



# UNITED ARAB EMIRATES (UAE) Climate Fact Sheet

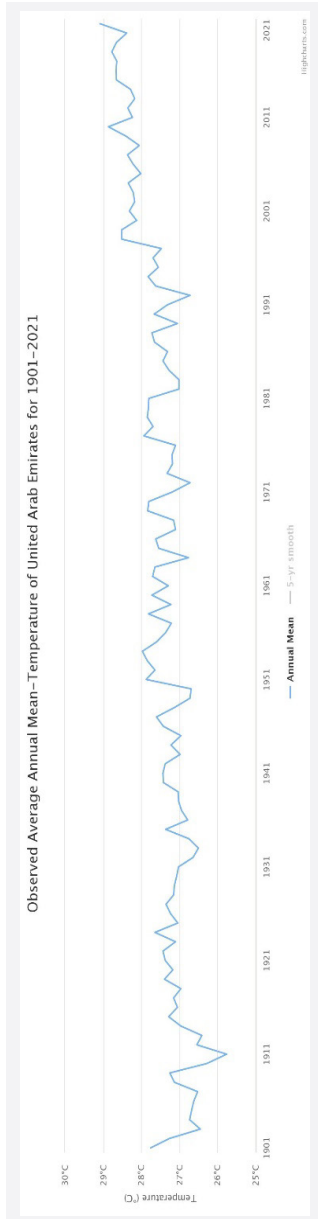
# United Arab Emirates (UAE) Climate Fact Sheet

## I- GENERAL CLIMATE OVERVIEW

The UAE has an arid desert climate with only two main seasons, winter and summer separated by two transitional periods, respectively. The winter season (December to March) has a mean temperature ranging from 16.4°C to 24°C. The first transitional period (April to May) is distinguished by variability and rapid change in weather. Temperatures start to increase gradually over most regions during this period. The mean temperature during this season ranges from 26°C to 33.5°C. The summer season (June to September) is characterized by extremely high temperature which can be expected to climb up to 50°C, especially over the southern parts. Mean temperature during this season ranges from 32°C to 37.2°C. Summer rainfalls tend to be lower, particularly along the coastal areas, away from the mountains. The second transitional period (October to November) has a mean temperature ranging from 24°C to 30°C. Rainfall is sparse and inconsistent in the UAE. The country averages between 140 – 200 mm of rainfall per year, with some mountainous areas experiencing up to 350 mm/year. The UAE is also prone to occasional, violent dust storms, locally known as shamal winds (WB CCKP, 2021).

## II- CLIMATE CHANGE TRENDS

The ND-GAIN Country Index summarizes a country's vulnerability(1) to climate change and other global challenges in combination with its readiness(2) to improve resilience. UAE's ND-GAIN Index rank is 31. It is the 143rd most vulnerable country and the 29th most ready country. The low vulnerability score and high readiness score of United Arab Emirates places it in the lower-right quadrant of the ND-GAIN Matrix, which means that adaptation challenges still exist, but United Arab Emirates is well positioned to adapt (University of Notre Dame, 2023).



**Figure-1:** Observed Average Annual Mean Temperature (1901-2021) (WB CCKP, 2021)

1 Vulnerability measures a country's exposure, sensitivity, and ability to adapt to the negative impact of climate change. ND-GAIN measures the overall vulnerability by considering vulnerability in six life-supporting sectors - food, water, health, ecosystem service, human habitat, and infrastructure.

2 Readiness measures a country's ability to leverage investments and convert them to adaptation actions. ND-GAIN measures overall readiness by considering three components - economic readiness, governance readiness and social readiness.

## From Past to Present:

The average annual mean temperature in the UAE for the year 1901 was 27.75 °C. This number increased to reach 29.08 °C in 2021 (+ 1.33 °C) (figure 1).

