

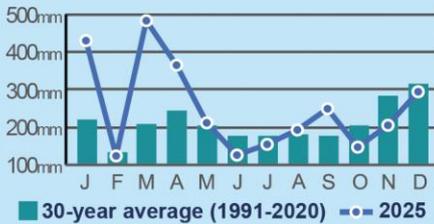
Annual Climate
Assessment
Singapore

2025



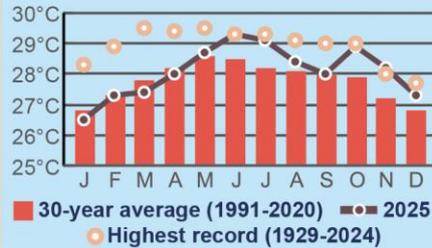
Singapore's Climate in 2025

Monthly Total Rainfall



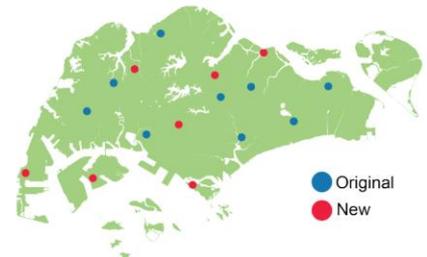
2025 was Singapore's 7th wettest year since 1980, with exceptional rainfall in January and March due to Northeast Monsoon surges.

Monthly Mean Temperature



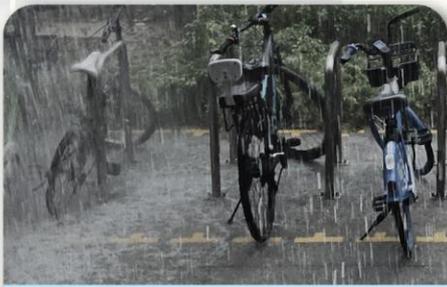
2025 was Singapore's 8th warmest year since 1929 despite a cooler start due to La Niña. 2025 had the warmest June and November on record.

Heat Stress Monitoring Network



Network of wet-bulb globe temperature sensors was expanded to provide better coverage for heat stress monitoring across Singapore.

NOTABLE WEATHER EVENTS IN 2025



Wet Start to the Year
Northeast Monsoon surges in January and March brought exceptional rainfall and broke rainfall records.

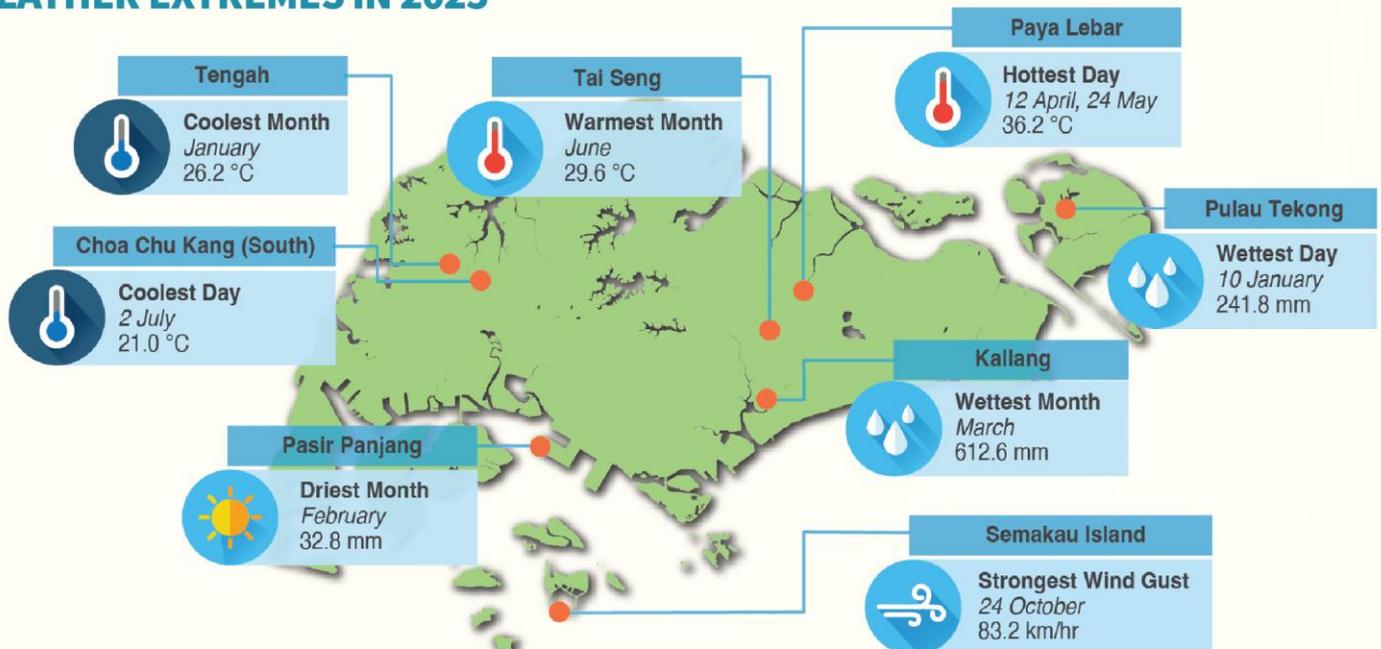


Heavy April Thunderstorms
During the intermonsoon period, heavy thunderstorms in the afternoon of 13 April led to flash floods.



Warmest November
Light winds and below-average rainfall led to extreme temperatures, with new November maximum temperature of 36.0°C at Newton.

WEATHER EXTREMES IN 2025



Overview of Singapore’s Climate in 2025

2025 began with cool and wet weather in Singapore, influenced by La Niña and Northeast Monsoon surges. Annual total rainfall reached 2,984.9 mm, 18% above the long-term average, with exceptionally wet conditions in January (6th wettest January since 1980) and March (wettest March since 1980). Despite a relatively dry period from May to August, 2025 was the 7th wettest year since 1980.

Although the year started and ended with La Niña conditions, which typically bring cooler weather, Singapore experienced its warmest June and November since 1929. Singapore’s annual mean temperature was 28.1°C, making 2025 the joint 8th warmest year on record (tied with 2010 and 2002), reflecting a long-term warming trend due to climate change.

This report reviews Singapore’s weather and climate in 2025, and updates Singapore’s long-term rainfall and temperature trends. It also features the newly expanded coverage of Singapore’s heat stress monitoring network.

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Large-scale Climate Variability in 2025

Global climate drivers, such as the El Niño – Southern Oscillation (ENSO) and the Indian Ocean Dipole (IOD), are sources of year-to-year variability for Singapore’s climate.

In 2025, both ENSO and IOD influenced Singapore’s climate. The year started and ended with La Niña events, which contributed to wetter and more moderate temperatures for Singapore in 2025. A negative IOD event in the second half of the year also contributed to wetter conditions for Singapore.

Further information on sea surface temperature (SST), ENSO, IOD and the Madden-Julian Oscillation (MJO), and how these drivers modulated Singapore’s climate in 2025, is described below.

Sea Surface Temperature

SST refers to the temperature of the upper few meters of the ocean. SST is used in monitoring climate drivers such as ENSO and IOD (see following sections), as well as to track stress to marine life such as corals, and to serve as a key climate change indicator.

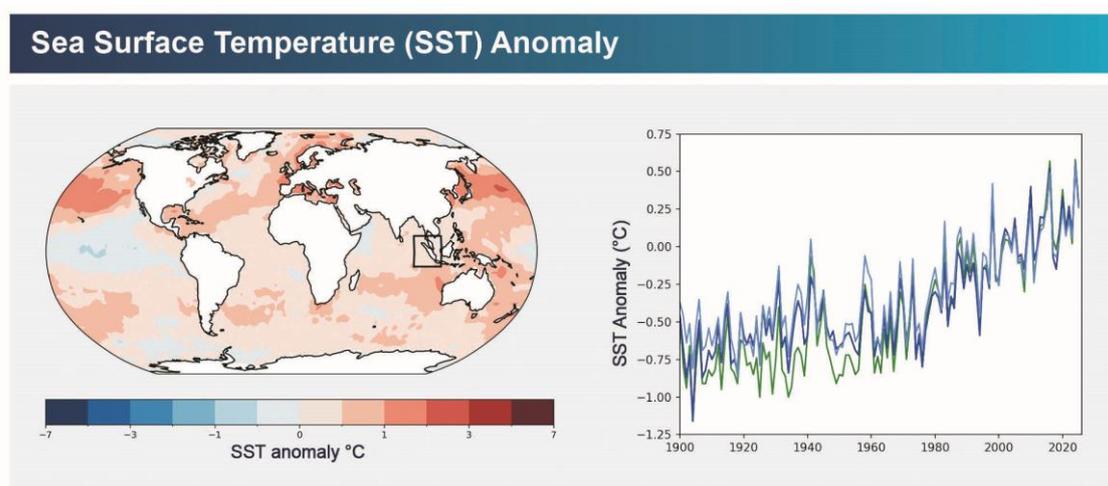


Figure 1: Sea surface temperature (SST) anomaly (°C) for 2025 (ERSSTv6 dataset), relative to the 1991 – 2020 long-term average (left). Black box indicates the region used for the trend. SST anomaly for region around Singapore (right) using three long-term SST datasets: ERSSTv6 (green), COBE2 (blue), and HadISST (light blue).

Global SST continues to rise, with 2025 ranking as the third warmest year on record, in line with the long-term warming trend and presence of La Niña conditions¹. In 2025, most SSTs around the globe were warmer than the 1991 – 2020 averages (red colours in Figure 1, left), although cooler than average temperatures occurred in the central and eastern tropical Pacific Ocean, associated with La Niña conditions, and to a lesser extent in the western tropical Indian Ocean, associated with the negative IOD. For the region around Singapore (black box in Figure 1, left), SST dropped slightly after record or near-record temperatures in 2024 (Figure 1, right). In 2025, the average anomaly was 0.26°C – 0.31°C below the 2024 value, but still 0.26°C – 0.29°C above the 1991 – 2020 baseline. These temperatures mark the warmest annual SST recorded for any year not preceded by an El Niño or positive IOD

¹ WMO Press Release 14 January 2026 <https://wmo.int/news/media-centre/wmo-confirms-2025-was-one-of-warmest-years-record>

event. While La Niña events are often associated with dips in SST around Singapore, e.g. 2017, 2021, and 2025, this temporary cooling in recent years is dwarfed by the long-term warming trend.

The El Niño – Southern Oscillation (ENSO) Overview

La Niña conditions were present during most of 2025. La Niña events refer to SSTs being cooler than average in the central and eastern tropical Pacific Ocean for more than a season (at least 5 months) and typically result in increased rainfall over the western Pacific. The La Niña event that developed in 2024 continued into 2025, gradually weakening before returning to ENSO-neutral conditions from April 2025² (Figure B1, where sustained values below -0.6°C indicate La Niña conditions). A second La Niña event developed in the second half of the year, with La Niña conditions present again from September 2025 onwards.

Based on MSS’ updated definition (see Box 1), a La Niña event was present at the start of 2025. As La Niña events affect both the ocean and atmosphere, reviewing atmospheric conditions, alongside SST, is critical. From January – March 2025 (the decay phase of the La Niña event), there was more cloud over Southeast Asia and warmer SSTs over the western Pacific Ocean which are typical of La Niña events (Figure 2). The trade winds were also stronger over the western Pacific. However, around Singapore, the winds were more northeasterly in 2025 compared to January – March in previous La Niña events. This difference is likely associated with other climate drivers and sources of year-to-year variability including the three monsoon surges Singapore experienced. The patterns in Figure 2 are further evidence of the occurrence of a La Niña event in 2024/2025.

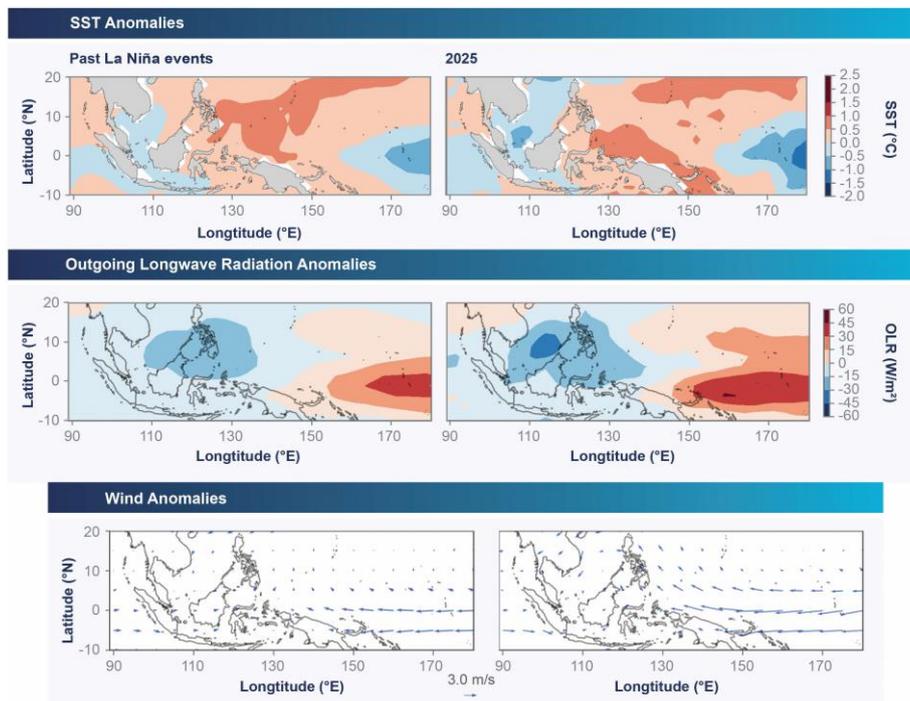


Figure 2: Comparison of conditions in January – March during past 10 La Niña events (left) with those in 2025 (right) for SST anomalies (top), Outgoing Longwave Radiation (OLR) anomalies where blue colours indicate more cloud than usual, and red indicates less cloud than usual (middle), and wind anomalies at 850 hPa, where easterly anomalies in the western Pacific indicate increase trade wind strength (bottom). January – March 2025 is similar to past La Niña events for all three variables.

² The Nino3.4 index and classification of events can differ between international climate centres, due to the data used, or how the index is calculated. There are small changes to the 2024 values, due to the switch to RONI.

Box 1: Switching to the Relative Oceanic Nino Index (RONI)

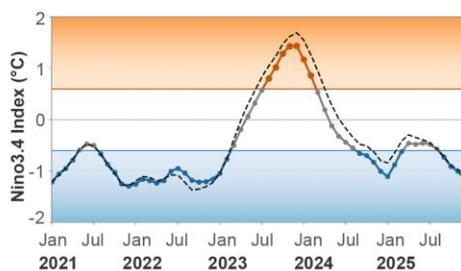


Figure B1: Comparison between RONI (dotted line) and MSS Nino3.4 index (black dashed line) from January 2021 to December 2025. The indices measure the average SST anomaly in the central-eastern equatorial Pacific Ocean (termed the 'Nino3.4 region'), using different ways to account for the background warming trend. The two timeseries are within 0.1°C of each other for over half the time.

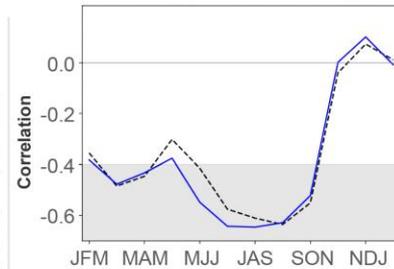


Figure B2: Correlation between Singapore's rainfall over three months and respective Nino3.4 index: MSS' previous definition (black dashed) and RONI (blue). Values that are more strongly correlated are shaded in grey.

The Nino3.4 index is one of the cornerstones of ENSO monitoring and prediction. This index is often termed the 'Oceanic Nino Index' (ONI) when a three-month running mean is used. The ONI corresponds closely with the atmospheric response to ENSO, which is important as ENSO is a coupled ocean-atmospheric phenomenon. However, there has been divergence between the atmospheric response and the ONI in recent years, due to the gradual warming of the world's oceans.

Why switch to RONI?

The Relative ONI or RONI accounts for the long-term warming trend or other changes. RONI captures how warm or cool the Nino3.4 region is compared to the rest of the tropics by subtracting the average SST anomaly for the entire tropics from the ONI. Starting in 2024, international climate centres have begun to shift to use the RONI.

Why does it change?

