



## Information on the climate in Luxembourg in 2012

Station: Luxembourg/Findel-Airport (WMO 06590, 376 m, a.s.l.)

Reference period: WMO normal period 1961 to 1990

### 1. Air temperature

#### Anomalies with respect to 2012

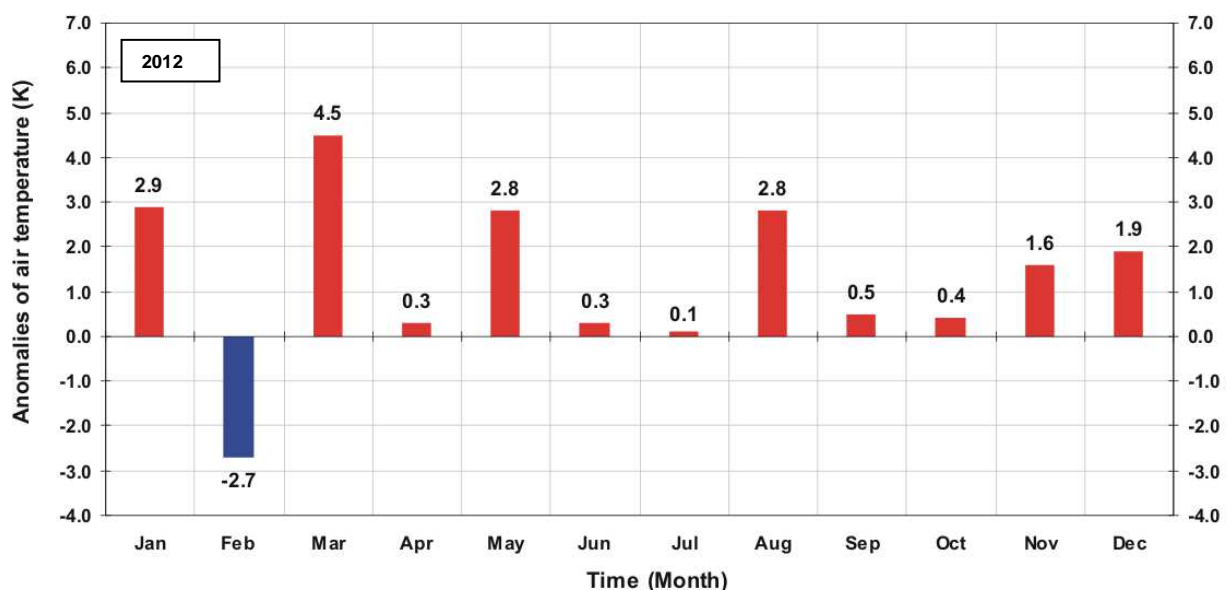
The annual mean air temperature for 2012 at Luxembourg Findel-Airport was 9.6°C. The anomaly of the annual mean air temperature relative to the average of the reference period from 1961 to 1990 resulted in plus 1.3 K. The number of 27 summer days (maximum air temperature  $\geq 25^{\circ}\text{C}$ ) and 4 hot days (maximum air temperature  $\geq 30^{\circ}\text{C}$ ) were slightly lower than the long-term normal. Despite the cold period in the first half of February the 50 days with frost (minimum air temperature  $< 0^{\circ}\text{C}$ ) and 60 days of ground frost (grass temperature  $< 0^{\circ}\text{C}$ ) were considerably below the normal.

#### Anomalies with respect to seasons

The winter 2011/2012 showed mean air temperatures of 1.8°C. The air temperature was 1.1 K above the normal, significantly milder than the previous winter periods, but colder than the winter 2006/2007 and 2007/2008. Due to a significant number of persisting high-pressure systems and periods of extensive sunshine duration seasonal mean air temperatures at the Findel-Airport station were unusually high in spring. Spring mean air temperatures were 2.5 K above the normal, the fourth-warmest spring on record (10.3°C), only exceeded by 2007, 2009, and 2011. Summer mean air temperatures in 2012 were at 17.1°C, deviating by plus 1.0 K from the normal. The seasonal average in autumn was 9.6°C, thus 0.8 K higher than the long-term average (1961-1990).

#### Anomalies with respect to single months

In 2012 all months except for February were above the 1961-1990 normal (Figure 1). Due to mainly westerly winds and a succession of low-pressure systems stormy and mild weather was predominant in January causing monthly mean air temperatures to rise 2.9 K above the long-term average.



**Fig. 1:** Anomalies of monthly mean air temperatures (K) relative to the WMO normal period of 1961 to 1990 at Luxembourg/Findel (WMO 06590, 376 m, a.s.l.) in 2012.



