

2020 brings to a close a decade of measurements that confirm temperatures are rising. Annual rainfall was in line with normal levels, but with unusual seasonal distribution and some particularly heavy episodes, as occurred for example on 4 June, when the equivalent of three times the monthly precipitation fell.

### Temperature: 2020—a particularly hot year

**Table 1. Temperatures by decade**

	Average	Average of minimum values	Average of maximum values	Absolute minimum	Absolute maximum
1971-1980	15.73	12.79	18.68		
1981-1990	16.23	13.37	19.08		
1991-2000	16.42	13.51	19.34	-1.5	33.7
2001-2010	16.77	13.96	19.57	-1.5	35.5
2011-2020	17.09	14.57	19.66	-0.8	34.7
2020	17.9	15.4	20.4	6.6	33.3

Unit: degree Celsius

Source: Department of the Environment

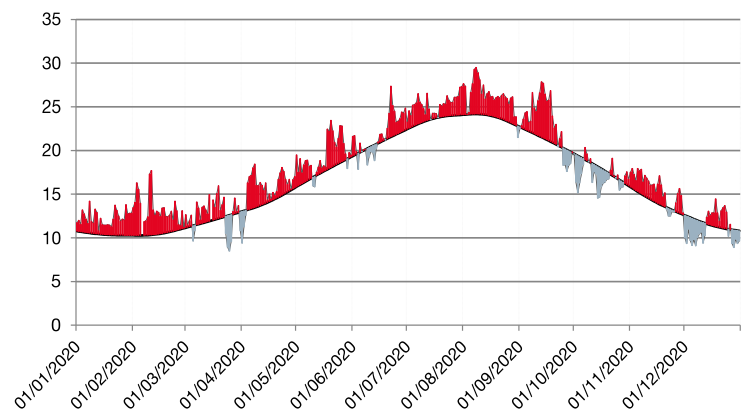
With an average temperature of 17.8°C, 2020 was one of the four hottest years recorded in the Principality since 1969 (along with 2019, 2018 and 2006), and up +1.33°C on the climate normal.

An analysis of daily data indicates that 2020 was a particularly hot year. Temperatures remained above normal for most of the year, except during October and December.

The summer saw a series of strong heatwaves. The absolute maximum for the year was 33.3 °C and was recorded at the Exotic Garden station at 10.16 a.m. on 9 August 2020.

Since the early 1970s, each decade has seen a higher average temperature than the one before it. The temperatures recorded between 2011 and 2020 have confirmed this trend, with a larger increase in minimum temperatures. As in 2019, no temperatures below zero were recorded in 2020 (the absolute minimum for the year was 6.6°C, recorded at the station in the Exotic Garden at 4.31 a.m. on 26 March).

**Figure 1. Divergence of average daily temperatures in 2020 from climate normal (1981–2010)**



Unit: degree Celsius

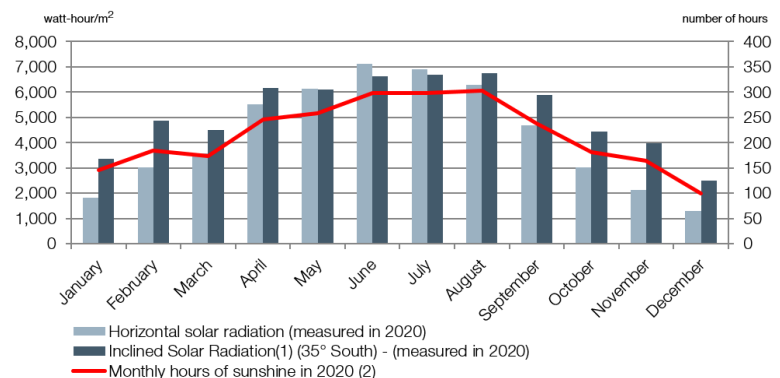
Source: Department of the Environment

### Sunshine: average of seven hours per day.

Solar energy and sunshine contribute to the mild winters experienced on the French Riviera and in Monaco.

At an average of more than seven hours per day, levels of sunshine in 2020 were approximately the same (-1%) as in 2019 (a total of 2,590 hours compared with 2,616 hours in 2019, or a total of 26 hours less sunshine). However, this decline masks some significant disparities by month. The sun shone for 87 fewer hours in March, but for 52 and 37 more hours in April and May respectively.

**Figure 2. Average daily sunshine (in Wh/m²) and number of hours of sunshine per month in 2020**



Source: Department of the Environment

### Definitions

- Since 2012, the publication “Focus: Weather” has offered an analysis of the climate conditions reported by the Exotic Garden weather station, drawing on temperature and rainfall data. The data presented in the publication is representative of local weather conditions in an urban environment. Since 2017, data on sunshine and wind measured by the Department of the Environment from the roof of Monaco’s Oceanographic Museum has also been included in the Focus, along with some point data recorded at the station located on the pierhead of the sea wall.
- Climate normals consist of the mean precipitation and temperature values, calculated over a continuous period of 30 years, at the end of each decade.
- A 35° south-facing incline corresponds to the annual optimum for the production of photovoltaic energy.

