

CLIMATOLOGICAL DROUGHTS AND DRY SPELLS 2020

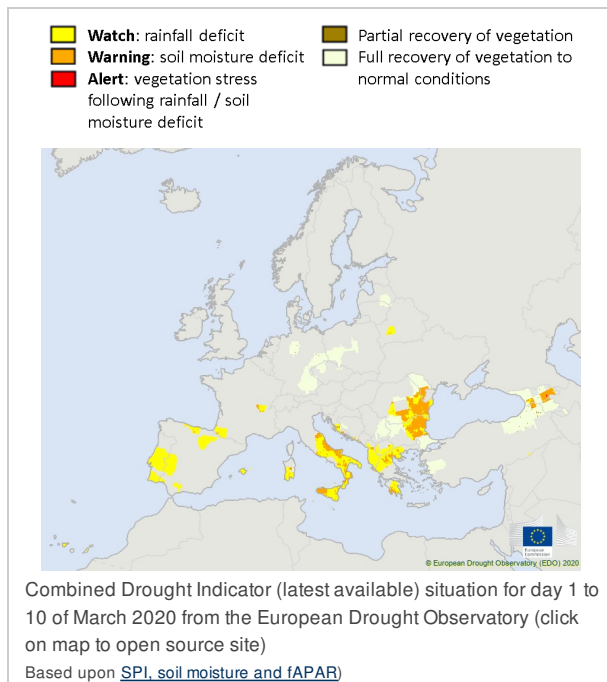
Provisional Past Weather and Climate of Ireland

Met Éireann, *The Irish Meteorological Service*

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Both droughts and floods are related to extremes rainfall accumulations, but also to other atmospheric and surface conditions. Their impacts are on the natural physical environment. Climatological dry periods are classified as dry spells, absolute droughts and partial droughts. The definitions of which depend on the spell duration and deficiencies in the total daily amounts of rainfall. Dry periods can occur any time of the year, high air temperatures are not necessary. Indeed, winter deficiencies can impact water resources during the following summer.

The digital record in the National Climate Archive at Met Éireann contains the nation's meteorological observations. From this, analysis of the climatological dry periods in Ireland can be determined using daily rainfall accumulations from the synoptic stations. The first occurrence of a dry period in the digital record is 16 days long at Shannon Airport, Co Clare from Wed 1 Jan 1941 to Thu 16 Jan 1941.



This report details the occurrences of dry periods in 2020 together with some climatological context and further details.

Dry Spells

A dry spell is a period of 15 or more consecutive days to none of which is credited 1.0 mm or of precipitation.

Station Name	County	Start Date	End Date	Length (days)
Dunsany	Meath	Wed 18 Mar 2020	Sat 4 Apr 2020	18
Gurteen	Tipperary	Wed 18 Mar 2020	Sat 4 Apr 2020	18
Oak Park	Carlow	Thu 19 Mar 2020	Sat 4 Apr 2020	17
Roches Point	Cork	Thu 19 Mar 2020	Sat 4 Apr 2020	17
Johnstown	Wexford	Thu 19 Mar 2020	Sat 4 Apr 2020	17
Cork Airport	Cork	Thu 19 Mar 2020	Sat 4 Apr 2020	17
Casement Aerodrome	Dublin	Wed 18 Mar 2020	Thu 2 Apr 2020	16
Phoenix Park	Dublin	Wed 18 Mar 2020	Wed 1 Apr 2020	15
Dublin Airport	Dublin	Wed 18 Mar 2020	Wed 1 Apr 2020	15
Mullingar	Westmeath	Wed 18 Mar 2020	Wed 1 Apr 2020	15
Moore Park	Cork	Thu 19 Mar 2020	Thu 2 Apr 2020	15

The last dry spell to end before 2020 was 17 days long at Roches Point, Co Cork from Wed 4 Sep 2019 to Fri 20 Sep 2019.

The longest dry spell observed was 48 days long at Kilkenny, Co Kilkenny from Sun 13 Aug 1972 to Fri 29 Sep 1972.