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A pronounced high-pressure system over Central Europe resulted in a period with cold easterly winds. Monthly mean air temperatures dropped to  $-1.6^{\circ}\text{C}$  ( $-2.7$  K below the normal). Extremely sunny and warm weather from mid-March onwards caused mean air temperatures to rise up to  $8.5^{\circ}\text{C}$ , resulting in the warmest March ever recorded at the Findel-Airport in Luxembourg since 1947. Unsettled weather conditions with rapid temperature fluctuations dominated in May. Mean air temperatures rose to  $14.6^{\circ}\text{C}$ , resulting in a positive anomaly of  $2.8$  K above the normal. The weather in June and July was dominated by low-pressure with associated frontal systems. Mean air temperature for June and July were  $15.2^{\circ}\text{C}$  and  $17^{\circ}\text{C}$  respectively, slightly above the long-term average. June was the coolest June since 2001. In contrast, August was characterized by warm and thundery weather with mean air temperatures to rise up to  $19.2^{\circ}\text{C}$ . This was the seventh-warmest August in the ranking since 1947 at Findel-Airport. The absolute maximum air temperature has been recorded on 19 August ( $35.2^{\circ}\text{C}$ ). The air temperatures in September ( $13.9^{\circ}\text{C}$ ) and October ( $9.5^{\circ}\text{C}$ ) were slightly above the normal, deviating by plus  $0.5$  K and plus  $0.4$  K. Mean air temperatures in November were  $5.4^{\circ}\text{C}$  ( $1.6$  K above the 1961-1990 normal). The first half of December was characterized by a cold weather regime, followed by mild and very unsettled weather conditions with strong thaw. Thus, mean air temperatures rose to  $2.9^{\circ}\text{C}$ , resulting in a positive anomaly of  $1.9$  K in December.

**Table 1:** Monthly and annual mean air temperatures ( $^{\circ}\text{C}$ ) as well as anomalies (K) relative to the WMO normal period of 1961 to 1990 at Luxembourg/Findel (WMO 06590, 376 m, a.s.l.) in 2012.

| 2012  | Jan | Feb  | Mar | Apr | May  | Jun  | Jul  | Aug  | Sep  | Oct | Nov | Dec | Year |
|---|-----|------|-----|-----|------|------|------|------|------|-----|-----|-----|------|
| <b>Air temperatures (<math>^{\circ}\text{C}</math>)</b> | 2.9 | -1.6 | 8.5 | 7.8 | 14.6 | 15.2 | 17.0 | 19.2 | 13.9 | 9.5 | 5.4 | 2.9 | 9.6  |
| <b>Normals (1961-1990)</b>                              | 0.0 | 1.1  | 4.0 | 7.5 | 11.8 | 14.9 | 16.9 | 16.4 | 13.4 | 9.1 | 3.8 | 1.0 | 8.3  |
| <b>Anomalies (K)</b>                                    | 2.9 | -2.7 | 4.5 | 0.3 | 2.8  | 0.3  | 0.1  | 2.8  | 0.5  | 0.4 | 1.6 | 1.9 | 1.3  |

### Extremes and peculiarities

February 2012 was characterized by large fluctuations between daily minimum ( $-15^{\circ}\text{C}$ ) and maximum ( $13.7^{\circ}\text{C}$ ) air temperatures. The thermal amplitude of  $28.7^{\circ}\text{C}$  was the highest value ever recorded in the station history. Since the start of records in 1947 the highest monthly mean temperatures have been recorded in March 2012 ( $8.5^{\circ}\text{C}$ ). Together with March 2003 this month is sharing the ranking of the highest mean maximum air temperature ( $13^{\circ}\text{C}$ ). No other temperature records occurred in 2012.

Luxembourg experienced a cold wave in the first half of February with minimum air temperatures at a height of 2 m of below  $-10^{\circ}\text{C}$ . The absolute minimum air temperature occurred on 7 February ( $-15^{\circ}\text{C}$ ). Since the 1990s the cold wave events can be referred to as unusual. Before the 1990s the station history shows that cold waves were more frequent in January and February. Between 1947 and 2010 in total 30 days had a minimum air temperature of less than or equal to  $-15^{\circ}\text{C}$ . The absolute extreme minimum temperature at Luxembourg Findel-Airport occurred in February 1956 ( $-20.2^{\circ}\text{C}$ ).



## 2. Precipitation amount

In this study, observational days for precipitation are based on daily sums between 06 UTC and 06 UTC of the following day.