## Projected:



- Temperature:** While mean temperature for the reference period 1995-2014 was between 27.18 and 27.87 °C, it is expected to increase and reach 29.81 °C by mid-century under a high-emission scenario(3), and 33.80 °C by the end of the century under a high-emission scenario (figure 2, Top). In addition, the number of hot days where the maximum temperature (Tmax) is greater than 35 °C is expected to rise from 179.08 days (2014 reference) to reach 197.69 days by mid-century and 237.46 days by end of century under a high-emission scenario (figure 2, Bottom).



- Precipitation:** While the average precipitation for the reference period 2014 was 30.20 mm, it is projected to increase by mid-century under a high-emissions scenario to reach 44.19 mm and by end of century under a high-emissions scenario to reach 54.06 mm (figure 3).

## III- CLIMATE CHANGE IMPACTS

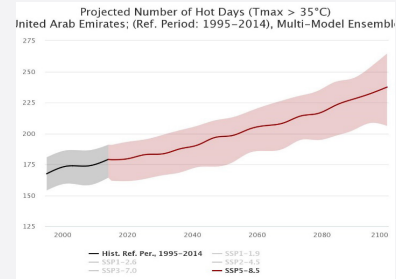
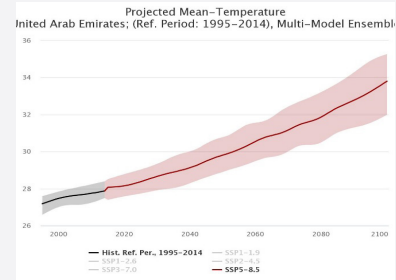


### a- Natural Hazards

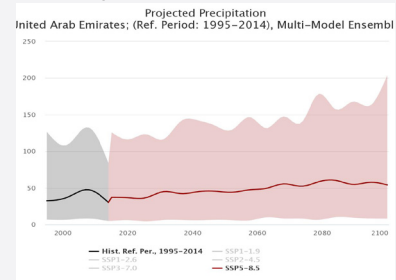
Figure 4 summarizes the risk level of natural hazards in UAE. It shows that the country has a high risk of coastal floods, extreme heat, and water scarcity that will increase due to climate change.

An example of such hazards is the December 2017 flash flood that was caused by heavy rains in the UAE, where dozens of people were evacuated from homes in Fujairah, Al Ain and Khor Fakkan (Davies, 2017).

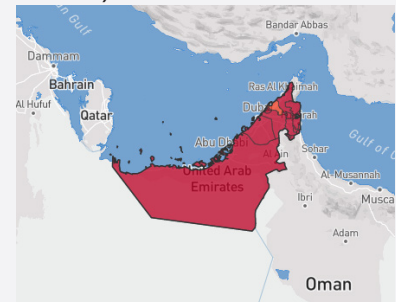
Figure 5 shows that under a high-emissions scenario, sea level rise is projected to increase and reach 0.21 m by mid-century and 0.59 m by the end of the century.



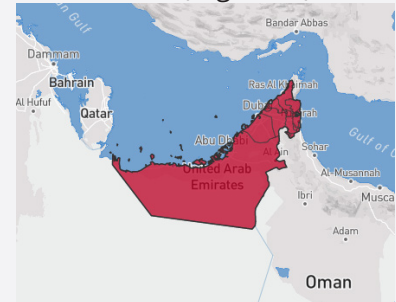
**Figure-2:** Projected Mean Temperature (Top) and Projected Number of Hot Days [Tmax greater than 35 °C] (Bottom) (WB CCKP, 2021)



**Figure-3:** Projected Precipitation (WB CCKP, 2021)



coastal flood (High Risk)



water scarcity (High Risk)

3 SSP5\RCP8.5-The highest baseline emissions scenario in which emissions continue to rise throughout the twenty-first century, depicting a world of rapid and unconstrained growth in economic output and energy use.