## Rainfall: 2020 – a relatively dry year

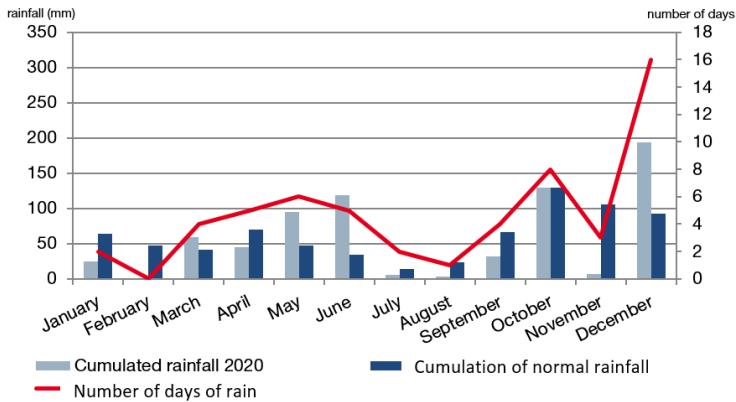
**Table 2. Rainfall by decade**

	Annual average rainfall	Observed annual maximum	Date	Number of days of rain ( $\geq 1$ mm)	Absolute max in one day	Date
1971-1980	848	1.217	in 1979			
1981-1990	706	1.114	in 1984			
1991-2000	805	1.116	in 2000	64	115,2	on 10/25/1999
2001-2010	695	1.134	in 2008	63	110,0	on 11/05/2008
2011-2020	883	1.485	in 2014	63	148,4	on 10/04/2015
2020	715			56	85,7	on 06/07/2020

Unit: millimeter

Source: Department of the Environment

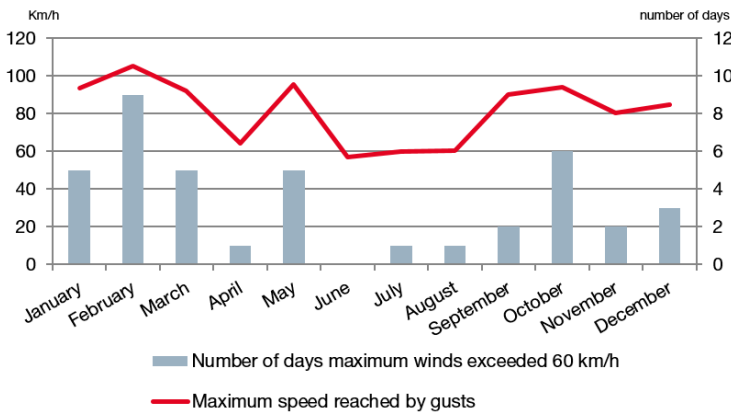
**Figure 3. Number of days of rain and rainfall**



Source: Department of the Environment

## Wind: gust reaching more than 105 km/h

**Figure 4. Number of windy days and maximum gust speed**



Source: Department of the Environment

## 2 October – Storm Alex

Storm Alex developed over the Atlantic and first made landfall in Brittany on 1 October 2020 with winds of 186 km/h recorded on Belle-Île-en-Mer. As it moved east, the storm went on to cause an exceptional Mediterranean weather event. The Alpes-Maritimes region was placed on red alert on 2 October 2020.

Monaco experienced two waves of rainfall. The first, on the morning of 2 October, recorded total precipitation of 30 mm. During the evening and early part of the night, a further 60 mm fell in the space of a few hours. Over the course of the event, around 100 mm of rain (100 litres per square metre) were recorded in Monaco.

However, it was onto areas further inland that the storms deposited extreme amounts of rain (> 400 mm, or more than 400 litres per square metre). The Estéron, Tinée and especially the Vésubie and Roya river valleys were particularly hard hit.

Featuring five years in which there has been heavy rainfall, including the record-breaking year of 2014, average rainfall for the decade 2011–2020 remains high, despite four years (2015, 2016, 2017 and 2020) in which there was less rain than normal. The rainfall normal in Monaco is 735.4 mm and 63 days of rain per year.

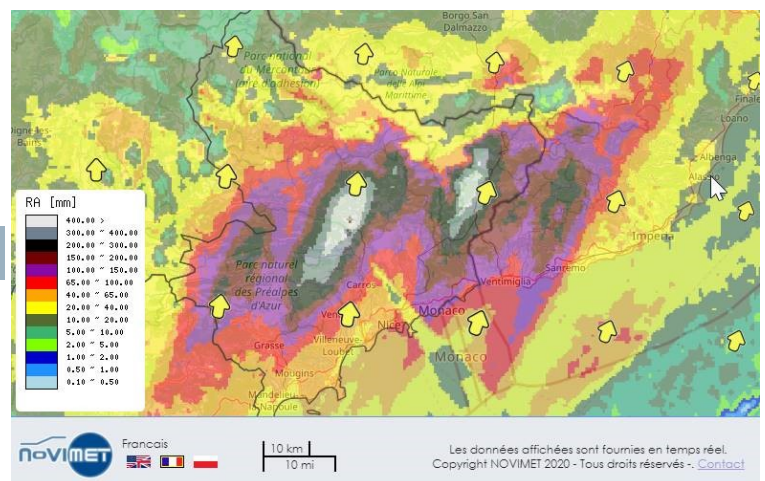
With total rainfall of 715 mm, 2020 saw slightly less rain (20 mm below the normal). The number of days of rainfall (> 1 mm) was also lower than has been seen in the last 30 years, by an average of seven days.

Spring and December experienced higher rainfall than expected, with some very heavy daily precipitation during two events. On 4 June, 85.7 mm of rain fell, compared with a monthly normal of 35 mm, and on 2 October, 81.3 mm fell, compared with a monthly normal of 134 mm. It rained on 16 days during December (compared with a normal of 7), with total precipitation of 193.2 mm, higher than the average of 101.5 mm.

Conversely, February, July and August saw almost no rain and, more unusually, there was very little rain after 2 October until the end of November.

In 2020, wind gusts exceeded 60 km/h on 40 days, compared with 50 in 2019.

The strongest gust recorded during 2020 was measured at 105.1 km/h on 11 February at the weather station on the pierhead of the semi-floating sea wall in Port Hercule. During the same month, wind speeds were above 60 km/h on nearly one day in every three.



RA (rain accumulation) : rainfall in millimeter per square meter