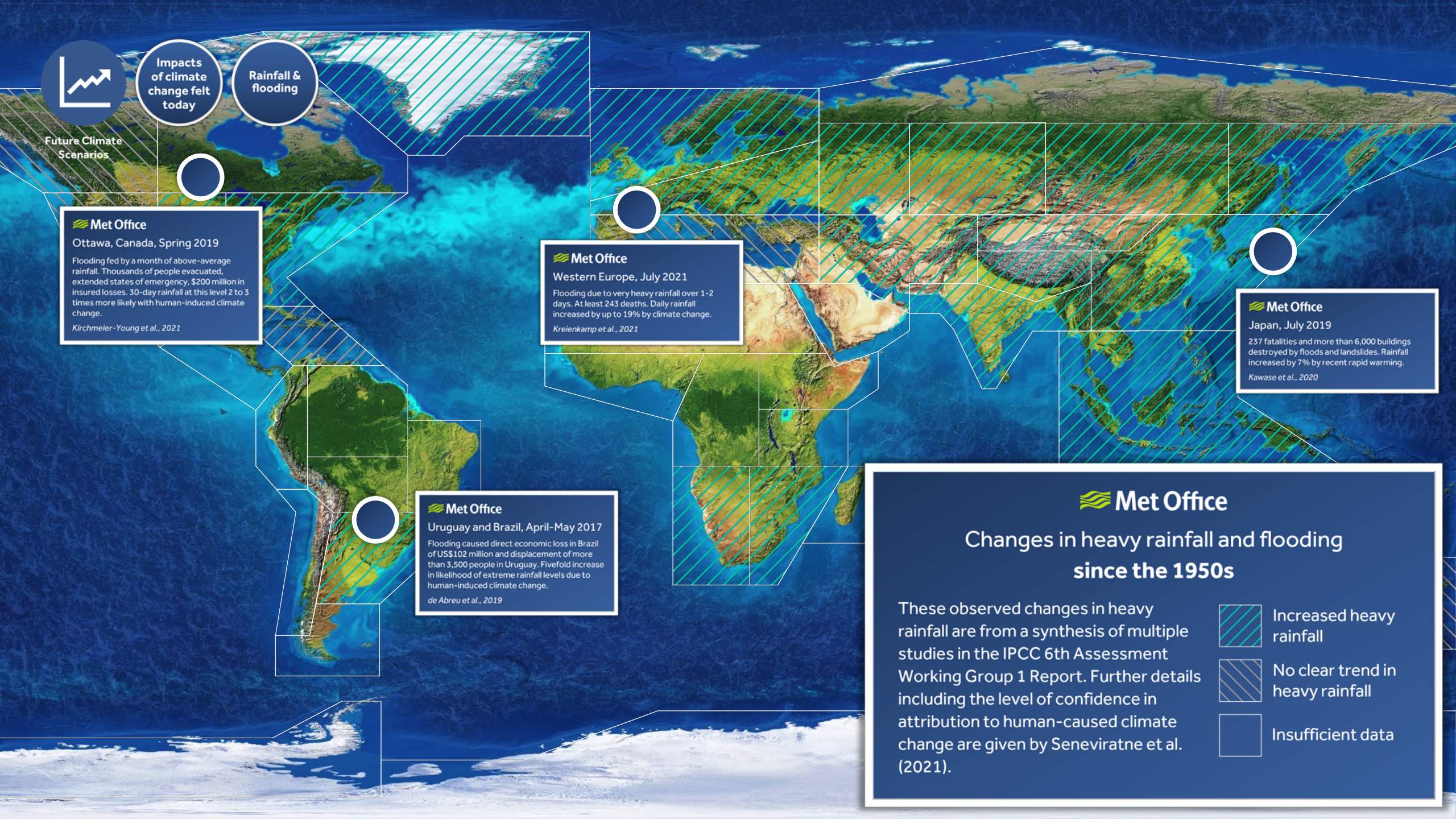

Future Climate Scenarios
Future impacts of climate change on heat hazard
Impacts of climate change felt today
Future impacts of climate change on wildfires
Glaciers
River flows
Drought
High temperatures
Fire weather
Rainfall & flooding

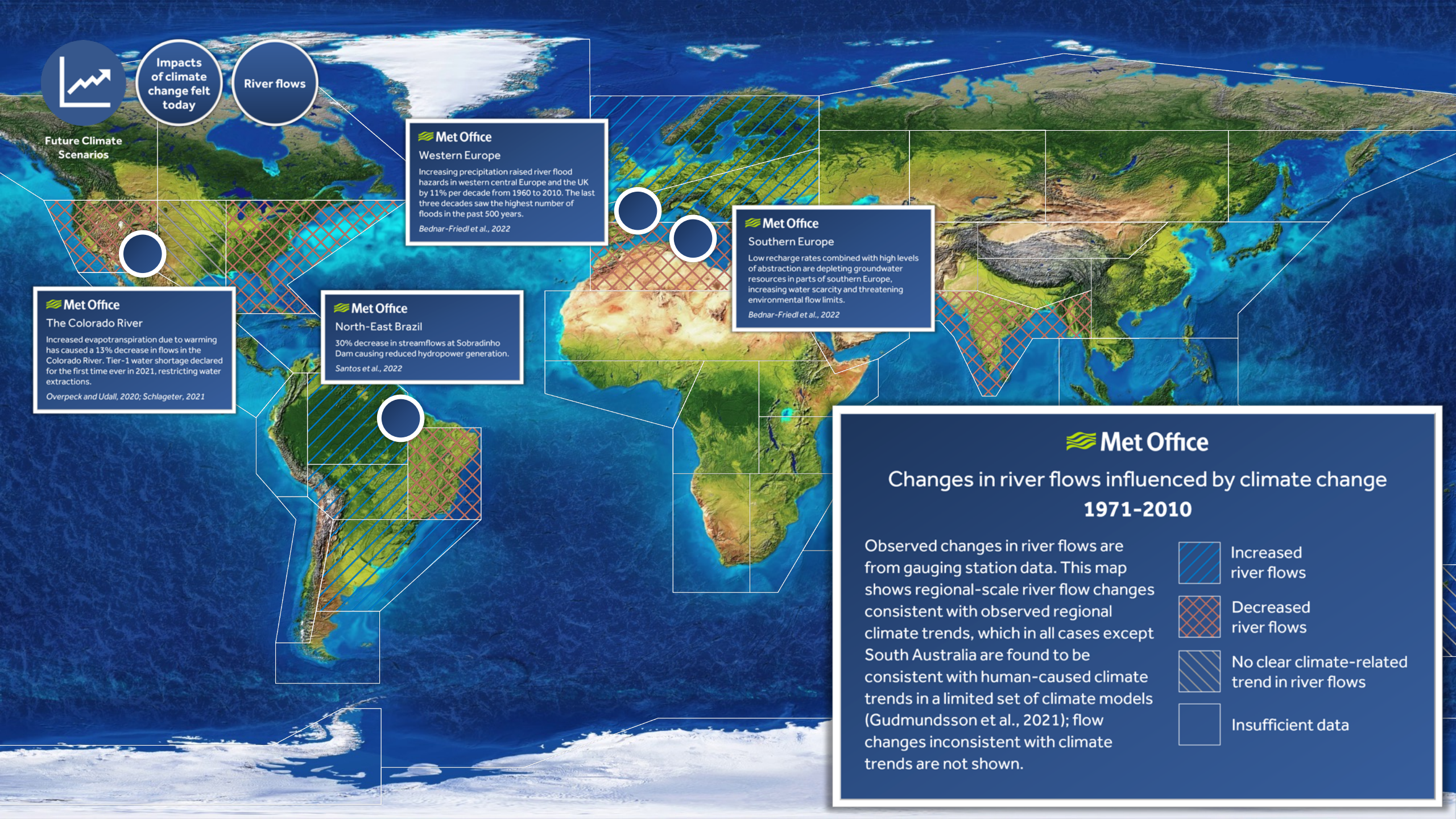

Future Climate Scenarios
Impacts of climate change felt today
High temperatures
Met Office
Pacific Northwest, June 2021
Record temperature for Canada of 49.6°C. 1,400 excess deaths in the USA and Canada. Extensive wildfires, disruption to rail and road infrastructure, flooding due to rapid snowmelt. Extreme heat at this level is virtually impossible without human-caused climate change.
Philip et al., 2021
Met Office
United Kingdom, July 2022
Record high temperatures of over 40°C across wide areas of England; over 1000 excess deaths in over-65s, 13 deaths due to drowning; widespread disruption to railway network; multiple wildfires; and numerous private houses destroyed. London Fire Brigade had busiest day since Second World War. Event would have been 4°C cooler in pre-industrial times.
Zaccariah et al., 2022a
Met Office
India and Pakistan, March 2022
At least 90 deaths across India and Pakistan, Glacial Lake Outburst Flood in northern Pakistan, forest fires in India. 10-35% reduction in crop yields in Haryana, Uttar Pradesh, and Punjab. Extreme heat 30 times more likely due to climate change.
Zaccariah et al., 2022b
Met Office
Siberia, June 2020
Record temperature of 38°C north of Arctic Circle. Forest fires affecting hundreds of thousands of hectares, thawing of permafrost, rapid growth of damaging swarms of Siberian silk moth.
Ciavarella et al., 2020
Met Office
Changes in extreme high temperatures since the 1950s
These observed changes in hot extremes, are from a synthesis of multiple studies in the IPCC 6th Assessment Working Group 1 Report. Further details including the level of confidence in attribution to human-caused climate change are given by Seneviratne et al. (2021).
Increased hot extremes
No clear trend in hot extremes
Insufficient data