Overall, the difference between RONI and MSS' previous definition^[a] is small (Figure B2). However, switching to RONI can change the classification of borderline El Niño or La Niña events, such as the 2024/2025 La Niña. It can also result in small changes in the magnitude or timing of the events, for example the 2023/2024 El Niño is slightly lower based on RONI (1.5°C compared to 1.7°C) and the return to neutral was one month earlier (March 2024 compared to April 2024), similar to the differences caused by using different SST observations.

What does it mean for Singapore?

ENSO is an important driver of Singapore's year-to-year rainfall variability. One way to assess the impact is to consider the correlation between seasonal rainfall and RONI. Figure B2 shows similar results when using the RONI (blue line) and MSS index (black dashed line). The main impact, shaded in grey, occurs during the Southwest monsoon season (June – September) and into the second inter-monsoon period (October), following by the first inter-monsoon period (February/March – May).

By switching to RONI, MSS is aligning with the international community, and making use of the latest advances in climate science, an example of adapting how we monitor our climate in a warming world.



^[a] Turkington et al. 2018: [The impact of global warming on sea surface temperature based El Niño–Southern Oscillation monitoring indices.](#)

The 2024/2025 La Niña event likely contributed to Singapore’s wetter conditions at the start of the year. For Singapore, during February to May, ENSO has a small influence on Singapore’s rainfall. La Niña events tend to bring wetter conditions compared to El Niño events, although there is significant year-to-year variability.

After the 2024/2025 La Niña event, ENSO was in the neutral phase for most of the Southwest Monsoon season. Typically, ENSO has its strongest influence on Singapore’s rainfall between June and October. However, the second La Niña event only developed around September 2025. While we experienced above average rainfall in September, October was notably dry. It is not unusual though for a particular month to be drier (or wetter) than average due to other climate drivers, such as MJO, or day-to-day variability.

The two La Niña events moderated Singapore’s annual mean temperature in 2025. The largest impact is usually seen during the decay phase of the La Niña, with relatively cooler temperatures compared to normal, and this cooling was seen in 2025 with Singapore’s temperatures near or below average for the first part of the year.

The Indian Ocean Dipole (IOD) Overview

The IOD refers to a broad pattern of temperature differences in the western and eastern Indian Ocean. Sustained warmer anomalies in the western tropical Indian Ocean and cooler anomalies in the eastern tropical Indian Ocean indicate a positive IOD event, while cooler anomalies in the west and warmer anomalies in the east indicate a negative IOD event. This difference in SST is measured by the IOD Index, also known as the Dipole Mode Index (DMI).

In 2025, the year started with IOD index values within the neutral range. However, in the second half of the year, there was a quick transition to a negative IOD event from August to November. By December, the IOD index returned to the neutral range (Figure 3).

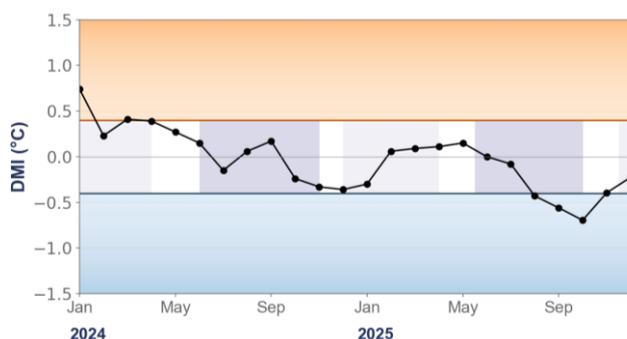


Figure 3: The IOD Index (DMI) shows values within the neutral range (white/grey) for the first half of 2025, with a negative IOD event during August – November 2025, based on the average of three long-term SST datasets. The approximate timings of the Northeast and Southwest Monsoon seasons are shaded in light grey and grey, respectively.

The 2025 negative IOD was strongest from August to October, with above average rainfall observed for the region around Singapore (Figure 4, top). For August to October, positive IOD events typically bring below average rainfall to Singapore and the surrounding regions, while negative IOD events tend to bring above average rainfall for similar regions (Figure 4, bottom). The region of above average rainfall in August to October 2025 is similar to the typical response of a negative IOD, with Singapore’s total rainfall for the same period slightly higher than the long-term average rainfall for the same months, possibly with influence from the negative IOD.

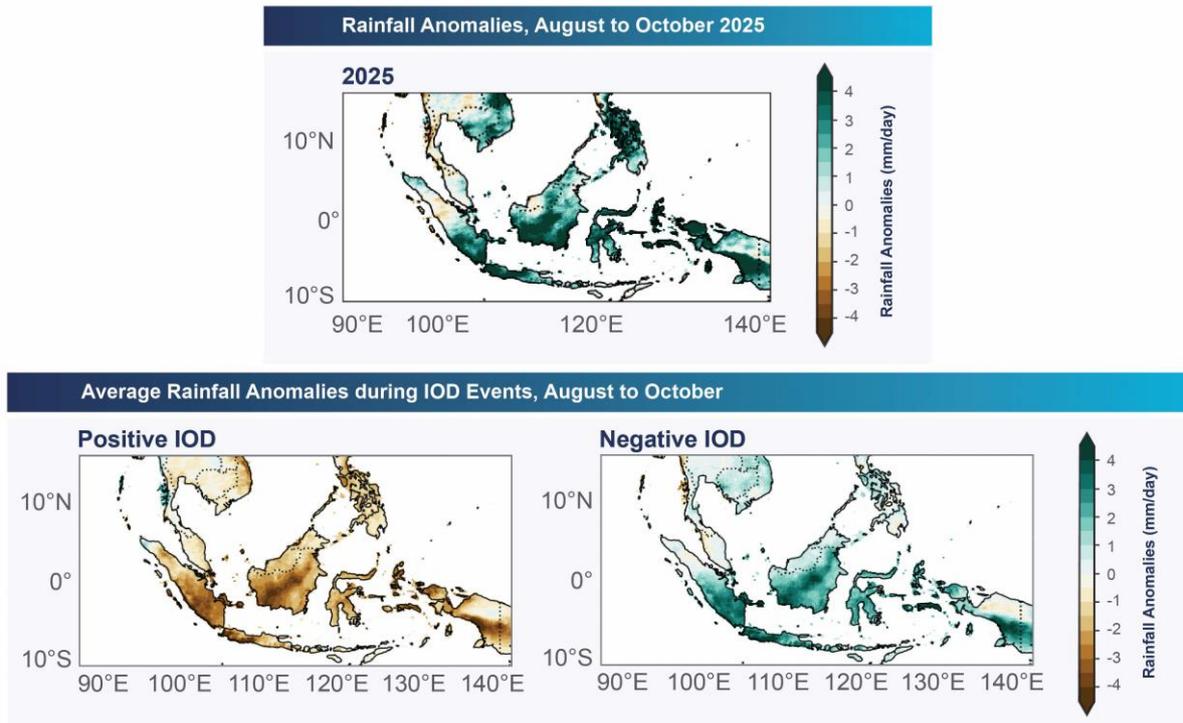


Figure 4: Average rainfall (CHIRPS) anomalies during August – October for 2025 (top), positive IOD events (bottom left) and negative IOD events (bottom right) during 1981 – 2025, relative to climatology (1991-2020).

The Madden-Julian Oscillation (MJO) Overview

At the subseasonal timescale (one to four weeks), the MJO is an important driver of climate variability in Singapore and the surrounding regions. The MJO is characterised by a pulse of cloud or rain that moves eastward along the equator, with a typical cycle lasting between 30 to 60 days. The MJO’s path along the equatorial region is divided into eight sub-geographical locations, known as phases, with each phase corresponding to the location where the MJO brings enhanced convective activity and the associated rainfall. Typically, when the MJO is active over the Indian Ocean and the western Maritime Continent (Phases 2 – 4), it brings wetter conditions to Singapore. While the MJO contributed to wetter conditions in January 2024³, wetter conditions are not guaranteed. This section reviews the behaviour of MJO in January 2025 and to examine its interaction with other weather features affecting Singapore.

The first Northeast Monsoon surge occurred between 10 – 13 January while the MJO was active over the Western Hemisphere (Phases 8 and 1). Typically, an active MJO in Phases 8 and 1 has little influence on Singapore’s rainfall; consequently, it did not contribute to the anomalously wet conditions in Singapore during this period. In contrast, the second monsoon surge (January 17 – 19) coincided with an active MJO over the Indian Ocean (Phases 2 and 3). Regionally, this resulted in more widespread rainfall over the southern and central Maritime Continent compared to the previous week (Figure 5). However, while the region around Singapore experienced increased rainfall, Singapore unexpectedly saw less rainfall during the second monsoon surge. This suggests that Singapore’s exceptional wet January was primarily driven by the first monsoon surge on 10 – 13 January. Furthermore, even when

³ See the MJO section of ACAR 2024 for more information: <https://go.gov.sg/nea-acar-2024>

monsoon surges coincide with favourable MJO phases, local weather processes can lead to atypical rainfall responses at small scales such as Singapore.

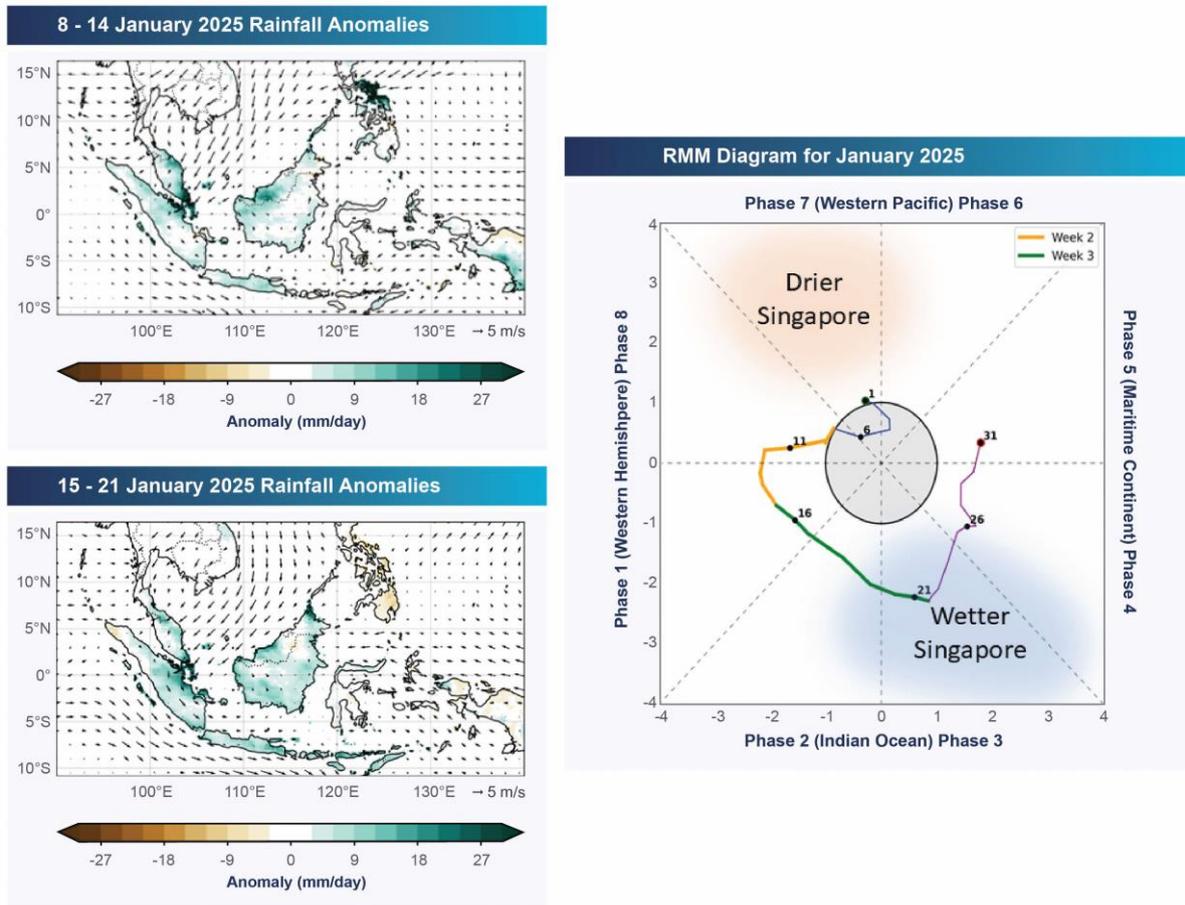


Figure 5: Rainfall anomaly for Week 2 (8 – 14 January 2025) (top left) and Week 3 (15 – 21 January 2025) (bottom left), respectively, with green (brown) shading denoting wetter (drier) than the 1991 – 2020 period average. Real-time Multivariate MJO (RMM) diagram for January 2025 (right), with the thick yellow and green lines denoting Week 2 and Week 3 of January 2025, respectively⁴.

⁴ Data sources: CHIRPS (rainfall), Bureau of Meteorology, Australia (RMM values)

Temperature

Global Temperature

The global average temperature for 2025 was the second or third warmest on record, depending on the dataset used, 1.44°C ($\pm 0.13^{\circ}\text{C}$) above the 1850 – 1900 average⁵. Many parts of the world experienced temperatures much warmer than average (Figure 6). Furthermore, the years 2015 to 2025 were the eleven warmest years on record in all global datasets monitored⁵.

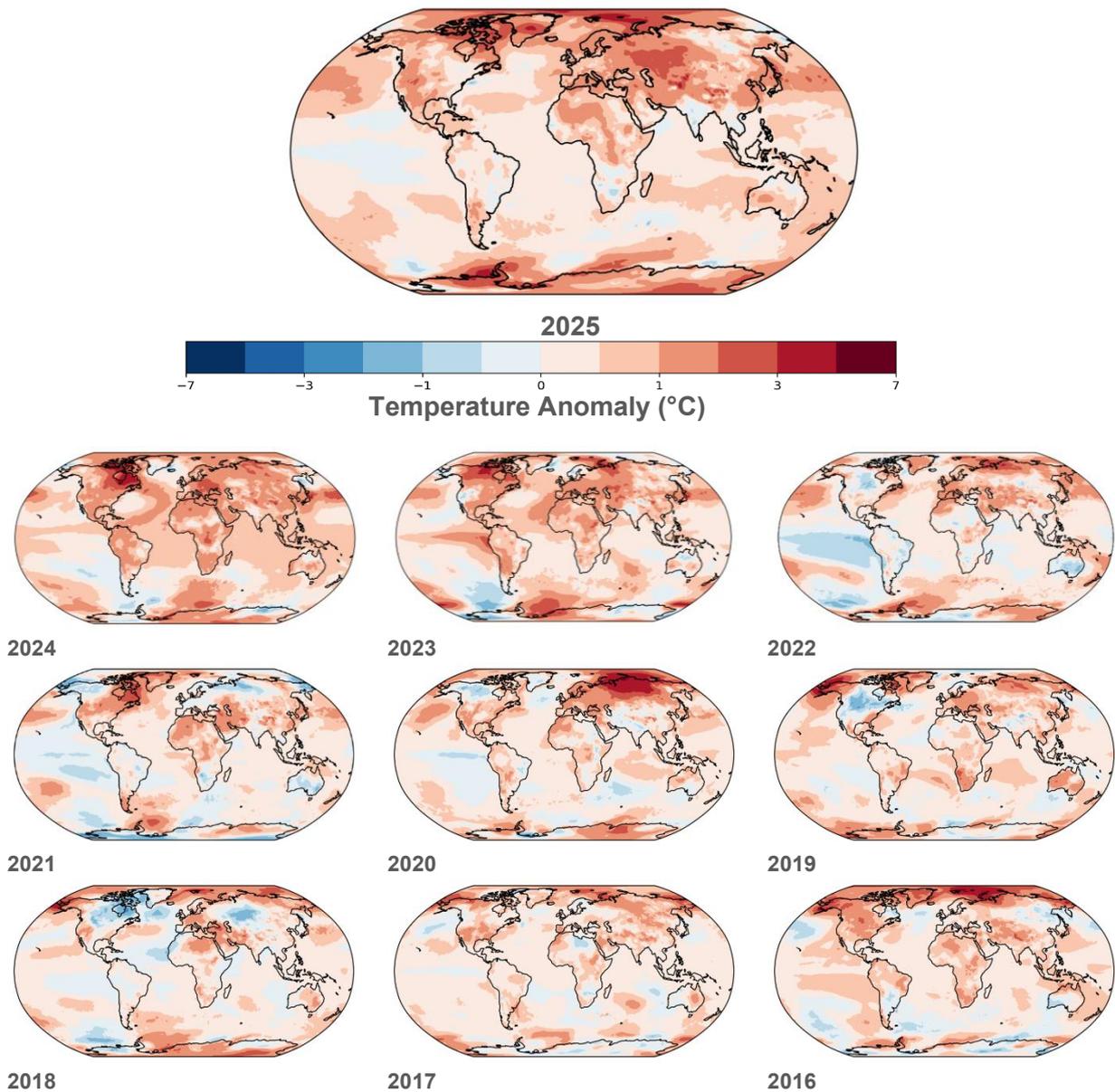


Figure 6: Global annual surface air temperature anomaly for 2025. Subsequent figures show the anomalies for the past 10 years relative to the 1991 – 2020 climatology⁶.