Absolute Droughts

An absolute drought is a period of 15 or more consecutive days to none of which is credited 0.2 mm or more of precipitation. An absolute drought is often part of a more extensive dry spell and in prolonged droughts, two or all three categories may overlap and in some cases coincide. (See section Frequency of Dry Periods below.)

Station Name	County	Start Date	End Date	Length (days)
Phoenix Park	Dublin	Wed 18 Mar 2020	Wed 1 Apr 2020	15
Dublin Airport	Dublin	Wed 18 Mar 2020	Wed 1 Apr 2020	15
Dunsany	Meath	Wed 18 Mar 2020	Wed 1 Apr 2020	15
Casement Aerodrome	Dublin	Wed 18 Mar 2020	Wed 1 Apr 2020	15

The last absolute drought to end before 2020 was 16 days long at Sherkin Island, Co Cork from Mon 24 Jun 2019 to Tue 9 Jul 2019.

The longest absolute drought observed was 33 days long at Casement Aerodrome, Co Dublin from Wed 3 Sep 1986 to Sun 5 Oct 1986.

Partial Droughts

A partial drought is a period of at least 29 consecutive days, the mean daily rainfall of which does not exceed 0.2 mm.

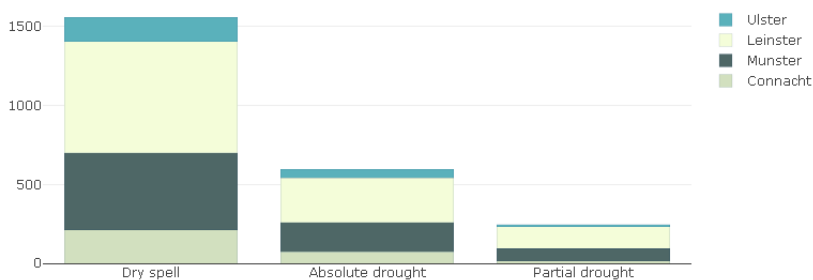
No partial drought in 2020.

The last partial drought to end before 2020 was 36 days long at Roches Point, Co Cork from Wed 20 Jun 2018 to Wed 25 Jul 2018.

The longest partial drought observed was 62 days long at Roches Point, Co Cork from Thu 16 Jun 1983 to Tue 16 Aug 1983.

Frequency of Dry Periods

This graph illustrates the frequency of dry spell and drought events, over the available digital record, grouped by province. It becomes obvious then to see that partial droughts are generally less frequent than absolute droughts, the opposite of what might be expected from the conventional use of the terms partial and absolute.



Climatology of Dry Periods

The Long-Term Average period used is 1981-2010.

The table below shows the total number of dry periods at selected stations when a dry period started during 1981 and ended during 2010. The station with the lowest number of dry periods was at Belmullet. In 1986, Rohan observed that the stations at Belmullet and Valentia Observatory had particularly small numbers of dry periods over the twenty-five period 1960-1984; Kerry and Mayo have small numbers of dry periods over the the thirty year period 1981-2010.

Station Name	County	Dry Spells	Absolute Droughts	Partial Droughts	Total Number Dry Periods
Casement Aerodrome	Dublin	58	23	12	93
Dublin Airport	Dublin	58	22	10	90
Cork Airport	Cork	55	17	10	82
Shannon Airport	Clare	48	20	8	76
Claremorris	Mayo	30	11	8	49
Valentia Observatory	Kerry	28	13	2	43
Belmullet	Mayo	23	4	1	28

Distribution among the months of the dates of commencement of the dry periods

The following analysis at **Casement Aerodrome, Co Dublin** excludes any dry periods that commenced or ended in 2020. Dry periods were observed as commencing Saturday 3 April 1954 and Sunday 26 May 2019. The months February, March, April, May, June, July and August are well represented:

Dry Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Dry spell	10	10	12	13	11	8	12	9	6	10	6	4	111
Absolute drought	1	3	4	8	3	6	7	2	5	3	2	1	45
Partial drought	1	2	2	2	2	1	6	5	0	1	1	0	23

The following analysis at **Valentia Observatory, Co Kerry** excludes any dry periods that commenced or ended in 2020. Dry periods were observed as commencing Monday 21 April 1941 and Friday 13 July 2018. The months April, May, June and July are well represented:

Dry Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Dry spell	1	5	5	17	10	8	7	4	5	5	3	1	71
Absolute drought	1	2	2	6	3	5	5	2	1	3	3	1	34
Partial drought	1	0	1	0	0	1	1	1	0	0	0	0	5

Climate Change

A changing climate leads to changes in the frequency, intensity, spatial extent, duration, and timing of weather and climate extremes, and can result in unprecedented extremes.

