

B-EPICC: Hydrology and water resources – Ethiopia

Collaborative analysis of projected future hydrological conditions in Ethiopia with local researchers

B-EPICC hydrology team



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POTS DAM INSTITUTE FOR
CLIMATE IMPACT RESEARCH



Supported by:



based on a decision of the German Bundestag



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Content

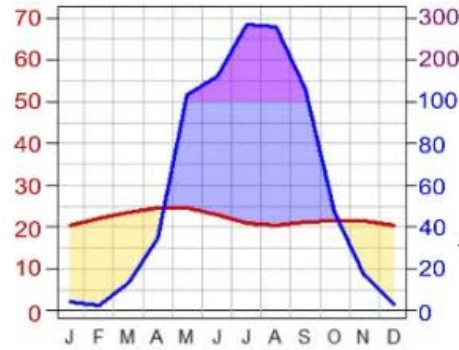
- Current and future hydroclimate conditions in Ethiopia
- The impact of climate change on water resources and hydropower production
- Collaborative analysis of projected future hydrological conditions in Ethiopia as part of the B-EPIC project

Ethiopia exhibits complex topography and hydroclimatic conditions

Unimodal precipitation regimes

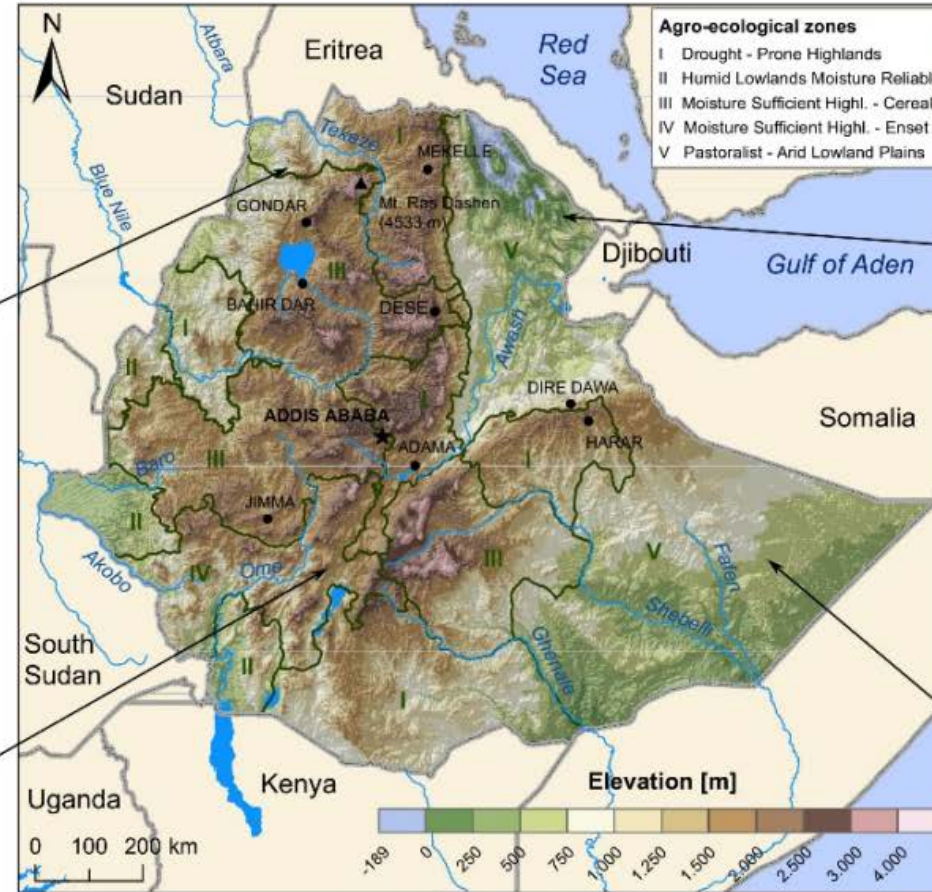
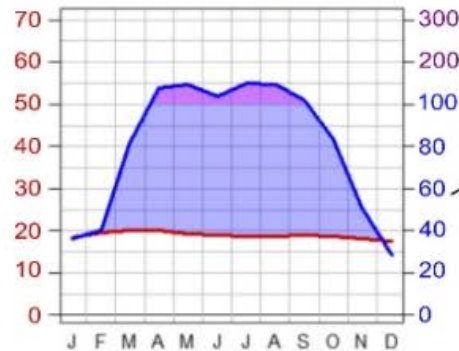
Tropic - cool / semiarid