⁵ WMO Press Release 14 January 2026 <https://wmo.int/news/media-centre/wmo-confirms-2025-was-one-of-warmest-years-record>

⁶ Data source: ERA5

Singapore's Temperature in 2025

At the Changi climate station, the mean temperature in 2025 was 28.1°C, 0.3°C above the long-term⁷ average and the joint 8th highest on record, tied with 2010 and 2002 (Figure 7). 2025's mean daily maximum and mean daily minimum temperatures of 31.8°C and 25.4°C were the 11th (tied with 1990) and 7th highest on record, respectively.

The mean temperature for the last decade from 2016 to 2025 was 28.09°C, Singapore's second highest 10-year period on record and slightly lower than 2015 to 2024 period (28.11°C), which was the warmest.

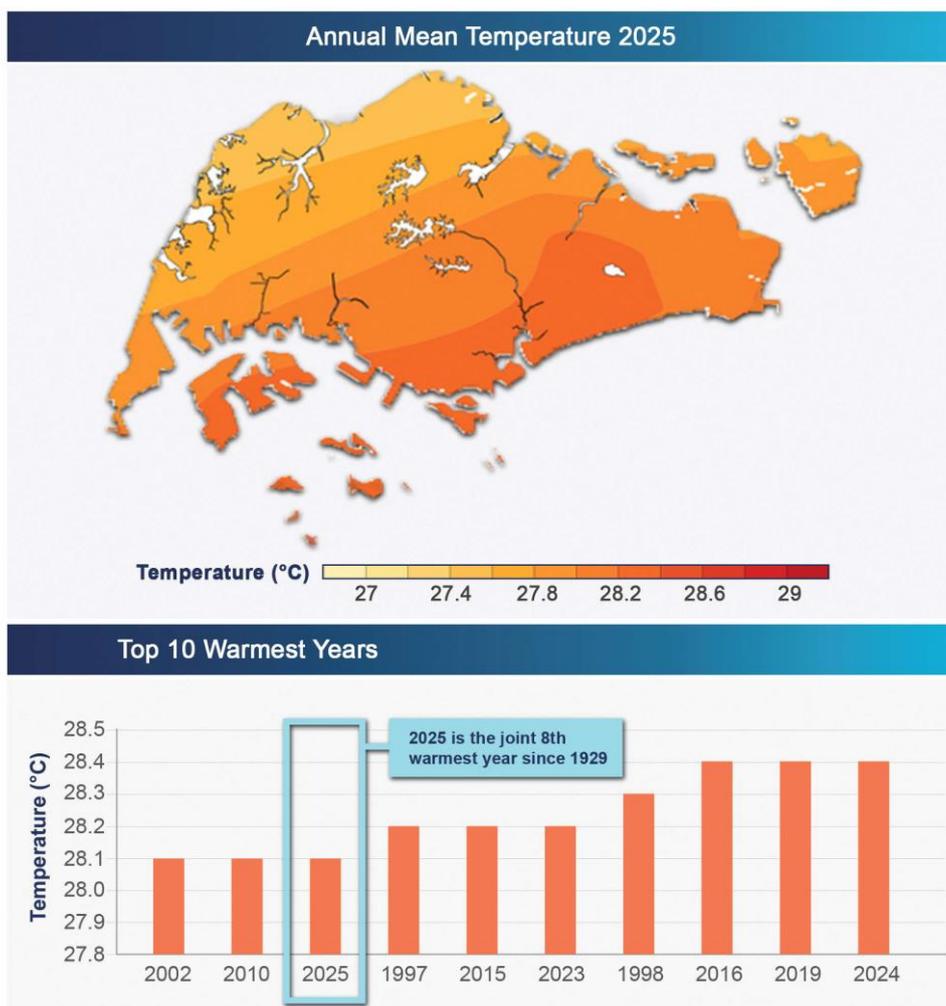


Figure 7: Annual mean temperature across Singapore in 2025 (top) and the top 10 warmest years on record (based on the Changi climate station) (bottom).

Singapore experienced a relatively cool start to 2025, with the climate station recording monthly mean temperatures at or below their respective long-term averages throughout the Northeast Monsoon season from January to March and during the first half of the inter-monsoon period in April (Figure 9).

⁷ This refers to the most recent 30-year reference period from 1991 to 2020.

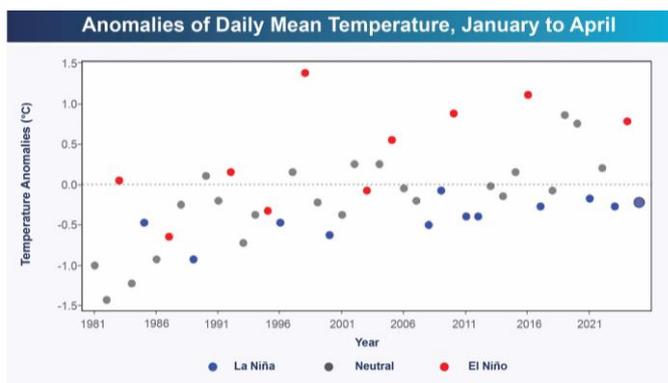


Figure 8: Anomalies of daily mean temperature for January to April at Changi climate station, relative to the 1991 – 2020 average (dotted line). 2025 is indicated by the larger dot.

The 2024/2025 La Niña event moderated Singapore's temperatures in the first half of the year. Historically, the average temperature from January to April is lower than the long-term mean for most years with the presence of La Niña. However, in recent years, the temperatures have tracked closer to the 1991–2020 average, reflecting the influence of the long-term warming trend (Figure 8).

Temperatures began to rise above the long-term average from the inter-monsoon month of May, with monthly mean temperature 0.1°C above its long-term average (Figure 9). With the onset of the Southwest Monsoon season in June, temperatures rose further. June was the warmest month of 2025. The month's mean temperature of 29.3°C was 0.8°C above its long-term average and tied with 1997 as the warmest June on record. Its mean daily maximum and daily minimum temperatures also ranked fifth and second highest for the month respectively. This warm trend continued into July, which was the second warmest month in 2025 and the second warmest July on record. July's monthly mean temperature of 29.1°C was 0.9°C above its long-term average. Monthly mean temperatures fell in August and September, with September's monthly mean temperature returning to its long-term average.

Temperatures rose again during October and November. The climate station recorded a daily maximum temperature of 35.9°C on 28 October, breaking the previous October record by a wide margin of 1.3°C (Table 2). October's monthly mean temperature was its second highest, while both its monthly mean daily maximum and daily minimum temperatures ranked third highest for the month (Figures 9 – 11).

Record-breaking temperatures continued into November, with monthly mean temperature (28.2°C) and monthly mean daily maximum temperature (32.8°C) the highest on record for the month. November's monthly mean daily minimum temperature of 25.1°C was the fourth highest on record for the month. At the climate station, both the daily maximum and minimum temperature records for November were broken. On 1 November, the climate station recorded a daily minimum temperature of 27.7°C, breaking its previous record by 0.4°C and on 8 November, the daily maximum temperature of 35.4°C broke the previous November record by 0.8°C (Table 2). More information on record breaking temperatures in November can be found in the Notable Events (page 13).

December's monthly mean temperature returned closer to the long-term average, at 0.5°C above its long-term average, compared to October and November, which were both 1.0°C above their respective long-term averages (Figure 9). The second half of 2025 was warmer than the first half. While La Niña events helped to moderate Singapore's temperature in the second half of the year, the effect was less than for the first half of the year, and extended dry periods, particularly in the inter-monsoon months, can bring record high temperatures even when La Niña conditions are present.

Other temperature records broken in 2025 are listed in Table 2 (for the climate station) and Table 3 (for all other stations).

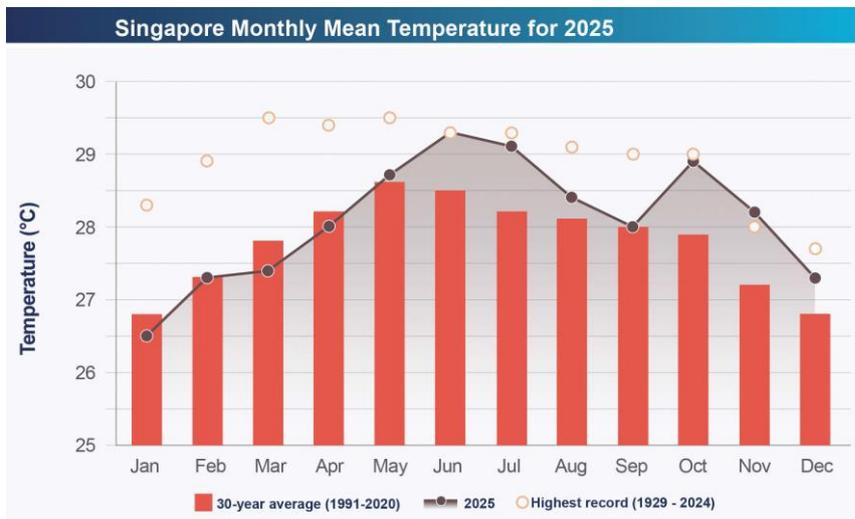


Figure 9: Climate station monthly mean temperature for 2025 (solid line), long-term average (bars, 1991 – 2020) and the corresponding historical extremes (circles).

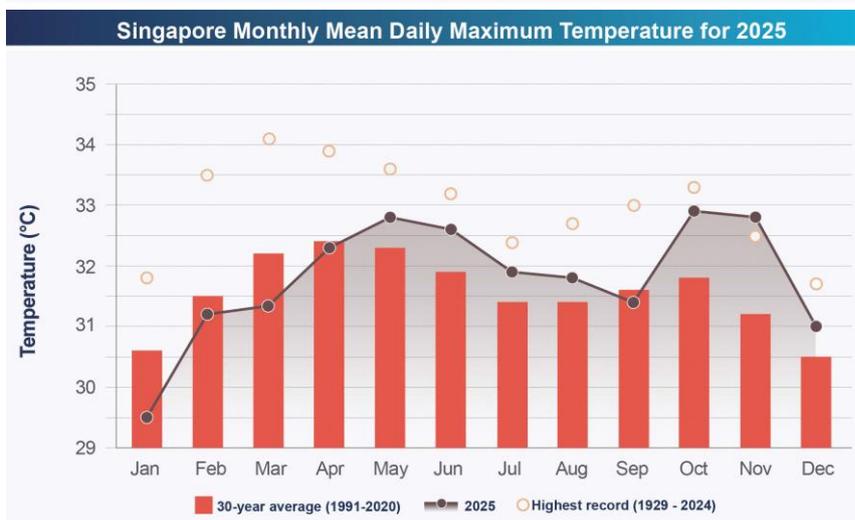


Figure 10: Climate station monthly mean daily maximum temperature for 2025 (solid line), long-term average (bars, 1991 – 2020) and the corresponding historical extremes (circles).

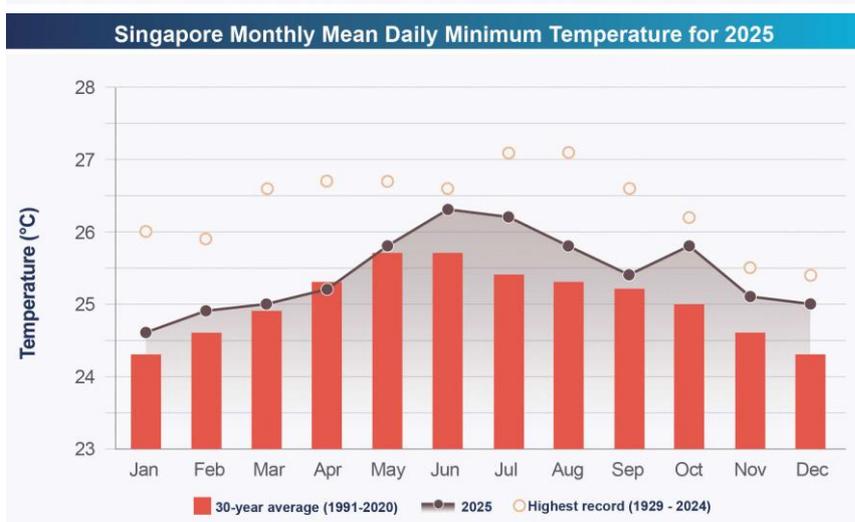


Figure 11: Climate station monthly mean daily minimum temperature for 2025 (solid line), long-term average (bars, 1991 – 2020) and the corresponding historical extremes (circles).

Notable Event: Highest Temperature ever recorded in November

November, like April, falls within one of Singapore's inter-monsoon periods, typically characterised by light and variable winds. Although the month is not usually associated with extreme temperatures, the first half of November 2025 was exceptionally warm, with daytime temperatures exceeding 33°C.

The high temperatures were compounded by notably dry conditions, as much of the island experienced below-average rainfall. The month began with a record-breaking event. On 1 November, Newton recorded a maximum temperature of 36.0°C, the highest ever observed in November. This surpassed the previous November record of 35.8°C, last recorded at Newton on 3 November 2023 and at Admiralty on 18 November 2019.

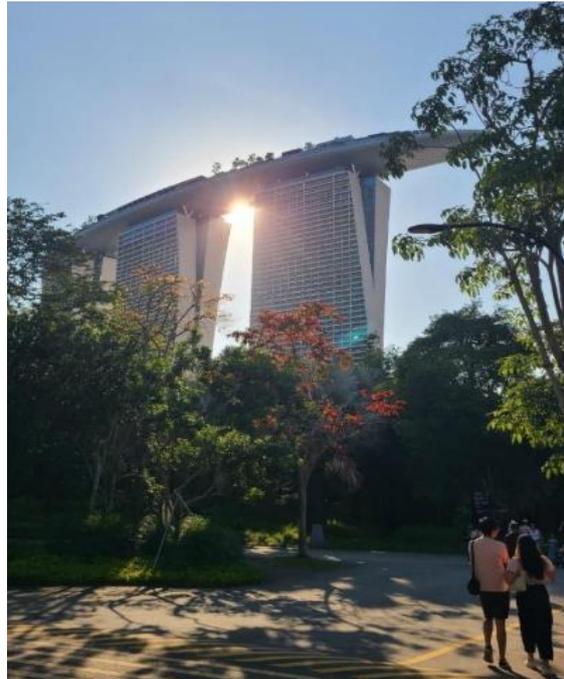


Figure 12: Singapore experienced dry and sunny weather on 1 November 2025 (photo by Mah King Kheong)

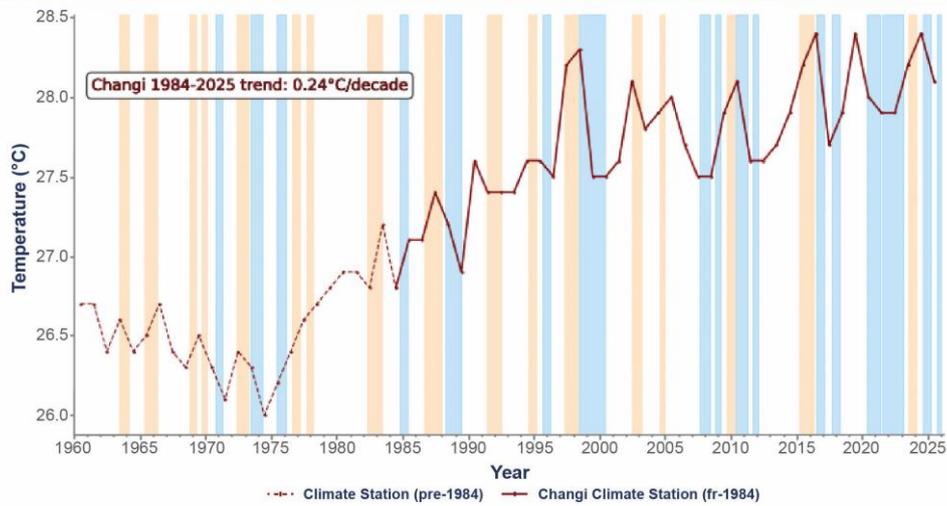
Singapore's Long-term Temperature Trends: Historical

Annual temperatures at the Changi climate station have risen at rates of 0.13°C and 0.29°C per decade for the daily maximum and daily minimum temperatures respectively, between 1984⁸ and 2025 (Figure 13). On top of this, periods with El Niño (light orange bars) tend to amplify the annual temperatures, while periods with La Niña (blue bars) tend to moderate annual temperatures.