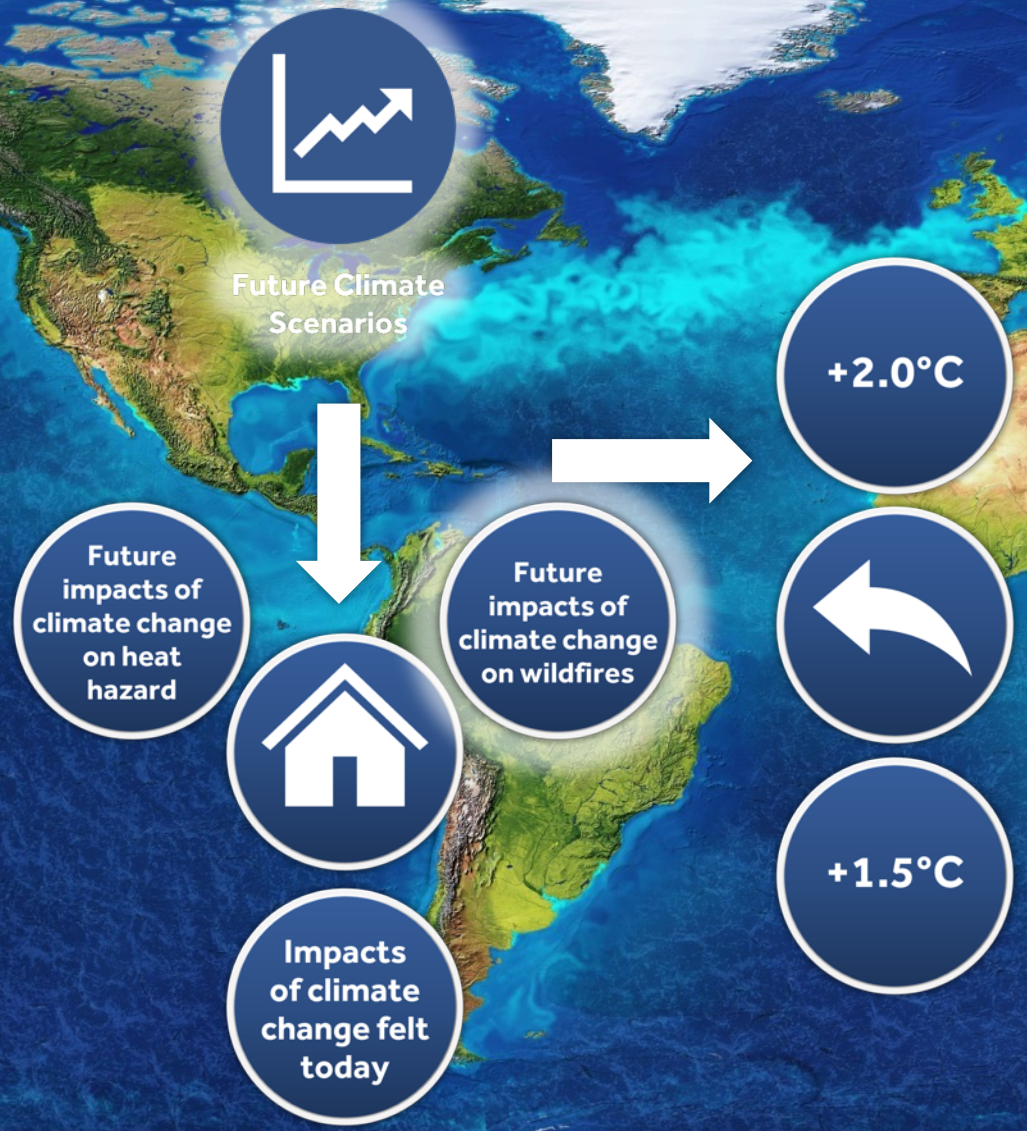

Impacts of climate change felt today
Glaciers
ure Climate
cenarios
Met Office
Glacier mass loss accelerated after 1990, especially in western Canada, the USA, and the southern Andes.
World Glacier Monitoring Service, 2017
Met Office
Reduced glacier runoff in regions where the glaciers have already passed their peak water stage, e.g. in Canadian Rocky Mountains, Swiss Alps, tropical Andes and North Caucasus.
Hock et al., 2019; Rets et al., 2020
Met Office
Changes in glacier mass
2010-2019
Observed changes in glacier mass are from a synthesis of multiple sources (Caretta et al., 2022).
Decline in glacier mass
Not applicable


Impacts of climate change felt today
Fire weather
Future Climate Scenarios
Met Office
Great Plains, USA, May-July 2017
"Billion-dollar disaster" one of Montana's worst wildfire seasons on record. Agricultural losses of $2.5 billion. Event was 1.5 times more likely due to increased evapotranspiration.
Hoell et al., 2019
Met Office
Amazonia, 2015-2016
Burned forest area of 3,993 km² in 2015 and 5,253 km² in 2016, increases of 51% and 99% relative to average of non-drought years in 2006-2016. 242 Tera-grams carbon dioxide emitted. Human-induced climate change quadrupled the risk of the severe drought event.
Silva Junior et al., 2019; Ribeiro Neto et al, 2021
Met Office
South China, April 2019
A lightning-caused forest fire in Muli County killed 31 people and burned about 30 hectares of forest. Anthropogenic global warming increased the weather-related risk of extreme wildfire by 7.2 times. In addition, the El Niño event increased risk by 3.6 times.
Du et al., 2021
Met Office
Australia, 2019-2020
97,000 km² burnt, 5900 buildings destroyed. 34 human deaths and millions affected by hazardous air quality. 0.5 - 1.5 billion wild animals and tens of thousands of livestock killed. At least 30% of habitat affected for seventy species. Fuel was dried by extreme high temperatures made at least twice as likely by long-term warming trend. Likelihood of severe levels of Fire Weather Index increased by at least 30% despite no attributable increase in drought.
Haque et al., 2021; Ward et al., 2020; van Oldenborgh et al., 2021
Met Office
Changes in length of fire weather season
1979-2019
Fire weather refers to weather conditions conducive to the spread of fire should one be ignited, and the fire weather season length (FWSL) is the period of time with fire-conducive weather conditions (Jones et al., 2022).
Increasing length of fire weather season
No clear trend in length of fire weather season
Not applicable


Impacts of climate change felt today
Drought
Future Climate Scenarios
Met Office
Washington State, USA, 2015
$335 million loss for the agricultural industry. Drought emergency declared in May following several months of snowpack drought resulting from exceedingly high temperatures despite normal precipitation.
Fosu et al., 2016
Met Office
Southern Levant, Syria, 2014
Drought amplified an already complex water and food situation in a war-affected region with a refugee crisis. Persistent drought in the 2014 rainy season was unprecedented for the critical January–February period in the observational record and was made about 45% more likely by anthropogenic climate change.
Bergaoui et al., 2015
Met Office
China, May-June 2019
Over 640,100 hectares of crops damage. Over 100 rivers and 180 reservoirs dried out. Over 824,000 people and 566,000 head of livestock faced severe lack of drinking water. Direct economic loss of 2.81 billion Yuan ($400 million). The low precipitation levels were 1.4 to 6 times more likely due to human-caused climate change.
Lu et al, 2021
Met Office
South Africa, 2015-2019
Water supply was reduced to 20% of capacity in January 2018. Agricultural yields in 2019 declined by 25%. Anthropogenic greenhouse forcing at least doubled the likelihood of drought levels seen in 2015-2019 with possible offsetting effects by anthropogenic aerosols.
Kam et al., 2021
Met Office
Changes in agricultural drought since the 1950s
Agricultural drought refers to periods with abnormally low soil moisture due to both a shortage of rainfall and excess evapotranspiration, and during the growing season impinges on crop production or ecosystem function.
These observed changes in heavy rainfall are from a synthesis of multiple studies in the IPCC 6th Assessment Working Group 1 Report. Further details including the level of confidence in attribution to human-caused climate change are given by Seneviratne et al. (2021).
Increase in agricultural drought
Decrease in agricultural drought
No clear trend in agricultural drought
Insufficient data


Impacts of climate change felt today
Rainfall & flooding
Future Climate Scenarios
Met Office
Ottawa, Canada, Spring 2019
Flooding fed by a month of above-average rainfall. Thousands of people evacuated, extended states of emergency, $200 million in insured losses. 30-day rainfall at this level 2 to 3 times more likely with human-induced climate change.
Kirchmeier-Young et al., 2021
Met Office
Western Europe, July 2021
Flooding due to very heavy rainfall over 1-2 days. At least 243 deaths. Daily rainfall increased by up to 19% by climate change.
Kreienkamp et al., 2021
Met Office
Japan, July 2019
237 fatalities and more than 6,000 buildings destroyed by floods and landslides. Rainfall increased by 7% by recent rapid warming.
Kawase et al., 2020
Met Office
Uruguay and Brazil, April-May 2017
Flooding caused direct economic loss in Brazil of US$102 million and displacement of more than 3,500 people in Uruguay. Fivefold increase in likelihood of extreme rainfall levels due to human-induced climate change.
de Abreu et al., 2019
Met Office
Changes in heavy rainfall and flooding since the 1950s
These observed changes in heavy rainfall are from a synthesis of multiple studies in the IPCC 6th Assessment Working Group 1 Report. Further details including the level of confidence in attribution to human-caused climate change are given by Seneviratne et al. (2021).
Increased heavy rainfall
No clear trend in heavy rainfall
Insufficient data


Future Climate Scenarios
Impacts of climate change felt today
River flows
Met Office
Western Europe
Increasing precipitation raised river flood hazards in western central Europe and the UK by 11% per decade from 1960 to 2010. The last three decades saw the highest number of floods in the past 500 years.
Bednar-Friedl et al., 2022
Met Office
Southern Europe
Low recharge rates combined with high levels of abstraction are depleting groundwater resources in parts of southern Europe, increasing water scarcity and threatening environmental flow limits.
Bednar-Friedl et al., 2022
Met Office
The Colorado River
Increased evapotranspiration due to warming has caused a 13% decrease in flows in the Colorado River. Tier-1 water shortage declared for the first time ever in 2021, restricting water extractions.
Overpeck and Udall, 2020; Schlageter, 2021
Met Office
North-East Brazil
30% decrease in streamflows at Sobradinho Dam causing reduced hydropower generation.
Santos et al., 2022
Met Office
Changes in river flows influenced by climate change
1971-2010
Observed changes in river flows are from gauging station data. This map shows regional-scale river flow changes consistent with observed regional climate trends, which in all cases except South Australia are found to be consistent with human-caused climate trends in a limited set of climate models (Gudmundsson et al., 2021); flow changes inconsistent with climate trends are not shown.
Increased river flows
Decreased river flows
No clear climate-related trend in river flows
Insufficient data