Ø 22 °C 1478 m Σ 1094.3 mm



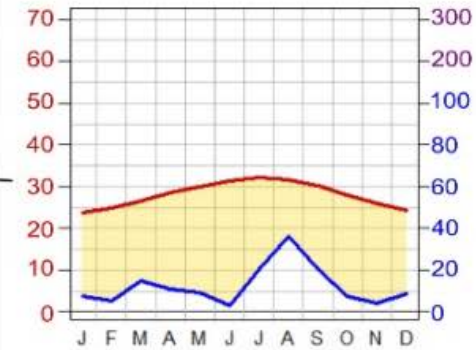
Tropic - cool / humid

Ø 18.9 °C 1879 m Σ 1129.6 mm



Tropic warm / arid

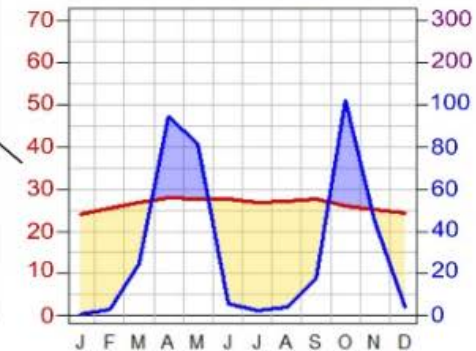
Ø 28.1 °C 13 m Σ 149 mm



Bimodal precipitation regime

Tropic warm / arid

Ø 26.4 °C 566 m Σ 393.7 mm



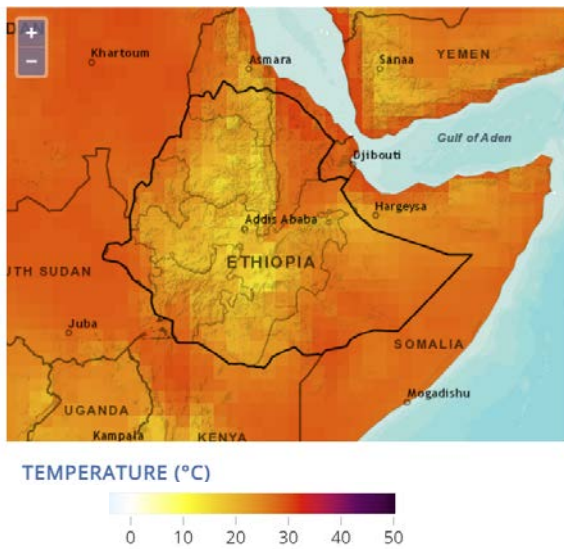
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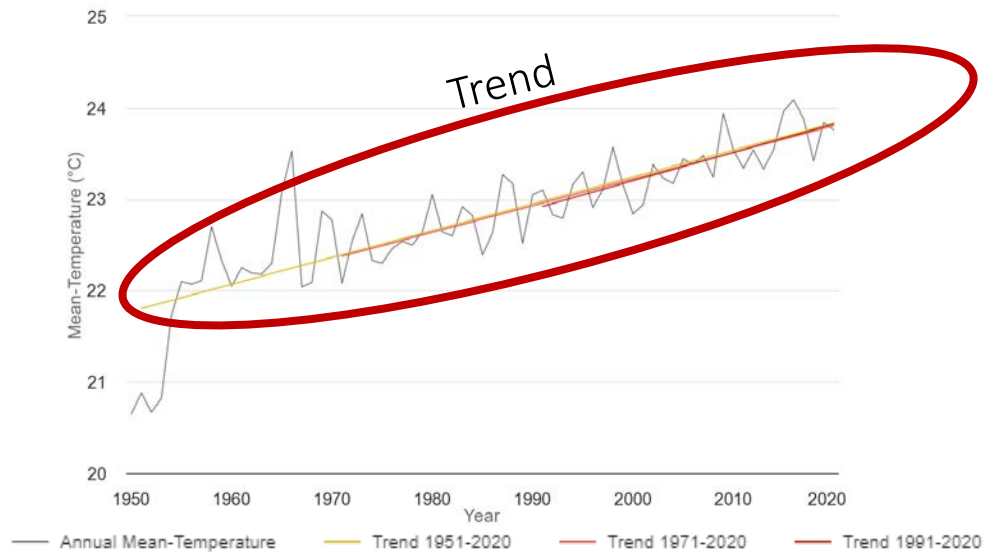
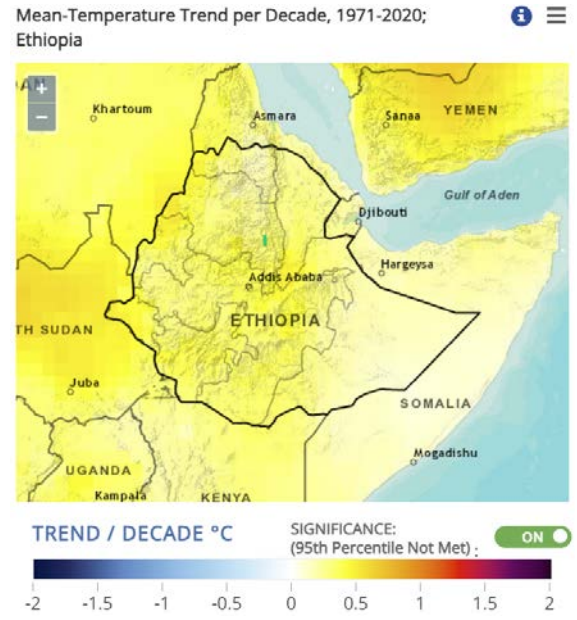
Climate risk analysis for identifying and weighing adaptation strategies in Ethiopia's agricultural sector