Coastal cities in the UAE are likely to be at increasing risk from sea level rise and associated flooding, which would inundate about 8.1% of the Emirate of Ajman, 1.2% of the Emirate of Sharjah and 5.9% of the Emirate of Umm Al-Quwain (EWS-WWF & Acclimatise, 2017). It is worth noting that 85% of the UAE population live in coastal areas which will be at risk of flooding, along with more than 90% of the nation’s infrastructure including tourist resorts, ports, and mega construction projects (Melville-Rea et al., 2021).

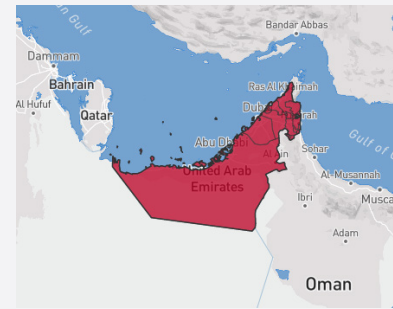
## b- Water

There are three main sources of fresh water in the UAE: groundwater, desalinated water and treated wastewater. The booming economy and industrial development in the country have increased water demand over the last few decades, which has largely been met by desalination (EWS-WWF & Acclimatise, 2017). The UAE’s groundwater resources could be exhausted as early as in 2030. In the UAE and the region, the direct effect of climate change on groundwater resources depends upon the change in the volume and distribution of groundwater recharge from rainfall events. Climate change would not only affect groundwater quantity but also its quality. Sea level rise is likely to lead to saltwater intrusion into coastal aquifers, affecting groundwater quality. Once saltwater has intruded into the fresh groundwater system, it is difficult to remedy groundwater. In the UAE, the coastal aquifers that have freshwater resources, including Fujairah and Ras Al Khaimah, could be affected (UAE MOCCA, 2021).

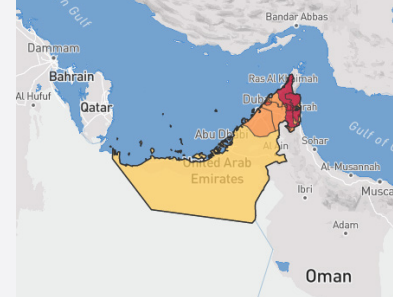
Figure 6 represents the projected annual Standardized Precipitation Evapotranspiration Index (SPEI)(4) in UAE. The projected maximum annual SPEI drought index under a high-emissions scenario will score a value of -1.87 by 2050 and will reach -2.53 by the end of the century. Such negative values imply an increasing high pressure on water resources which could lead to water scarcity. A consequence of water scarcity could be a decline in agricultural productivity especially for crops that need irrigation. Other consequences include inadequate sanitation which can lead to deadly diarrheal diseases and other water-borne illnesses (WWF, 2023).

## c- Agriculture

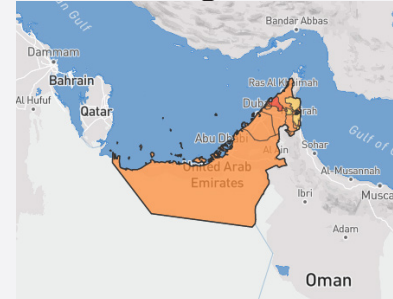
In the UAE, unfavorable climatic conditions, scarcity of water, and soils with poor water and nutrient holding capacity are obstacles to traditional agriculture and food production. Arable land is limited, and local



extreme heat (High Risk)



landslide (High Risk)



river flood (Medium Risk)



urban flood (Low Risk)



wildfire (Very Low Risk)

**Figure-4:** Climate-Related Natural Hazards Risk Level (ThinkHazard, 2020)

4 An index which represents the measure of the given water deficit in a specific location, accounting for contributions of temperature-dependent evapotranspiration and providing insight into increasing or decreasing pressure on water resources. Negative values for SPEI represent dry conditions, with values below -2 indicating severe drought conditions, likewise positive values indicate increased wet conditions.

agriculture largely relies on the use of non-renewable groundwater for irrigation. Changes in climatic conditions will impact prevalent agricultural methods and production. Increase in temperatures and reduced overall rainfall in the region will likely hold adverse consequences for open-field agriculture. These impacts on traditional agriculture and arable land underline the importance of agricultural technology and innovation not only in optimizing production and yield from traditional farming but also in the advancement of alternative agriculture methods, such as hydroponics, in addition to diversification of sources of food imports (UAE MOCCA, 2021). In fact, the UAE imports 85% of the food it consumes. In 2020 for instance, the country imported \$24 billion of agriculture, fisheries, and forestry (AFF) products (Australian Government, 2022).

