

# The Status of Ireland's Climate 2020

Editors and Lead Authors: Walther C.A. Cámaro García and Ned Dwyer

Credit: Kilian Harford, Met Éireann

## ABOUT THIS SUMMARY

This document is a summary of the 2nd edition of the Status of Ireland's Climate report, which presents the current state of Ireland's climate. This assessment is based on the collation and analysis of data from almost 50 internationally defined essential climate variables observed in the atmospheric, oceanic and terrestrial environments.

It also documents the status of Ireland's climate-observing infrastructure, noting where it is robust, where gaps exist and where observing programmes need to be enhanced.

The assessment was conducted in collaboration with state agencies, universities, research groups and organisations based in both Ireland and abroad as they conduct these systematic observations and submit quality-controlled data to global observation programmes which allows for Irish data to be considered in international analyses.

These observations and their analyses support our understanding of Ireland's changing climate within an international context and informs the assessment of the actions required to reduce carbon emissions and adapt to climate changes appropriately.



# WHY DO WE NEED CLIMATE OBSERVATIONS?

To understand how and why climate is changing.

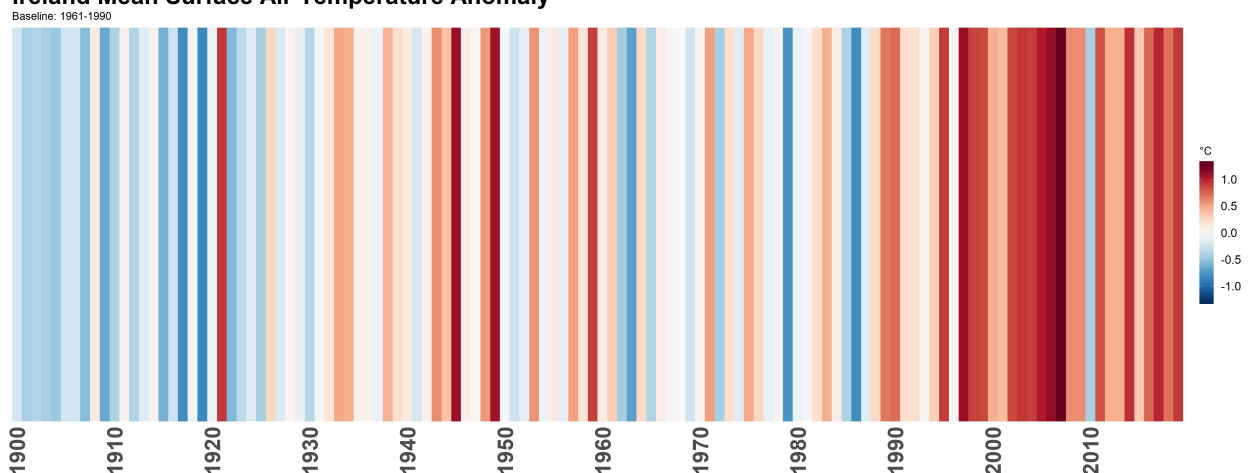
To inform responses and actions to mitigate climate change and adapt to its impacts in Ireland.

To contribute to European and global analysis of climate observations and enable comparison of climate changes in Ireland with those across Europe and the rest of the world.

As a party to the UN Framework Convention on Climate Change and its 2015 Paris Agreement Ireland has committed to carry out observations of the climate across the atmosphere, ocean and terrestrial domains as part of the Global Climate Observing System.

The Global Climate Observing System requires the measurement of over 50 Essential Climate Variables in the atmospheric, oceanic, and terrestrial domains.

**Ireland Mean Surface Air Temperature Anomaly**



ANNUAL AIR TEMPERATURE DIFFERENCE (1900 - 2019) COMPARED TO THE MEAN VALUE CALCULATED OVER THE PERIOD 1961 TO 1990.