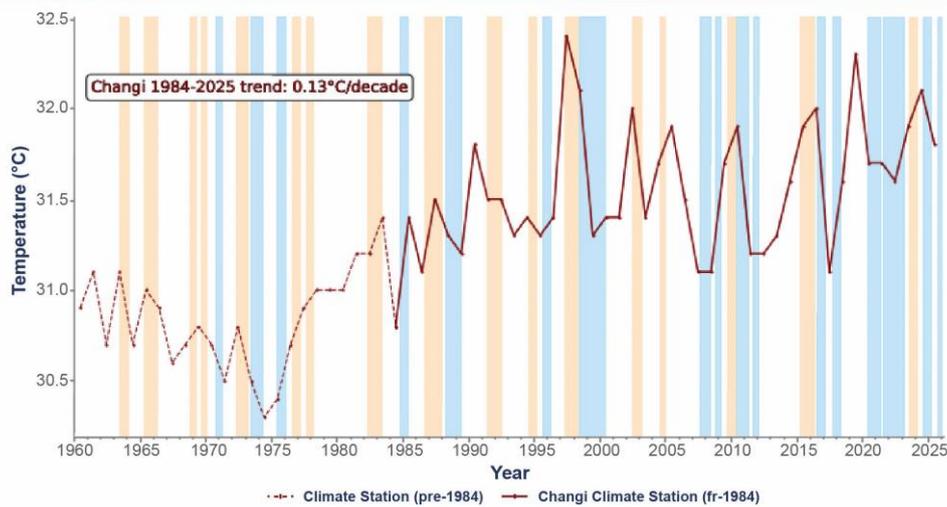
Singapore's temperature observations highlight the influence of the long-term warming trend on top of the year-to-year variability associated with large-scale climate drivers. Over 5 – 10 years, years tend to be cooler when La Niña events decay (those following El Niño tend to be warmer). However, over 30 years or more, the long-term warming trend dominates, such that recent cooler years associated with La Niña are still warmer than El Niño years four decades ago. Temperatures in 2025 follow this pattern, with annual mean temperature 0.3°C cooler than in 2024, but still 8th warmest on record. This pattern is also seen in daily minimum temperatures (Figure 13).

⁸ Singapore's climate station has been relocated over time and has been situated at Changi Airport since 1984. Hence, trend values are presented for 1984 – 2025.

Singapore Annual Mean Temperature



Singapore Annual Mean Daily Maximum Temperature



Singapore Annual Mean Daily Minimum Temperature

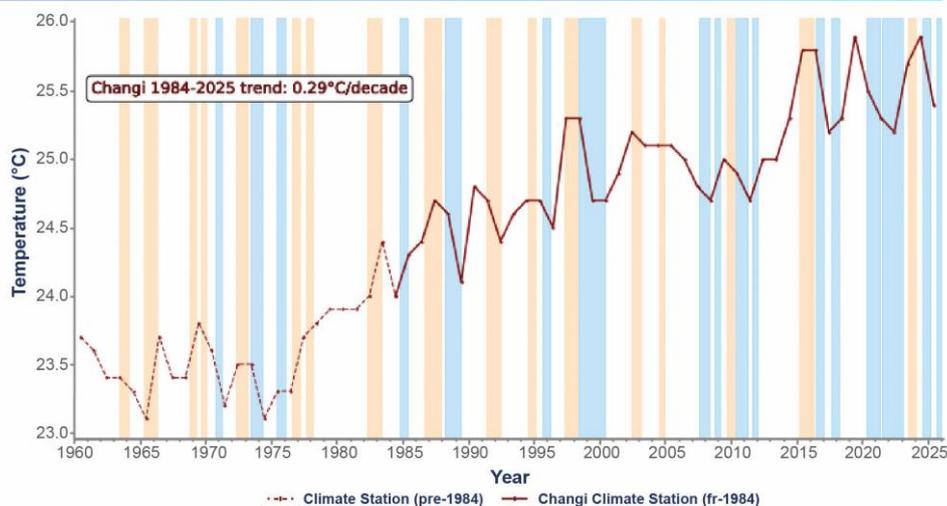


Figure 13: Annual mean temperatures since 1960 (based on the climate station). El Niño and La Niña years from 1961 onwards are highlighted in light orange and blue bars, respectively.

Heat Stress

The wet bulb globe temperature (WBGT) is an internationally recognised indicator of heat stress, accounting for the main environmental factors contributing to heat stress: wind, air temperature, humidity, and solar radiation. Singapore measures WBGT using a network of sensors and categorises heat stress into high (WBGT (°C) ≥ 33), moderate (31 ≤ WBGT (°C) < 33), and low (WBGT (°C) < 31) risk levels.

In 2025, MSS expanded its WBGT monitoring network to improve heat stress monitoring coverage across Singapore. Seven new stations were installed in the second half of the year as shown in Figure 14 below. Data from the Sakra Road (Jurong Island) station were published online from July 2025, while data from the other six new stations were published online from September 2025.

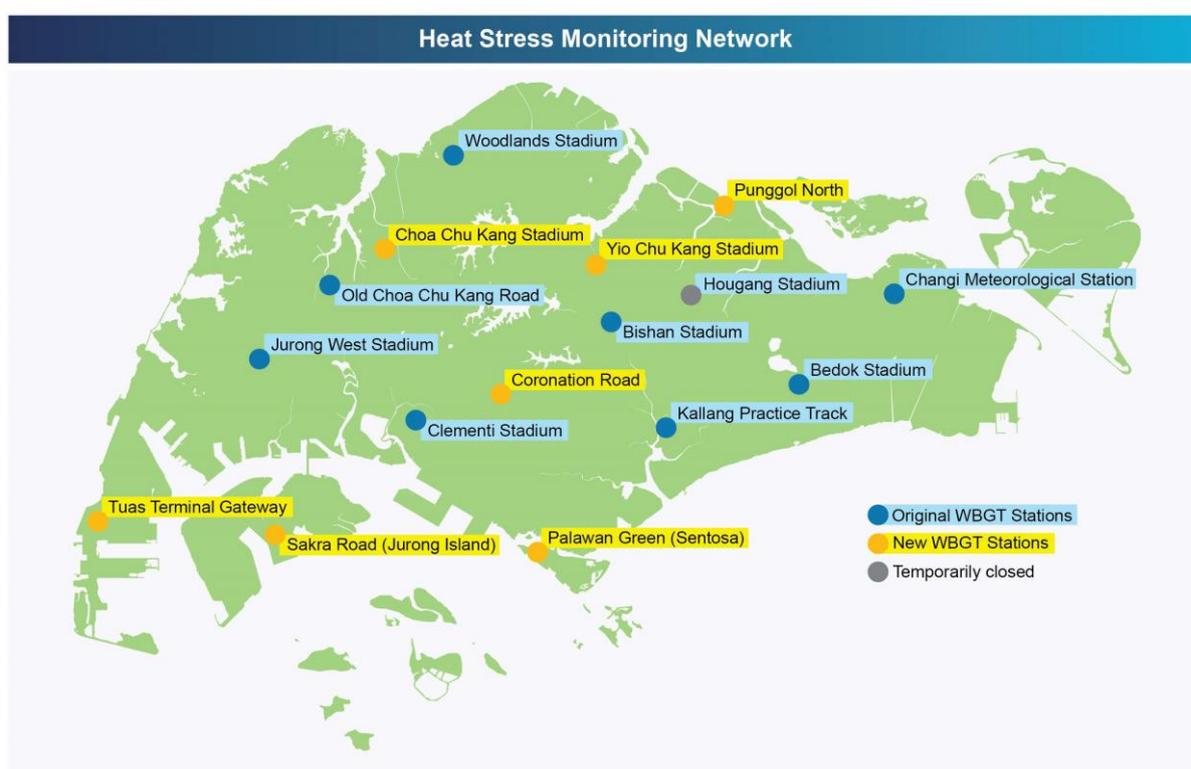


Figure 14: Locations of MSS' WBGT sensors across Singapore (as of 31 Dec 2025). New WBGT stations installed in 2025 are highlighted in yellow. Hougang Stadium's WBGT station (grey dot) has been offline since end June 2024 due to renovation works at the stadium.

The annual average daily mean and maximum WBGT in 2025 were 26.5°C and 30.0°C respectively, both lower than in 2024 (Figure 15). This is consistent with the decrease in annual mean temperature in 2025 (Figure 13). Monthly average daily mean WBGTs were also below their respective 2018 – 2024 average for most months of the year (Figure 16). The annual averages do not include observations from the new stations, as they were only operational in the second half of 2025.

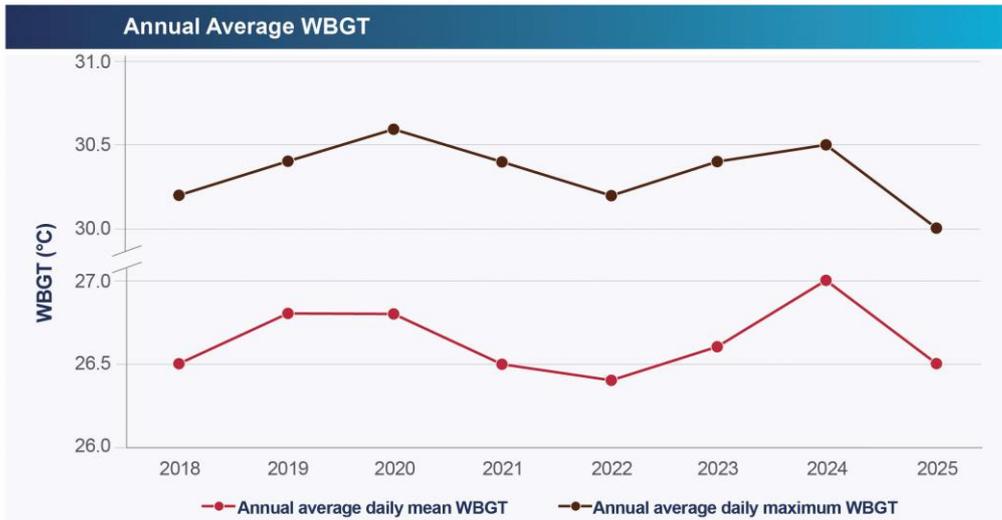


Figure 15: Annual average WBGT based on available data from original WBGT stations from 2018 to 2025.

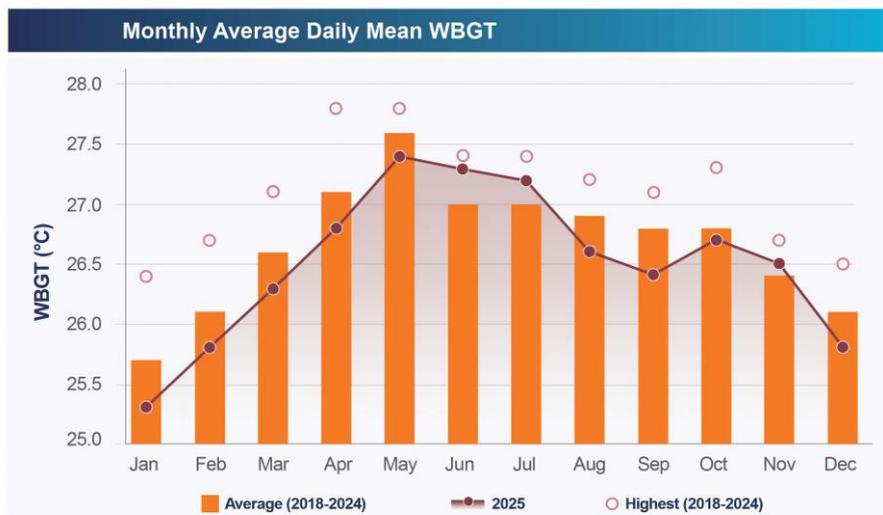


Figure 16: Monthly average daily mean WBGT in 2025 based on available data from original WBGT stations (orange solid line), average from 2018 to 2024 (bars) and highest from 2018 to 2024 (circles).

Despite the lower average WBGT values, Singapore experienced 29 days of high heat stress⁹ in 2025 (Figure 17) compared to 21 days in 2024. A day of high heat stress is defined as one in which any station records an hourly-average WBGT of 33°C or higher. From January to August, the number of high heat stress days was lower than the 2018 – 2024 average. September and October had the most such days for their respective months since 2018. This increase was partly due to the expansion of the WBGT network. With more stations in operation, there is a greater likelihood of detecting high heat stress events.

⁹ Heat stress levels are based on Wet-Bulb Globe Temperature (WBGT). A day of high heat stress is defined when any hourly-average WBGT at a station is equal to or greater than 33°C. Warm temperatures coupled with other factors (humidity, wind speed and solar radiation) contribute to occurrences of high heat stress.

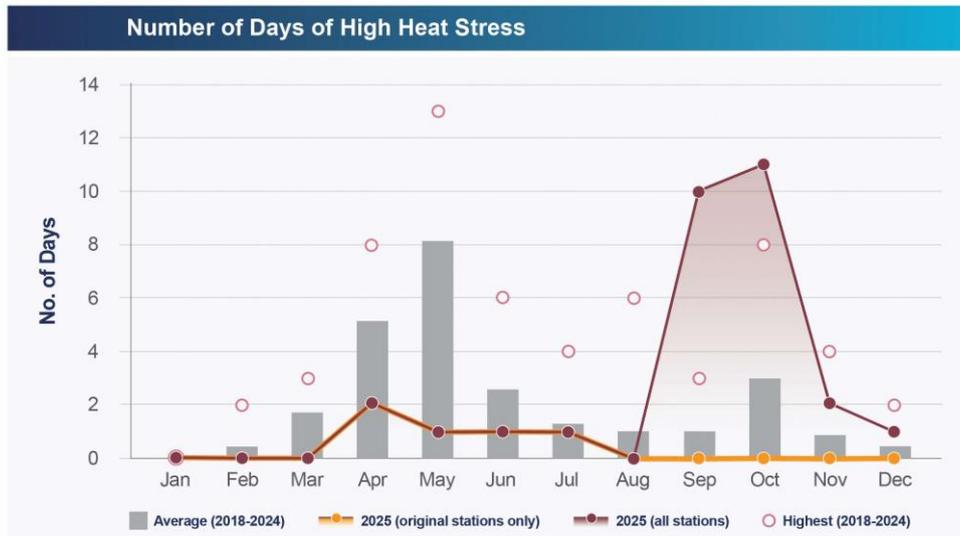


Figure 17: Monthly number of days of high heat stress in 2025 based on the original stations (orange solid line) and all stations including the 7 new stations operational from July 2025 onwards (red solid line), monthly average from 2018 to 2024 (bars) and highest monthly number from 2018 to 2024 (circle) based on the original stations.

Highest WBGT in 2025

The highest 15-minute average WBGT recorded in 2025 was 35.0°C, observed at Palawan Green (Sentosa) on 31 October 2025. This was also the highest 15-minute average WBGT ever recorded by MSS' WBGT network. Across Singapore on this day, the highest WBGT values were generally observed between 12:00 pm and 2:00 pm, coinciding with the period of strongest solar radiation during the day (Figure 18).

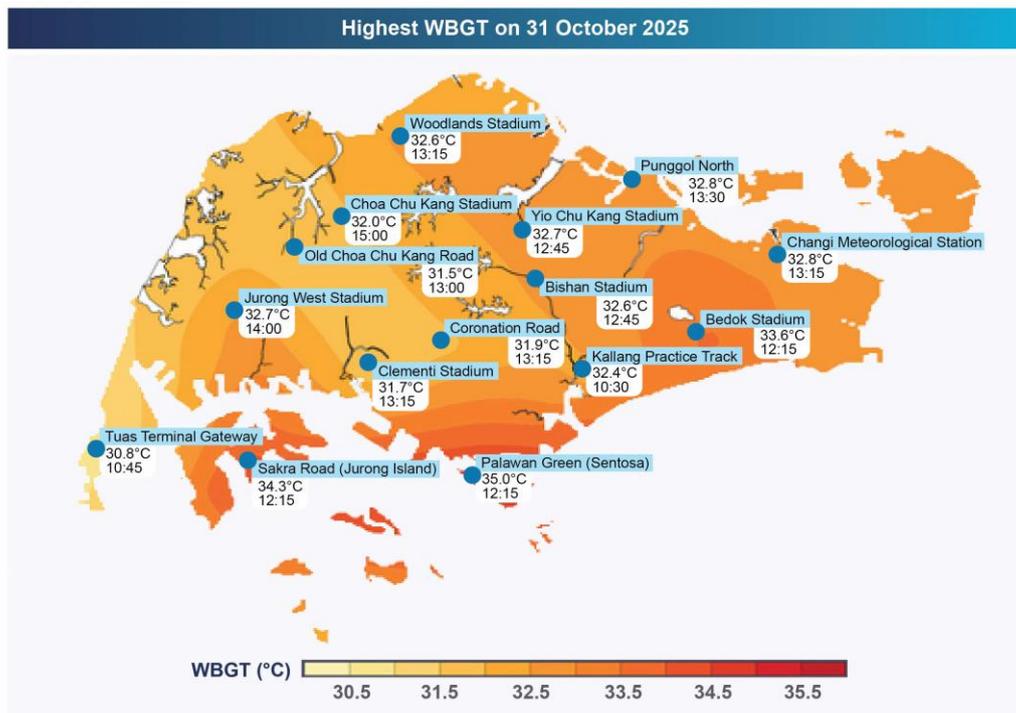


Figure 18: Highest 15-minute average WBGT and corresponding time recorded across Singapore on 31 October 2025.