## d- Energy

Figure 7 (Top) shows that electricity consumption in UAE increased from 1990 (15.54 TWh) to 2019 (131.43 TWh). This rise in consumption also increased the total CO2 emissions from the energy sector by 243.28 % from 1990 to 2019 (figure 7, Bottom). It is expected that electricity consumption will keep on augmenting especially with the expected increase in the warm spell duration index(5) until the end of the century under a high emission scenario (figure 8).

**Renewable Energy:** It is expected that the UAE’s renewables sector will register robust growth over the coming decade with capacity growing at an annual average of 16.7% between 2021 and 2030 to account for 11.3% of the power mix by 2030. The country is also looking to revisit its energy strategy with increased focus on solar energy and green hydrogen over the coming decade. Several milestones that depict the energy transition efforts done by the UAE are as follows (International Trade Administration, 2021):

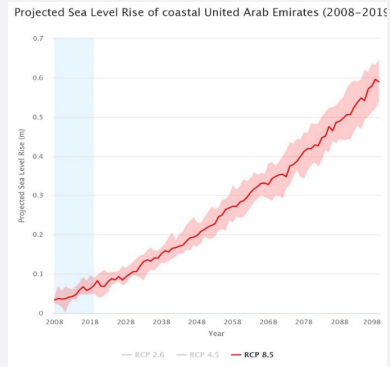
the establishment in 2006 of the Abu Dhabi Future Energy Company “Masdar” and the first carbon-neutral zero waste city “Masdar City”

the hosting of the annual World Future Energy Summit in Abu Dhabi since 2008

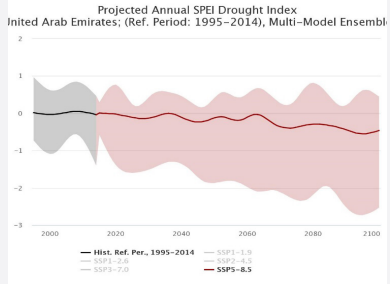
the establishment of the Emirates Nuclear Energy Corporation (ENEC) in 2009

the International Renewable Energy (IRENA)’s designation of Abu Dhabi as its headquarters in 2009 and IRENA’s relocation on the edge of Masdar City campus in 2015

the development of strategic mega solar projects and its climate change action efforts culminating in the signing of the Paris agreement in 2016

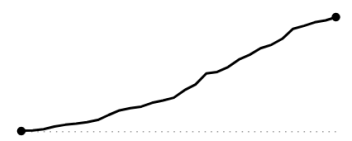


**Figure-5:** Projected Sea Level Rise of Coastal UAE (WB CCKP, 2021)



**Figure-6:** Projected Annual SPEI Drought Index (WB CCKP, 2021)

Electricity final consumption  
TWh



**131.43**

↑ 745.75% from 1990

Total CO2 emissions  
Mt of CO2



**177.99**

↑ 243.28% from 1990

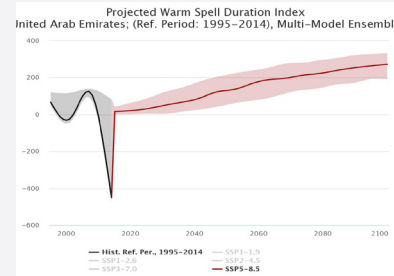
**Figure-7:** Electricity Final Consumption (Top) and Total CO2 Emissions (Bottom) (IEA, 2019)

<sup>5</sup> An index that depicts periods characterised by several days of very warm temperatures compared to local or regional averages.