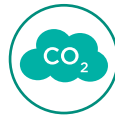
More information on climate stripes: <https://showyourstripes.info>

LINK TO FULL REPORT

### GREENHOUSE GASES

#### EMISSIONS CONTINUE TO RISE

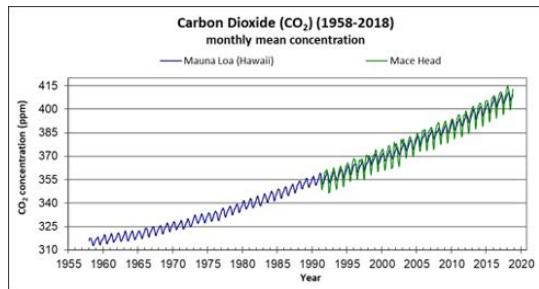
Atmospheric concentrations of carbon dioxide, methane and nitrous oxide are the highest observed since measurements began.



↑ + 50%  
CO<sub>2</sub>

↑ + 170%  
CH<sub>4</sub>

↑ + 20%  
N<sub>2</sub>O



Monthly mean concentration of carbon dioxide at Mauna Loa, Hawaii (1958-2018) and Mace Head Research Station, Ireland (1992-2018)

Background **carbon dioxide (CO<sub>2</sub>)** concentrations reached 414 ppm in 2020 which is approximately a **50% increase** compared to pre-industrial levels.

**Methane (CH<sub>4</sub>)** concentrations are at 1940 ppb - which is approximately a **170% increase** compared to pre-industrial levels.

**Nitrous oxide (N<sub>2</sub>O)** concentrations are now above 330 ppb - which is approximately a **20% increase** compared to pre-industrial levels.

### RAINFALL

#### ANNUAL AVERAGE AMOUNTS OF PRECIPITATION ARE INCREASING

↑ + 6%

Annual precipitation was **6% higher** in the period 1989 to 2018, compared to the 30-year period 1961 to 1990. The decade 2006 to 2015 was the **wettest on record**.



### AEROSOLS

#### AEROSOLS AFFECT CLIMATE DYNAMICS IN SEVERAL WAYS AND REPRESENT AN AREA OF GREAT UNCERTAINTY IN THE UNDERSTANDING OF THE EARTH'S CLIMATE SYSTEM

Atmospheric levels of sulfur over the 35-year period 1980 - 2015, as measured at Valentia Observatory, Co. Kerry show an approximately **80% reduction**, highlighting the success of regulation and technological advances.



### AIR TEMPERATURE

#### ANNUAL AVERAGE AIR TEMPERATURE IS RISING

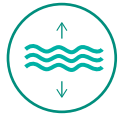
↑ + 0.9°C

The annual average surface air temperature in Ireland has increased by approximately **0.9°C over the last 120 years**, with a rise in temperatures being observed in all seasons.

Fifteen of the top 20 warmest years on record have occurred since 1990.

#### THE LENGTH OF WARM SPELLS HAS INCREASED SLIGHTLY OVER THE LAST 60 YEARS





### SEA LEVEL

#### SEA LEVEL CONTINUES TO RISE

↑ + 2-3 mm/year

Ireland

↑ + 1.7 mm/year

Dublin

Satellite observations indicate that the **sea level around Ireland has risen** by approximately **2-3mm/year** since the early 1990s. Analysis of sea level data from Dublin Bay suggests a rise of approximately 1.7mm/year since 1938 which is consistent with global average rates.

### OCEAN ACIDITY



#### THE OCEAN IS BECOMING MORE ACIDIC

↓ -0.05 pH units  
(change 1991 - 2013)

Measurements in the surface waters to the west of Ireland between 1991 and 2013 indicate an **increase in ocean acidity** which threatens calcifying species such as corals, shellfish and crustaceans.

