

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. 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. 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 Wednesday 1 January 1941 to Thursday 16 January 1941 .

This report details the occurrences of dry periods in 2020 together with some climatological context and further details of other droughts identified by searching the digital record of rainfall observations in the National Climate Database held at Met Éireann.

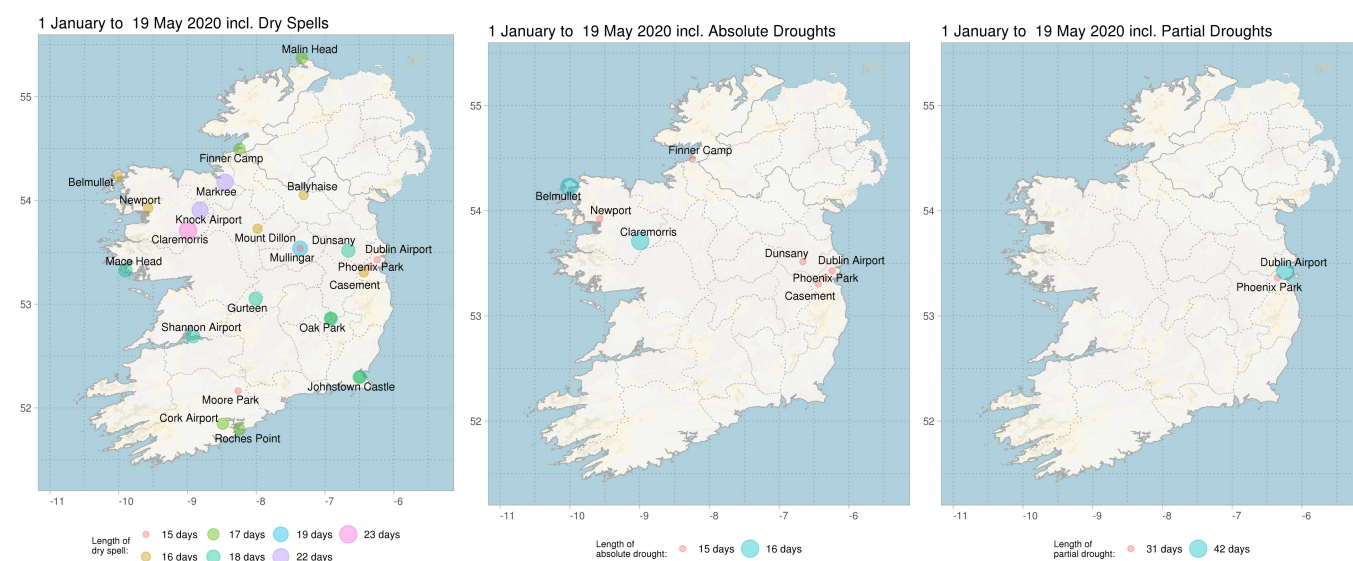
There were 37 dry periods in Ireland during 2020, between Wednesday 18 March 2020 and yesterday. Of these 27 were dry spells at 22 stations, eight were absolute droughts at eight stations and two were partial droughts at two stations. The highest number of dry periods occurred at Dublin Airport, Co Dublin with four dry periods (one absolute drought, two dry spells and one partial drought), Phoenix Park, Co Dublin with three dry periods (one absolute drought, one dry spell and one partial drought) , Dunsany, Co Meath with three dry periods (one absolute drought and two dry spells).

See Tables 1, 2 and 3 below for details on the dry spells, partial and absolute droughts (respectively), where shaded rows highlight if a dry period commenced in the current month.

The two instances of dry spells at Dublin Airport in March and April 2020 were broken only by a daily rainfall total of 1.6 mm on the day between them, that is on Thursday 2 April 2020 - which broke the absolute drought at that station, but not enough to break the partial drought. Dry spells at three stations in County Cork lasted 17 days from Thursday 19 March to Saturday 4 April 2020.