Spatial variation of temperature and its trends in current conditions in Ethiopia

Observed climatology of mean-temperature (1991-2020)

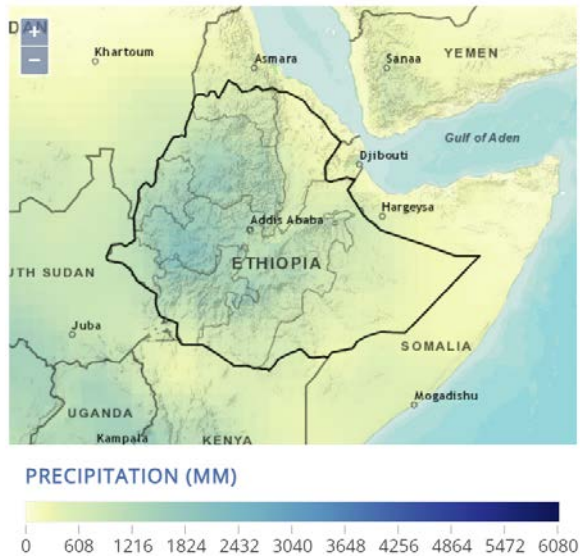


Temperature trend over the entire country

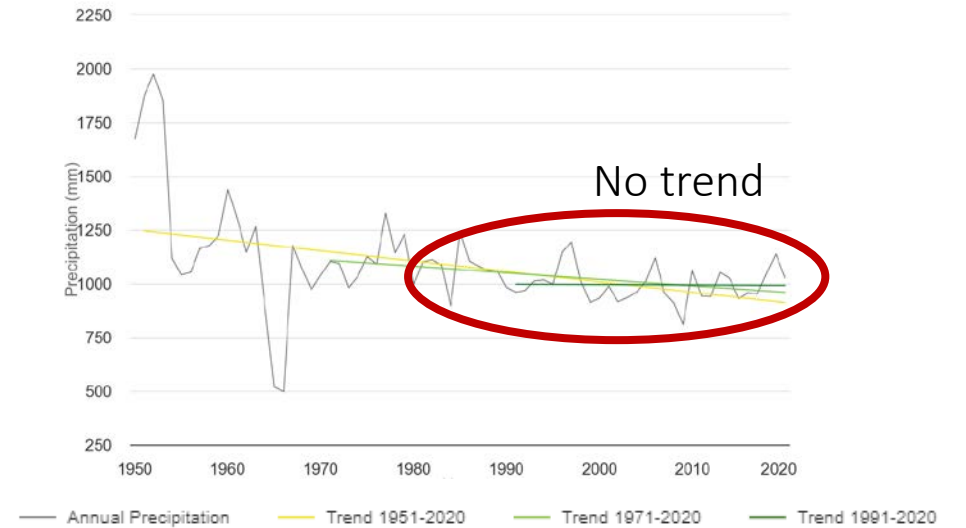
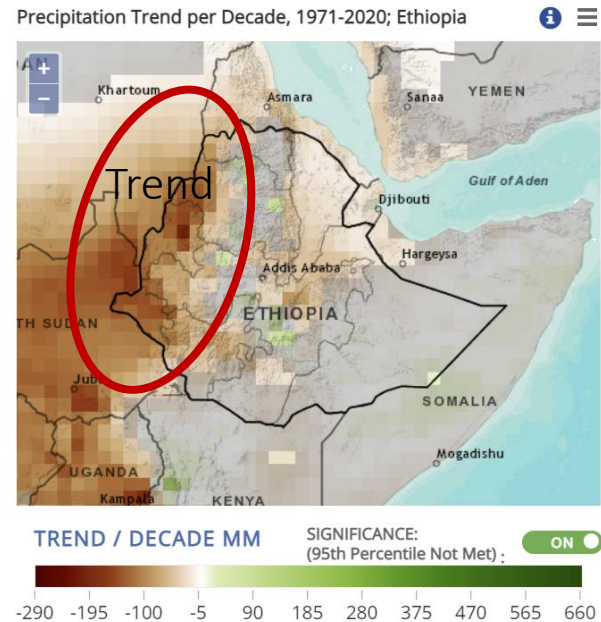