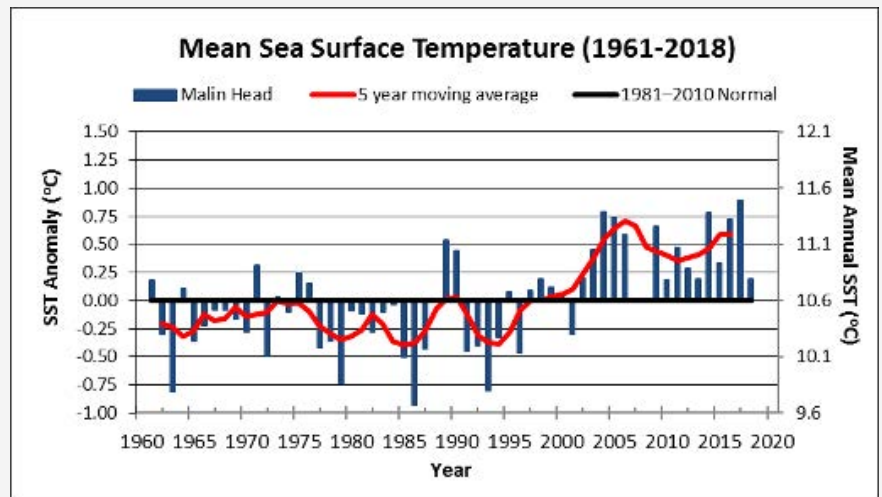


### SEA SURFACE TEMPERATURE

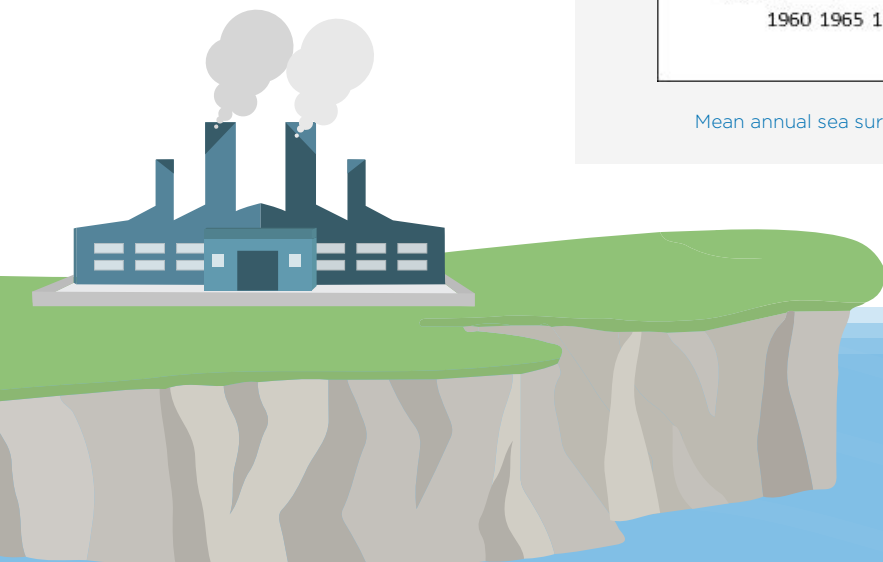
#### THE OCEAN IS GETTING WARMER

↑ + 0.15°C /decade  
(Global trend 1990 - 2020)

The average **sea surface temperature** at Malin Head over the 10 years between 2009 and 2018 was **0.47°C** above the 1981-2010 mean.



Mean annual sea surface temperature (SST) and anomalies at Malin Head (1961-2018)



### RIVER FLOWS



#### THERE IS AN INCREASE IN FLOWS ACROSS MOST OF THE COUNTRY

However, there is evidence in recent years of an increase in potential drought conditions especially in the east.