By the end of the day on Tuesday 28 April 2020, there were seven ongoing dry spells in counties Mayo, Sligo, Galway, Donegal and Roscommon - the highest period total was 2.2 mm of rainfall with 23 days at Claremorris, Co Mayo (one day from breaking its longest dry spell); two absolute droughts in County Mayo at Claremorris (0.2 mm total rainfall) and Belmullet (0.1 mm total rainfall); while Dublin Airport was at 42 days of a partial drought (4.8 mm total rainfall). During Wednesday 29 April 2020, two bands of rain crossed north-eastward over the country, breaking all these dry spells, absolute and partial droughts. The highest daily rainfall at Claremorris during Wednesday was 10.6 mm, Dublin Airport observed only 4.1 mm and Belmullet measured 7.7 mm.

Locations of Dry Periods in 2020



Dry Spells

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

Table 1: Dry spells

Station Name	County	Start Date	End Date	Length	Total Rainfall	Max Daily Rainfall	Max Daily Temp
Claremorris	Mayo	Mon 6 Apr	Tue 28 Apr	23 days	2.2 mm	0.8 mm (Mon 6 Apr)	20.5 °C (Fri 24 Apr)
Markree	Sligo	Tue 7 Apr	Tue 28 Apr	22 days	1.0 mm	0.3 mm (Mon 27 Apr)	19.3 °C (Thu 23 Apr)
Knock Airport	Mayo	Tue 7 Apr	Tue 28 Apr	22 days	1.5 mm	0.5 mm (Fri 10 Apr)	18.5 °C (Fri 24 Apr)
Mullingar	Westmeath	Fri 1 May	on-going	19 days	2.0 mm	0.9 mm (Sun 17 May)	22.0 °C (Sat 9 May)
Mace Head	Galway	Sat 11 Apr	Tue 28 Apr	18 days	1.8 mm	0.4 mm (4 days)	18.7 °C (Fri 17 Apr)
Oak Park	Carlow	Sat 2 May	on-going	18 days	0.8 mm	0.7 mm (Thu 7 May)	22.7 °C (Tue 19 May)
Shannon Airport	Clare	Sat 2 May	on-going	18 days	2.7 mm	0.9 mm (Mon 18 May)	21.3 °C (Sat 9 May)
Dunsany	Meath	Sat 2 May	on-going	18 days	1.1 mm	0.6 mm (Sun 17 May)	20.3 °C (Tue 19 May)
Dunsany	Meath	Wed 18 Mar	Sat 4 Apr	18 days	1.1 mm	0.8 mm (Thu 2 Apr)	15.8 °C (Wed 25 Mar)
Gurteen	Tipperary	Wed 18 Mar	Sat 4 Apr	18 days	2.5 mm	0.8 mm (2 days)	14.1 °C (Thu 26 Mar)
Johnstown Castle	Wexford	Sat 2 May	on-going	18 days	1.1 mm	0.5 mm (2 days)	17.6 °C (Fri 8 May)
Oak Park	Carlow	Thu 19 Mar	Sat 4 Apr	17 days	0.7 mm	0.3 mm (2 days)	15.2 °C (Thu 26 Mar)
Roches Point	Cork	Thu 19 Mar	Sat 4 Apr	17 days	0.7 mm	0.6 mm (Sat 21 Mar)	13.9 °C (Thu 2 Apr)
Malin Head	Donegal	Thu 9 Apr	Sat 25 Apr	17 days	0.9 mm	0.7 mm (Sat 11 Apr)	16.3 °C (Fri 10 Apr)
Johnstown Castle	Wexford	Thu 19 Mar	Sat 4 Apr	17 days	0.6 mm	0.2 mm (2 days)	13.9 °C (Thu 2 Apr)
Finner Camp	Donegal	Sun 12 Apr	Tue 28 Apr	17 days	1.5 mm	0.8 mm (Sun 12 Apr)	19.0 °C (Fri 24 Apr)
Cork Airport	Cork	Thu 19 Mar	Sat 4 Apr	17 days	1.0 mm	0.8 mm (Sat 21 Mar)	14.0 °C (Thu 26 Mar)
Ballyhaise	Cavan	Mon 13 Apr	Tue 28 Apr	16 days	0.4 mm	0.3 mm (Sat 18 Apr)	19.5 °C (Sat 25 Apr)
Newport	Mayo	Sat 11 Apr	Sun 26 Apr	16 days	0.8 mm	0.7 mm (Sat 11 Apr)	21.6 °C (Fri 24 Apr)
Mount Dillon	Roscommon	Mon 13 Apr	Tue 28 Apr	16 days	1.4 mm	0.9 mm (Sat 18 Apr)	21.3 °C (Sat 25 Apr)
Belmullet	Mayo	Mon 13 Apr	Tue 28 Apr	16 days	0.1 mm	0.1 mm (Wed 15 Apr)	19.1 °C (2 days)
Casement Aerodrome	Dublin	Wed 18 Mar	Thu 2 Apr	16 days	0.4 mm	0.4 mm (Thu 2 Apr)	16.5 °C (Wed 25 Mar)
Phoenix Park	Dublin	Wed 18 Mar	Wed 1 Apr	15 days	0.0 mm	0.0 mm (all days)	16.1 °C (Wed 25 Mar)
Dublin Airport	Dublin	Wed 18 Mar	Wed 1 Apr	15 days	0.0 mm	0.0 mm (all days)	14.9 °C (Wed 25 Mar)
Dublin Airport	Dublin	Fri 3 Apr	Fri 17 Apr	15 days	1.8 mm	0.6 mm (3 days)	19.4 °C (Sat 11 Apr)
Moore Park	Cork	Thu 19 Mar	Thu 2 Apr	15 days	0.6 mm	0.4 mm (Sat 21 Mar)	15.6 °C (Thu 26 Mar)
Mullingar	Westmeath	Wed 18 Mar	Wed 1 Apr	15 days	0.3 mm	0.2 mm (Thu 19 Mar)	15.8 °C (Wed 25 Mar)

