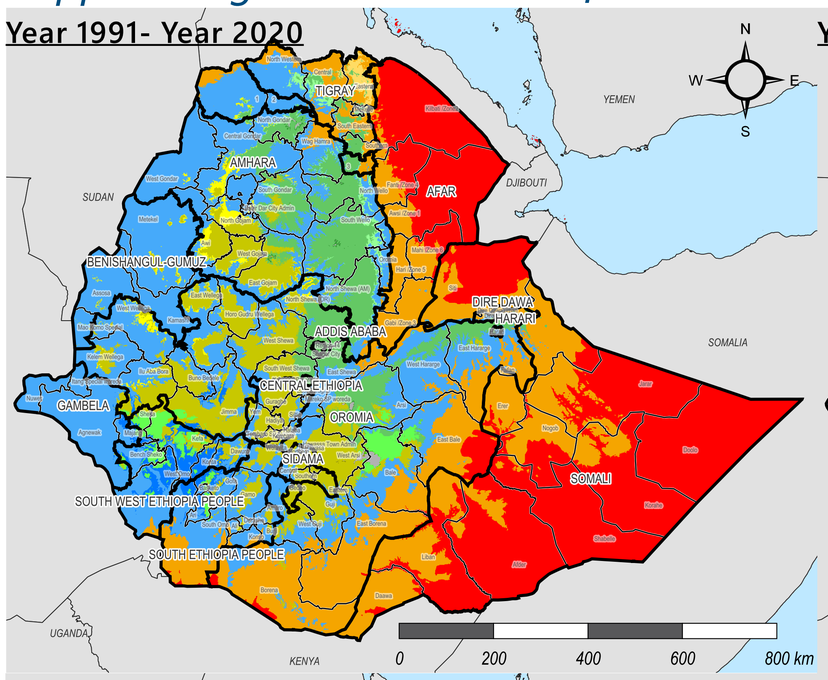
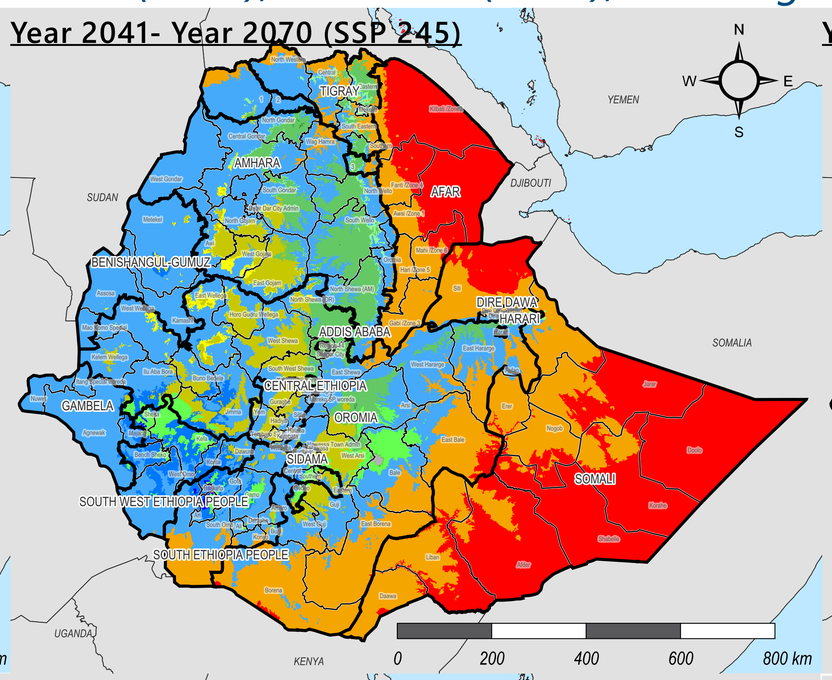
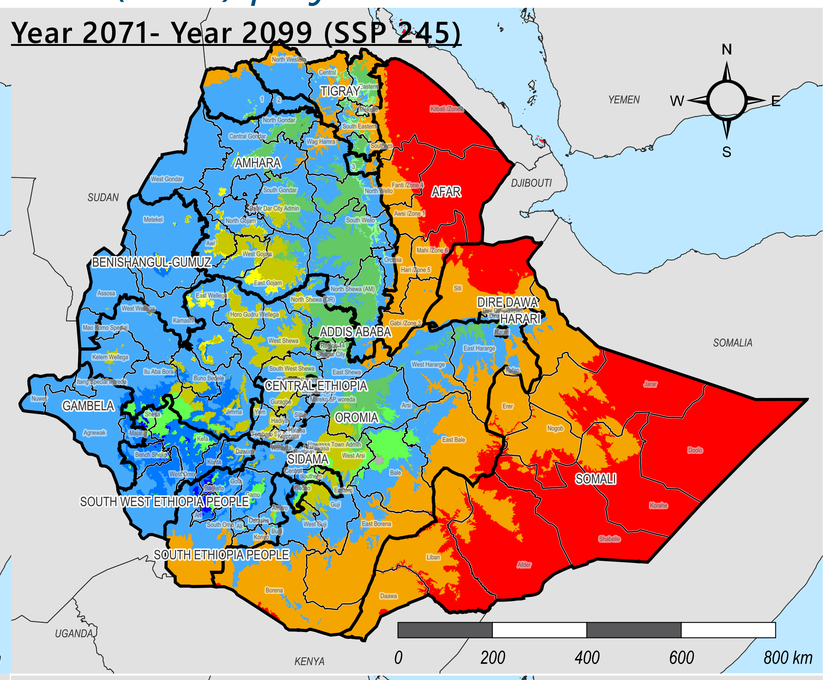
ETHIOPIA - CLIMATE HAZARD EXPOSURE AND IMPACT