### Anomalies with respect to 2012

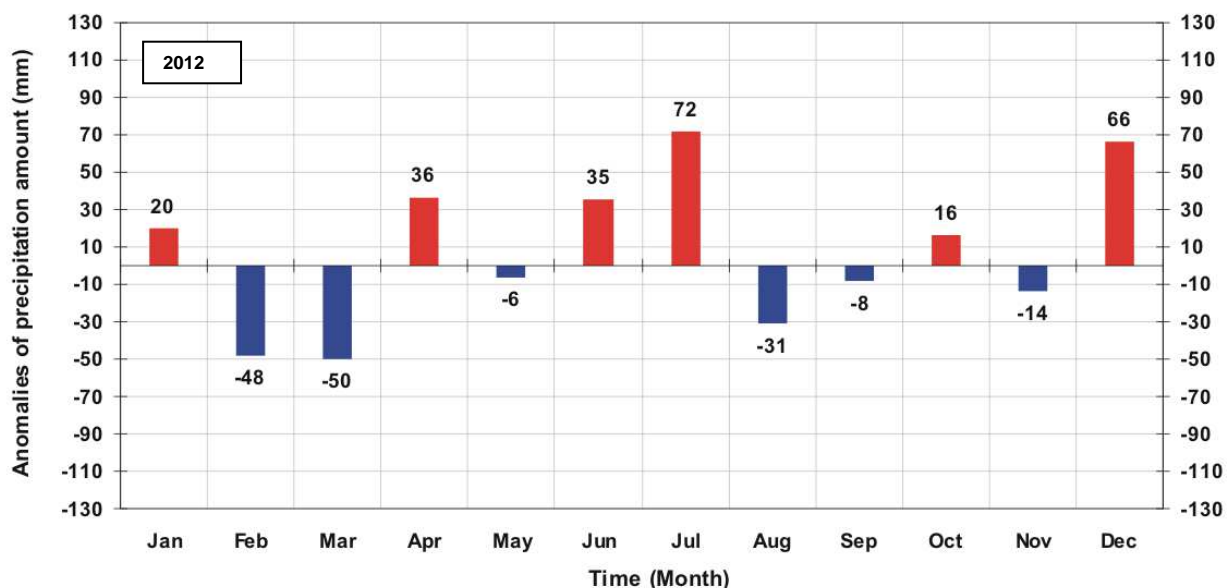
The annual precipitation amount reached 963 mm in 2012. Annual rainfall was 10% higher than the long-term average of 875 mm (1961 to 1990).

### Anomalies with respect to seasons

Seasonal precipitation amount in winter 2011/2012 amounted to a total of 295 mm at Luxembourg Findel-Airport, deviating 84 mm from the long-term average of 211 mm (1961 to 1990). Winter 2011/2012 was the eight-wettest winter recorded since 1947. In spring the precipitation amount reached 192 mm. The seasonal precipitation total was about 10% lower than the 1961 to 1990 climatological normal (212 mm). Due to the unsettled weather conditions in summer 2012 seasonal precipitation amounted to 298 mm, about 134% of the long-term average total of 222 mm. Luxembourg Findel-Airport recorded 222 mm in autumn, slightly below the normal of the 30-year period (228 mm).

### Anomalies with respect to single months

In contrast to 2011, individual months at Luxembourg Findel-Airport were highly variable regarding the precipitation amounts (Figure 2). Strong westerly winds in January caused precipitation amounts (91 mm) to exceed the normal (1961-1990) amount by 20 mm. The pronounced high-pressure situation at the end of winter and beginning of spring resulted in a very dry February (14 mm) and March (20 mm). For February, only 1959, 1965, 1986, 1993, and 1998 received less precipitation. Precipitation amounts in April were 97 mm, resulting in a positive anomaly of 36 mm above the normal.



**Fig. 2:** Anomalies of monthly precipitation amount (mm) relative to the WMO normal period of 1961 to 1990 at Luxembourg/Findel (WMO 06590, 376 m, a.s.l.) in 2012. Observational days for precipitation are based on daily sums between 06 UTC and 06 UTC of the following day.



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The beginning of summer was dominated by low-pressure systems with associated weather fronts, causing frequent and widespread precipitation events. Precipitation in June exceeded the long-term average by more than 40%, in July with a total amount of 140 mm by more than 100%. Along with 2005 year 2012 was the third-wettest July in the station history since 1947, only exceeded by July 1987 and 2000. The highest daily precipitation amount in 2012 was recorded on July 13 (29.6 mm). Monthly precipitation amount in August 2012 was the lowest record (41 mm) since 1998, almost half the amount of the normal. September, October, and November showed only slight variations in comparison with the 30-year normal. Autumn was followed by a wet December with precipitation amounts of 146 mm, exceeding the long-term average by 80 mm (1961-1990).

**Table 2:** Monthly and annual precipitation amount (mm) as well as anomalies (mm) relative to the WMO normal period of 1961 to 1990 at Luxembourg/Findel (WMO 06590, 376 m, a.s.l.) in 2012. Observational days for precipitation are based on daily sums between 06 UTC and 06 UTC of the following day.

| 2012                      | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Year |
|---------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| Precipitation amount (mm) | 91  | 14  | 20  | 97  | 75  | 117 | 140 | 41  | 62  | 61  | 69  | 146 | 963  |
| Normals (1961-1990)       | 71  | 62  | 70  | 61  | 81  | 82  | 68  | 72  | 70  | 75  | 83  | 80  | 875  |
| Anomalies (mm)            | 20  | -48 | -50 | 36  | -6  | 35  | 72  | -31 | -8  | -14 | -14 | 66  | 88   |

### Extremes and peculiarities

No extremes in precipitation amount and intensity in 2012 were recorded at Luxembourg Findel-Airport. December 2012 showed 25 days with precipitation, exceeding the normal by 8 days. In July and December 6 days with precipitation amounts of more than 10 mm were recorded, thus three times more than the long-term average (1961-1990).