The longest dry spell in the digital record at Claremorris, Co Mayo was 24 days between Wednesday 20 June 2018 and Friday 13 July 2018 with 0.1 mm on Tuesday 10 July 2018 and on Wednesday 11 July 2018 and highest temperature was 30.2 °C on Thursday 28 June 2018 in that period.

The last dry spell to end before 2020 was 17 days long at Roches Point, Co Cork from Wednesday 4 September 2019 to Friday 20 September 2019

The longest dry spell observed was 48 days long at Kilkenny, Co Kilkenny from Sunday 13 August 1972 to Friday 29 September 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.

Table 2: Absolute droughts

Station Name	County	Start Date	End Date	Length	Total Rainfall	Max Daily Rainfall	Max Daily Temp
Claremorris	Mayo	Mon 13 Apr	Tue 28 Apr	16 days	0.2 mm	0.1 mm (2 days)	20.5 °C (Fri 24 Apr)
Belmullet	Mayo	Mon 13 Apr	Tue 28 Apr	16 days	0.1 mm	0.1 mm (Wed 15 Apr)	19.1 °C (2 days)
Phoenix Park	Dublin	Wed 18 Mar	Wed 1 Apr	15 days	0.0 mm	0.0 mm (all days)	16.1 °C (Wed 25 Mar)
Dublin Airport	Dublin	Wed 18 Mar	Wed 1 Apr	15 days	0.0 mm	0.0 mm (all days)	14.9 °C (Wed 25 Mar)
Newport	Mayo	Sun 12 Apr	Sun 26 Apr	15 days	0.1 mm	0.1 mm (Wed 15 Apr)	21.6 °C (Fri 24 Apr)
Dunsany	Meath	Wed 18 Mar	Wed 1 Apr	15 days	0.0 mm	0.0 mm (all days)	15.8 °C (Wed 25 Mar)
Finner Camp	Donegal	Mon 13 Apr	Mon 27 Apr	15 days	0.0 mm	0.0 mm (all days)	19.0 °C (Fri 24 Apr)
Casement Aerodrome	Dublin	Wed 18 Mar	Wed 1 Apr	15 days	0.0 mm	0.0 mm (all days)	16.5 °C (Wed 25 Mar)

The longest absolute drought in the digital record at Belmullet, Co Mayo was 22 days between Monday 21 May 2018 and Monday 11 June 2018 with 0.0 mm on all days and highest temperature was 24.6 °C on Tuesday 29 May 2018 in that period.