The peak WBGT of 35.0°C recorded at 12:15 pm at Palawan Green coincided with a period of high solar radiation and relatively low mean wind speeds (yellow bar in Figure 19). Reduced wind speeds limit heat dissipation, contributing to higher WBGT values.

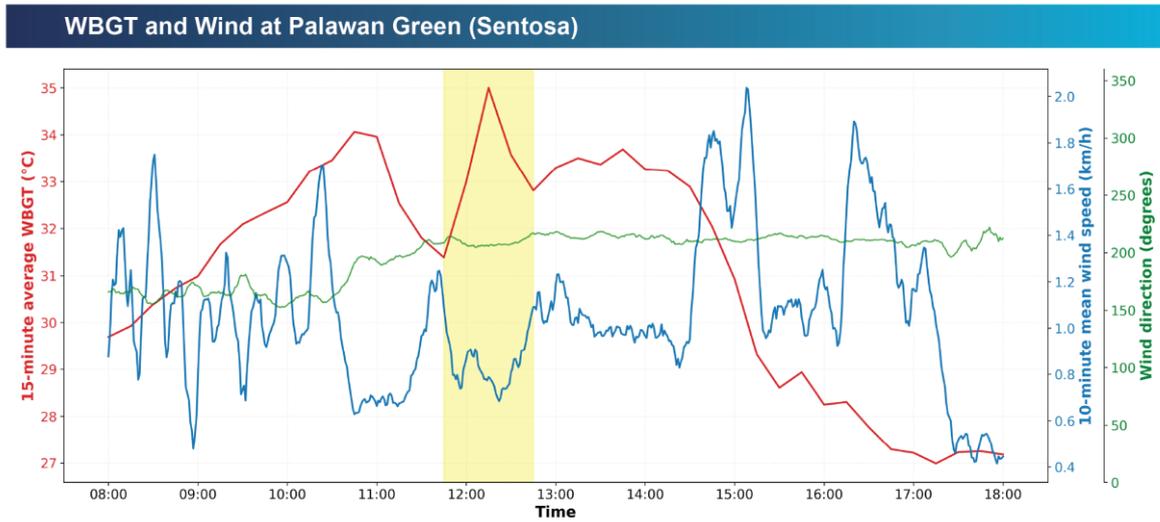


Figure 19: WBGT (red line) and wind speed (blue line) and direction (green line) at Palawan Green (Sentosa) station on 31 October 2025 from 8:00 am to 6:00 pm. Yellow bar from 11:45 am to 12:45 pm showed period of higher WBGT, partly due to lower wind speeds.

In addition to environmental conditions such as solar radiation and wind speed, surrounding site characteristics also influenced the WBGT measurements at Palawan Green. Weather stations located near the coast are often perceived to be cooler during the daytime due to the influence of sea breezes. Although the Palawan Green station is situated near Palawan Beach, it is partially sheltered by trees, particularly to the south and west (Figure 20). These trees may restrict wind flow from those directions, limiting ventilation at the site.

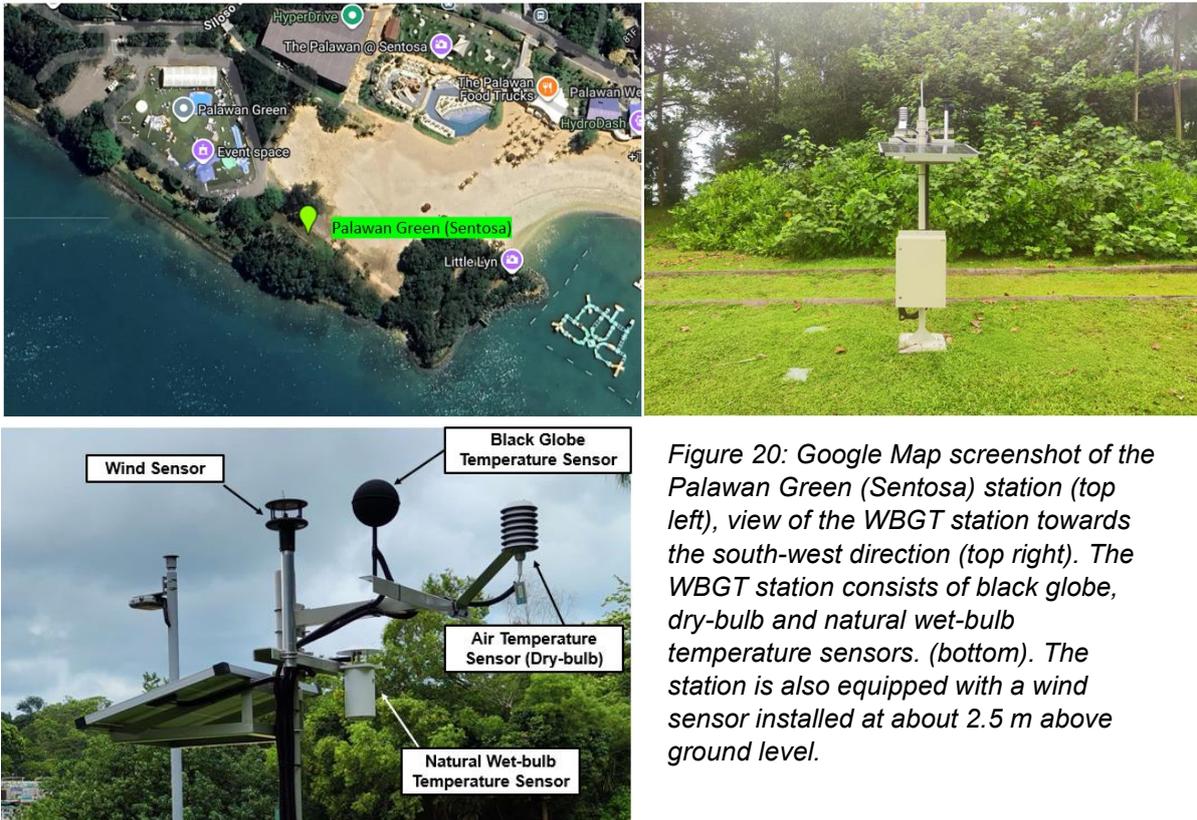


Figure 20: Google Map screenshot of the Palawan Green (Sentosa) station (top left), view of the WBGT station towards the south-west direction (top right). The WBGT station consists of black globe, dry-bulb and natural wet-bulb temperature sensors. (bottom). The station is also equipped with a wind sensor installed at about 2.5 m above ground level.

From September to December 2025, winds at Palawan Green were generally light, with mean wind speeds typically below 5 km/h. As shown in the wind roses (Figure 21), westerly winds in particular appeared to be reduced, likely due to the surrounding trees. Under lighter wind conditions, heat accumulates more readily, contributing to higher observed WBGT values.

In September and October 2025, these lighter wind conditions contributed to monthly mean WBGT values at Palawan Green that were higher than the average across the original stations. With the onset of the Northeast Monsoon towards the end of November, mean wind speeds increased, which in turn contributed to lower monthly mean WBGT values.

This case study highlights how both broader meteorological conditions and local site characteristics can influence heat stress measurements and the value of measuring WBGT at multiple sites across Singapore.

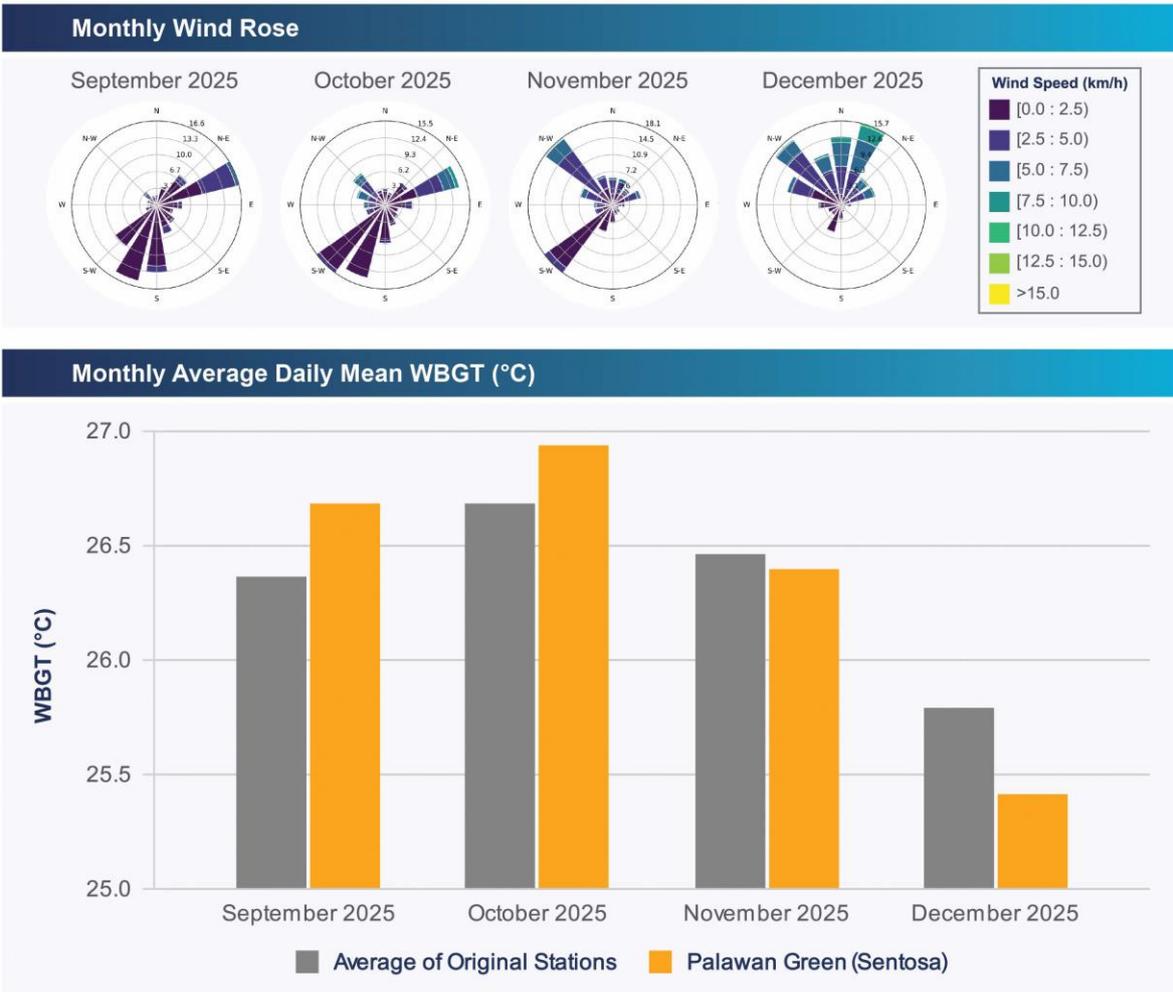


Figure 21: Monthly wind rose at Palawan Green (Sentosa) showing direction wind blowing from (top) and its monthly average daily mean WBGT compared to that of the average across original stations (bottom)

Rainfall

Singapore's Rainfall in 2025

Singapore's annual total rainfall¹⁰ (2984.9 mm) was 18% above the long-term average of 2534.3 mm and the 7th highest since 1980 (Figure 22). North-western and central Singapore experienced the highest rainfall totals (Figure 23, left), although most of Singapore experienced more rainfall than usual (Figure 23, right). The Changi climate station recorded 2833.5 mm of rainfall in 2025, 34% above its long-term average of 2113.3 mm.

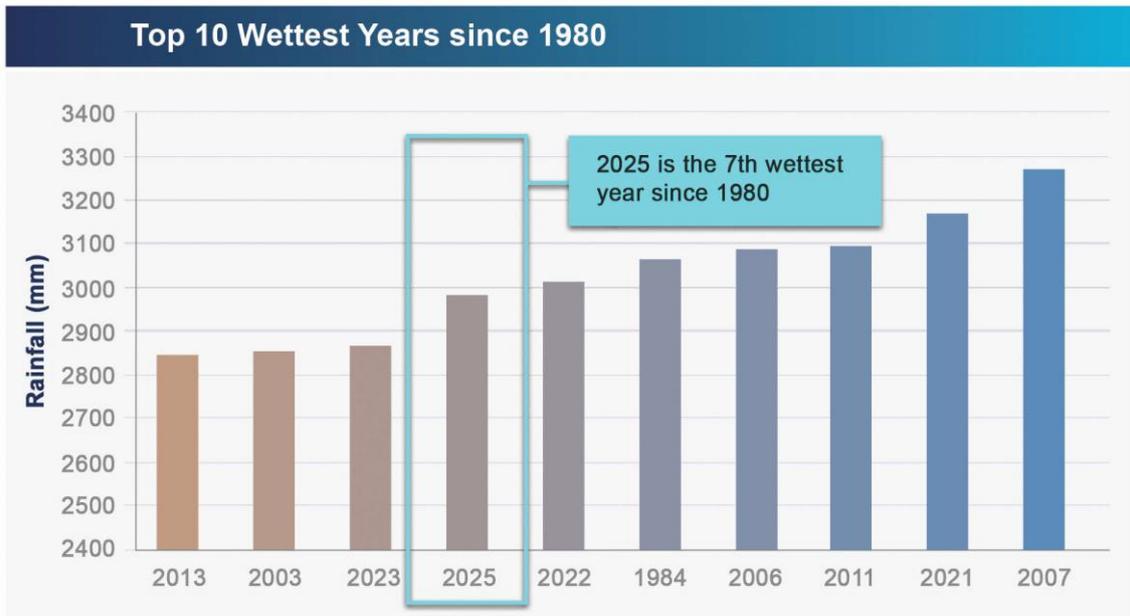


Figure 22: The top 10 wettest years since 1980 based on the Singapore average.

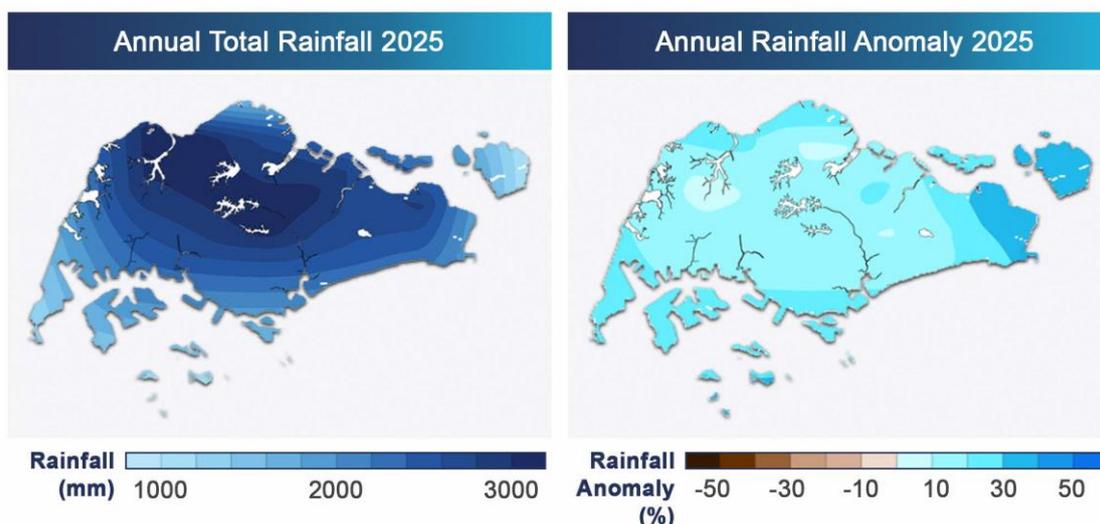


Figure 23 Annual total rainfall distribution across Singapore in 2025 (left). Annual rainfall anomalies (in percentage terms) across Singapore in 2025 (right).

