



مركز الإحصاء
STATISTICS CENTRE

Methodology

**Climate
Statistics**

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1. Overview

1.1. Introduction

Climate statistics is one of the pioneering projects carried out by the Statistics Center Abu Dhabi.

Primary climate data in Abu Dhabi are collected by the National Agency of Meteorology and Seismology. SCAD collects and publishes these data. These data are collected at 23 monitoring stations, located around the Emirate. SCAD then calculates maximum, minimum, average, average maximum, and average minimum data for each calendar month and year. These data are released in a mixture of quarterly and annual reports.

SCAD climate data includes measures of temperature, precipitation, relative humidity, wind speed, atmospheric pressure, and solar radiation.

The methodology used to calculate these climate statistics is consistent with international best practices and recommendations in this field (see details below).

1.2. Concepts and definitions

Climate – the weather conditions prevailing in an area in general or over a long period.

Temperature – the degree or intensity of heat present in air.

Precipitation – rain, snow, sleet, or hail that falls to or condenses on the ground.

Relative Humidity – the amount of water vapour present in air expressed as a percentage of the amount needed for saturation at the same temperature.

Wind Speed – the rate at which air is moving in a particular area.

Solar Radiation – the level of electromagnetic radiation emitted by the sun.

Atmospheric Pressure – the pressure exerted by the weight of the atmosphere.

1.3. Abu Dhabi special considerations

It should be noted that Abu Dhabi is an emirate and one of 7 emirates in UAE, and data collected is limited to Abu Dhabi emirate territorial. However, since the administrative sources used for collating data pertinent to climate statistics also operate at the emirate level, this should not be a factor which compromises data quality.

1.4. Classifications and standards applied

SCAD publishes five areas of climate statistics in line with the UN Framework for the Development of Environmental Statistics (FDES) (2013)¹: Temperature, Precipitation, Relative Humidity, Wind Speed, Atmospheric Pressure, and Solar Radiation.

1.5. Available breakdown

SCAD publishes the following subcomponents of each type of climate statistic:

Temperature:

- Maximum air temperature
- Average maximum air temperature
- Average air temperature

¹ See <https://unstats.un.org/unsd/envstats/fdes.cshtml>

- Average minimum air temperature
- Minimum air temperature

Relative Humidity:

- Maximum relative humidity
- Average maximum relative humidity
- Average relative humidity
- Average minimum relative humidity
- Minimum relative humidity

Precipitation:

- Maximum rainy days
- Total rainfall

Wind Speed:

- Maximum wind speed
- Average maximum wind speed
- Average wind speed

Solar Radiation:

- Maximum daily total solar radiation
- Average daily total solar radiation
- Minimum daily total solar radiation

Atmospheric Pressure:

- Average monthly atmospheric pressure

These statistics are reported on a monthly and quarterly basis. Atmospheric pressure statistics are released annually.

1.6. Importance and objectives of the indicator

Statistics on general physical climate conditions are important, as they help determine the scope of and influences on the environmental resources of a country. Without information on these baseline conditions, it is difficult for governments to judge the need for and efficacy of policies.

2. Indicator information

2.1. Geographical coverage

SCAD releases average data on the main climate measures for the Emirate as a whole, and for four subregions: Abu Dhabi, Al-Ain, Al-Dhafra, and The Islands. The primary data is collected from 23 weather monitoring stations, spread across the Emirate.

2.2. Statistical population

The primary data is collected from 23 weather monitoring stations, spread across the Emirate.

2.3. Periodicity

Monthly SCAD climate statistics for the Emirate as a whole are released every quarter. The SCAD Statistical Yearbook also contains monthly climate data for the four subregions: Abu Dhabi, Al-Ain, Al-Dhafra, and The Islands. Long-term climate data are also released in the annual Climate Change Statistics report.

2.4. Timeliness

SCAD publishes quarterly climate statistics within two months of the end of the relevant quarter.