The last absolute drought to end before 2020 was 16 days long at Sherkin Island, Co Cork from Monday 24 June 2019 to Tuesday 9 July 2019

The longest absolute drought observed was 33 days long at Casement Aerodrome, Co Dublin from Wednesday 3 September 1986 to Sunday 5 October 1986 . The [National Record](#) (and pre-digital) was 38 days at Limerick from 3 April to 10 May 1938.

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.

Table 3: Partial droughts

Station Name	County	Start Date	End Date	Length	Total Rainfall	Max Daily Rainfall	Max Daily Temp
Dublin Airport	Dublin	Wed 18 Mar	Tue 28 Apr	42 days	5.8 mm	2.3 mm (Sat 18 Apr)	19.4 °C (Sat 11 Apr)
Phoenix Park	Dublin	Wed 18 Mar	Fri 17 Apr	31 days	3.2 mm	1.1 mm (2 days)	20.5 °C (Sat 11 Apr)

The longest partial drought in the digital record at Dublin Airport, Co Dublin was 52 days between Monday 28 May 2018 and Wednesday 18 July 2018 with 3.6 mm on Sunday 15 July 2018 and highest temperature was 26.5 °C on Wednesday 27 June 2018 in that period.

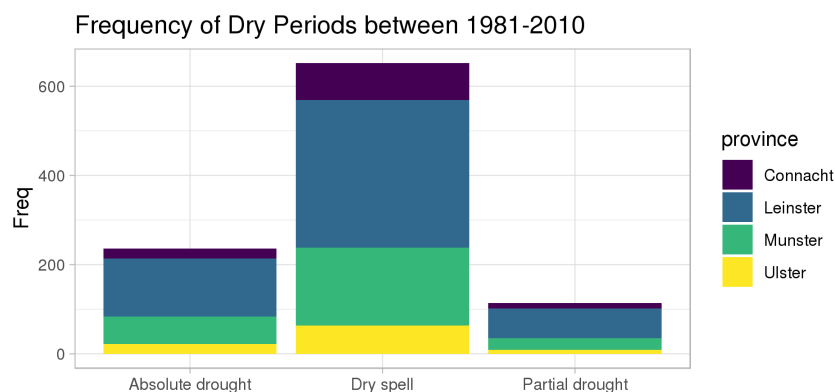
The last partial drought to end before 2020 was 36 days long at Roches Point, Co Cork from Wednesday 20 June 2018 to Wednesday 25 July 2018

The longest partial drought observed was 62 days long at Roches Point, Co Cork from Thursday 16 June 1983 to Tuesday 16 August 1983

Climatology of Dry Periods

The graph across 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.

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; 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
Valentia Observatory	NA	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:

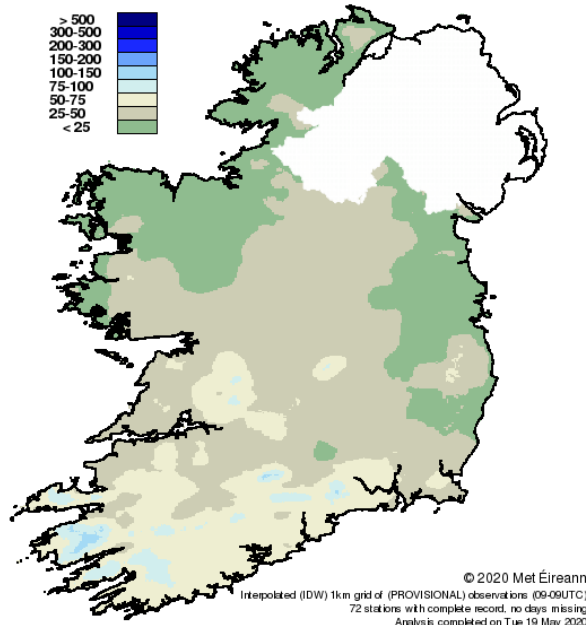
Dry Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Dry spell	10	10	12	13	11	8	12	9	6	10	6	4	111
Absolute drought	1	3	4	8	3	6	7	2	5	3	2	1	45
Partial drought	1	2	2	2	2	1	6	5	0	1	1	0	23