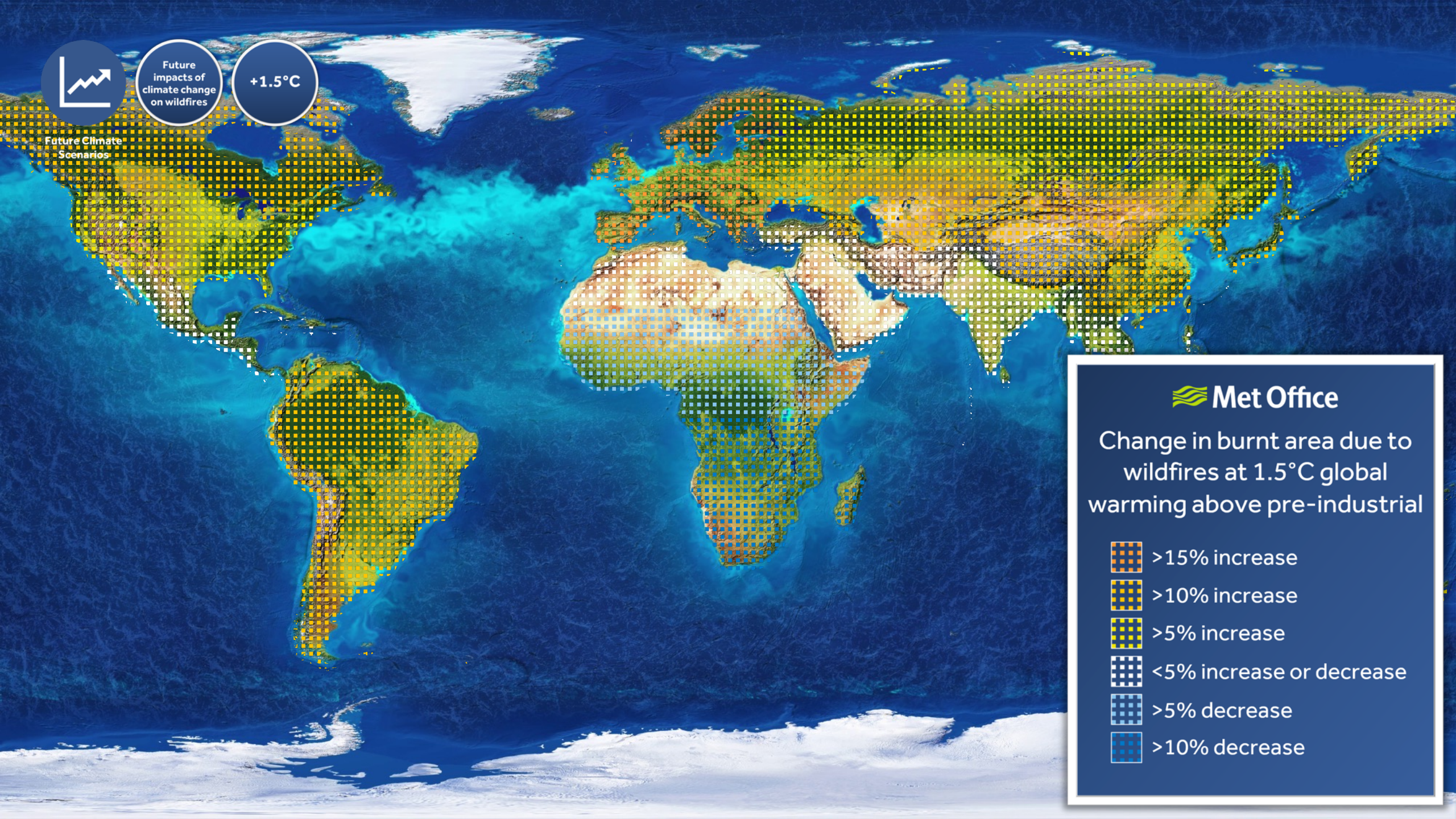


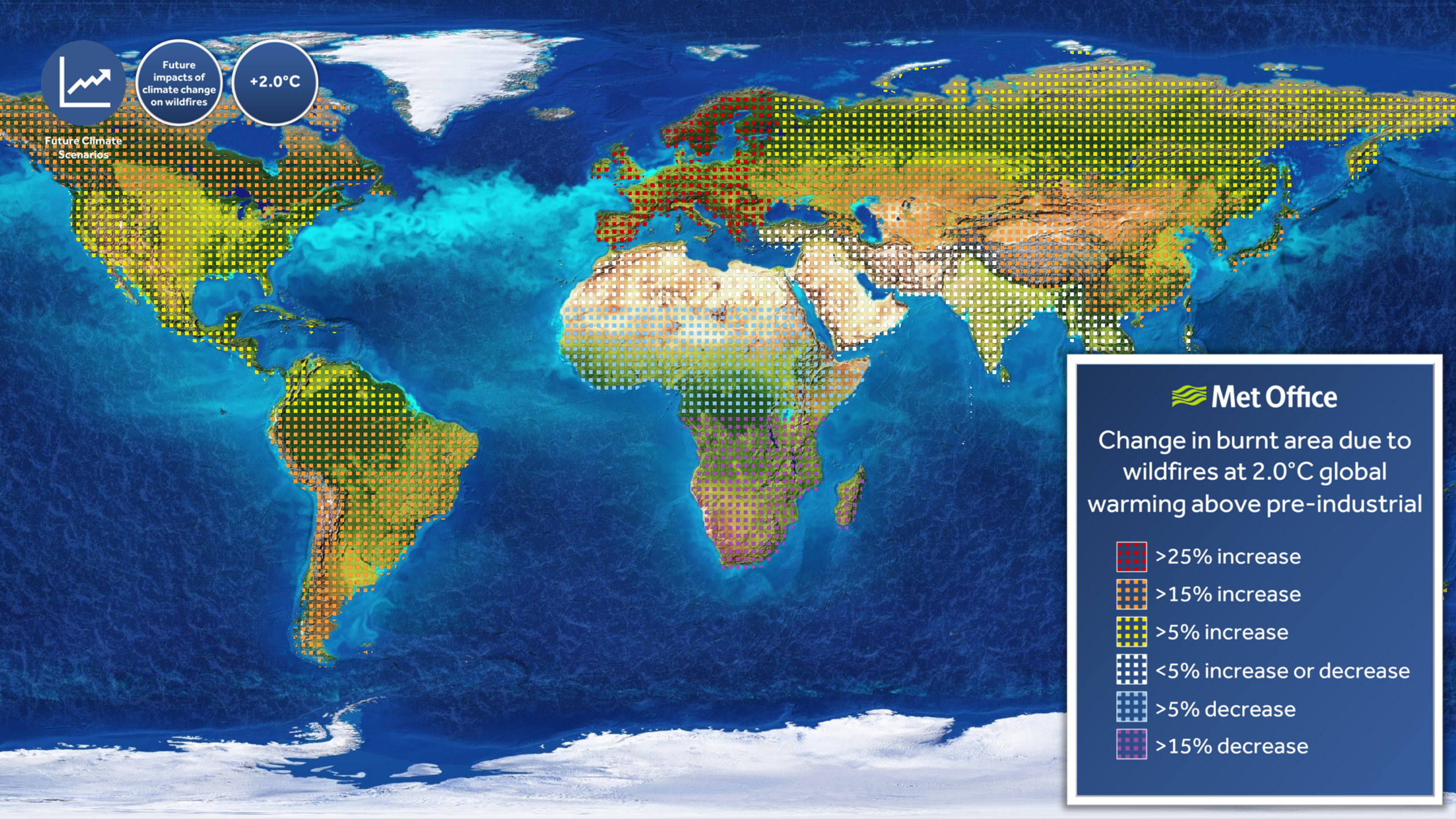
Met Office

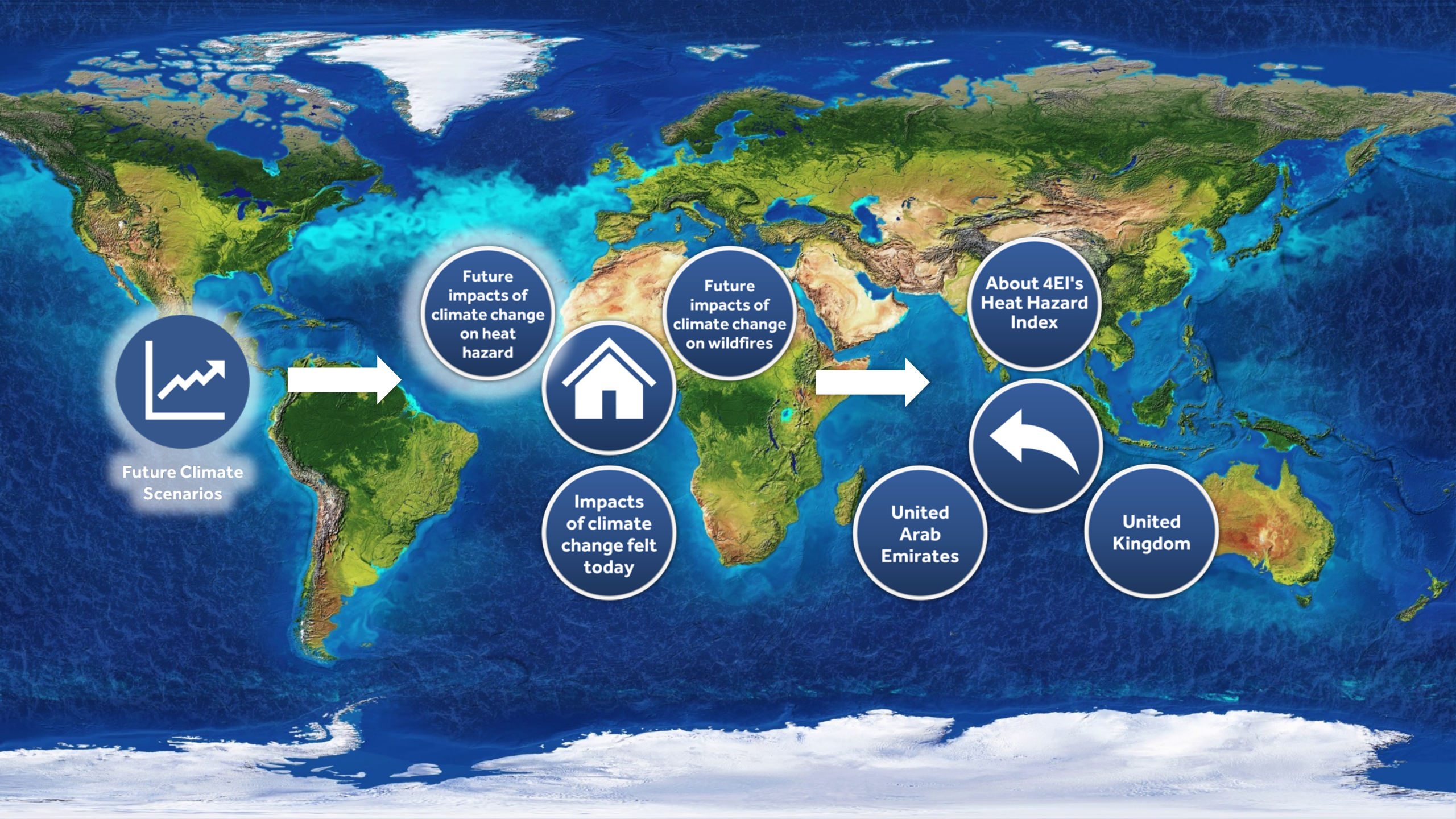
Maps of percentage change in burnt area at 1.5°C and 2°C global warming levels