Spatial variation of precipitation and its trends in current conditions in Ethiopia

Observed climatology of precipitation (1991-2020)

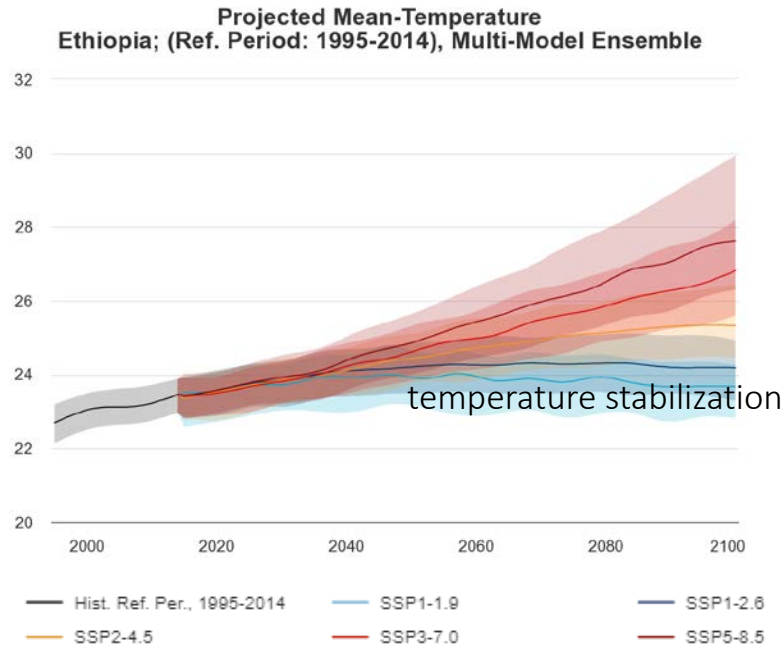
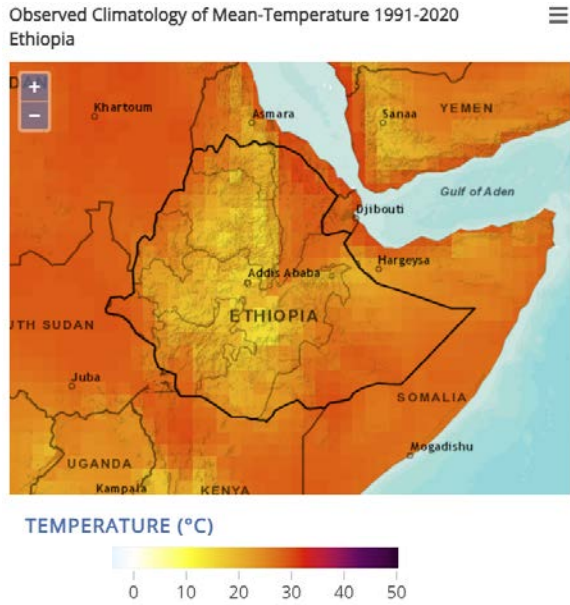