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:

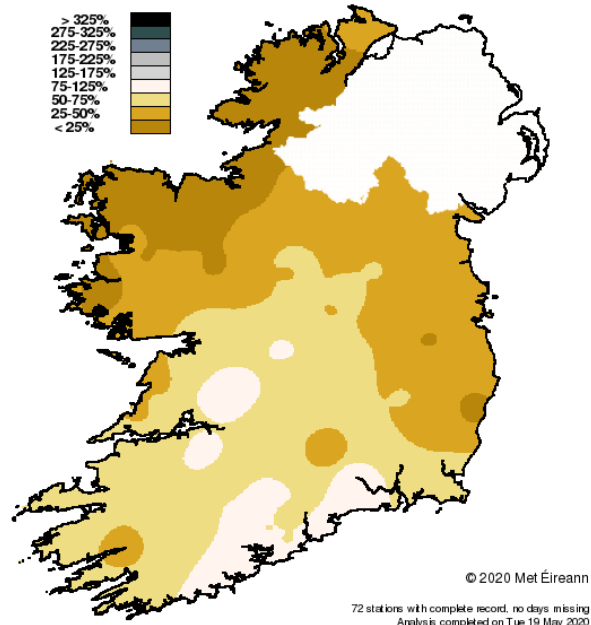
Dry Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Dry spell	1	5	5	17	10	8	7	4	5	5	3	1	71
Absolute drought	1	2	2	6	3	5	5	2	1	3	3	1	34
Partial drought	1	0	1	0	0	1	1	1	0	0	0	0	5

Monthly weather synopses and rainfall maps

Total Monthly Rainfall (mm) - April 2020 (PROVISIONAL)

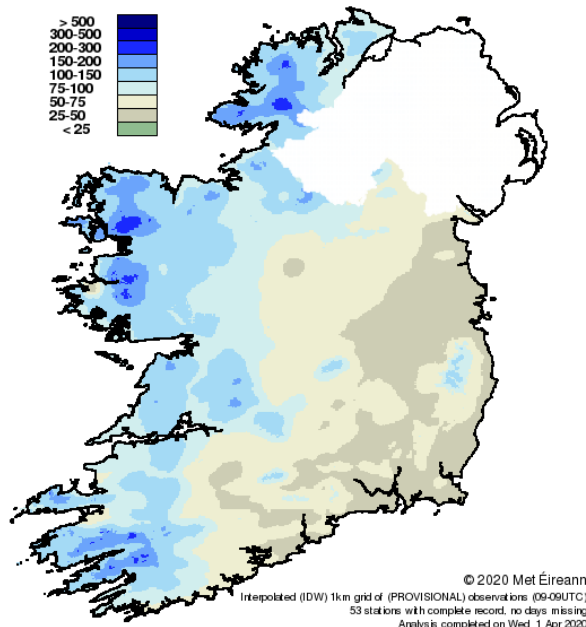


Rainfall % of 1981-2010 Monthly Average - April 2020 (PROVISIONAL)