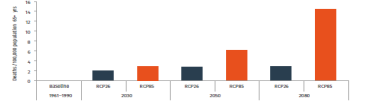
Climate change is expected to increase mean annual temperature and the intensity and frequency of heatwaves resulting in a greater number of people at risk of heat-related medical conditions. Heatwaves can pose a particular threat to human, animal and even plant health, resulting in loss of life, livelihoods, socioeconomic output, reduced labour productivity, rising demand for and cost of cooling options, as well as contribute to the deterioration of environmental determinants of health (air quality, soil, water supply). Particularly vulnerable groups include elderly people, children, individuals with pre-existing conditions like diabetes, and individuals who are socially isolated. Figure 9 shows that under a high emissions scenario, heat-related death in elderly people (65+ years) in the UAE is projected to increase to about 15 deaths per 100 000 by 2080 compared to the estimated baseline of nearly zero deaths per 100 000 annually between 1961 and 1990. A rapid reduction in emissions could limit heat-related deaths in elderly people to just under 3 deaths per 100 000 in 2080. In addition, many of the drivers of climate change, such as inefficient and polluting forms of energy and transport systems, contribute to air pollution. Air pollution is now one of the largest global health risks, causing approximately seven million deaths every year. In 2017, all UAE cities for which data has been reported, had annual mean PM2.5 levels above the WHO guideline value of 10 µg/m<sup>3</sup>, and the number of reported deaths in 2016 caused by air pollution scored 1 432 deaths (WHO, 2019).

## IV- CLIMATE CHANGE RESPONSE: NATIONAL AND INTERATIONAL

- The UAE announced the launch of the UAE Net Zero by 2050 Strategic Initiative in 2021, embarking on a path towards net-zero emissions by 2050. Earlier, in 2017, the UAE adopted the National Climate Change Plan 2017-2050, laying down a framework for management of GHG emissions, climate change adaptation, and private sector-driven innovative economic diversification. The UAE also launched the National Climate Change Adaptation Program that identifies sectoral risks and defines action plans for strengthening climate resilience. Climate and energy security considerations have also led to the adoption of the National Energy Strategy 2050 which sets targets which are underpinned by the UAE Green Agenda 2015-2030 that enables the public and private sectors to translate a shared vision of a competitive and sustainable economy into reality. The UAE Council on Climate Change and Environment, an inter-ministerial, inter-emirate governance body, ensures alignment across federal



**Figure-8:** Projected Warm Spell Duration Index (WB CCKP, 2021)



**Figure-9:** Heat-Related Death in Elderly People (65+ years) (WHO, 2019)

and emirate-level policies and interventions. At the federal level, the UAE Ministry of Climate Change and Environment (MOCCA) and the UAE Ministry of Energy and Infrastructure (MOEI) are the two key entities engaged in the execution of climate and sustainable energy plans (UAE Updated Second NDC, 2022).

• **National** laws and policies (UAE, 2022):

The UAE Federal Law No. 24 of 1999 on the Protection and Development of the Environment prohibits the following:

1. Any intentional disposal of pollutants or wastes from ships, aircraft, or any other means into the marine environment
2. Any deliberate dumping from ships or industrial installations or other means into the marine environment.

In addition, Federal Law No. 23 of 1999 and its Ministerial Decree No. 302 of 2001 were issued to address exploitation, conservation, and development of living aquatic resources in the UAE.

→ The different international documents submitted as part of the UNFCCC are seen in table 1:

**Table 1:** Timeline of UNFCCC Document Submission (ClimateWatch, 2022)

Date	Document Submitted
2007	First National Communication
2010	Second National Communication
2013	Third National Communication
2015	INDC
2016	First NDC
2019	Fourth National Communication
2020	Second NDC
2022	*Updated Second NDC

\* In this updated NDC, the UAE is raising its 2030 target with greater ambition – 31% compared to business as usual (BAU) for the year 2030. The country has also announced its intention to achieve net-zero emissions by 2050.