Some climate extremes (e.g., droughts, floods) may be the result of an accumulation of weather or climate events that are, individually, not extreme themselves (though their accumulation is extreme).

There is medium confidence that since the 1950s some regions of the world have experienced a trend to more intense and longer droughts, in particular in southern Europe and West Africa, but in some regions droughts have become less frequent, less intense, or shorter, for example, in central North America and northwestern Australia.

There is medium confidence that droughts will intensify in the 21st century in some seasons and areas, due to reduced precipitation and/or increased evapotranspiration.

Definitional issues, lack of observational data, and the inability of models to include all the factors that influence droughts preclude stronger confidence than medium in the projections. Elsewhere there is overall low confidence because of inconsistent projections of drought changes (dependent both on model and dryness index).

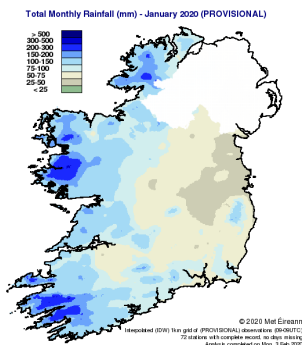
		Observed Changes (since 1950)	Attribution of Observed Changes	Projected Changes (up to 2100) with Respect to Late 20th Century
Impacts on Physical Environment	Droughts (Section 3.5.1)	<i>Medium confidence</i> that some regions of the world have experienced more intense and longer droughts, in particular in southern Europe and West Africa, but opposite trends also exist. [Regional details in Table 3-2]	<i>Medium confidence</i> that anthropogenic influence has contributed to some observed changes in drought patterns. <i>Low confidence</i> in attribution of changes in drought at the level of single regions due to inconsistent or insufficient evidence.	<i>Medium confidence</i> in projected increase in duration and intensity of droughts in some regions of the world, including southern Europe and the Mediterranean region, central Europe, central North America, Central America and Mexico, northeast Brazil, and southern Africa. Overall <i>low confidence</i> elsewhere because of insufficient agreement of projections.

Extracts from IPCC Chapter 3 (2018)

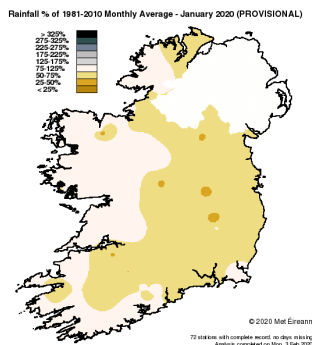
Monthly Rainfall

The following rainfall maps illustrate the percentage of normal rainfall across each region with respect to the 1981-2010 average period, where the last map is the latest month.