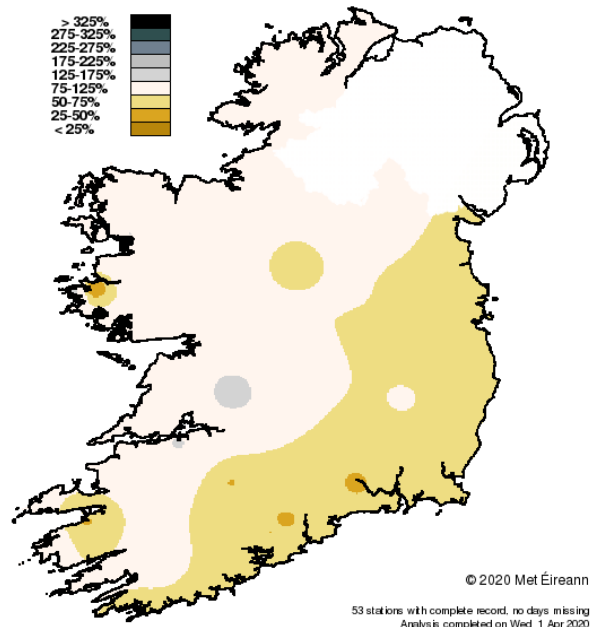


Very dry, mild and sunny The very dry weather, which started in the final third of March, with high pressure dominating, continued through most of April. This led to absolute drought, partial drought and dry spell conditions being reported at many stations between the 18th March and the 29th April, most especially in the Northwest and East. Atlantic weather fronts broke through from the south and southwest at times, such as on Sunday the 5th, between Friday the 10th and Easter Sunday the 12th and between Friday the 17th and Sunday the 19th, but pressure stayed relatively high and rainfall amounts relatively low, apart from a few heavy falls in the South and Southwest. It was cool and cloudy at times, especially at the start of the month, in a northerly airflow, when high pressure was located to the west of Ireland. There were also numerous warm sunny days, especially during the mid-week periods, when high pressure built directly over or to the northeast of Ireland. It was warmest in the western half of the country during these periods, as the winds were mostly from the east off a cool Irish sea. The weather finally broke on the 29th as a complex area of low pressure brought active weather fronts across the country from the south and southwest, followed by showers on the 30th.

Total Monthly Rainfall (mm) - March 2020 (PROVISIONAL)

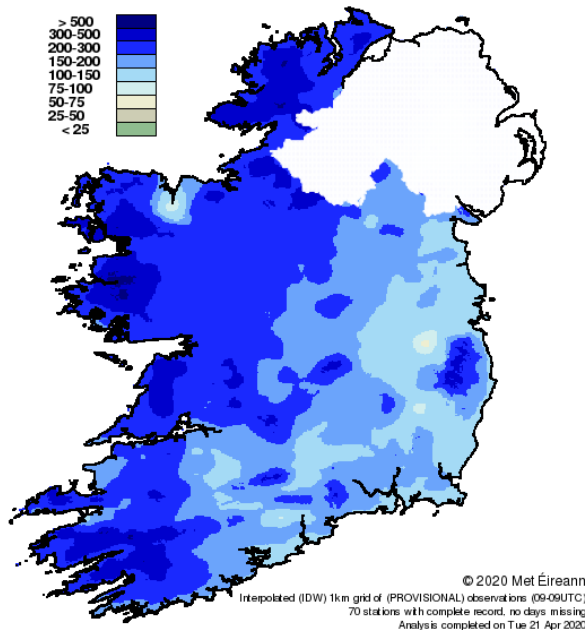


Rainfall % of 1981-2010 Monthly Average - March 2020 (PROVISIONAL)

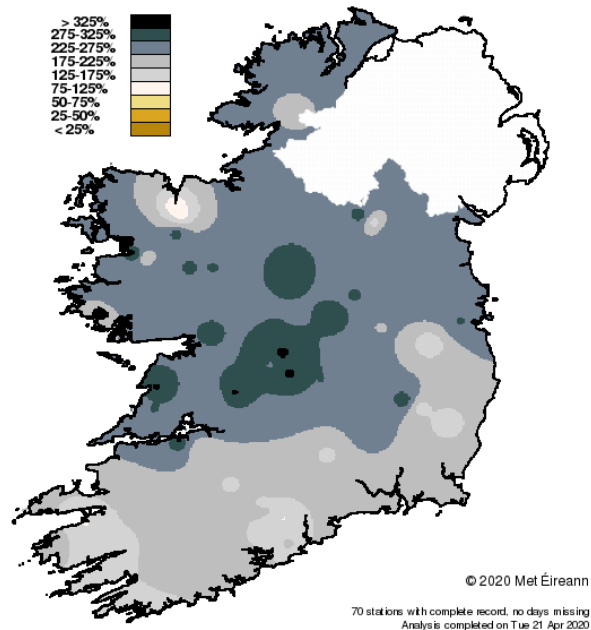


Cool and sunny, dry in the East Storm Jorge, brought both February's strongest wind gusts on the 29th and March's strongest wind gusts on the 1st, as the storm filled and pulled away to the north-east. This left Ireland in a cool and showery westerly airflow for most of the first week of March. A series 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.