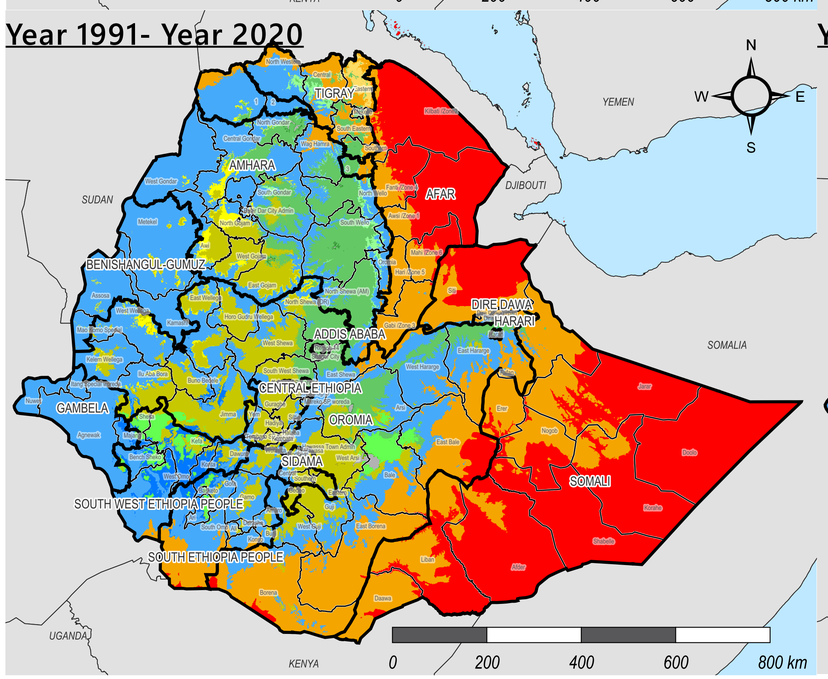
Koppen Geiger Climate Classification: historical (1991), mid-term (2070), and long-term (2099) projections