¹⁰ Averaged across 32 stations islandwide with continuous rainfall records starting from 1980.

2025 began with exceptionally wet conditions, especially in January and March due to the Northeast Monsoon surges. The 430.0 mm of rainfall recorded in January was nearly double its long-term average of 222.4 mm and the 6th wettest January since 1980 (Figure 24). March 2025 was the wettest March on record, both islandwide and at the climate station. March's islandwide average rainfall was 482.9 mm, 130% above the month's long-term average (Figure 24) while the climate station's monthly total rainfall of 550.1 mm broke the previous record of 528.3 mm (Table 2). April's islandwide average rainfall of 364.9 mm was 49% above its long-term average and ranked second wettest April since 1980. While the monsoon surges explain much of the wet start to the year, the La Niña conditions likely also contributed to the wetter conditions.

In contrast, Singapore experienced relatively dry conditions from May to August with monthly rainfall closer to their respective long-term averages. June was notably drier with islandwide average rainfall of 126.4 mm, 28% below its long-term average of 175.5 mm (Figure 24).

September marked a return to wetter conditions with islandwide average rainfall of 249.3 mm, 42% above the month's long-term average. However, below-average rainfall was generally recorded islandwide for the rest of the year.

Other rainfall records broken in 2025 are listed in Table 2 (for the climate station) and Table 3 (for all other stations).

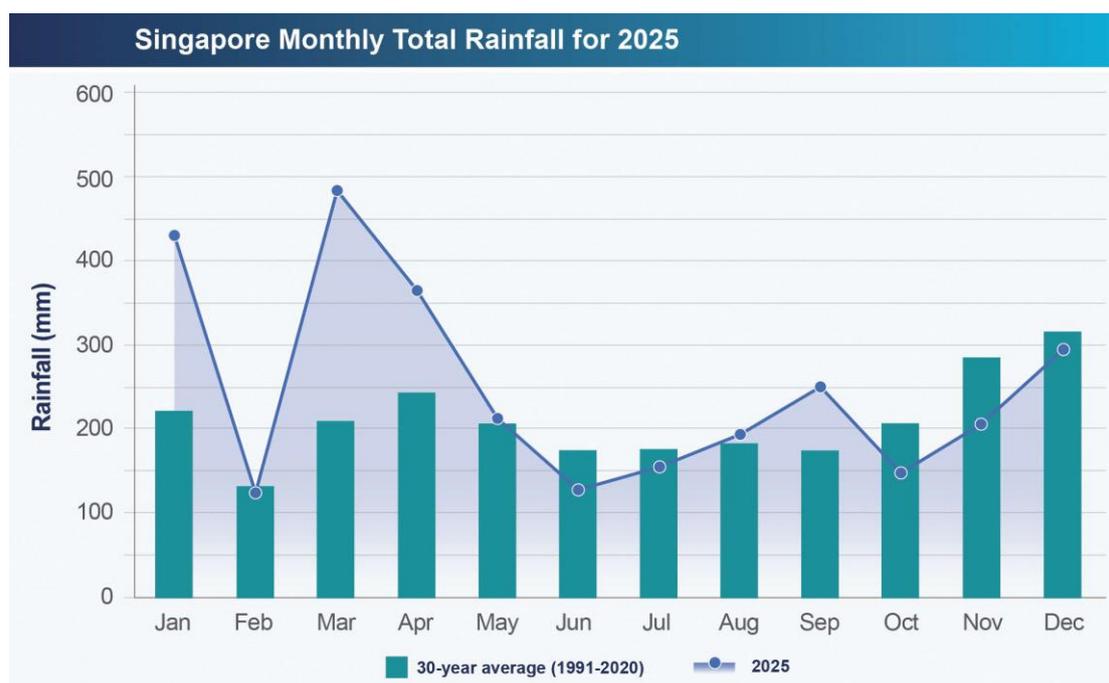


Figure 24: Singapore average monthly total rainfall for 2025 (solid line) and long-term average (bars, 1991 – 2020).

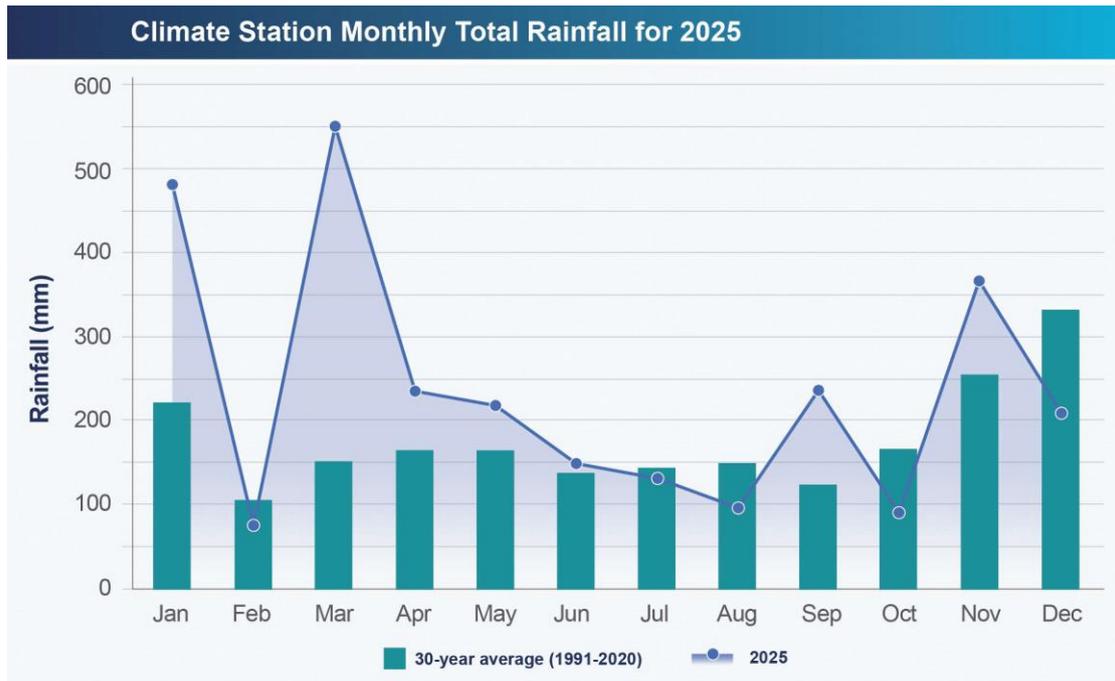


Figure 25: Climate station monthly total rainfall for 2025 (solid line) and long-term average (bars, 1991 – 2020).

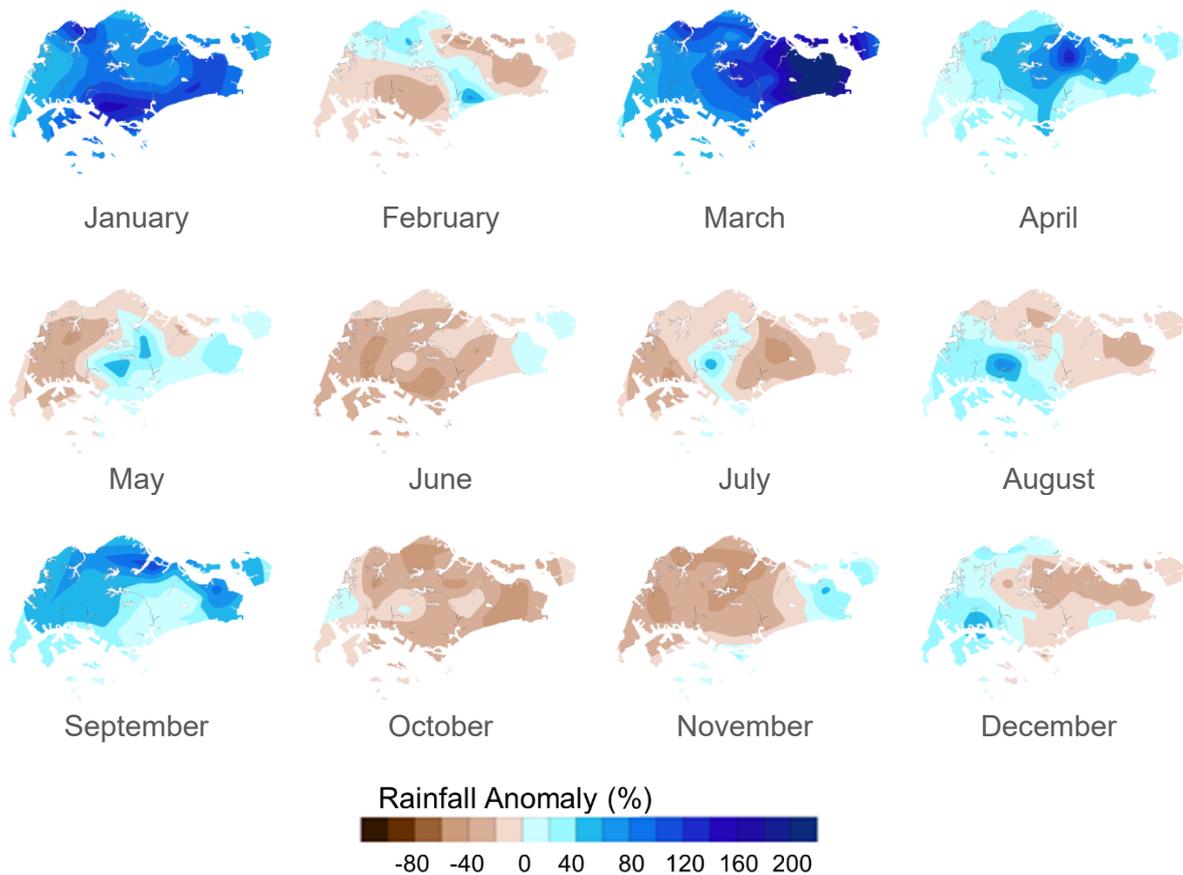


Figure 26: Monthly rainfall anomalies (in percentage term) across Singapore in 2025 (relative to the climatological period 1991 – 2020 for the particular month).

Notable Event: Three Northeast Monsoon Surges Soak Singapore in Early 2025

Early 2025 marked one of Singapore's wettest and coolest starts of the year on record, shattering rainfall records and bringing unusually low temperatures. In January, two surges developed in quick succession — the first from 10 to 13 January (Figure 27), followed by another between 17 and 19 January (Figure 28). A monsoon surge is a weather phenomenon during the Northeast Monsoon season when strong, cool winds from the South China Sea intensify, bringing periods of prolonged widespread rain and windy conditions to the surrounding region (see Box 2).

BOX 2: WHAT IS A NORTHEAST MONSOON SURGE?

A Northeast Monsoon surge (often referred to simply as a 'monsoon surge') is a recurring, synoptic-scale weather system that typically occurs between December and early March. During the Northern Hemisphere winter, a strong high-pressure system develops over continental Asia, extending from Siberia to southern China. When the pressure gradient intensifies, it releases a burst of cold air known as a monsoon surge. This monsoon surge traverses the South China Sea towards the equator, bringing enhanced wind and rain to Southeast Asia, including Singapore.

Monsoon surges are commonly associated with cooler temperatures, strengthened winds, and prolonged rainfall. As the air mass travels equatorward, it is warmed by the ocean and absorbs immense amounts of moisture. Upon reaching the Maritime Continent, this fast-moving air undercuts the pre-existing warm, moist air, enhancing uplift and triggering deep convection.

In Singapore, monsoon surges can be further intensified through interactions with local weather processes, resulting in heavy, widespread and long-lasting rainfall. This was evident during the first monsoon surge of 10 – 13 January 2025, which brought substantial rainfall across the island. However, not all synoptic-scale monsoon surges result in exceptional wet conditions locally. For instance, the subsequent surge of 17 – 19 January 2025 brought primarily cooler and windy conditions, but with comparatively less rainfall in Singapore than the first surge.

During the first monsoon surge, a daily total rainfall of 241.8 mm was recorded at Pulau Tekong on 10 January 2025, which was the highest daily total rainfall ever recorded in January, exceeding the previous record of 238.2 mm on 30 January 2011 (Table 3).

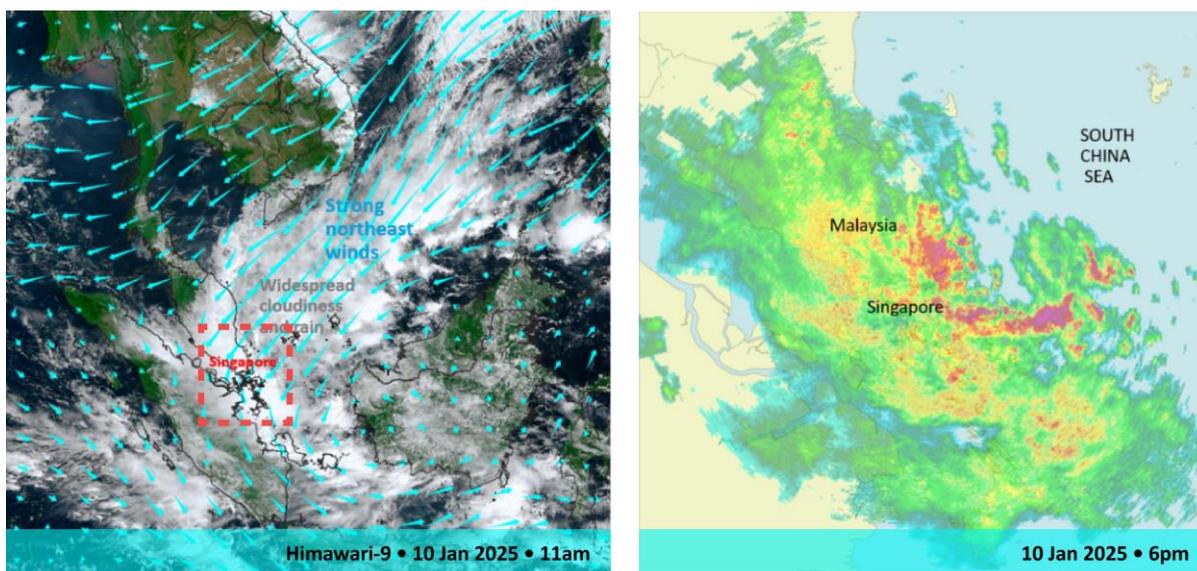


Figure 27: Himawari satellite image at 11am on 10 January 2025 with wind overlay (data source: ERA5) showing the first monsoon surge (left). White areas represent areas of extensive cloudiness and rain. The red box marks the region shown in the weather radar image of the first monsoon surge (right) at 6pm on 10 January 2025.

The second monsoon surge, which occurred from 17 to 19 January, was not as intense as the first and brought mainly occasional showers across Singapore and nearby regions. Both surges, however, contributed to cool weather conditions. During the first surge between 10 and 13 January 2025, Singapore experienced three days when the maximum daily temperature stayed below 28°C. On 11 January, the East Coast Parkway recorded a high of just 25.7°C, while Newton saw a minimum of 21.6°C — the lowest temperature of the month.

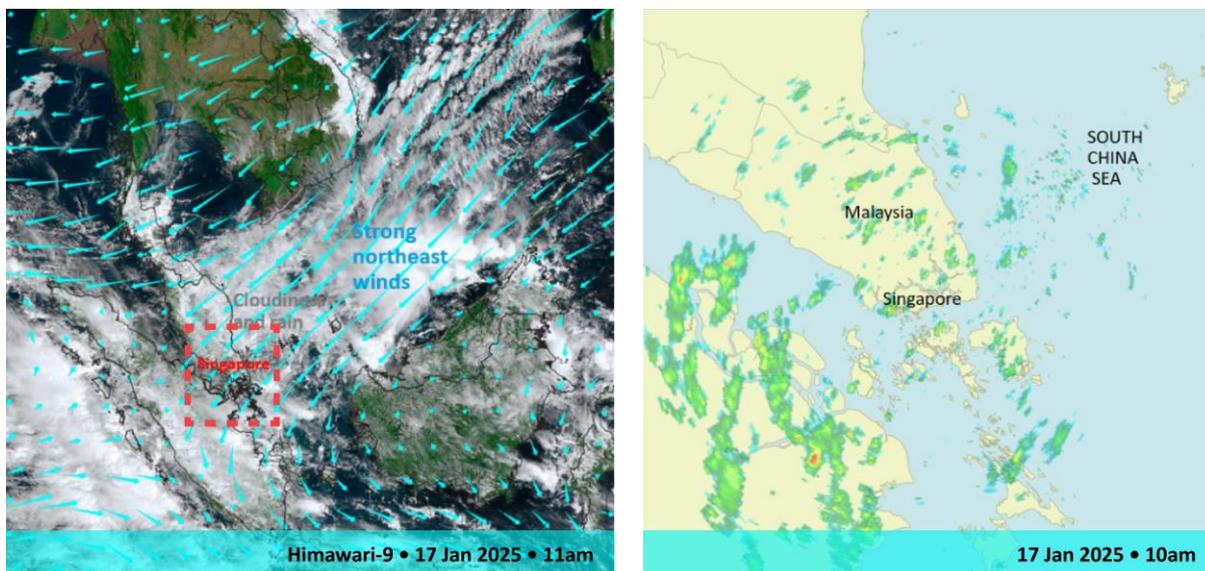


Figure 28: Himawari satellite image at 11am on 17 January 2025 with wind overlay (data source: ERA5) showing the second monsoon surge (left). The white areas showing cloudiness and rain are not as intense (bright) as for the first surge. The red box marks the region shown in the weather radar image of the second monsoon surge (right) at 10am on 17 January 2025. The rain areas are less extensive as compared to those of the first surge in Figure 27.