Precipitation trend over the entire country

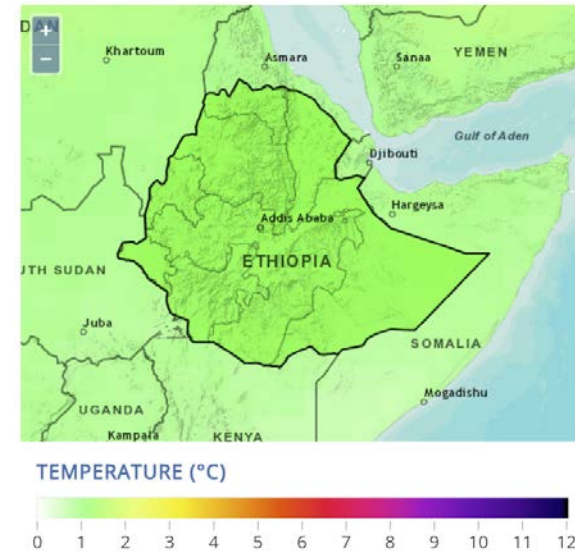


Temperature projection based on CMIP6 climate models

Projected temperature changes for 2040-2059 (the 2050s) relative to 1995-2014
high warming scenario (SSP5-8.5)



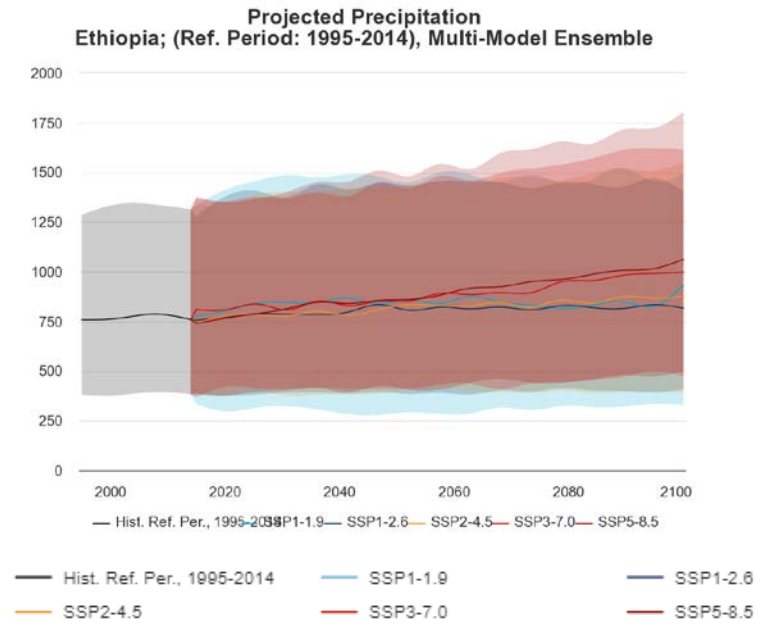
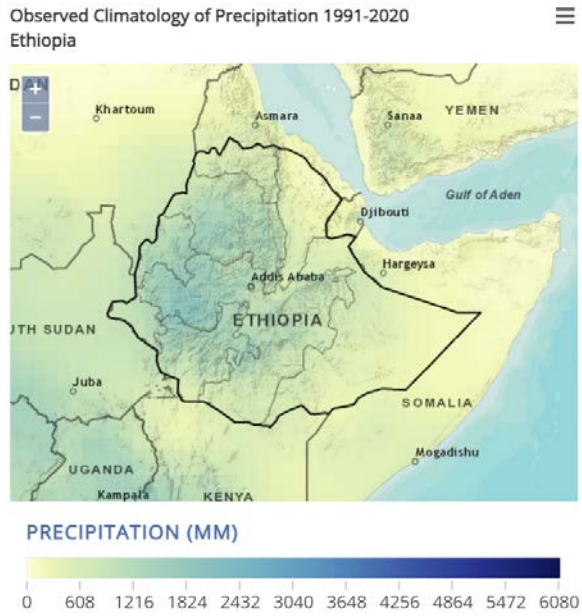
Low warming scenario (SSP1-2.6)



Precipitation projection based on CMIP6 climate models

Projected precipitation changes for 2040-2059 (the 2050s) relative to 1995-2014

high warming scenario (SSP5-8.5)



$\Delta = +100$ mm

Low warming scenario (SSP1-2.6)



$\Delta = +90$ mm



The evidence and projections of climate change should be a wake-up call for:

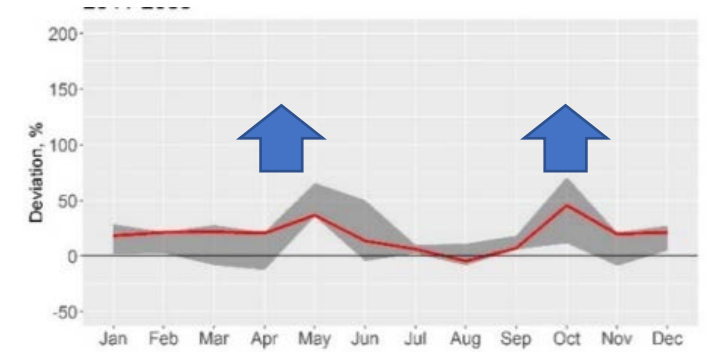
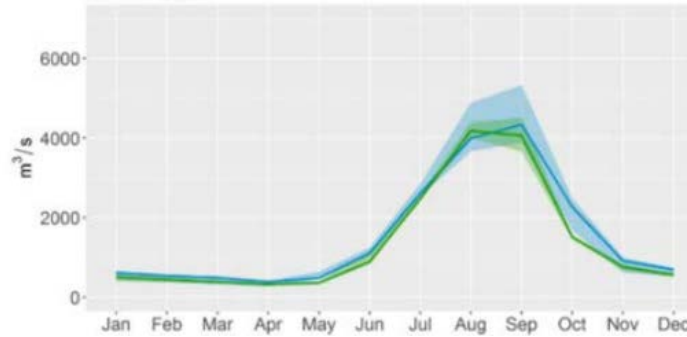
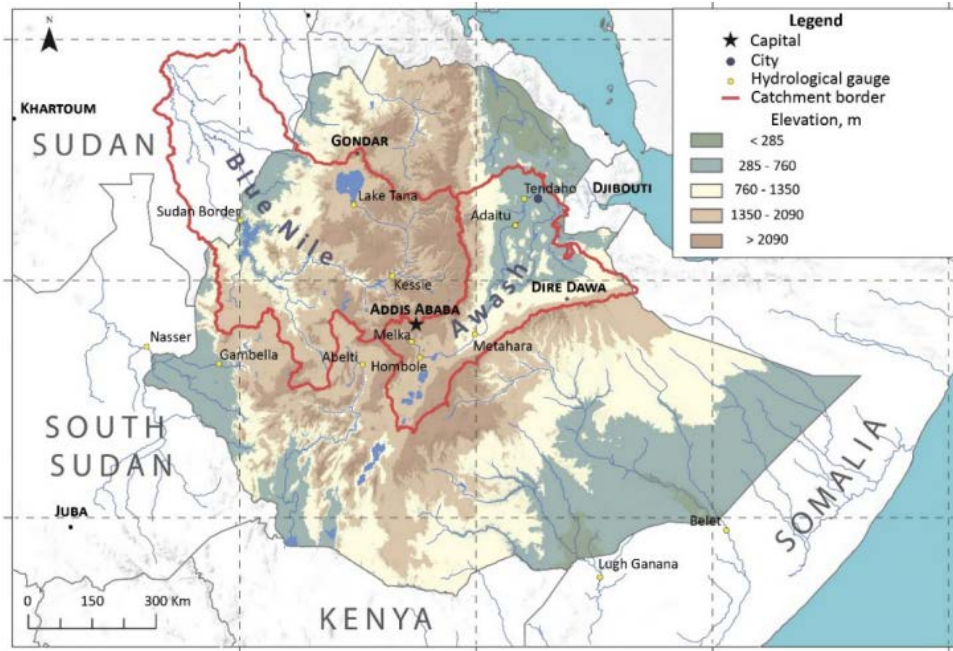
- Scientist to research the current and future hydro-climate conditions
- and for governments, local leaders, and people to improve their preparedness for extreme weather events

To support these efforts, the Potsdam Institute for Climate Impact Research (PIK) has been contributing to the analysis of the impact of climate change on water resources in Ethiopia through various research projects.

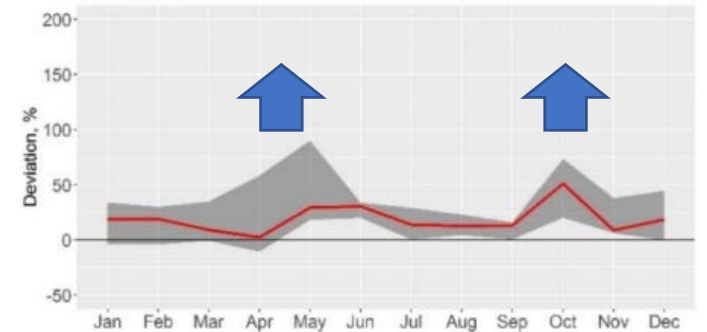
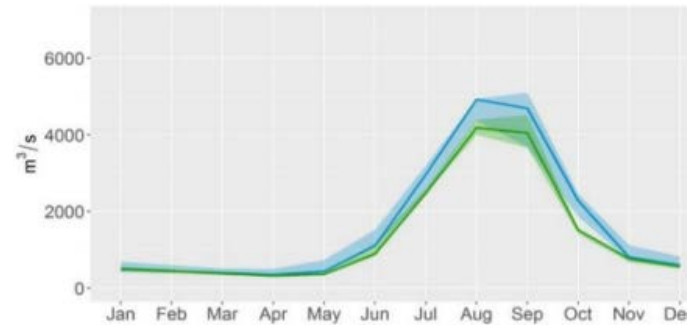
Climate risk analysis for identifying and weighing adaptation strategies in Ethiopia's agricultural sector