Fire is a natural phenomenon which is vital for the health of many ecosystems, and many landscape fires do not present immediate risks to society. However, fires that burn out of control can have serious negative environmental, economic, and societal impacts. The risk of fires is changing in many regions due to factors such as changes in land use and climate change, potentially increasing the likelihood of damaging impacts.

These maps show how burnt area due to fires may change around the world at 1.5°C and 2°C global warming compared to the present day. The global warming levels are relative to pre-industrial levels (1860 – 1900) and a land surface computer model called JULES-INFERNO was used to simulate the projected changes in burnt area. Coloured areas show the projected % increase or decrease for burnt area in Global Fire Emissions Database (GFED) fire regions.


Future impacts of climate change on wildfires
+1.5°C
Future Climate Scenarios
Met Office
Change in burnt area due to wildfires at 1.5°C global warming above pre-industrial
>15% increase
>10% increase
>5% increase
<5% increase or decrease
>5% decrease
>10% decrease


Future impacts of climate change on wildfires
+2.0°C
Future Climate Scenarios
Met Office
Change in burnt area due to wildfires at 2.0°C global warming above pre-industrial
>25% increase
>15% increase
>5% increase
<5% increase or decrease
>5% decrease
>15% decrease


Future Climate Scenarios
Future impacts of climate change on heat hazard
Impacts of climate change felt today
Future impacts of climate change on wildfires
About 4EI's Heat Hazard Index
United Arab Emirates
United Kingdom


Future Climate Scenarios
Future impacts of climate change on heat hazard
About 4EI's Heat Hazard Index
SPACE CLIMATE
4EI Limited
4EI Heat Hazard
Please view the story here

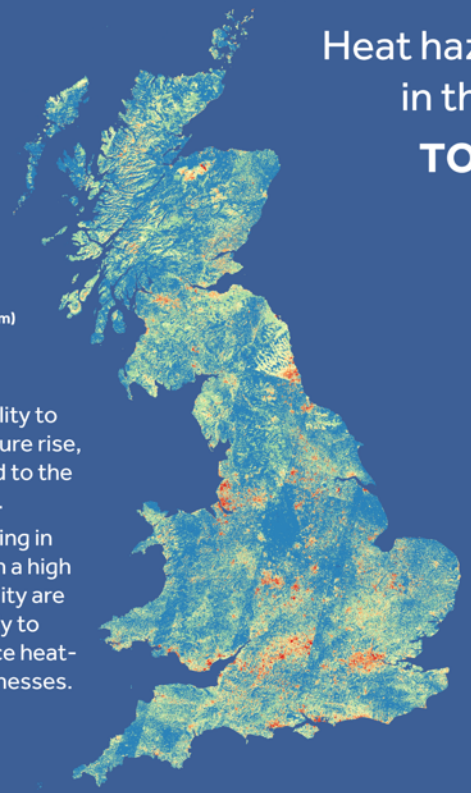
Future Climate Scenarios

Future impacts of climate change on heat hazard

United Kingdom

Heat hazards in the UK

TODAY



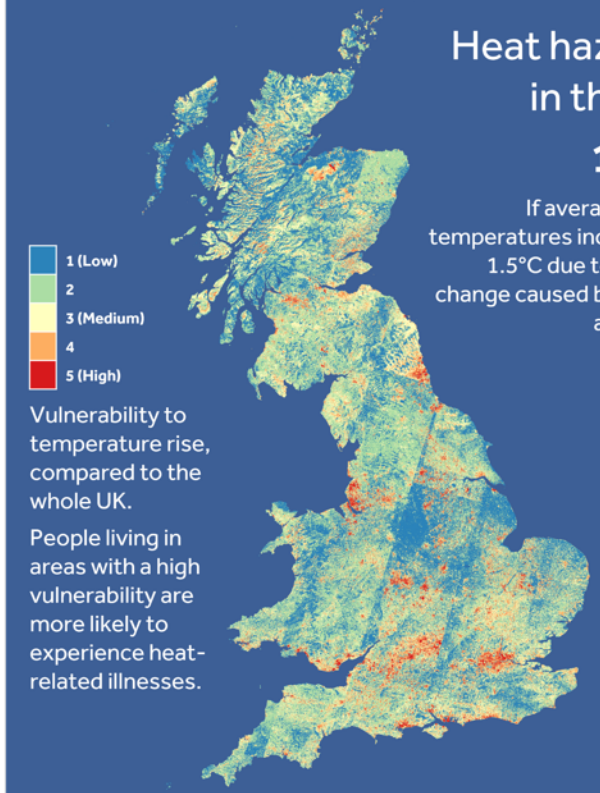
Vulnerability to temperature rise, compared to the whole UK.

People living in areas with a high vulnerability are more likely to experience heat-related illnesses.

Heat hazards in the UK

1.5°C

If average global temperatures increase by 1.5°C due to climate change caused by human activities.



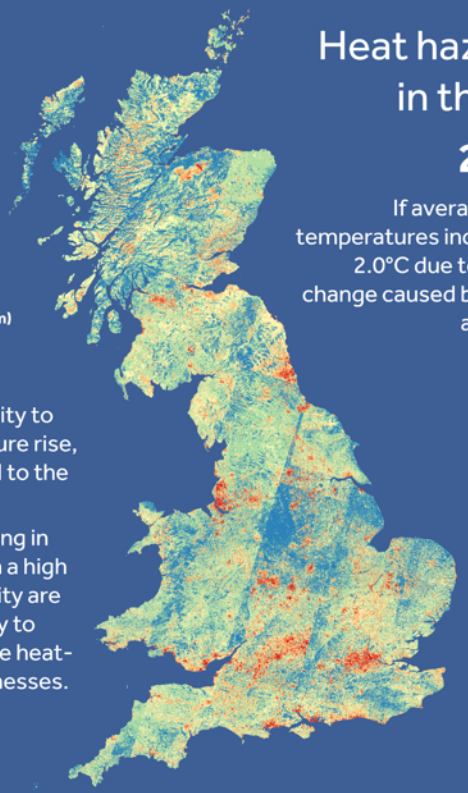
Vulnerability to temperature rise, compared to the whole UK.

People living in areas with a high vulnerability are more likely to experience heat-related illnesses.

Heat hazards in the UK

2.0°C

If average global temperatures increase by 2.0°C due to climate change caused by human activities.



Vulnerability to temperature rise, compared to the whole UK.

People living in areas with a high vulnerability are more likely to experience heat-related illnesses.

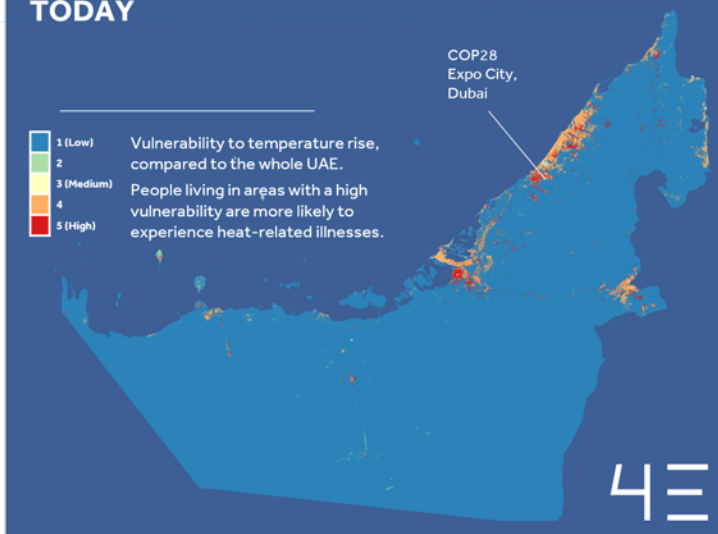
Future Climate Scenarios

Future impacts of climate change on heat hazard

United Arab Emirates

Heat hazards in the UAE

TODAY



Vulnerability to temperature rise, compared to the whole UAE.

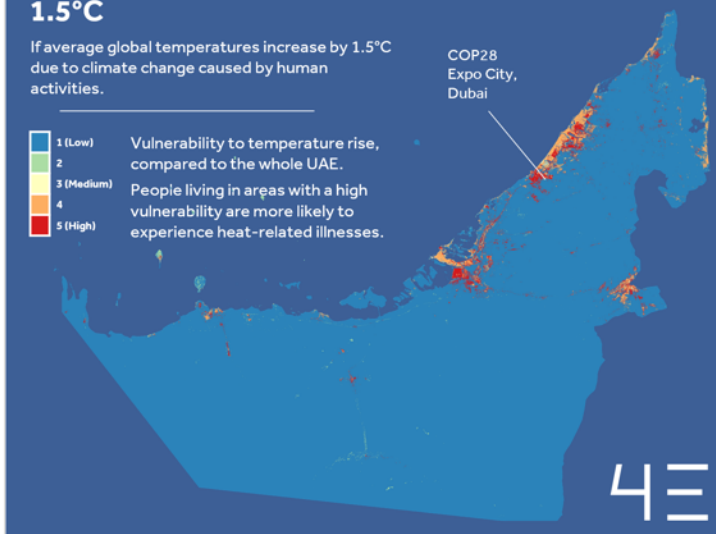
People living in areas with a high vulnerability are more likely to experience heat-related illnesses.