A third monsoon surge struck Singapore on 19–20 March 2025, bringing moderate to heavy showers across the island and nearby regions (Figure 29). This surge produced cool conditions which extended late into March and this has not often been seen in Singapore’s climate history.

On 20 March, Kallang recorded 216.8 mm of rain, the highest daily total for the month. The surge also ushered in cooler weather, with minimum temperatures ranging from 22°C to 24°C and maxima between 24°C and 28°C. Tuas South registered the lowest reading at 21.9°C. This surge contributed to an exceptionally wet March, with the islandwide average rainfall of 272.3 mm over the two days exceeding March’s long-term average of 209.7 mm.

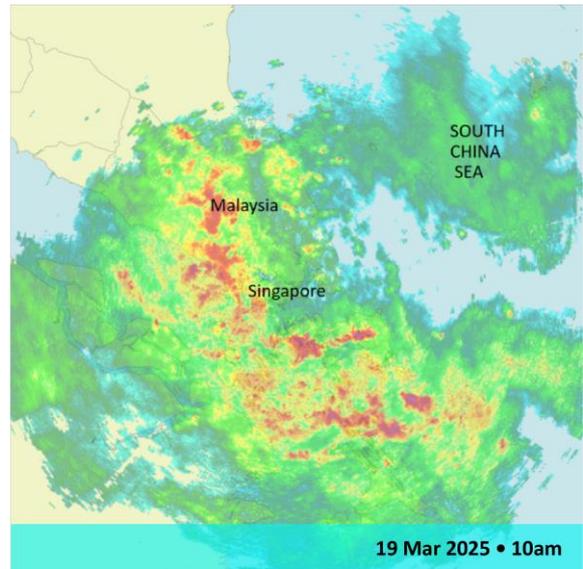
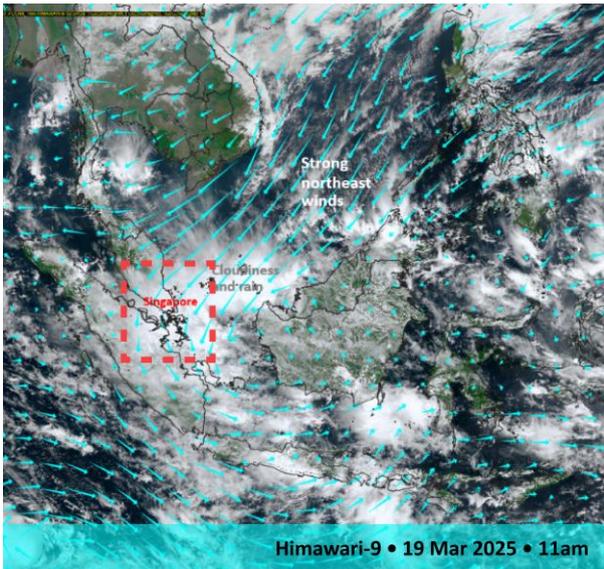


Figure 29: Himawari satellite image at 11am on 19 March 2025 with wind overlay (data source: ERA5) showing the third monsoon surge (left). The red box marks the region shown in the weather radar image of the third monsoon surge (right) at 10am on 19 March 2025.



Figure 30: Heavy rain in Tampines East on 10 January 2025 (left, photo by He Yujia). Heavy rain on 20 March 2025 (right, photo by Avester Lau).

Notable Event: Heavy Thunderstorms Drench Singapore on 13 April

April is part of the inter-monsoon period, when light winds often spark intense thunderstorms. Heavy thunderstorms in April 2025 led to flash floods on a few days. In particular, on 13 April 2025, strong solar heating of land areas during the day coupled with convergence of winds over Singapore and the surrounding vicinity led to the development of widespread intense thundery showers over Singapore in the afternoon. The rain started around noon, became heaviest at about 2pm, and only eased after 4pm. Yishun Ring Road area recorded 117.0mm of rainfall that day, which was also the highest for April 2025.

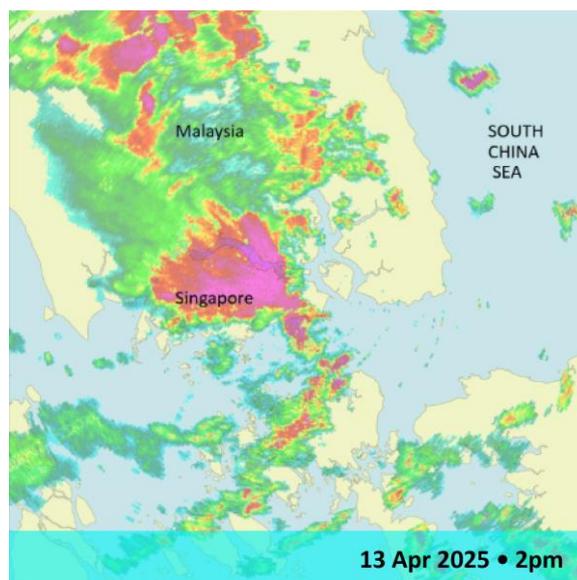


Figure 31: Weather radar image showing heavy rain at 2pm on 13 April 2025.

The torrential rain resulted in PUB issuing flash flood risks for many locations including in Punggol, Yishun, Toa Payoh and Bukit Timah, where the heavy rain resulted in high water levels in drains and canals. Flash floods occurred at Yishun, Punggol and the Kallang-Paya Lebar Expressway near Buangkok and subsided within an hour.

Singapore's Long-term Rainfall Trend: Historical

Singapore's annual total rainfall has increased by 92.5 mm per decade from 1980 to 2025 (Figure 32). Generally, Singapore tends to be wetter during years influenced by La Niña conditions (e.g. 2021–23, 2010/11, 2007/08) and considerably drier than normal during years affected by strong El Niño conditions (e.g. 2015/16, 1997/98 and 1982/83). Additionally, Singapore's annual rainfall can be reduced by strong positive IOD events, such as in 2019 when one of the strongest positive IOD events on record happened. Then, Singapore experienced an extended period of rainfall deficit between July – September, when monthly rainfall totals were well below their climatological averages.

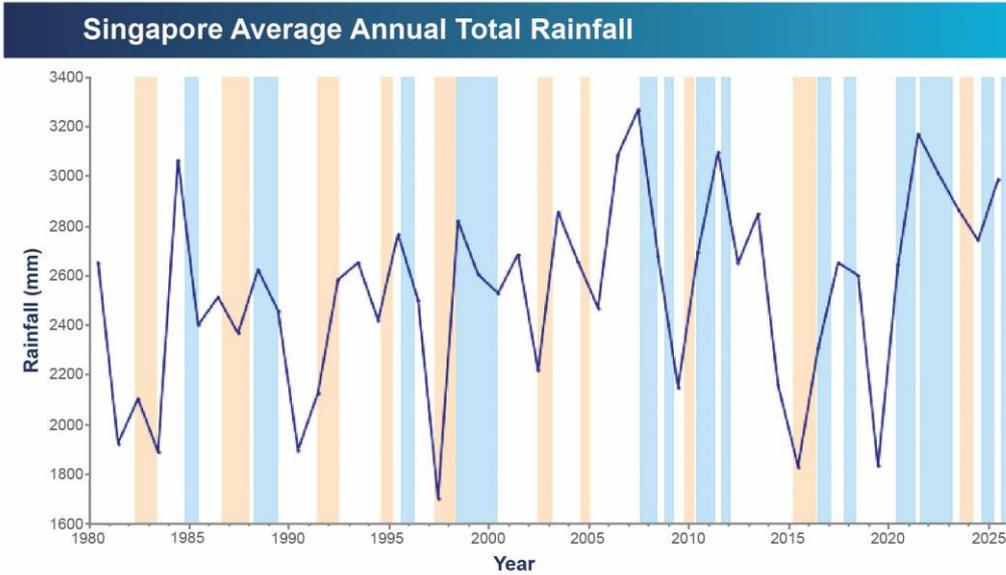


Figure 32: Average annual total rainfall since 1980 (across the islandwide stations). El Niño and La Niña years are highlighted in light orange and blue bars, respectively.

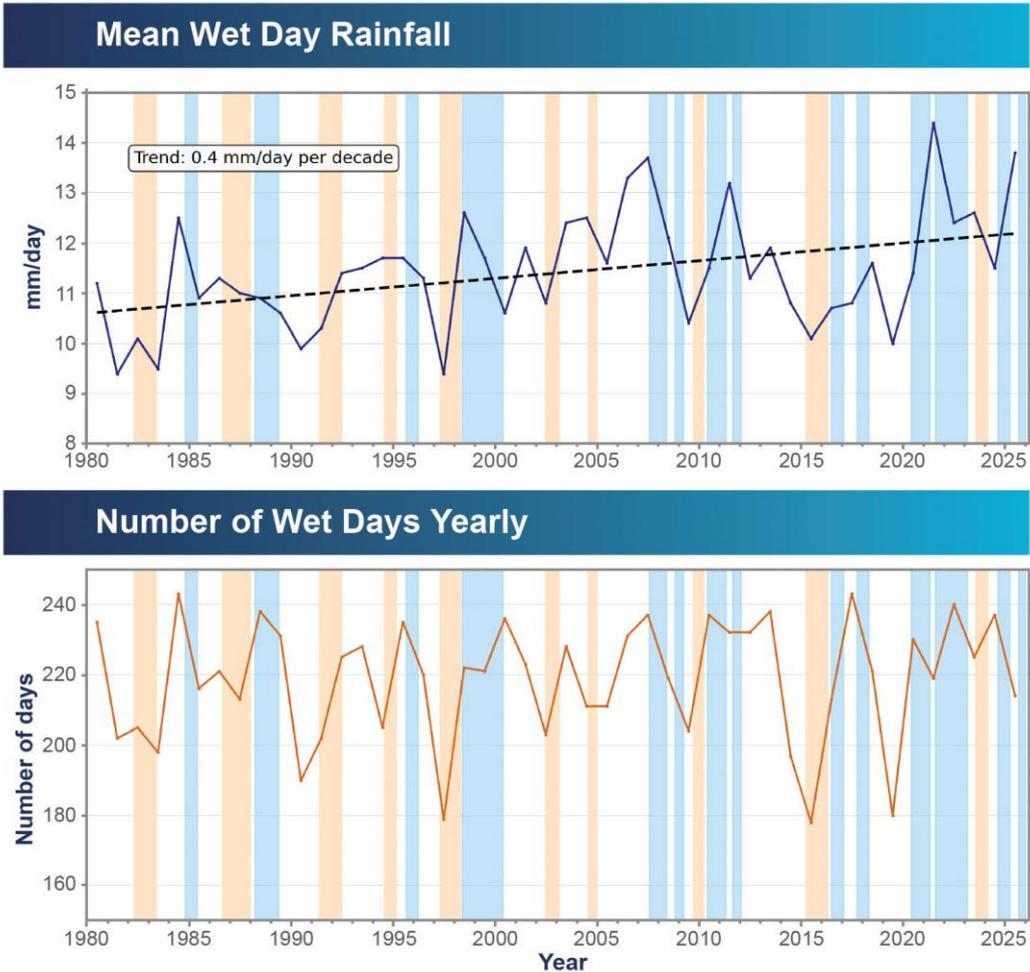


Figure 33: The Simple Daily Intensity Index (SDII) showing average rainfall intensity (in mm/day) on wet days (top) and total number of wet days each year (bottom). El Niño and La Niña years are highlighted in light orange and blue bars, respectively. The dashed line indicates a statistically significant trend at the 5% level.

While annual rainfall provides an aggregated view of rainfall received each year, it is also useful to understand whether the average daily rainfall amount is changing over time when it rains. This characteristic is given by the Simple Daily Intensity Index (SDII, in mm/day), which measures the average rainfall amount on wet days¹¹.

Figure 33 shows that the SDII has been steadily increasing over time with a statistically significant upward trend (Figure 33, top). Notably, the amount in 2025 (13.8 mm/day) is the second highest behind 2021 (14.4 mm/day), both of which are years affected by La Niña conditions. Generally, average wet day intensities tend to be higher in La Niña years and much lower in El Niño (e.g. 1982/83, 1997/98) and strong positive IOD years (e.g. 2019). The mean wet day rainfall intensity and average number of wet days over the 1980 – 2025 period are 11.4 mm/day and 218.9 days, respectively.

Interestingly, over the same period, the annual total number of wet days has not increased considerably and shows very large year-to-year variation (Figure 33, bottom). These variations are again linked to different ENSO years. Singapore tends to experience a higher annual number of wet days during La Niña years and a substantially lower number during El Niño years.

Despite statistically significant increases in Singapore’s annual total rainfall and average rainfall intensity on wet days, there has been no corresponding increase in extreme 30-minute (Figure 34) and 60-minute rainfall observed between 1980 and 2025.

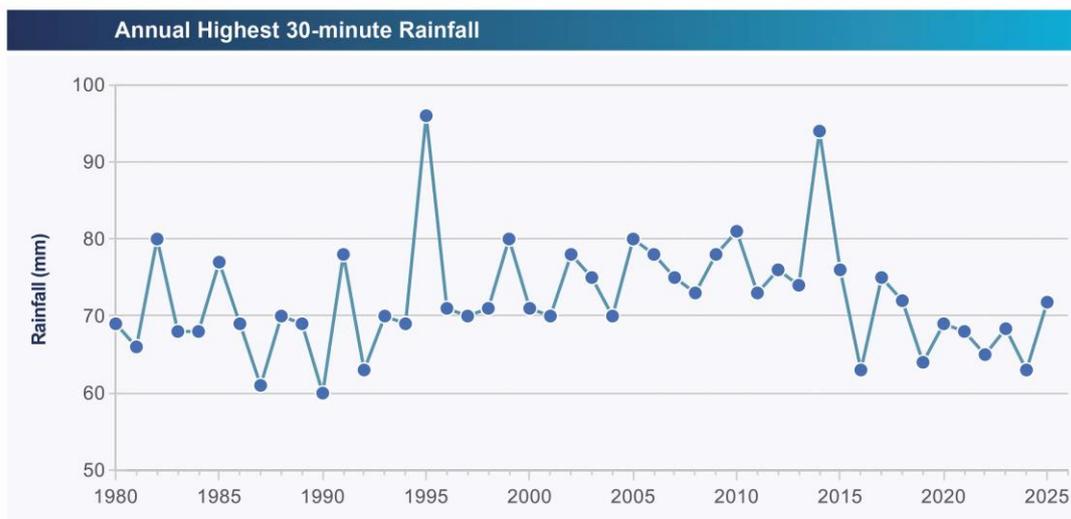


Figure 34: Annual highest 30-minute rainfall since 1980 (across the islandwide stations). No visible trend observed between 1980 and 2025.

Figure 35 shows that the highest 30-minute rainfall intensity in several months in 2025 (white dots) exceeded the corresponding 1991–2020 monthly long-term average (blue bars). February and April were particularly significant, as their peak intensity not only exceeded the 90th percentile for the recent decade (2015–2024), but also surpassed the higher historical 90th percentile for the 1980–2024 period (Figure 35).

¹¹ A day is considered as wet day when the daily rainfall averaged across islandwide stations ≥ 1 mm.

