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FACT SHEET

Climate Change Information Fact Sheet TUNISIA

Definitions
Ensemble: A collection of model simulations characterizing a climate prediction or projection. [IPCC AR5]
Representative Concentration Pathway (RCP): Scenarios that include time series of emissions and concentrations of the full suite of greenhouse gases and aerosols and chemically active gases, as well as land use/land cover. RCPs usually refer to the portion of the concentration pathway extending up to 2100, for which Integrated Assessment Models produced corresponding emission scenarios. [IPCC AR5]
RCP8.5: Generally, high emissions. One high pathway for which radiative forcing reaches >8.5 W m^{-2} by 2100 and continues to rise for some amount of time. [IPCC AR5]
RCP4.5: Generally, moderate emissions. One of two intermediate stabilization pathways in which radiative forcing is stabilized at approximately 4.5 W m^{-2} after 2100. [IPCC AR5]

CLIMATE IMPACTS AND VULNERABILITIES

TEMPERATURE

Current (based on historical climate conditions and recent trends, generally over the past few decades)
Tunisia's temperatures range from an average monthly high of 30.5°C in mid-summer (July and August) to an average monthly low of 10°C in mid-winter (January) [CCKP]. Tunisia's mean annual temperatures rose by about 1.4°C in the 20th century, with the most rapid warming taking place in the summer (1.8°C) and the least in the spring (1.4°C) [Verner, et al.]. Most of the warming has occurred since the 1970s, though summer mean maximum temperatures have risen since the 1960s. The number of warm days per year has also increased.

Future: 2030 (generally 2020-2049)
By 2030, the mean annual temperature in the country is projected to increase by 0.38°C, 1.03°C, and 1.86°C for the 10th, 50th, and 90th percentiles for the RCP4.5 model ensemble runs [CCKP]. These results are similar to RCP8.5 10th, 50th, and 90th percentile model ensembles (0.5°C, 1.28°C, 2.20°C). Maximum annual temperatures are projected to increase by 1.06°C to 1.26°C, and minimum annual temperatures by 0.98°C and 1.27°C for the RCP4.5 and 8.5 median ensemble runs respectively.

Future: 2050 (generally 2040-2059)
By 2050, the mean annual temperature in the country is projected to increase by 0.67°C, 1.63°C, and 2.64°C for the 10th, 50th, and 90th percentiles for the RCP4.5 model ensemble runs [CCKP]. These results are similar to RCP8.5 10th, 50th, and 90th percentile model ensembles (1.25°C, 2.25°C, 3.33°C). Increases within the two RCP4.5 and RCP8.5 median ensembles are highest in summer months of July (2°C, 2.85°C, respectively) and August (2.08°C, 3.06°C, respectively). The median ensemble for RCP4.5 and RCP8.5 project minimum annual temperature increases of 1.57°C and 2.19°C, and maximum annual temperature increases of 1.64°C and 2.29°C,

respectively. Under the A2 scenario, a summer hotspot emerges on the Tunisian border with Algeria, where local temperature increases in the summer could be as great as 5.3°C by the 2050s [Verner, et al.]. Increases in the number of hot days (especially in July, August, September) and decreases in the number of cool days are projected for the median ensemble by midcentury for the A2 and B1 scenarios [CCKP]. A global analysis shows a statistically significant increase in long heat waves and warm nights in North Africa [Verner].

PRECIPITATION AND FLOODING

Current (based on historical climate conditions and recent trends, generally over the past few decades)
There is a notable difference between mean annual rainfall from the south (less than 100 mm on the margins of the Sahara) to north (more than 700 mm on the Mediterranean coast) [Verner, et al.]. Over the last few decades, the northern regions of North Africa (including Tunisia) have experienced a significant decrease in the amount of precipitation received in winter and early spring [IPCC Ch 22]. The observed record also indicates greater than 330 dry days (with less than 1 mm day rainfall) per year over a 1997–2008-time period. Annual rainfall has decreased 5% per decade in the Northern part of Tunisia since 1950, while heavy rainfall events have become more frequent [Verner, et al.]. Western areas have experienced stable or declining rainfall, and the east has experienced increasing winter totals since the 1950s. Spring rainfall has decreased in most areas, but particularly in the eastern half of the country. Autumn rainfall has declined mostly in the South. There is an association between El Niño and reductions in rainfall for parts of Tunisia.

Future: 2030 (generally 2020-2049)
The median ensemble runs for RCP4.5 and 8.5 indicate an average annual rainfall change of 0 mm/day, and -0.1mm/day, by the middle of the 2030s [USGS]. By 2030, the RCP4.5 10th percentile (-29%), median (-3.3%), and 90th percentile (25%) ensembles for mean annual precipitation indicate high uncertainty in the direction and amount of change across the models [CCKP]. These results are similar to RCP8.5 (-31%, -2.4%, and 27%).