4EI

Heat hazards in the UAE

1.5°C

If average global temperatures increase by 1.5°C due to climate change caused by human activities.



Vulnerability to temperature rise, compared to the whole UAE.

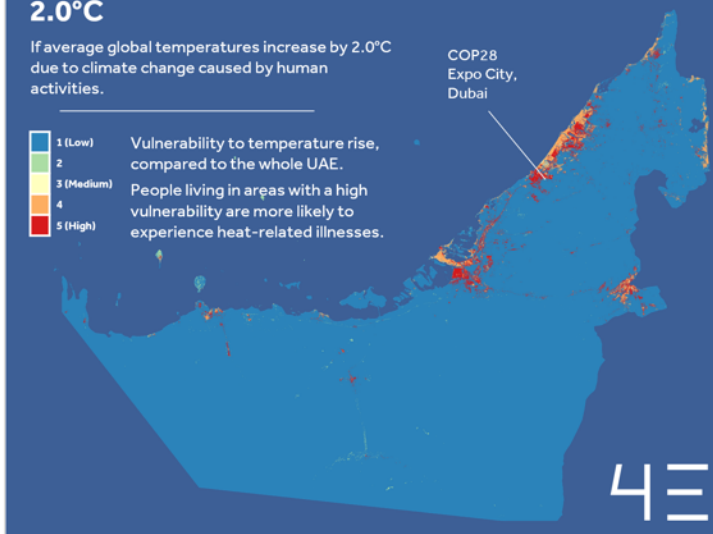
People living in areas with a high vulnerability are more likely to experience heat-related illnesses.

4EI

Heat hazards in the UAE

2.0°C

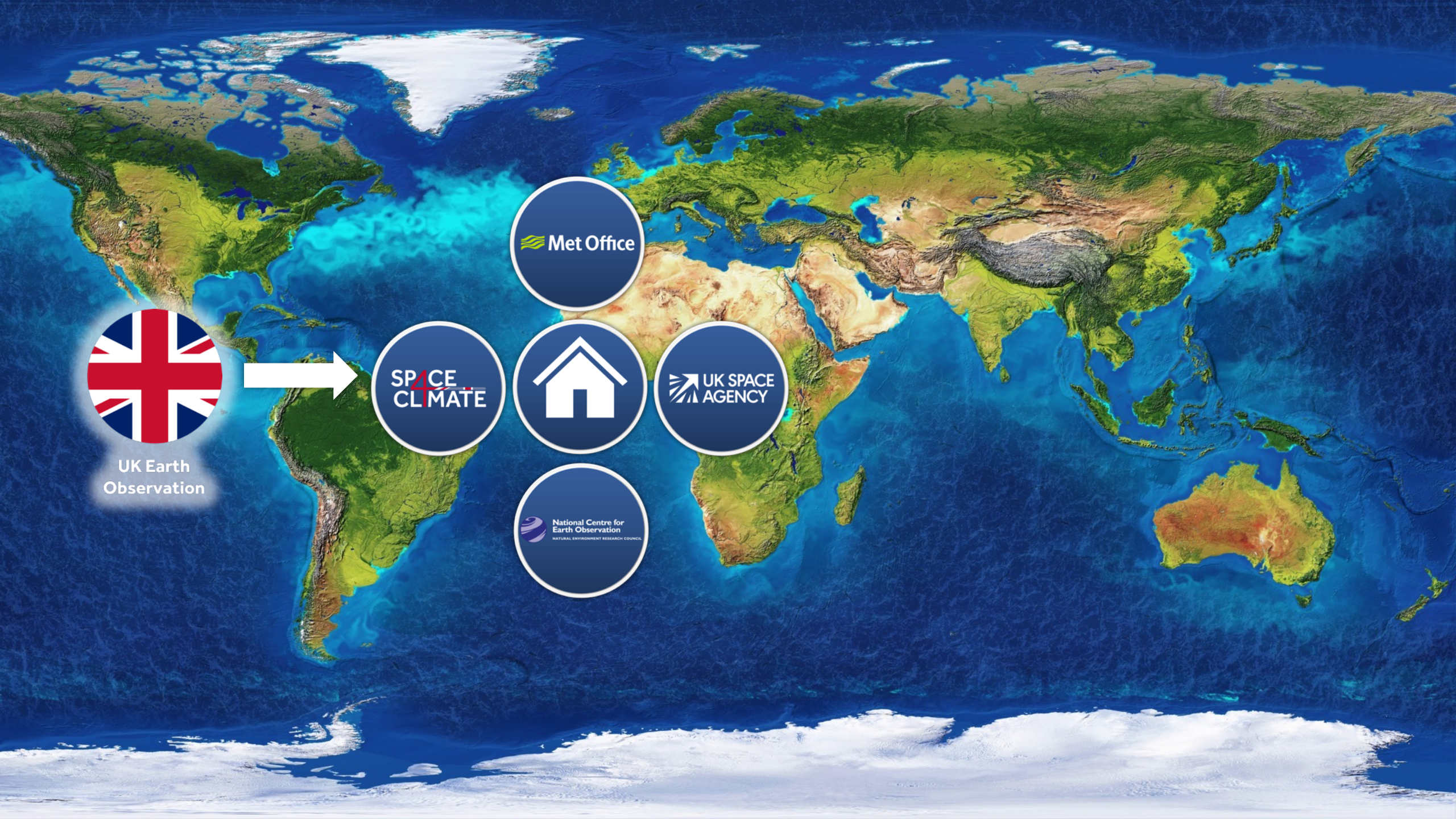
If average global temperatures increase by 2.0°C due to climate change caused by human activities.



Vulnerability to temperature rise, compared to the whole UAE.

People living in areas with a high vulnerability are more likely to experience heat-related illnesses.

4EI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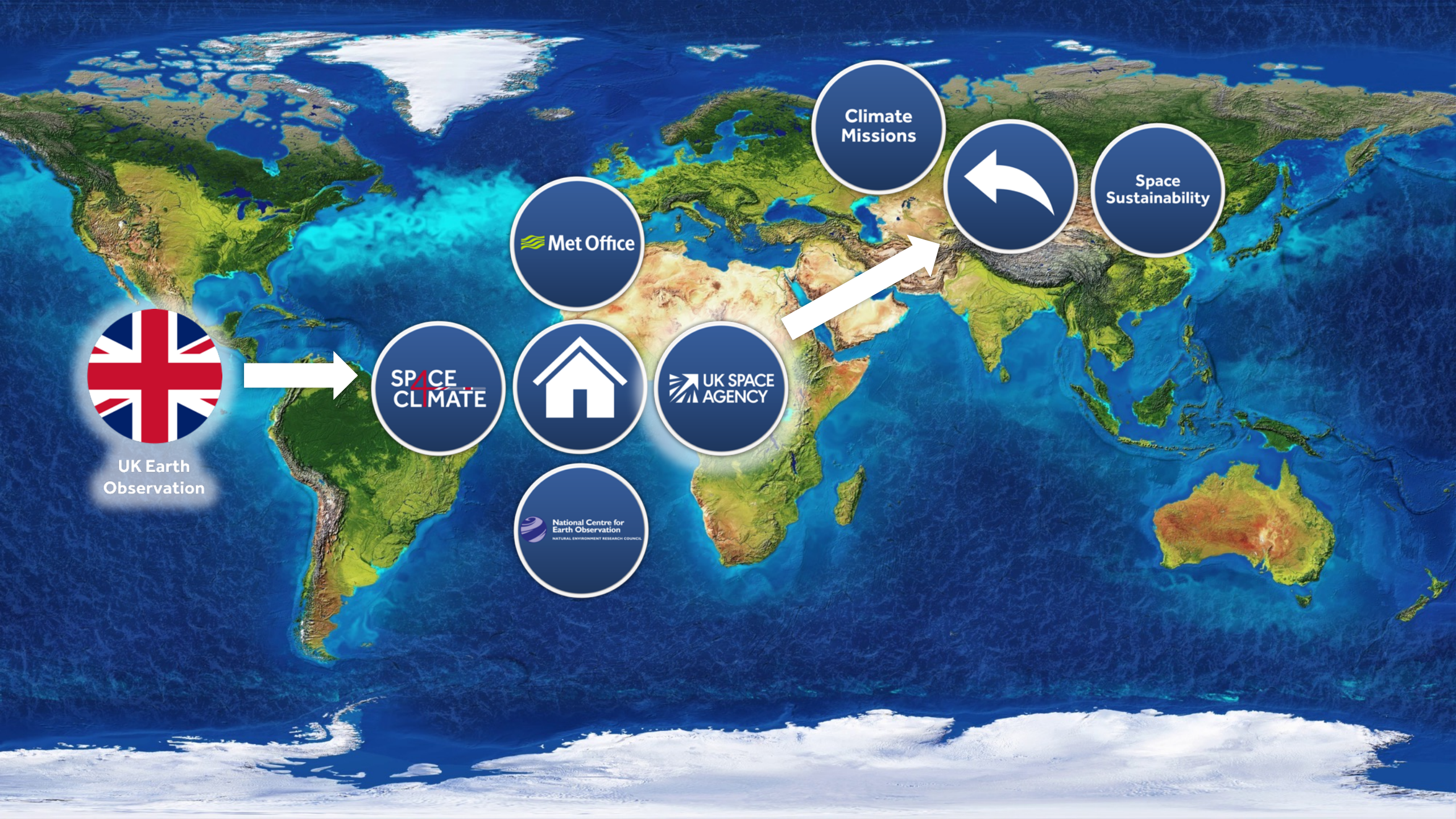
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Climate Missions

Biomass

The Biomass satellite will be the first to monitor the world's forests in 3D using an innovative radar and reflector design. Biomass will measure the amount of wood in branches, as well as tree trunks, reducing uncertainties in carbon stored in forests.

Image credit: ESA

Biomass

Satellite

"The Biomass mission gives amazing opportunities to do things for the climate. This is the first mission of its type in space and will have a legacy of a decade or more."