2.5. Units

A number of different units are used for different climate statistics:

- **Temperature:** degrees Celsius.
- **Relative Humidity:** the water vapor content of air as a percentage of theoretically possible water vapor content at the given temperature.
- **Precipitation:** millimeters of rainfall.
- **Wind speed:** knots.
- **Solar radiation:** watt-hours per square meter.
- **Atmospheric pressure:** millibars, also known as hectopascals.

2.6. Reference period

The reference period for climate statistics is each calendar month.

3. Methodology

3.1. Alignment to international standards

SCAD publishes climate data in line with Tier 2 of the standards set out in FDES (2013).

3.2. Data sources

SCAD receives raw climate data from the National Centre for Meteorology and Seismology, and is therefore not responsible for the primary collection methodology.

3.2.1 Survey data

The climate data is based on administrative data only.

3.2.2 Administrative data

Climate data is received from the National Centre for Meteorology and Seismology.

3.3. Data validation and editing

3.3.1 Data validation

Data editing allows for the identification of missing data. Missing data might be corrected by contacting the respondent or administrative data supplier once again, carrying forward the last observation in time-series studies, replacing the missing value with a set of plausible values or estimating the missing data based on parameters which have already been estimated. Any suggested amendments are checked after the data is entered and a list of data error indicators is produced to assess the level of accuracy of the data and to drive continued improvements in data accuracy.

The Statistical Data Quality Framework for Abu Dhabi outlines the quality standards which SCAD is committed to achieve, whether the source of such data is statistical surveys or administrative records. The framework seeks to create a unified understanding of statistical quality for all entities in the Statistical System in the Emirate of Abu Dhabi (SSAD), which will enable these entities to prepare consistent mechanisms and procedures in order to monitor, evaluate and develop the statistical quality of its administrative data.

Furthermore, the Manual of Statistical Quality Standards and Procedures for Administrative Records presents key standards and procedures to ensure the statistical quality of administrative records data. The manual, which is consistent with adopted international and local standards, outlines and describes the following quality dimensions: 1) organizational structure; 2) relevance; 3) clarity of administrative records preparation methodology; 4) accuracy; 5) coherence and consistency; 6) accessibility; and 7) timeliness, periodicity and punctuality.

3.3.2 Missing data adjustments

Quality adjustments and treatment of missing data is not applied to the data collected from the National Centre for Meteorology and Seismology.

3.4. Data processing

NCMS reports climate data from twenty-three monitoring stations in the Emirate, and average figures for the Emirate as a whole.

SCAD then releases average, maximum, and minimum data on the main climate measures for the Emirate as a whole, and for four subregions: Abu Dhabi, Al-Ain, Al-Dhafra, and The Islands.

- **Maximum air temperature** is the highest value of air temperature measured in the Emirate in the reference period.

- **Average maximum air temperature** is the arithmetic mean average of the maximum air temperatures measured each day over the reference period. In a month, this is the sum of the maximum temperature values observed in each day, divided by the number of days in the month.
- **Average air temperature** is the arithmetic mean average temperature observed across the entire reference period. This is the sum of all temperature observations in the period, divided by the number of temperature observations in the period.
- **Minimum air temperature** is the lowest value of air temperature measured in the Emirate in the reference period.
- **Average minimum air temperature** is the arithmetic mean average of the minimum air temperatures measured each day over the reference period. In a month, this is the sum of the minimum temperature values observed in each day, divided by the number of days in the month.
- **Maximum relative humidity** is the highest value of relative humidity measured in the Emirate in the reference period.
- **Average maximum relative humidity** is the arithmetic mean average of the maximum relative humidity values measured each day over the reference period. In a month, this is the sum of the maximum relative humidity values observed in each day, divided by the number of days in the month.
- **Average relative humidity** is the arithmetic mean average relative humidity observed across the entire reference period. This is the sum of all relative humidity observations in the period, divided by the number of relative humidity observations in the period.
- **Minimum relative humidity** is the lowest value of relative humidity measured in the Emirate in the reference period.
- **Average minimum relative humidity** is the arithmetic mean average of the minimum relative humidity values measured each day over the reference period. In a month, this is the sum of the minimum relative humidity values observed in each day, divided by the number of days in the month.
- **Maximum daily rainfall** is the maximum amount of daily rainfall observed by a given station in the month.
- **Total rainfall** is the total amount of rain that falls during the reference period.
- **Maximum wind speed** is the highest value of wind speed measured in the Emirate in the reference period.
- **Average maximum wind speed** is the arithmetic mean average of the maximum wind speeds measured each day over the reference period. In a month, this is the sum of the maximum wind speed values observed in each day, divided by the number of days in the month.
- **Average wind speed** is the arithmetic mean average wind speed observed across the entire reference period. This is the sum of all wind speed observations in the period, divided by the number of wind speed observations in the period.
- **Maximum solar radiation** is the highest level of solar radiation measured in the Emirate in the reference period.