UAE is going to host the 28th session of the Conference of Parties (COP 28) to the UNFCCC from November 30, 2023, to December 12, 2023. The country will be the second in the Middle East to host a COP session after Egypt, a decision made by the UNFCCC after UAE received unanimous support from the Asia-Pacific group at COP 26 in Glasgow, Scotland in

2021. COP 28 in the UAE reflects the government's effort for over three decades in the transition to clean and renewable energy sources along with technological advancements and climate-smart solutions. The conference will mainly focus on the economic case for inclusive climate action, with participation from more than 80,000 delegates, including 140 heads of state and government, and more than 5,000 media professionals. Dubai Expo City will serve as the venue as both COP 28 and Expo 2020 Dubai aim at achieving sustainability and encouraging global cooperation to address global issues (Global Media Insight, 2022).



## V- REFERENCES

- Australian Government. (2022). Retrieved from [https://www.agriculture.gov.au/sites/default/files/documents/march\\_2022\\_-\\_united\\_arab\\_emirates\\_food\\_and\\_agriculture\\_snapshot.pdf](https://www.agriculture.gov.au/sites/default/files/documents/march_2022_-_united_arab_emirates_food_and_agriculture_snapshot.pdf)
- ClimateWatch. (2022). Retrieved from <https://www.climatewatchdata.org/countries/ARE>
- Davies, R. (2017). Oman and UAE – Deadly Floods Hit After Torrential Rain. Retrieved from <https://floodlist.com/asia/oman-uae-floods-december-2017>
- EWS-WWF & Acclimatise. (2017). UAE Climate Change Risks & Resilience: An overview of climate change risks to 12 key sectors. Retrieved from [https://preparecenter.org/wp-content/sites/default/files/uae\\_climate\\_change\\_risk\\_and\\_resilience.pdf](https://preparecenter.org/wp-content/sites/default/files/uae_climate_change_risk_and_resilience.pdf)
- Global Media Insight. (2022). UNFCCC COP 28 – The Global Climate Summit in UAE. Retrieved from <https://www.globalmediainsight.com/blog/cop28-global-climate-summit-uae/>
- IEA. (2019). Retrieved from <https://www.iea.org/countries/united-arab-emirates>
- International Trade Administration. (2021). Retrieved from <https://www.trade.gov/energy-resource-guide-united-arab-emirates-renewable-energy>
- Melville-Rea et al. (2021). A Roadmap for Policy-Relevant Sea-Level Rise Research in the United Arab Emirates. *Frontiers in Marine Science*, 8, 670089.
- ThinkHazard. (2020). Retrieved from <https://thinkhazard.org/en/report/255-united-arab-emirates>
- UAE. (2022). Retrieved from <https://u.ae/en/information-and-services/environment-and-energy/environmental-protection#:~:text=The%20UAE%20Federal%20Law%20No,means%20into%20the%20marine%20environment>
- UAE MOCCA. (2021). The UAE State of Climate Report: A Review of the Arabian Gulf Region's Changing Climate & Its Impacts.
- UAE Updated Second NDC. (2022). Retrieved from <https://unfccc.int/sites/default/files/NDC/2022-09/UpdateNDC-EN-2022.pdf>
- University of Notre Dame. (2023). Retrieved from <https://gain.nd.edu/our-work/country-index/rankings/>
- WHO. (2019). Retrieved from <https://www.who.int/publications/i/item/health-and-climate-change-country-profile-2019-united-arab-emirates>
- World Bank Climate Change Knowledge Portal (WB CCKP). (2021). Retrieved from <https://climateknowledgeportal.worldbank.org/country/united-arab-emirates>
- WWF. (2023). Water scarcity. Retrieved from <https://www.worldwildlife.org/threats/water-scarcity#:~:text=When%20waters%20run%20dry%2C%20people,and%20other%20water%2Dborne%20illnesses>