Prof Shaun Quegan
National Centre for Earth Observation
University of Sheffield
UK Biomass Science Team Lead

esa

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Watch the Biomass video

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Climate Missions

MicroCarb

A joint venture by the UK and French space agencies, the MicroCarb satellite will be the first European satellite dedicated to measuring atmospheric Carbon Dioxide (CO_2), determining emissions of carbon across the globe with extreme precision.

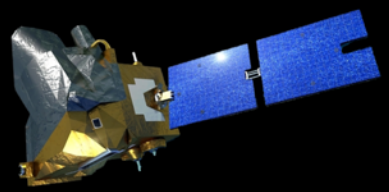

Image credit: CNES

MicroCarb
Satellite

"Data from MicroCarb will play a crucial role in extending our current ability to verify reductions in global and national emissions of CO_2 in response to the demands of the Paris Agreement."

Prof Paul Palmer
Lead UK MicroCarb Scientist
NCEO Science Director

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Watch the MicroCarb video

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Launched in late 2022, and currently in the calibration and validation phase, SWOT will provide images of Earth's oceans, lakes, rivers and wetlands in higher resolution than ever before, revolutionising global assessments of water resources on land.

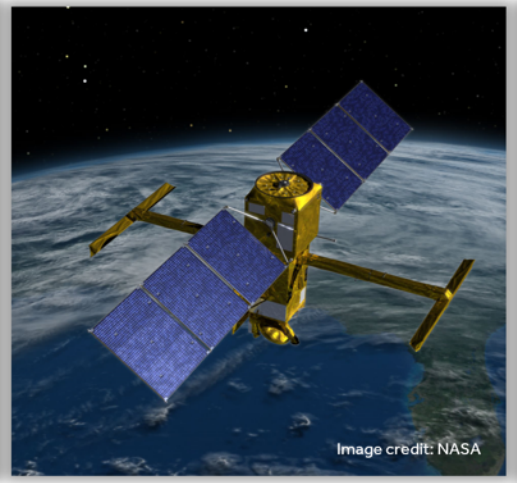
Image credit: NASA

SWOT

Surface Water and Ocean Topography Satellite

"I'm so proud of the UK expertise enabling SWOT to be built and calibrated. It is a major new climate mission giving unprecedented data across the globe."

Beth Greenaway
Chair of Space4Climate
UK Space Agency Head of Earth Observation and Climate

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Climate Missions

TRUTHS

The TRUTHS mission is currently in development by ESA, on behalf of the UK Space Agency and other partner nations across Europe. TRUTHS will be a calibration laboratory in space, increasing the accuracy of Earth Observation data by up to ten times. It will provide a benchmark reference of the 'optical' radiation state of the planet from which change can be detected in as short a time as possible.

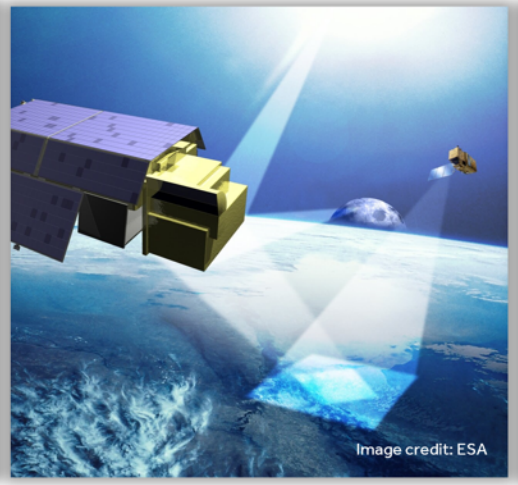

Image credit: ESA

TRUTHS

Traceable Radiometry Underpinning Terrestrial- and Helio-Studies Satellite

"This climate mission puts the UK at the forefront of space-based Earth Observation, it will become the 'gold standard' for EO data which will underpin global climate information services going into the future"

Prof Nigel Fox
Chief Scientist for Earth Observation and Climate, National Physical Laboratory
Space4Climate Board Member

esa

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Watch the TRUTHS video

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Climate Missions

TRUTHS demo

CEOS-RadCalNet site RRV
Railroad Valley, Nevada, USA

NPL

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This site, operated by the University of Arizona, is part of the Committee on Earth Observation Satellites (CEOS) RadCalNet network of bright desert -like sites with instrumentation to provide data to calibrate Earth viewing satellites. The data are freely available to all, to improve harmonisation of the world's Earth viewing satellite sensors.

Following the launch of the ESA TRUTHS mission, sites such as this will be regularly re-calibrated from space, improving the accuracy of their data.

Top of the Atmosphere (ToA) spectrally resolved reflectance values are provided every 30 minutes as a reference to calibrate satellite imagers which pass over the site. This is of particular importance to small 'newspace' sensors which rarely have any on-board calibration systems.

These reflectance values are determined by a set of autonomous instruments called RadCaTS viewing the ground complemented by instruments monitoring the atmosphere to enable corrections to be made for light passing through.

CEOS-Pseudo-Invariant Calibration Site (PICS) Libya-4
Libya-4

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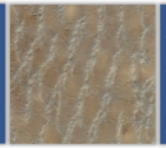

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CEOS-RadCalNet site GONA
Gobabeb near the Namib desert, Namibia

NPL

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This site, operated by National Physical Laboratory (NPL) on behalf of the European Space Agency (ESA) and the French space agency (CNES), is part of the Committee on Earth Observation Satellites (CEOS) RadCalNet network of bright desert -like sites with instrumentation to provide data to calibrate Earth viewing satellites. The data are freely available to all, to improve harmonisation of the world's Earth viewing satellite sensors.

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Top of the Atmosphere (ToA) spectrally resolved reflectance values are provided every 30 minutes as a reference to calibrate satellite imagers which pass over the site. This is of particular importance to small 'newspace' sensors which rarely have any on-board calibration systems.

Reflectance values are determined by an instrument that rotates on top of a 10 m tower to scan the surface reflectance and observe the atmosphere. It is autonomous and sits inside a small fenced area to keep out wild animals (see picture).


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Max Alexander's 'Our Fragile Space' Images
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NATURAL ENVIRONMENT RESEARCH COUNCIL
CLEAR
Active Debris Removal Programme
LeoLabs Visualisation

UK SPACE AGENCY

Astroscale

clearspace today

Read the UK Space Agency press release

The UK Space Agency is funding two debris removal mission studies – led by Astroscale and ClearSpace (£4m) – which will inform on which mission concept to progress to a full design and launch phase. Launching in 2026, this will demonstrate national capability to rendezvous, dock with and deorbit two pieces of UK space debris.

UK SPACE AGENCY

Active Debris Removal Programme

We rely on satellites every day for the environment, economy and more. When these satellites end their useful lives, they become space debris, along with objects such as tools from astronauts, and even tiny flecks of paint. Over 130 million of these pieces of space debris are estimated to be orbiting Earth.

Space debris is dangerous because of the speed it travels and the risk to working satellites we rely on every day. Action must be taken now to ensure that the space environment remains safe, secure, and sustainable for future generations. The UK is committed to tackling this issue – it is one of our top priorities for space.

UK Earth Observation

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Space Sustainability

CLEAR

The CLEAR servicer satellite will be equipped with state-of-the art sensors and a robotic capture mechanism. It will grab derelict satellites, manoeuvre them to a lower orbit and release them, such that they safely burn into the atmosphere.

ClearSpace and Astroscale have been awarded £4 million from the UK Space Agency to design missions to remove existing pieces of space debris, working with a consortium of industry partners.

Image credit: clearspace today

CLEAR

Clearing of the LEO Environment with Active Removal Satellite

"As our reliance on space technologies increases rapidly and the UK becomes a global hub of satellite design, manufacturing and launch, we are committed to leading efforts to make space more sustainable."

Dr Paul Bate
Chief Executive of the UK Space Agency

clearspace today

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Watch the CLEAR video

Read the press release

UK Earth Observation

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Space Sustainability

COSMIC

Grown out of Harwell in Oxfordshire, COSMIC is a true British endeavour with partners and suppliers across the UK. COSMIC is set to be Astroscale's fifth mission into space.

ClearSpace and Astroscale have been awarded £4 million from the UK Space Agency to design missions to remove existing pieces of space debris, working with a consortium of industry partners.

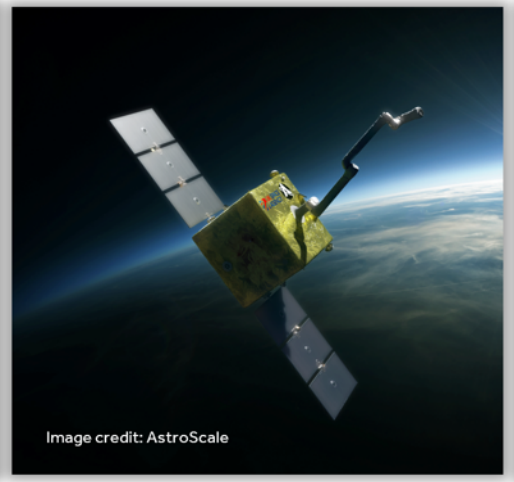

Image credit: AstroScale

COSMIC

Cleaning Outer Space Mission through Innovative Capture Satellite

"As our reliance on space technologies increases rapidly and the UK becomes a global hub of satellite design, manufacturing and launch, we are committed to leading efforts to make space more sustainable."

Dr Paul Bate
Chief Executive of the UK Space Agency

Astroscale

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Watch the COSMIC video

Read the press release

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Space Sustainability

Max Alexander's 'Our Fragile Space' Images

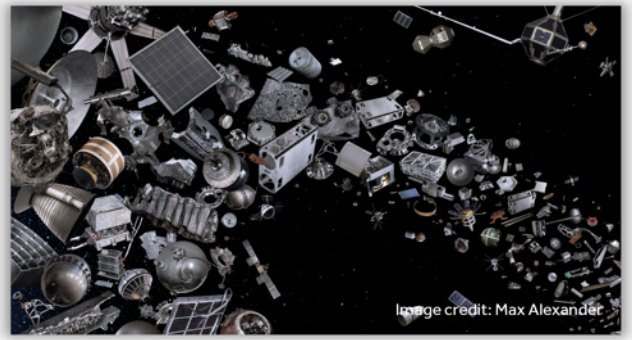
Our Fragile Space

Protecting the Near-Space Environment

An exhibition by Max Alexander
maxalexander.com

The focus is the critical issue of space debris, and the sustainability initiatives to mitigate against it.

