Global Water Security Center

MOZAMBIQUE: Existing Unrest, Poor Infrastructure, and Flooding Challenge Critical Minerals Development

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BLUF

Mozambique's potential to mine mineral resources and be a shipping hub could be delayed by unrest, limited infrastructure and labor, and flood damage.

UNREST: Conflict across Mozambique hampers economic development necessary for mineral extraction and transport.

- **Increased displacement due to violence, repeated floods, food insecurity, lack of employment opportunities, limited aid, and existing grievances may drive rebel recruitment, potentially increasing rebel groups' strength and driving violence in Cabo Delgado and unrest in other areas.**
- Rebel group insurgency in Cabo Delgado, one of Mozambique's poorest provinces, stalled a $20B liquefied natural gas extraction project in 2021. As of October 2025, there are plans to restart this project and other projects.
- Rising tension in some parts of the country has stemmed from large-scale industrial customers receiving more reliable electrical service, assumed to be at the expense of other consumers.

INFRASTRUCTURE: Sparse transportation and electrical infrastructure makes economic development challenging.

- Improving railways and roads is a priority in Mozambique to increase trade from landlocked countries **(Map 1)**. **Finding enough skilled labor to simultaneously upgrade and repair flood-damaged infrastructure has been difficult.**
- Hydropower supplies over 80% of Mozambique's electricity, mostly from the Cahora Bassa dam **(Map 1)**, which was constructed to export inexpensive energy to South African mines. Exporting 65-85% of the generated electricity has driven efforts to add additional energy sources in Mozambique.
- Limited electricity infrastructure leaves only 9% of the rural population with electricity access, compared to 78% in urban areas. Increased electrical demand from additional mining operations, typically in rural areas, would be a challenge to meet, if connecting to the national grid.

FLOODING: An increase in flooding (Figure 1), in conjunction with existing grievances, would fuel additional instability and undermine development.

- **Increased heavy rain and flooding can damage electrical lines, roads, bridges, and railroads, delaying shipments and increasing maintenance costs.**
- Mozambique experiences flooding from storms and cyclones. By 2035, the country may experience ~12 days annually of heavy rain, up from ~6 days in 2010.

Map 1: Mozambique is in a position to be a transport hub for minerals from inland countries.

Development in Mozambique relies on updating current transportation and electrical infrastructure to support additional capacity, but floods and instability challenge this.

Rail and roadways in Mozambique connect inland mining regions in Malawi, Eswatini, South Africa, Zambia, and Zimbabwe to Mozambique's three deep-water ports for shipping.

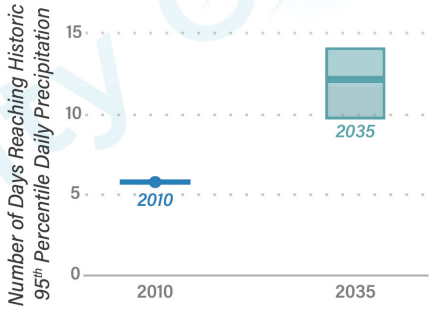

Figure 1: More concentrated rainfall may increase flooding.

Flooding may damage infrastructure and make transportation and electricity systems more costly to maintain, hindering development.

Sources:

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Map Sources:

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Data Analysis Methods:

DATASETS: Historical Weather Data from ERA5 [1950-2024] - daily values for precipitation and average temperature, daily maximum temperature & daily minimum temperature . Future Weather Data from CMIP6 down-scaled by NASA Earth Exchange Global Daily Downscaled Projection (NEX-GDDP-CMIP6). Scenario: SSP245 and/or SSP585 [2025-2045 & 2050-2070, historical 1975-1995 & 2000-2010]. 17 models: ACCESS-ESM1-5, BCC-CSM2-MR, CanESM5,CMCC-ESM2, FGOALS-g3, GISS-E2-1-G, MIROC-ES2L, MPI-ESM1-2-HR, MRI-ESM2-0, NESM3, NorESM2-MM, CNRM-ESM2-1, EC-Earth3-Veg-LR, GFDL-ESM4, INM-CM5-0, IPSL-CM6A-LR, KIOST-ESM.

CALCULATIONS: Baseline (sometimes called "normal") and representative future values for each year of interest are calculated using 21-year time intervals around the date of interest. Our historic normal is based on the year 2000 (1990-2010) using ERA5 data. To bias correct future values, we calculate the difference or ratio between NEX-GDDP-CMIP6 modeled future [2035 (2025-2045) and/or 2050 (2040-2060)] and modeled historic [2000 (1990-2010)] values and add this difference to the historic baseline value or multiply the ratio by the historic baseline value for each metric of interest. All calculations are spatially distributed (quarter-degree grid cells) and aggregated as the final step.

Important note: Values reported are median values based on the 17 model outputs. Error bars are the 95% confidence interval around the median.

Precipitation

95th Percentile Precipitation Day Count: The number of days reaching the 95th percentile of historic daily precipitation events, excluding days with less than 1 mm of precipitation. For future extreme precipitation, we calculated the average number of days that reached or exceeded the historic 95th percentile value.

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