- **Average solar radiation** is the arithmetic mean average level of solar radiation observed across the entire reference period. This is the sum of all solar radiation observations in the period, divided by the number of solar radiation observations in the period.
- **Minimum solar radiation** is the lowest level of solar radiation measured in the Emirate in the reference period.
- **Average atmospheric pressure** is the arithmetic mean level of atmospheric pressure observed across the reference period. It is equal to the sum of all atmospheric pressure measurements taken in the month, divided by the number of observations.

3.4.1. Linking different datasets

Linking different datasets is not applicable to this publication.

3.4.2. Sample weighting

Weighting is not applicable to the production of climate statistics.

3.4.3. Statistical calculation method

The main indicators to be calculated:

- **Annual average air temperature:** Average air temperature is the arithmetic mean average temperature observed across the entire reference period. This is the sum of all temperature observations in the period, divided by the number of temperature observations in the period.
- **Annual average minimum air temperature:** Average maximum air temperature is the arithmetic mean average of the maximum air temperatures measured each day over the reference period.
- **Absolute maximum air temperature by region:** Maximum air temperature is the highest value of air temperature measured in the Emirate in the reference period.
- **Annual average rainfall:** Sum of all rainfall observations in the reference period, divided by the number of rainfall observations in the reference period in each region.
- **Monthly total rainfall by region:** Monthly total rainfall is the total amount of rain that falls during a specific month.
- **Annual Heaviest fall in one day:** Heaviest quantity of daily rainfall observed by a given station over the reference period.

3.4.4. Seasonal adjustment

Seasonally adjusted estimates are not produced for this publication.

3.4.5. Chain linking

Chain linking is not applied to this production.

4. Special cases

The climate statistics do not present special cases of indicators.

5. Outputs and quality

5.1 Dissemination and accessibility

Data are disseminated in SCAD official website and available in Excel and PDF on annual basis.

5.2. Length of available dataset

SCAD climate statistics are available back to 2010.

5.3. Methodology changes

SCAD began releasing quarterly updates to climate statistics in 2019.

5.4. Data coherence and comparability

Since climate data is reported in standard units, SCAD data is directly comparable with other regions, and within regions of the Emirate.

5.5. Data accuracy and potential sources of errors

SCAD do not collect the primary data for climate statistics in Abu Dhabi. Whilst the possibility for error exists in calculating averages, it is minimal.

5.6. Revision policy

Climate statistics are prepared on a Quarterly and annual basis, after two month of reference quarter end and in in the second quarter of the calendar year following the data reference period for annual data. The published climate statistics are final and are not subject to future reviews as a result of any new data that becomes available. If an error is discovered, there are procedures that were previously established with the Project Management Office to remove/amend the published error. These procedures are in line with the policy of the Statistics Centre - Abu Dhabi. Thus, the following year's report will contain amendments.

5.7. Limitations of dataset

It should be noted that the context of each monitoring station heavily impacts on climate at that location. For example, wind speed is considerably higher in areas of high elevation. Coordinates of the weather monitoring stations in the Emirate of Abu Dhabi can be found on National Centre of Meteorology and Seismology.