Total Monthly Rainfall (mm) - February 2020 (PROVISIONAL)

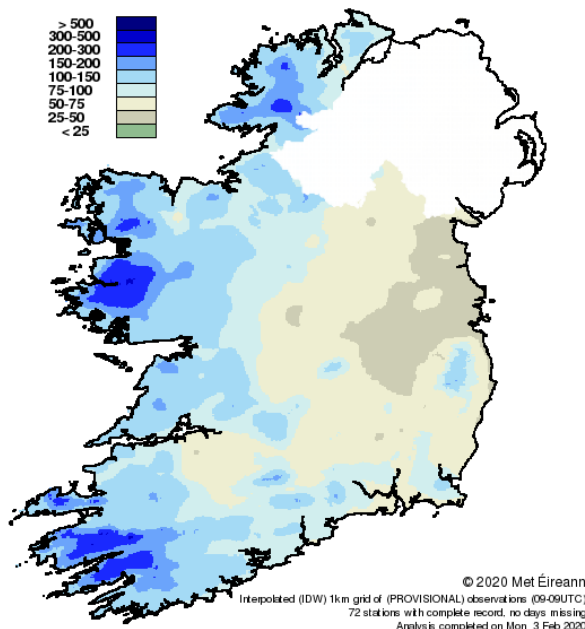


Rainfall % of 1981-2010 Monthly Average - February 2020 (PROVISIONAL)

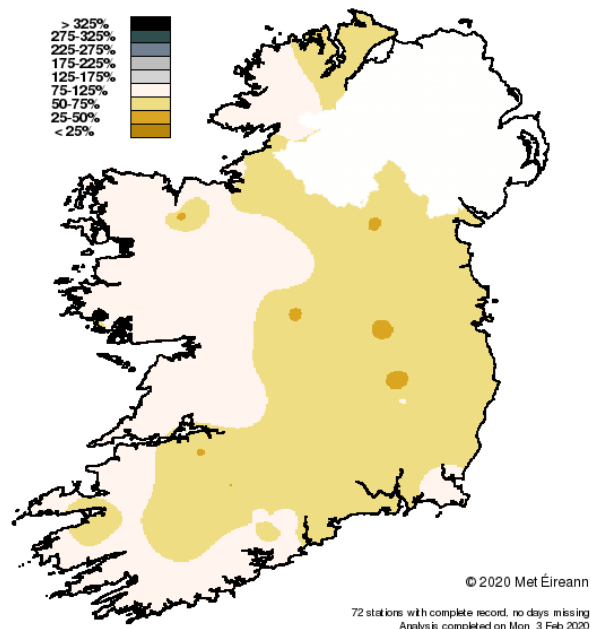


Very wet and windy. February 2020 was an exceptionally wet and windy month. A very strong polar jet stream, further south than normal, made conditions very conducive for extreme cyclogenesis and brought a series of vigorous Atlantic depressions, towards or just to the north of Ireland. These depressions, 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.

Total Monthly Rainfall (mm) - January 2020 (PROVISIONAL)



Rainfall % of 1981-2010 Monthly Average - January 2020 (PROVISIONAL)



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.

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)	Medium confidence 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]	Medium confidence that anthropogenic influence has contributed to some observed changes in drought patterns. Low confidence in attribution of changes in drought at the level of single regions due to inconsistent or insufficient evidence.	Medium confidence 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 low confidence elsewhere because of insufficient agreement of projections.

Extracts from IPCC Chapter 3 (2018)

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*