YEMEN - Ta'iz Governorate

Drought Hazard Analysis: Frequency Analysis of Drought Severity Classes for 2015–2024 (April–June)

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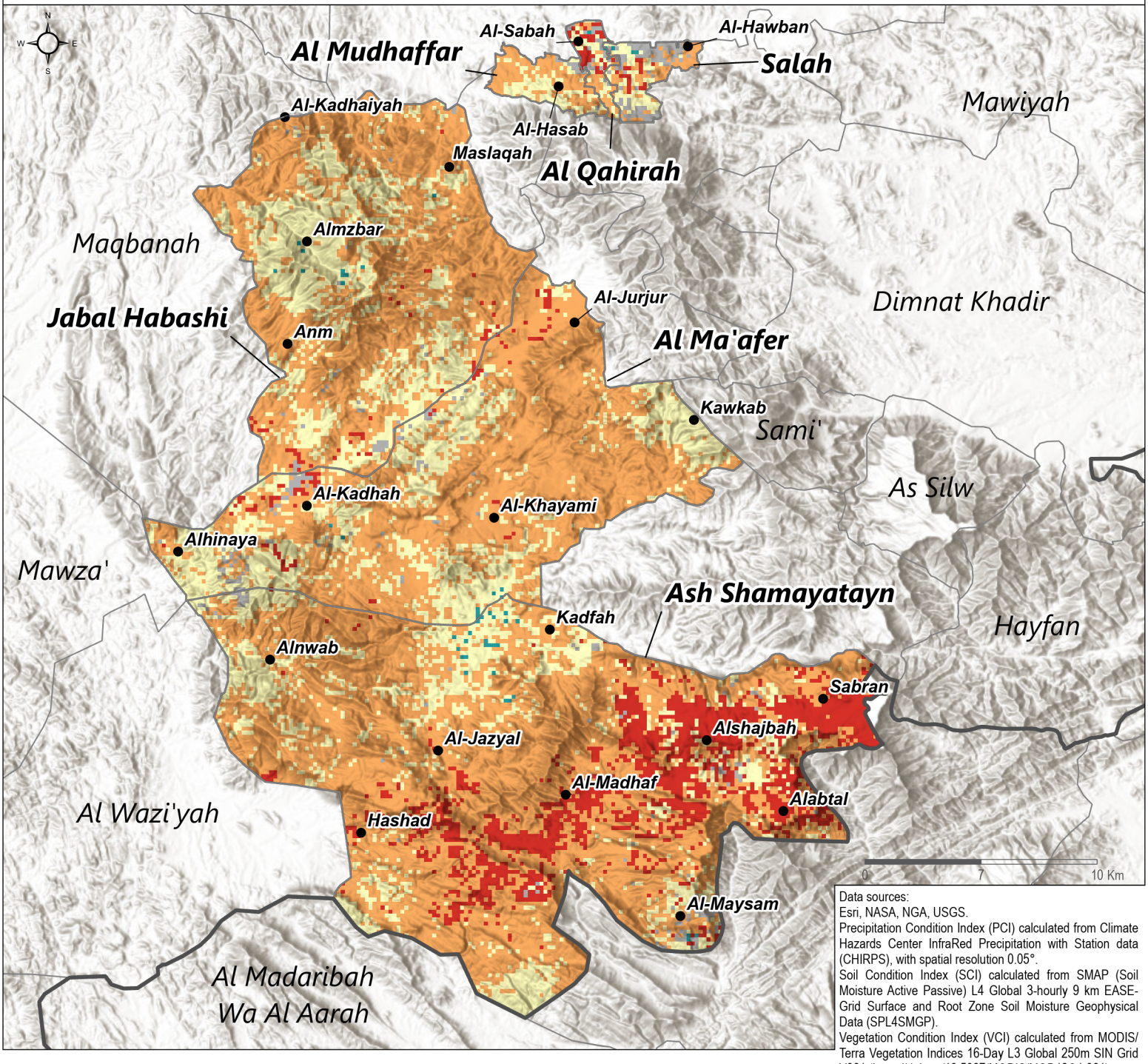
Methodology: Drought hazard and frequency were assessed using the multivariate Advanced Drought Response Index (ADRI). The ADRI index integrates four environmental and climatic indices — Vegetation Condition Index (VCI), Temperature Condition Index (TCI), Precipitation Condition Index (PCI), and Soil Condition Index (SCI)—to comprehensively capture drought conditions. Prior to ADRI computation, a preliminary drought-year screening analysis was conducted to identify years with the most severe water deficits during the period 2015–2024. This screening used precipitation time-series data from the Climate Hazards Group InfraRed Precipitation with Station (CHIRPS) dataset to evaluate interannual rainfall variability. Years exhibiting significant negative precipitation anomalies during the primary rainy season were flagged for further analysis. Based on this assessment, 2015, 2016, 2019, and 2021 were identified as the most severe drought years and selected for detailed ADRI evaluation. The primary rainy season (April–June) was chosen for analysis as it typically exhibits lower precipitation, coincides with the start of the cultivation period, and corresponds to high agricultural water demand, making it particularly sensitive to drought impacts. The component indices were calculated in Google Earth Engine (GEE) and integrated in the ArcGIS environment. The four component indices were combined into a single drought severity layer for each target year using the simplified ADRI formula: $ADRI = L \cdot c \cdot VCI + [VCI \cdot (TCI + PCI + SCI)] / (VCI + TCI + PCI + SCI + c)$, where $L = 0.25$ and $c = 0.01$. In the ADRI index, lower values indicate higher drought severity, while higher values correspond to lower severity or non-drought conditions. To create the final drought severity frequency map, individual ADRI drought severity rasters were generated for each of the four target years. These yearly severity rasters were combined into a multi-year composite. Drought severity frequency was then computed using the Cell Statistics tool in ArcGIS, applying the Majority option. This process identifies the most frequently occurring drought severity class for each pixel across the four-year period. The final output is a map of Drought Severity Frequency, highlighting areas that most consistently experienced high-severity drought during the worst years of the analysis period.



Legend

- Main settlements
- Governorate boundary
- District boundary
- Non-assessed districts

Most frequent drought severity class

- Exceptional drought
- Extreme drought
- Severe drought
- Moderate drought
- Mild drought
- No drought
- Mix of drought severity

Data sources:
Esri, NASA, NGA, USGS.
Precipitation Condition Index (PCI) calculated from Climate Hazards Center InfraRed Precipitation with Station data (CHIRPS), with spatial resolution 0.05°.
Soil Condition Index (SCI) calculated from SMAP (Soil Moisture Active Passive) L4 Global 3-hourly 9 km EASE-Grid Surface and Root Zone Soil Moisture Geophysical Data (SPL4SMGP).
Vegetation Condition Index (VCI) calculated from MODIS/ Terra Vegetation Indices 16-Day L3 Global 250m SIN Grid V061 (https://doi.org/10.5067/MODIS/MOD13Q1.061).
Temperature Condition Index (TCI) calculated from MODIS MOD11A2 V6.1 product provides an average 8-day land surface temperature (LST) in a 1200 x 1200 kilometer grid.
Coordinate System:GCS WGS 1984
File: ADRI_YEMEN
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