6. Institutional environment

Statistics Centre – Abu Dhabi (SCAD), as the competent government entity in charge of organizing statistical activities in the emirate, plays a pivotal role in supporting decision-makers, and policymakers in Abu Dhabi. The statistical activities in the emirate are organized by SCAD, with its strategic partners in the Statistical System of Abu Dhabi. It was established promulgated under a decree by HH Sheikh Khalifa bin Zayed Al Nahyan (may Allah have mercy upon him). The Law entrusts SCAD with the task of developing and organizing statistical in Abu Dhabi Emirate.

7. Glossary

Climate Change:

A change in climate conditions that can be determined using statistical tests of changes in the average values and / or the variations in the climate characteristics over an extended period, typically decades or longer. Climate change may be due to natural internal processes or external factors, or to persistent anthropogenic changes in the composition of the atmosphere or in land use, as well as due to Climate variability.

Climate:

Climate is the condition of the weather at a particular location or region over a long period of time that can be a month, a year, a season, or several years. It is the long-term conditions in the atmosphere resulting from the elements, such as temperature, solar radiation, humidity, rainfall, atmospheric pressure, wind speed and direction, and their variations.

Absolute Maximum Temperature:

Highest air temperature recorded during a specific month, measured in (°C).

Absolute Minimum Temperature:

Lowest air temperature recorded during a specific month, measured in (°C).

Mean Maximum Daily Temperature for a Month:

Average daily highest air temperature recorded daily during a specific month, measured in (°C).

Mean Minimum Daily Temperature for a Month: Average daily lowest air temperature recorded daily during a specific month, measured in (°C).

Mean Daily Temperature:

Average air temperature over the course of 24 hours, as recorded during consecutive equivalent periods, measured in (°C).

Mean Maximum Monthly Temperature:

Average monthly highest air temperature recorded during a specific month, throughout a specific number of years.

Mean Minimum Monthly Temperature:

Average monthly lowest air temperature recorded during a specific month, throughout a specific number of years, measured in (°C).

Precipitation:

Rainfall quantity recorded over the course of 24 hours, measured in (millimeters).

Maximum Relative Humidity:

Highest relative humidity recorded during a specific month, measured in (percentage).

Mean Maximum Relative Humidity:

Average daily highest relative humidity recorded daily during a specific month.

Mean Minimum Relative Humidity:

Average daily lowest relative humidity recorded daily during a specific month, measured in (percentage).

Mean Atmospheric Pressure:

Average atmospheric pressure, as adjusted as per the sea level, recorded over the course of 24 hours, during consecutive equivalent periods, measured in (hectopascal).

Mean Maximum Atmospheric Pressure:

Highest atmospheric pressure recorded daily, throughout a specific month (as adjusted as per the sea level), measured in (hectopascal).

Mean Minimum Atmospheric Pressure:

Lowest atmospheric pressure recorded daily, throughout a specific month (as adjusted as per the sea level), measured in (hectopascal).

Wind Velocity:

Wind flow speed over the earth surface, being the vertical movement of such flow, measured as of 10 meters above the surface upon using an anemometer, measured in (knots).

Mean Total Daily Sunshine Hours:

Average total for the periods of time during which peak sun hours are recorded in a manner that would be sufficient for casting shadows, measured in (hours).

Maximum Total Daily Sunshine Hours:

Highest total for the periods of time during which peak sun hours are recorded in a manner that would be sufficient for casting shadows, measured in (hours).

Mean Total Daily Solar Radiation:

Average daily total of global solar radiation time for a specific period, measured in (Watt.h/m²).

Maximum Wind Speed:

Highest wind speed measured in an open space over the course of 10 minutes, at a height of 10 meters above the surface.

Fog:

Invisible tiny liquid water droplets suspended in the air that may impact horizontal visibility when dropping to less than 1 kilometer above the surface.

Thunderstorm:

Sudden electrical discharges, featuring lightning and thunder, associated with cumulonimbus clouds, and often accompanied by precipitation.

Dust Storm / Sandstorm:

Particles of dust or sand lifted to high altitudes by a strong and turbulent wind. Dust storms and sandstorms impact horizontal visibility.



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