Future: 2050 (generally 2040-2059)
At mid-century, the median ensemble for RCP4.5 and RCP8.5 project mean annual rainfall reductions of -4.1% and -6.8%, respectively [CCKP]. Though, the 10th percentile ensembles for RCP4.5 and 8.5 project larger reductions (-36%), and the 90th percentile ensembles project mean annual increases (27% and 26%). A reduction in rainfall over northern Africa is very likely by the end of the 21st century [IPCC Ch 22]. The annual and seasonal drying/warming signal over the northern African region (including Egypt, Tunisia) is a consistent feature in the global and the regional climate change projections for the 21st century under the A1B and A2 scenarios. The greatest uncertainty is in summer rainfall over southern Tunisia [Verner, et al.].

DROUGHT

Current (based on historical climate conditions and recent trends, generally over the past few decades)
Nearly two-thirds of Tunisia is semiarid to arid, where drought can be frequent [FAO]. Drought episodes have been traced back to the sixth century in Tunisia, and the country has experienced 23 dry years from 1907 to 1997. Most recently, Tunisia experienced drought in 1982, 1987 to 1989, 1993 to 1995, and its worst drought in over 50 years from 1999 to 2002.

Future: 2030 (generally 2020-2049)
Estimates are highly uncertain and information is not readily available. Consider future drought conditions based on the most extreme past experience.

Future: 2050 (generally 2040-2059)
The combination of higher temperatures and declining rainfall (A2 and B1 scenarios) is projected to reduce water resources in Tunisia [IPCC Ch 22]. Projections also suggest a drying trend in the region, particularly along the Mediterranean coast, driven by large decreases expected in summertime precipitation [Radhouane]. North Africa would be particularly affected by droughts that would be more frequent, more intense and longer-lasting. Drought would be more frequent in summer than in winter. [Verner, et al.]

SEA LEVEL RISE AND STORM SURGE

Current (based on historical climate conditions and recent trends, generally over the past few decades)
Sea levels have risen across the Mediterranean by an average of more than 3.1 mm each year since 1992, although records from further back indicate considerable local variability [Verner, et al.]. One array of tide gauges indicates that since 1990, Mediterranean Sea levels have risen at a rate 5–10% faster than the 20th century mean rate.

Future: 2030 (generally 2020-2049)
Simple interpolation of a minimum and a maximum sea level rise scenario indicates that by 2030, the total, Mediterranean basin averaged sea level rise will be between 6.86 and 17.92 cm [Galassi].

Future: 2050 (generally 2040-2059)
Sea levels are projected to rise between 3 and 61 cm this century, depending upon local heat and salinity levels of the Mediterranean [Verner, et al.]. Between 1% and 3% of land in Tunisia will be affected by a 1-meter sea level rise [AFED]. A minimum and a maximum scenario indicate that by 2040–2050, the total, Mediterranean basin averaged sea level rise will be 9.8 and 25.6 cm [Galassi].

WINDS AND OTHER STORMS

Current (based on historical climate conditions and recent trends, generally over the past few decades)
Information about cyclone trends in the recent past in Tunisia is not readily available.

Future: 2030 (generally 2020-2049)
Estimates are highly uncertain and information is not readily available. Consider future winds and storms based on the most extreme past experience.

Future: 2050 (generally 2040-2059)
Global and regional climate scenarios show fewer cyclones over the Mediterranean [Verner, et al.]. Uncertainties in projections of cyclone frequency and tracks make it difficult to project how these changes will impact particular regions. There is only low confidence in region-specific projections [IPCC Ch 22].

Climate information sources	AFED = Arab Forum for Environment and Development (AFED), 2009. Arab Environment: Climate Change: Impact of Climate Change on Arab Countries. Edited By Mostafa K. Tolba And Najib W. Saab. Published with Technical Publications and Environment & Development magazine.
	CCKP = World Bank Climate Change Knowledge Portal
	CW = Climate Wizard
	FAO = Food and Agriculture Organization, 2008. A Review of Drought Occurrence and Monitoring and Planning Activities in the Near East Region. Food and Agriculture Organization of the United Nations Regional Office for the Near East, Cairo, Egypt and National Drought Mitigation Center University of Nebraska-Lincoln, Nebraska, USA. May 2008
	Galassi = Gaia Galassi, Giorgio Spada, 2014. Sea-level rise in the Mediterranean Sea by 2050: Roles of terrestrial ice melt, steric effects and glacial isostatic adjustment. Global and Planetary Change 123 (2014) 55–66
	IPCC = IPCC WG II, 2014. Climate Change 2014: Impacts, Adaptation, and Vulnerability. Chapter 22 (Africa)
	Radhouane = Radhouane, Leila, 2013. Climate change impacts on North African

	countries and on some Tunisian economic sectors. Journal of Agriculture and Environment for International Development (JAEID). 2013, 107 (1): 101 – 113
	USGS = Alder, J.R. and Hostetler, S.W., 2013. CMIP5 Global Climate Change Viewer. US Geological Survey.
	Verner, et al. = Verner, Dorte; Wilby, Robert; Breisinger, Clemens; Al-Riffai, Perrihan; Robertson, Richard; Wiebelt, Manfred; Kronik, Jakob; Clement, Viviane; Levine, Tamara; Esen, Ferhat; Roos, Philippe, 2013. Tunisia in a Changing Climate. Assessment and Actions for Increased Resilience and Development. The World Bank, Washington, DC.