The highest 30-minute rainfall recorded in 2025 was 72 mm on 14 February at Kranji Reservoir. This record set a new high for February’s highest 30-minute rainfall intensity, breaking the previous record of 70 mm set in February 2023 at nearby rain gauge at Kranji Road. This indicates that, although no significant increasing trend in extreme rainfall intensity is observed in Singapore to date, exceptionally intense short-duration rainfall events can still occur and may surpass the historical records.

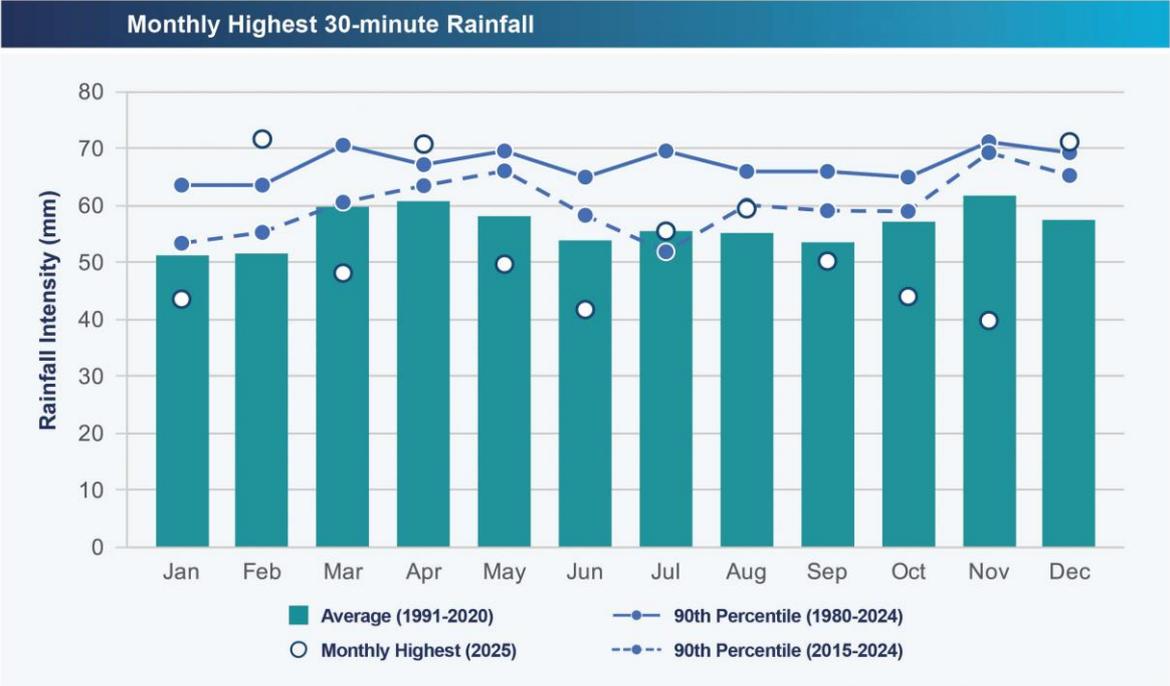


Figure 35: Monthly highest 30-minute rainfall intensities averaged over the 1991 – 2020 long-term period (blue bars) and the highest recorded 30-minute rainfall intensity in 2025 (white dots) across the islandwide stations. The solid blue line is the 90th percentile rainfall intensity for the 1980 – 2024 period, while the dotted blue line shows the 90th percentile for the most recent decade (2015 – 2024).

Weather Extremes and Records in 2025

Table 1: Temperature, rainfall and wind extremes recorded at the climate station in 2025 and the corresponding historical extremes.

	Climate Station Records	
	Historical Extremes*	2025
Hottest Day (°C)	36.0 26 Mar 1998	35.9 28 Oct
Coollest Day (°C)	19.4 30 Jan 1934 31 Jan 1934	22.1 14 May 28 Jun
Warmest Month (°C)	29.5 Mar 1998 May 2023	29.3 Jun
Coollest Month (°C)	24.2 Jan 1934	26.5 Jan
Wettest Day (mm)	512.4 2 Dec 1978	210.5 20 Mar
Wettest Month (mm)	818.6 Jan 1893	550.1 20 Mar
Driest Month (mm)	0.2 Feb 2014	73.8 Feb
Strongest Wind Gust (km/h)	90.7 29 Nov 2010	66.7 24 Oct

*Rainfall records since 1869; temperature records since 1929; wind records since 1984

Table 2: Summary of record-matching and record-breaking (in bold) temperatures and rainfall at the climate station in 2025.

Record Temperatures and Rainfall for Climate Station			
Climate Extreme	Previous Record (Year)	2025	New Record
Highest Daily Total Rainfall for March (mm)	122.8 (2004)	20 Mar	210.5
Highest Monthly Total Rainfall for March (mm)	528.3 (1913)	Mar	550.1
Highest Monthly Mean Temperature for June (°C)	29.3 (1997)	Jun	29.3
Highest Daily Maximum Temperature for October (°C)	34.6 (2002, 2016, 2017, 2022 and 2023)	28 Oct	35.9
Highest Daily Minimum Temperature for November (°C)	27.3 (2020)	1 Nov	27.7
Highest Daily Maximum Temperature for November (°C)	34.6 (2023, 2024)	8 Nov	35.4
Highest Monthly Mean Temperature for November (°C)	28.0 (1998, 2015 and 2019)	Nov	28.2
Highest Monthly Mean Daily Maximum Temperature for November (°C)	32.5 (2023)	Nov	32.8

Table 3: Summary of record-matching and record-breaking (in bold) temperatures and rainfall across all other stations in 2025.

Record Temperatures and Rainfall Across All Other Stations				
Climate Extreme	Previous Record (Location, Year)	2025	Location	New Record
Highest Daily Total Rainfall for January (mm)	238.2 (Pulau Ubin, 2011)	10 Jan	Pulau Tekong	241.8
Highest 30-minute Total Rainfall for February (mm)	70 (Kranji Road, 2023)	14 Feb	Kranji Reservoir	72
Highest Monthly Total Rainfall for April (mm)	560.4 (Jurong (West), 2007)	Apr	Yio Chu Kang Road	589.7
Highest Daily Maximum Temperature for August (°C)	35.4 (Seletar, 2016, Admiralty, 2020)	2 Aug	Paya Lebar	35.8
Highest Daily Maximum Temperature for November (°C)	35.8 (Admiralty, 2019 Newton, 2023)	1 Nov	Newton	36.0

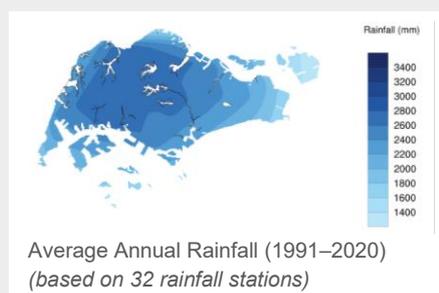
General Climate of Singapore

Singapore has a tropical climate which is warm and humid, with abundant total annual rainfall of approximately 2500 mm averaged across the islandwide stations. Generally, the eastern parts of Singapore receive less rainfall compared to other parts of the island. The winds are generally light but with a diurnal variation due to land and sea breezes.

The temperature variation throughout the year is relatively small compared to mid-latitude regions. The daily temperature range has a minimum usually not falling below 23–25°C during the night, and a maximum usually not rising above 31–33°C during the day.

Singapore's climate is traditionally classified into four periods according to the average prevailing wind direction:

- a) Northeast Monsoon (December to early March).
- b) Inter-monsoon (Late March to May).
- c) Southwest Monsoon (June to September).
- d) Inter-monsoon (October to November). The transitions between the monsoon seasons occur gradually, generally over a period of two months (the inter-monsoon periods). The winds during the inter-monsoon periods are usually light and variable in direction.



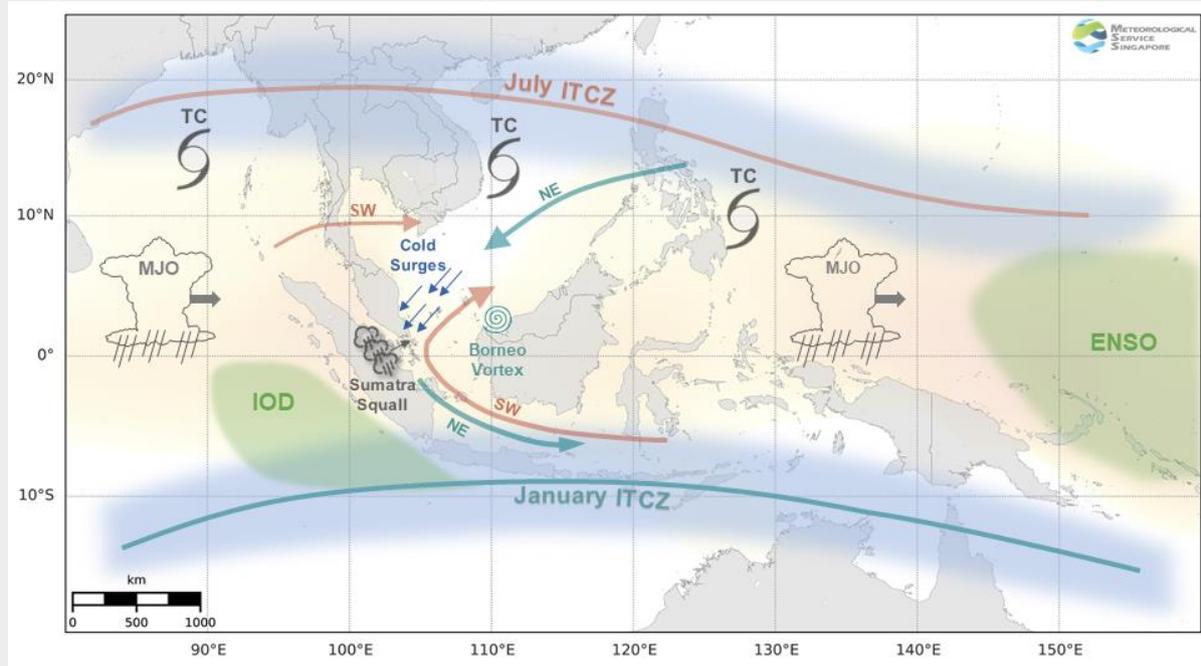
The three main rain-bearing weather systems that affect Singapore are the localised convective showers/thunderstorms, Sumatra squalls and Northeast Monsoon surges. The convective showers/thunderstorms occur throughout the year while Sumatra squalls commonly occur between April and November. The monsoon surges occur during the Northeast Monsoon season.

Sea Breeze Induced Thunderstorms: Sea breezes are winds formed as a result of temperature differences between the land and the adjoining sea. The sea breeze, carrying a large amount of moisture from the sea, blows inland during the day where the moist air mixes with the rising warm land air and, under unstable conditions, form rain clouds in the afternoon. During the Inter-monsoon periods, when winds are light, sea breezes are more common.

Sumatra Squalls: A Sumatra squall is an organised line of thunderstorms that develops over Sumatra or the Strait of Malacca, often overnight, and moves eastward to affect Peninsular Malaysia and Singapore. In a typical event, the squall line can bring about one to two hours of thundery showers. Often this happens in the predawn or morning hours. Some Sumatra squalls are also accompanied by strong wind gusts with speeds up to 80 km/h (22 m/s) which can uproot trees.

Northeast Monsoon Surges: A Northeast Monsoon surge is a surge of cold air from Central Asia. During the period December through early March, the continental northern Asia including Siberia experiences very low, cold temperatures. From time to time, this cold air surges southward from Central Asia to the South China Sea. This results in a sudden increase in northeasterly winds over the South China Sea blowing toward the warm tropics. The sea warms and moistens the overlaying air and the winds converge to bring widespread rain in the tropics. December and January are usually the wettest months of the year in Singapore. The few widespread moderate to heavy rain spells caused by surges of Northeast Monsoon winds contribute significantly to the rainfall in these months. A typical rain spell generally lasts for a few days.

Key Climate Drivers Affecting Weather and Climate



The **El Niño – Southern Oscillation (ENSO)** is the major influence on climate variability in the western tropical Pacific and Maritime Continent. It affects the year-to-year chance of droughts, extreme rainfall and floods, tropical cyclones, extreme sea levels, and coral bleaching.

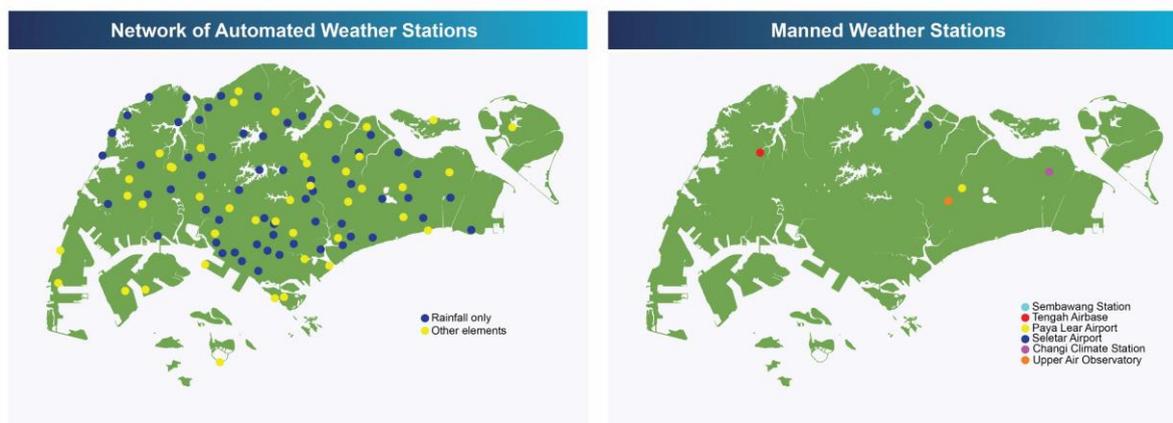
The **Intertropical Convergence Zone (ITCZ)** is a persistent east-west band of converging low-level winds, cloudiness, and rainfall stretching across the Maritime Continent into the Pacific Ocean bringing monsoonal rains. It migrates every year southward across the equator and back again, affecting most countries across the Maritime Continent.

Indian Ocean sea surface temperatures impact rainfall and temperature patterns across the Maritime Continent. Warmer than average sea surface temperatures can provide more moisture for weather systems crossing the region. Sustained changes in the difference between sea surface temperatures of the tropical western and eastern Indian Ocean are known as the **Indian Ocean Dipole (IOD)**. The IOD has three phases: neutral, positive and negative.

The **Madden-Julian Oscillation (MJO)** can be characterized as an eastward moving "pulse" of cloud and rainfall near the equator that typically takes around 30 to 60 days to circle the globe when present. Besides influencing the region's wind and bringing more rain, it can also bring periods of drier conditions associated with its dry or 'suppressed' phase.

A **Borneo Vortex** typically appears off the northwestern coast of northern Borneo. If a monsoon cold surge event coincides with a vortex, Singapore can experience enhanced rainfall as the convection strengthens over northwest Borneo and weakens north of Java. The lifetime of the vortex is typically a few days.

Tropical cyclones (TCs) typically form over large bodies of relatively warm water away from the equator. Because of the large-scale spatial extent of some TCs, they can have a remote impact on Singapore's weather.



About the Meteorological Service Singapore (MSS)

The MSS is Singapore's national authority on weather and climate. It is a pillar under the National Environment Agency (NEA).

MSS currently operates a network of five manned observation stations, one upper air observatory and around 100 automatic weather stations. Almost all the automatic weather stations measure rainfall and more than one-fifth of them measure other meteorological elements such as temperature, relative humidity, pressure, and wind. This observation network serves as the main source of climate data for this report.



The Changi Climate Station

The manned observation station at Changi is MSS's designated climate station. The climate station, first located at Outram in 1869, has moved several times over the years due to changes in local land use, before moving to its current site at Changi. The climate station serves as the reference station where its records are used for tracking the national long-term climate trends. The oldest climate station records are for monthly rainfall (starting from 1869) and temperature (starting from 1929, with a break from 1942 to 1947).

The installation of the automatic weather station network from 2009 greatly expanded the coverage of weather observations across Singapore. Prior to this, there were around 40 manual rainfall stations and just a few temperature stations in Singapore. For the purpose of analysing long-term climate trends and establishing climatological averages, only stations with continuous long-term (at least 30 years) records can be used.

Singapore is located deep within the tropics where wind and atmospheric conditions evolve rapidly. The twice daily soundings provide the main source of complete upper air information to support operations. In addition to operational purposes, the observation records from the station would also be useful for monitoring of long-term upper air conditions in the equatorial tropics, as the records extend back many decades to the 1950s.



Upper Air Observatory

Further Information

Meteorological Service Singapore: www.weather.gov.sg

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