trend 1972-2017

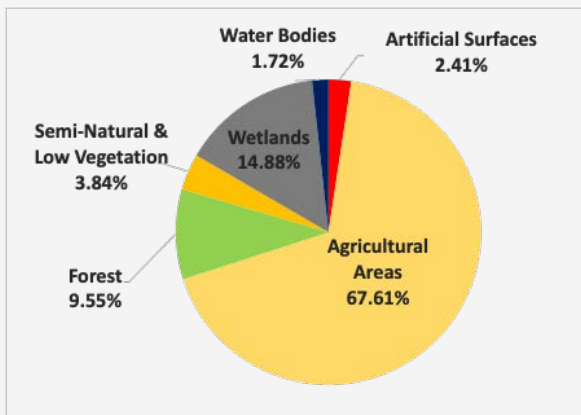
### LAND COVER

#### THE AREA OF FORESTS AND ARTIFICIAL SURFACES HAS INCREASED



+ 30 % (forest extent 1990 to 2018)

Land cover observations since 1990 show **increases** in the area covered by both **artificial surfaces** and **forests** and a **decrease** in **wetland areas** which include peatlands.



Main land cover type distribution in Ireland in 2018 (CORINE)



### VEGETATION FIRES



#### MOST FIRES OCCUR BETWEEN MARCH AND JUNE EACH YEAR

4,000 - 6,000 ha  
(Average area burned annually)

**Upland heaths and blanket bogs** have the strongest association with fires.

### ABOVE GROUND BIOMASS

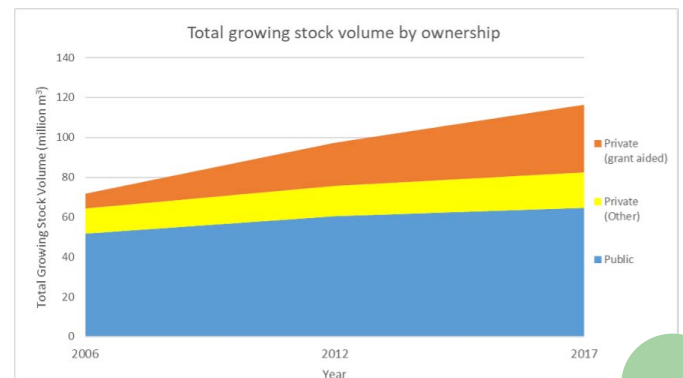


#### THE TOTAL VOLUME OF TREES AND HENCE CARBON SEQUESTERED IN FOREST HAS INCREASED



+38% (VOLUME OF TREES 2006 to 2017)

**Privately owned forest**, that has been grant aided by the Irish government has undergone the largest increase in tree volume.



Total growing stock (tree) volume (million m<sup>3</sup>) by ownership (2006 to 2017)



## HOW ARE CLIMATE VARIABLES MEASURED?

Observations of Essential Climate Variables are made by sensors and instruments deployed by people on land, rivers and lakes, in the seas around our coast, below the surface of the ocean and in our atmosphere. These are complemented by space based observations from satellites including the EU Copernicus system. The data collected are archived, quality controlled, and analysed by various organisations in order to understand our climate and how it is changing.



# WHAT NEEDS TO BE DONE TO IMPROVE THE NATIONAL CLIMATE OBSERVATION SYSTEM?

There are a number of issues that need to be addressed to make the national climate observation system more robust and capable of addressing the country's long-term needs with regard to climate monitoring and understanding.

The following recommendations are made:

Ensure continued maintenance of existing **climate monitoring** programmes and infrastructure, the transition of climate observations that rely on one-off funding to **long-term sustainable programmes**, and investigate potential to monitor essential climate variables not currently observed in Ireland.

Build on the **analysis of historic in situ and satellite data** records for those essential climate variables relevant to Ireland that have not yet been fully exploited.

**Establish climate-relevant observation networks**, for those variables currently not systematically monitored, that take advantage of existing national infrastructure and expertise.

Improve **discovery of and access to information and data** on Ireland's essential climate variables and related observational infrastructure.

GCOS Ireland should **co-ordinate development of a roadmap** for maintenance, consolidation and, where necessary, upgrade of Ireland's climate observation system.

[LINK TO FULL REPORT](#)