Our Fragile Space is set in the wider context of environmental sustainability; in this Anthropocene Epoch we have entered, humans are adversely affecting four domains: the land, the oceans, the atmosphere – and now near-space.



Our Fragile Space is a ground-breaking photography-led science communication about Near-Space – how this is part of the Earth's environment and needs protecting.

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Space Sustainability

LeoLabs Visualisation


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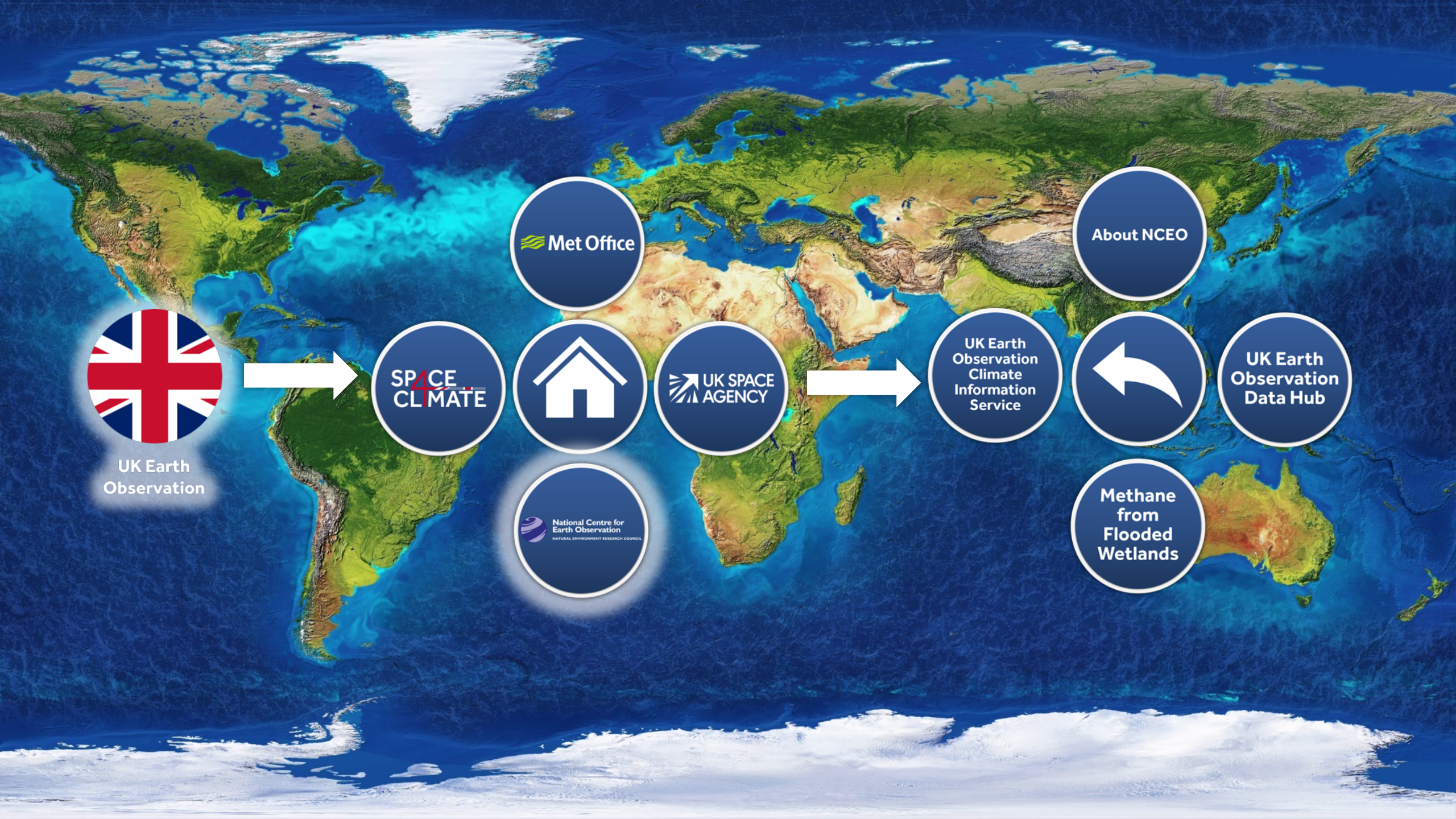
Space Sustainibility Video
Since 1957 humanity has launched
more than 15,000 satellites into orbit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UK Earth Observation Data Hub
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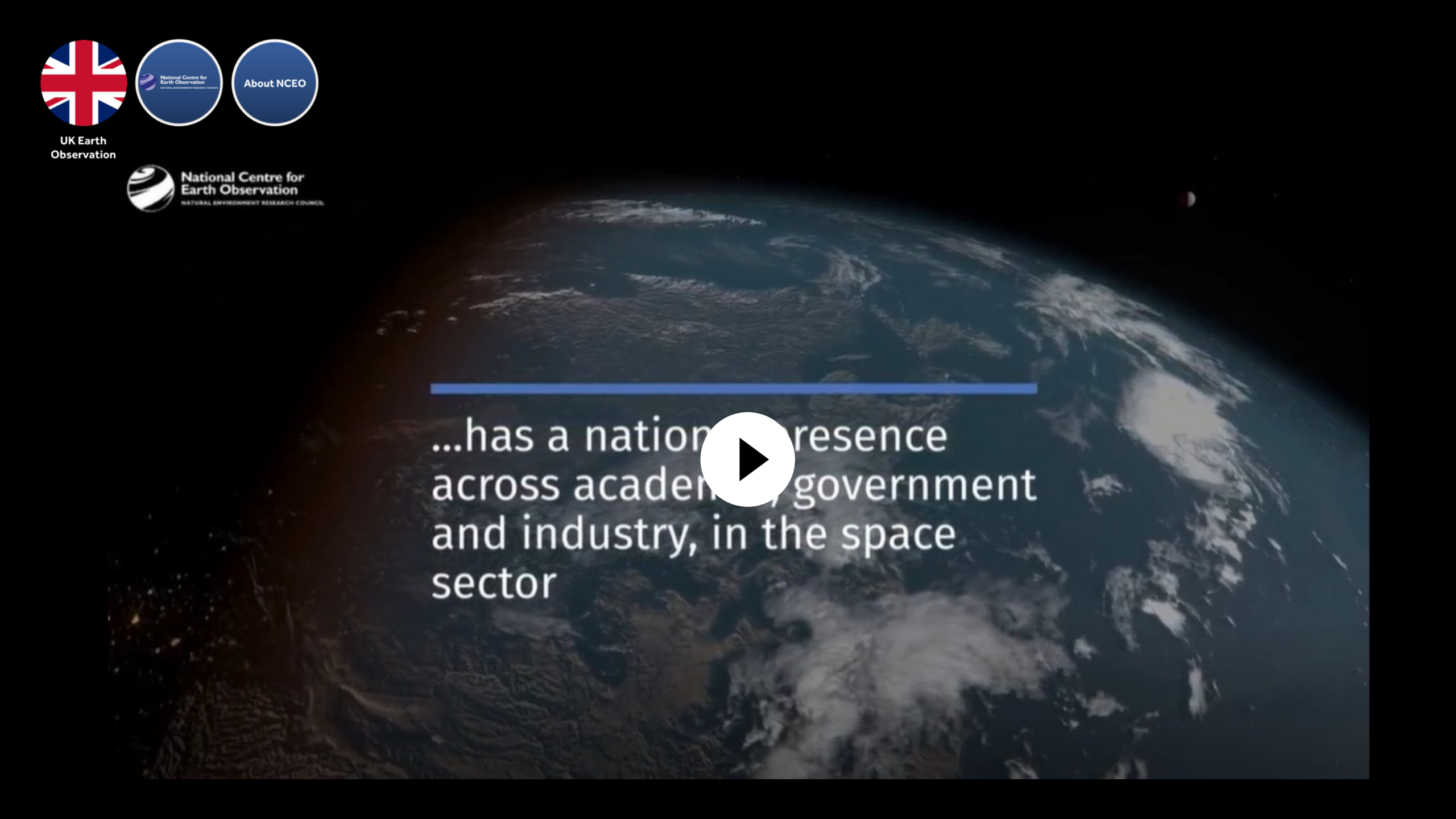
Methane from Flooded Wetlands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...has a nation presence
across academ government
and industry, in the space
sector

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UK Earth Observation Climate Information Service