Climate change impact on water resources of the Blue Nile basin using CMIP5 climate projections

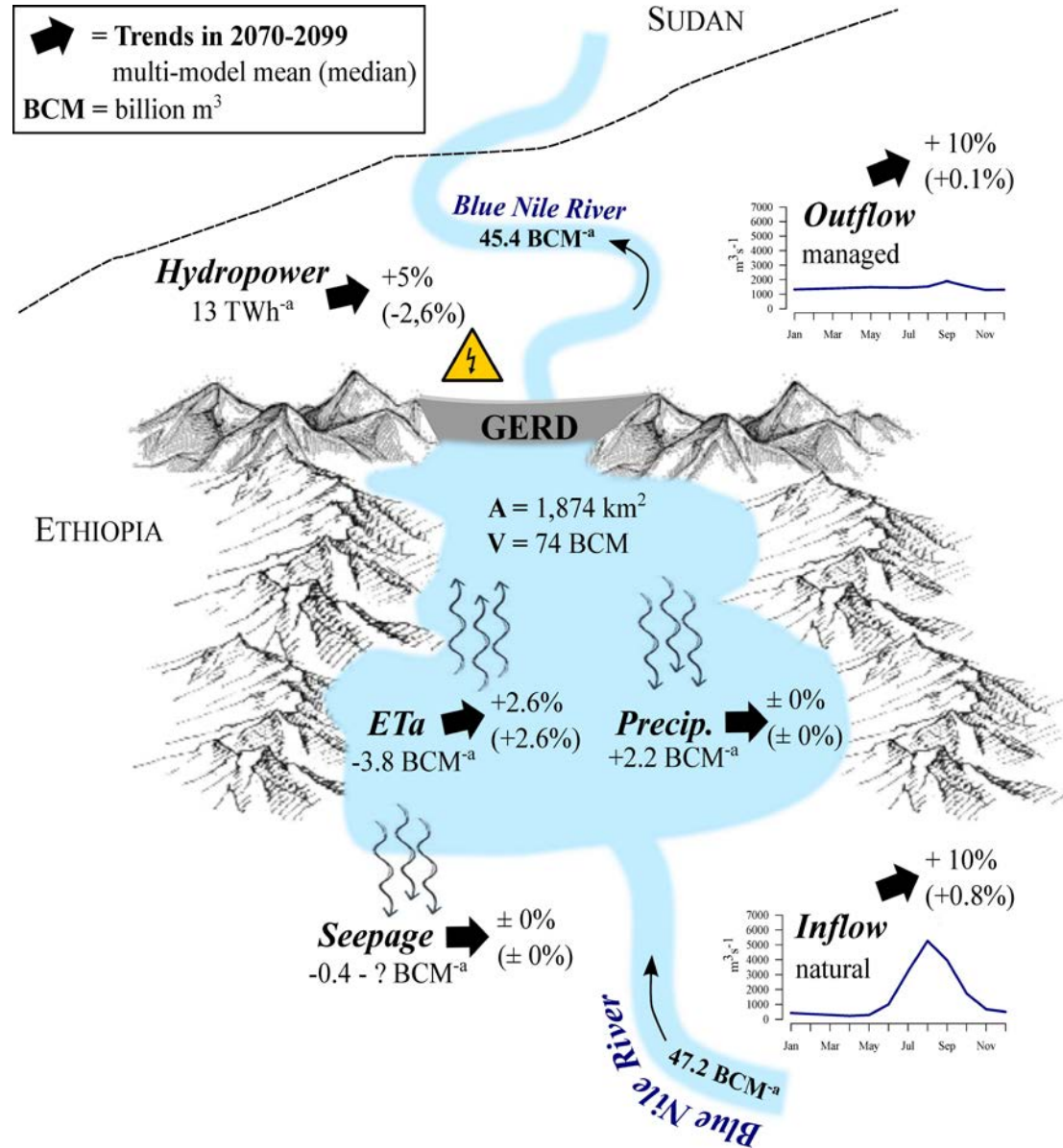
Projected streamflow for 2041-2060 (the 2050s) relative to 1986-2005
high warming scenario (RCP8.5)



