Mohamed Alkhyeli

Instructor Name

ISB 201, Section 004

3 December 2025

How Climate Change Affects Abu Dhabi, United Arab Emirates

I selected Abu Dhabi, UAE, because it is my birthplace and holds personal significance. Abu Dhabi sits directly on the Arabian Gulf, and most of its population and infrastructure lie at or near sea level. This makes the city extremely vulnerable to climate-driven changes in temperature, precipitation, sea level, and natural hazards. According to the Environment Agency–Abu Dhabi, rising temperatures, shifting rainfall patterns, and sea-level rise pose serious long-term risks to the Emirate (Environment Agency–Abu Dhabi, Climate Change Strategy).

Precipitation: Past and Projected Changes

Abu Dhabi receives less than 100 mm of precipitation annually, typical of a dry desert climate. Recent studies show rainfall patterns becoming more unpredictable, with extended droughts followed by intense storms (Government of UAE, Climate Change in the UAE). In April 2024, Al Ain recorded about 254 mm of rain within 24 hours—the highest total in 75 years—resulting in widespread flash flooding (Khaleej Times, "UAE: Number of Stormy Days Has Increased").

Short Term (Next 50 Years):

Climate models project that although annual rainfall totals may remain low, individual storms will become more powerful because warmer air holds more moisture (Climate Analytics, "Heavy Precipitation Threat"). This increases the likelihood of severe flash floods, especially since Abu Dhabi's landscape lacks natural drainage.

Long Term (50–100 Years):

By the end of the century, rainfall is expected to become even more variable, with longer drought periods and stronger storm events (Government of UAE, Climate Change in the UAE). Such variability will place additional stress on infrastructure, water supplies, and public safety.

Temperature: Past and Projected Changes

The UAE is one of the hottest regions in the world, and temperatures have steadily increased, producing more extreme heat days and stronger summer heat waves (Meteoblue, Climate Change Abu Dhabi). World Bank climate projections confirm that warming will continue throughout this century.

Short Term (Next 50 Years):

Average temperatures in Abu Dhabi are expected to rise by 1.5–2.5°C, leading to many more days reaching 40–45°C, especially when humidity intensifies the heat index along the coast (World Bank, Climate Change Knowledge Portal).

Long Term (50–100 Years):

By 2100, the Middle East is projected to experience some of the most dangerous heat stress conditions globally. Abu Dhabi will likely face longer heat waves, hotter nights, and increased strain on electricity demand and outdoor workers (Government of UAE, Climate Change in the UAE).

Sea-Level Rise

Sea-level rise is a major concern because 85% of Abu Dhabi's population and 90% of its infrastructure are located along the coast (Environment Agency–Abu Dhabi, Climate Change Strategy). Projections estimate a rise of 0.5–0.65 m by 2100. Even a 0.5 m increase could inundate 1.46% of developed land, while a 1.5 m rise could flood approximately 9.45%, impacting neighborhoods, roads, and coastal facilities (Earth.org, "Sea Level Rise Risk for Abu Dhabi"). Additional risks include saltwater intrusion into groundwater and accelerated coastal erosion (Government of UAE, Climate Change in the UAE).

Natural Hazards: Flooding, Storms, Heat, and Drought

Climate change intensifies several natural hazards that affect Abu Dhabi:

– Extreme Heat: Longer, hotter heat waves pose risks to public health, energy systems, and outdoor laborers (Government of UAE, Climate Change in the UAE).

– Storms & Flash Floods: Storm frequency has increased since 2000, demonstrated by the historic 2024 rainfall event (Khaleej Times, "UAE: Number of Stormy Days Has Increased").

– Drought & Water Stress: Higher temperatures increase evaporation, worsening water scarcity in an already arid region (Government of UAE, Climate Change in the UAE).

– Coastal Hazards: Rising seas and stronger storm surges threaten beaches, mangroves, ports, and shoreline infrastructure (Environment Agency–Abu Dhabi, Climate Change Strategy).

Adaptation Strategy: Mangroves and Climate-Resilient Planning

A key adaptation strategy is the expansion and restoration of mangrove forests combined with climate-resilient urban planning. The Abu Dhabi Climate Change Strategy highlights mangroves as a nature-based solution that reduces wave energy, stabilizes sediment, protects against storm surges, and stores carbon—helping cool coastal environments (Environment Agency–Abu Dhabi, Climate Change Strategy). Mangroves also support biodiversity and strengthen coastal ecosystems. Additional adaptation measures include stricter zoning for high-risk areas, improved drainage systems, and reinforcement of critical infrastructure to increase the city's resilience.

Works Cited

Climate Analytics. Heavy Precipitation Hitting Vulnerable Communities in the UAE and Oman Becoming an Increasing Threat as the Climate Warms. Climate Analytics, 2024, https://climateanalytics.org/briefings/heavy-precipitation-uae-oman-climate-change/.

Earth.org. Sea Level Rise 2100 Map—Abu Dhabi. Earth.org, 2023, https://earth.org/sea-level-rise-2100-map/.

Environment Agency – Abu Dhabi. Climate Change Strategy in the Emirate of Abu Dhabi 2023–2027. Environment Agency – Abu Dhabi, 2023, https://www.ead.gov.ae/-/media/Project/EAD/EAD/Documents/Climate-Change-Strategy-in-The-Emirate-of-Abu-Dhabi.pdf.

Government of the United Arab Emirates. “Climate Change.” UAE Government Portal, 2024, https://u.ae/en/information-and-services/environment-and-energy/climate-change.

Khaleej Times. “UAE: Number of Stormy Days Has Increased Over the Years, Says Climate Study.” Khaleej Times, 28 Nov. 2024, https://www.khaleejtimes.com/uae/environment/uae-number-of-stormy-days-has-increased-over-the-years-says-climate-study.

Meteoblue. Climate Change Abu Dhabi. Meteoblue, 2025, https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/abu-dhabi_united-arab-emirates_292968.

World Bank Group. United Arab Emirates—Climate Change Knowledge Portal (CMIP6 Projections). World Bank Group, 2025, https://climateknowledgeportal.worldbank.org/country/united-arab-emirates.