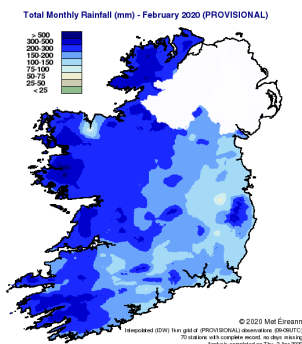
January Total Rain



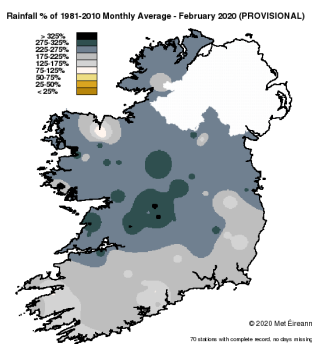
January % of 1981-2010



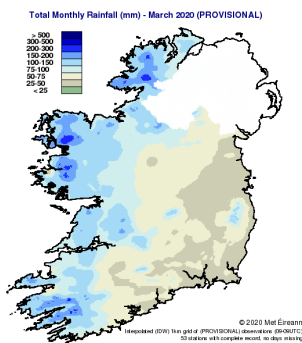
February Total Rain



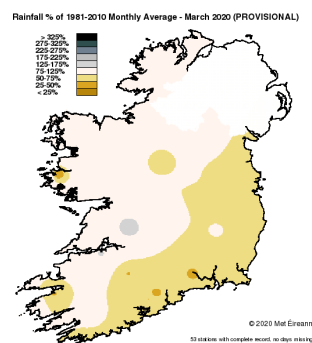
February % of 1981-2010



March Total Rain



March % of 1981-2010



Mild and Dry overall The first week of January was changeable with low pressure to the north and west and high pressure to the south and southeast. Relatively weak weather fronts crossed the country from time to time in a mild south-westerly airflow, with dry periods in between. The second week was more unsettled with active low-pressure systems dominating our weather in a mostly westerly or south-westerly airflow. One such system, Storm Brendan, brought the strongest winds of the month on the 13th, including a squall line which crossed the country from west to east with embedded thunderstorms. It remained very unsettled and windy up to the 16th. The rest of the third week saw high-pressure building over Ireland, which intensified to near record levels on the 20th and brought some cold, crisp, mostly sunny days with frost and fog at night. Anticyclonic gloom took over from the 21st when a weak weather front brought a lot of cloud into the high-pressure system over Ireland. Several dull days followed, along with some dense fog and drizzle up to the 25th. Atlantic weather fronts broke through on the 26th in a westerly airflow and introduced a fresh and cold polar maritime air mass, originating from Greenland. This brought wintry showers and frost at night, with lying snow in places, especially in the West and North. A weak warm front brought milder air in from the south-west on the 29th and the month finished mild and changeable once again.

Very wet and windy. February 2020 was an exceptionally wet and windy month. A very strong polar jet stream, further south than normal, made conditions very conducive for extreme cyclogenesis and brought a series of vigorous Atlantic depressions, towards or just to the north of Ireland. These depressions, including three named storms, Ciara, Dennis and Jorge, brought prolonged periods of heavy rainfall and stormy weather leading to extensive flooding in places, especially along the Shannon catchment. The first week of February started changeable with a transient area of high pressure giving a few dry days on the 5th and 6th. Storm Ciara affected Ireland on the 9th and 10th, followed by several cold days, with wintry showers and lying snow in places, as a polar maritime air mass moved in over the country. This pattern repeated the following weekend, as Storm Dennis, one of the deepest mid-latitude cyclones ever observed in the North Atlantic, affected Ireland on the 15th and 16th and again, was followed by a cold polar maritime air mass with several days of wintry showers. This see-saw pattern, with vigorous depressions in the North Atlantic sending active weather fronts across Ireland, followed by cold showery conditions continued up to the end of the month when Storm Jorge brought more heavy rain, with snow in places and the strongest winds of the month on the 29th.

Cool and sunny, dry in the East Storm Jorge, brought both February's strongest wind gusts on the 29th and March's strongest wind gusts on the 1st, as the storm filled and pulled away to the north-east. This left Ireland in a cool and showery westerly airflow for most of the first week of March. A series of low pressure systems to the north of Ireland dominated our weather between the 7th and 17th, bringing weather fronts across the country from west to east, interspersed with periods of cool showery weather as the winds remained mostly from the west. This included the strongest sustained winds of the month on the 12th. The remainder of the month was dominated by high pressure, however between the 21st and 25th, several weather fronts encroached and stalled in the western half of the country, giving some dull wet days there, but staying mostly dry further east. As one area of high pressure moved away to the east on the 25th, an Atlantic high pressure system intensified, reaching a high of 1055 hPa by the 29th, while centred between Iceland and Ireland. This was close enough for record high pressure for March to be recorded in the northwest of Ireland on the 29th. Between the 26th and the end of the month, the weather stayed mostly dry everywhere, but it became progressively cooler as an Arctic air mass moved in over Ireland from the north-east around the same intense high pressure system that stalled to the northwest of Ireland.

References

PK Rohan (1986). *The Climate of Ireland*. 2nd edition. Meteorological Service, Dublin
 IPCC Chapter 3. *Changes in Climate Extremes and their Impacts on the Natural Physical Environment*