Low warming scenario (RCP2.6)



Climate change impact on the hydropower production in Grand Ethiopian Renaissance Dam (GERD)



Article

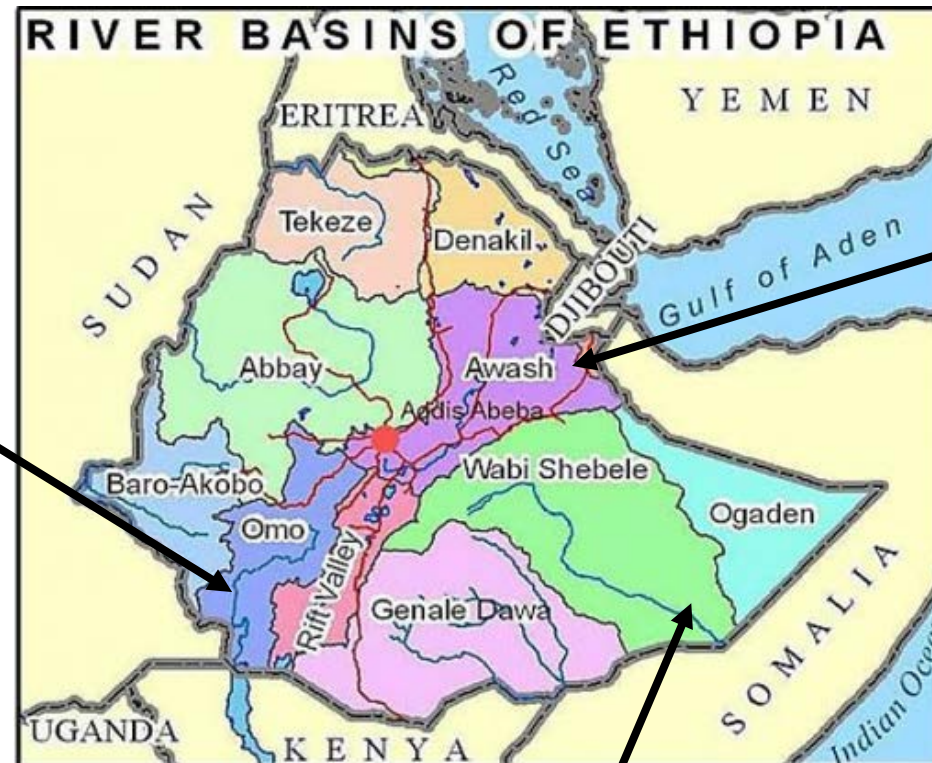
Management Scenarios of the Grand Ethiopian Renaissance Dam and Their Impacts under Recent and Future Climates

B-EPICC - Hydrology

As part of the B-EPICC project, we are collaborating with local researchers in Ethiopia to analyze the projected future hydrological conditions in three catchments.

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Omo-Gibe catchment
Tadesse Mosissa Ejeta



Awash river basin
Rahel Sintayehu Tessema

Juba and Shabelle watershed (transboundary
between Ethiopia and Somalia)

Lorenzo Villani

Data delivering

Bias-adjusted and statistically downscaled CMIP6 projections over Ethiopia generated by ISIMIP project

| 3 scenarios | 10 GCMs | 7 variables | Period |
|--|---|---|--|
| <ul style="list-style-type: none">• SSP1-2.6• SSP3-7.0• SSP5-8.5 | <ul style="list-style-type: none">• CanESM5• IPSL-CM6A-LR• UKESM1-0-LL• CNRM-CM6-1• CNRM-ESM2-1• MIROC6• GFDL-ESM4• MRI-ESM2-0• MPI-ESM1-2-HR• EC-Earth3 | <ul style="list-style-type: none">• Precipitation• Minimum temperature• Mean Temperature• Maximum temperature• Wind• Solar radiation• Relative humidity | <ul style="list-style-type: none">• Historical simulation (1850–2014)• Future projections (2015–2100) |

- The adjusted climate data were generated using the trend-preserving *Bias Adjustment and Statistical Downscaling method* (Lange, 2019)
- and the observational climate dataset E5W5 (daily and 0.5°)

THANK YOU