EOCIS uses measurements from satellites

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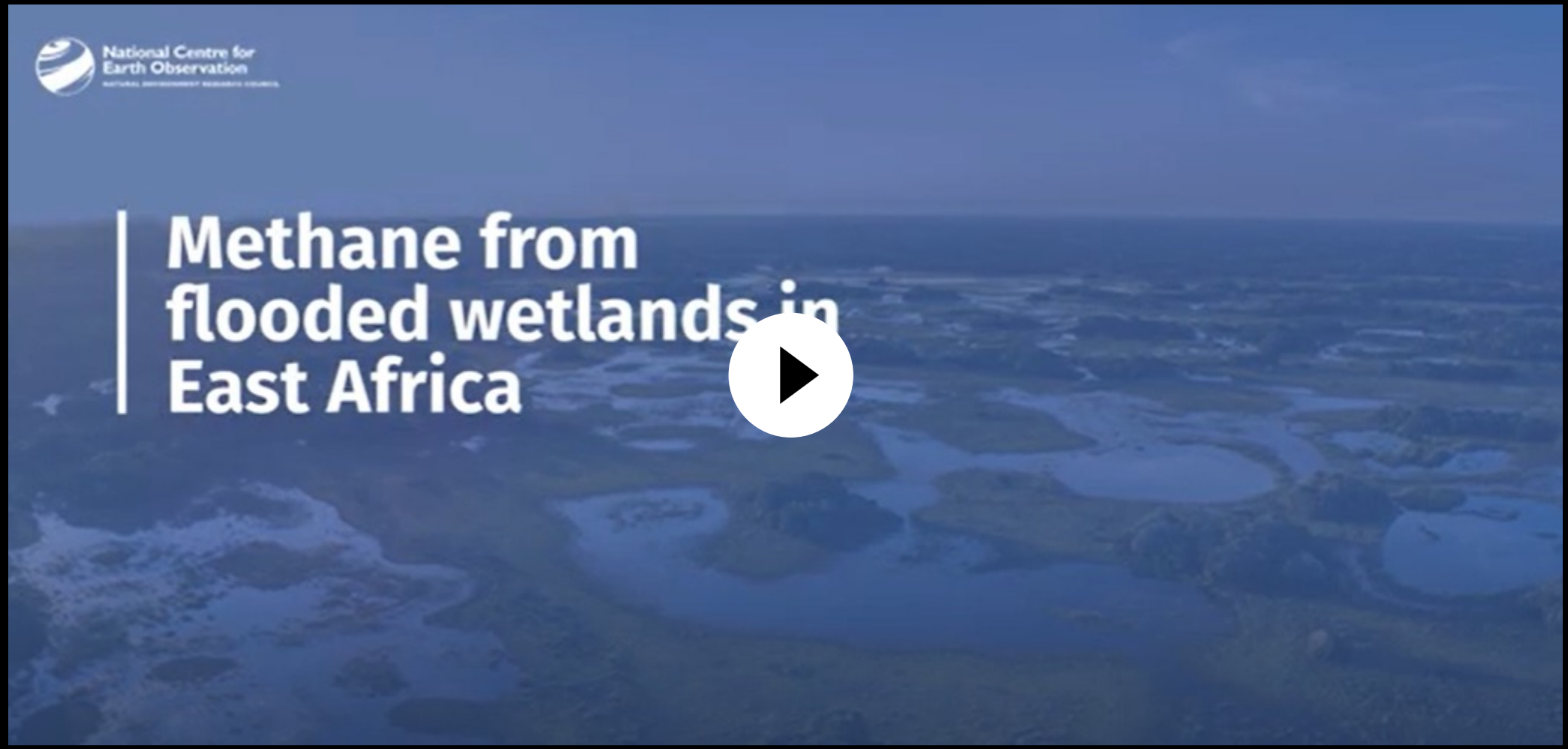

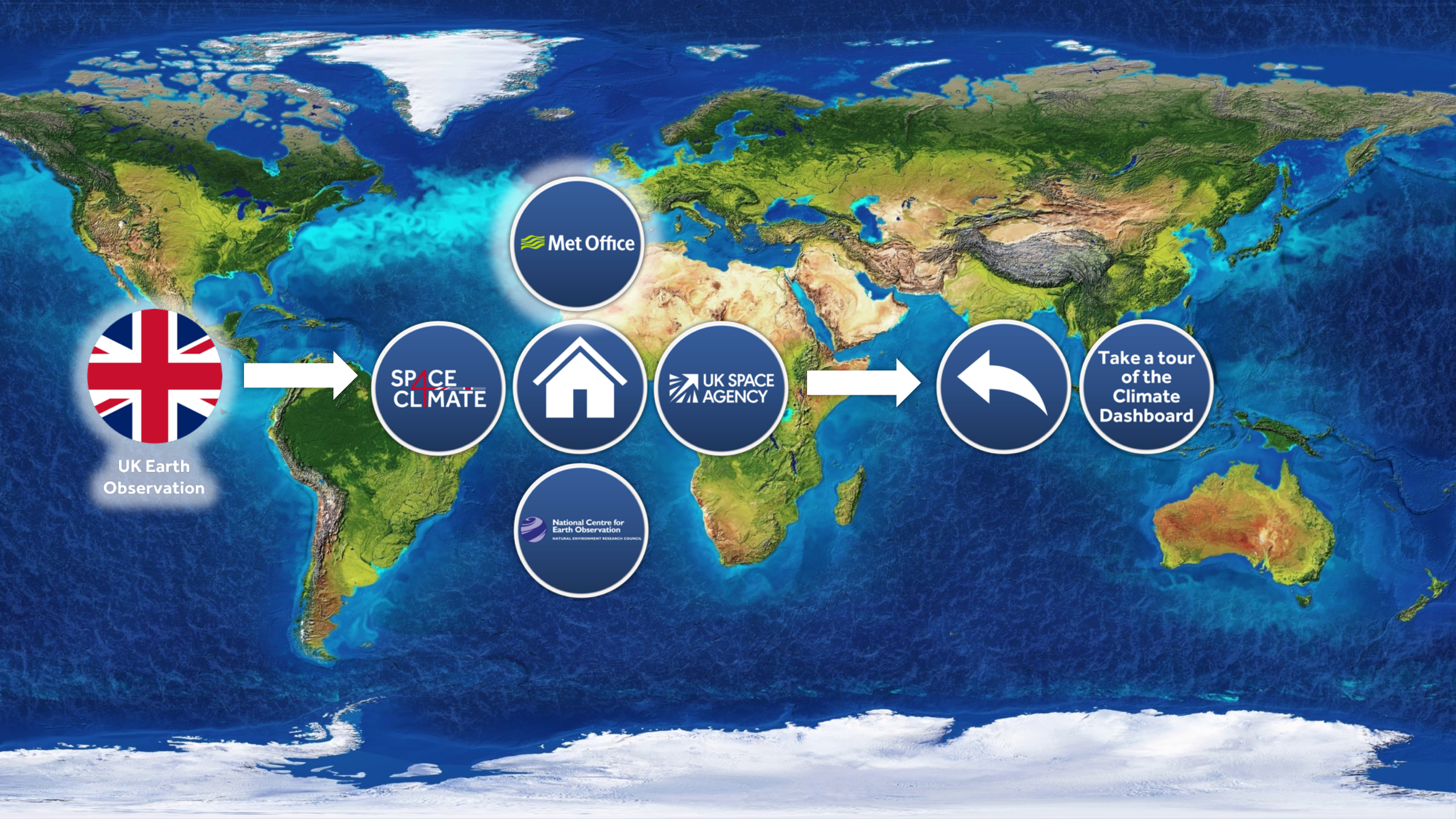
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Take a tour of the Climate Dashboard
National Centre for Earth Observation
NATURAL ENVIRONMENT RESEARCH COUNCIL

Met Office

Take a tour of the Climate Dashboard

Tracking the Changing Climate with Earth Observations

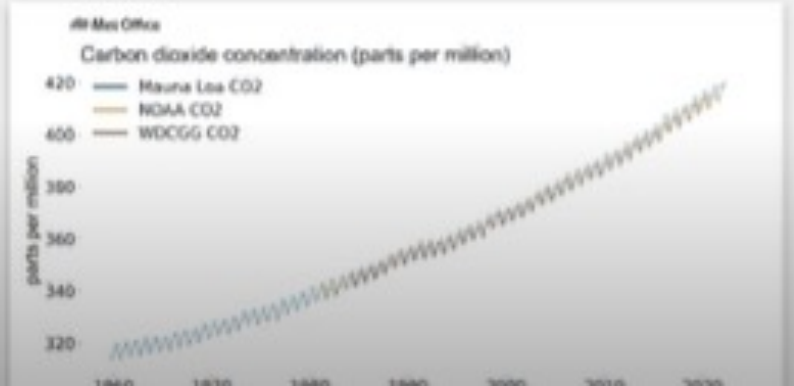
Indicators of change

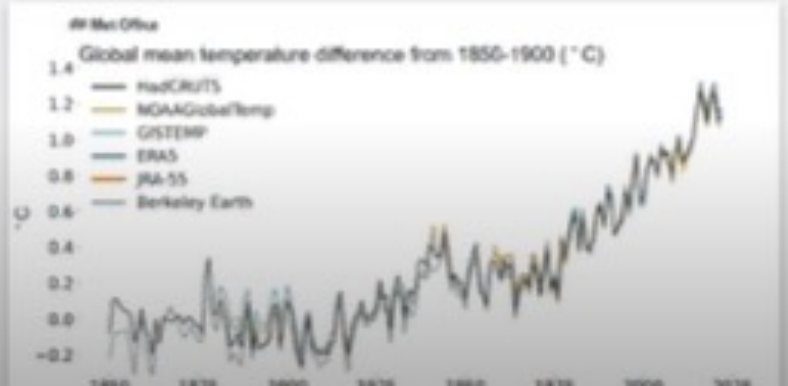
The climate is a complex system and it is changing fast. It can be hard to keep track of what is going on. We have put together a dashboard which gathers together the key indicators of climate change.

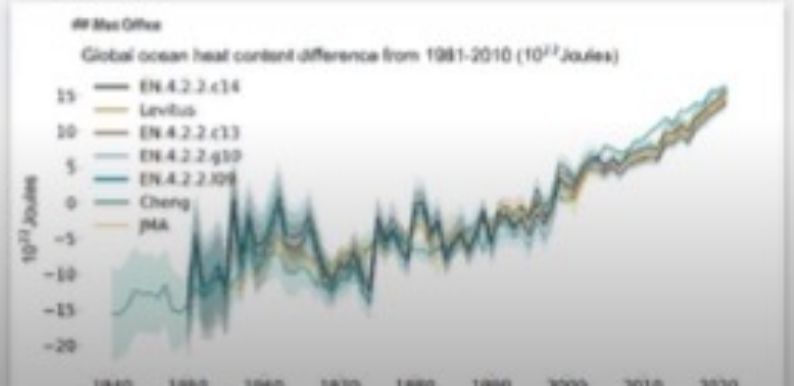
The indicators are based on earth observations made at surface stations, by ships and buoys at sea, from satellites and by observers and research teams around the world. These earth observing networks are crucial for understanding the changing climate.

There are many data sets out there providing useful information. As well as the data sets produced by the Met Office Hadley Centre, we have brought together data from respected institutes and research groups around the world to provide a more complete picture of what's happening in the climate.

The front page shows the main indicators. Beneath each one there is additior ▶ rilling down into why the indicator is important, how it has changed and how it was calculated. The pages also link through to the data so that you re for yourself.





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Department for Science, Innovation & Technology
Natural Environment Research Council
Centre for Satellite Data in Environmental Science
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University of Exeter
KING'S College LONDON
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Cranfield University
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Satellite Applications


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Every country needs a Space4Climate
When it's a global problem, it has local impacts.
Prof. John Remedios
Director, National Centre of Earth Observation