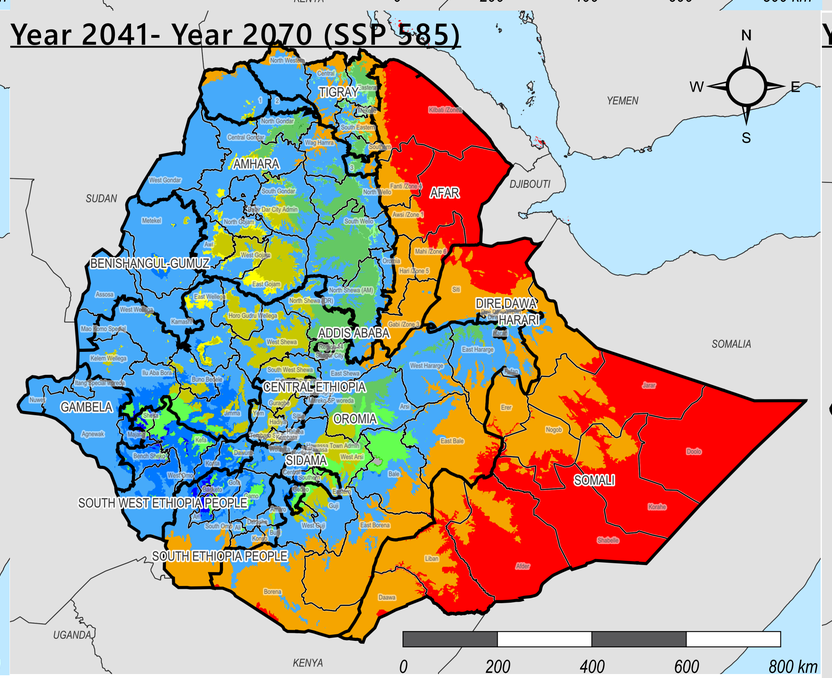
For Humanitarian Purposes Only
Production date: 26 February 2025

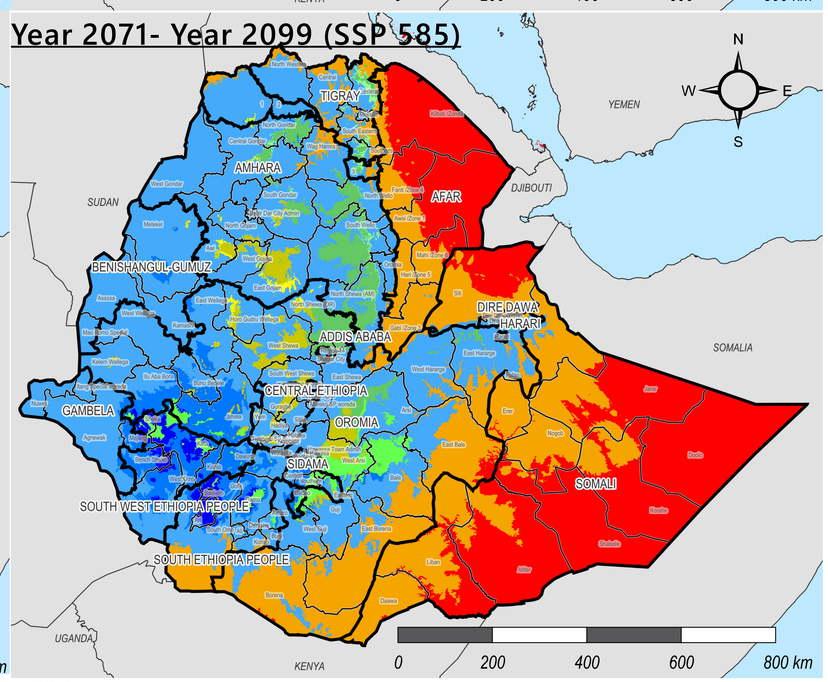












Koppen Geiger Classes

World countries boundary
Region boundary
Zone boundary

Climate classes

- Af Tropical, rainforest
- Am Tropical, monsoon
- Aw Tropical, savannah
- BWh Arid, desert, hot
- BWk Arid, desert, cold
- BSh Arid, steppe, hot
- BSk Arid, steppe, cold
- Csa Temperate, dry summer, hot summer
- Csb Temperate, dry summer, warm summer
- Csc Temperate, dry summer, cold summer
- Cwa Temperate, dry winter, hot summer
- Cwb Temperate, dry winter, warm summer
- Cwc Temperate, dry winter, cold summer
- Cfb Temperate, no dry season, warm summer
- Cfc Temperate, no dry season, cold summer
- ET Polar, tundra

Map Information:

The Köppen climate classification categorizes climates into five main types: A (Tropical), B (Arid), C (Temperate), D (Continental), E (Polar). This system helps understand ecosystems, vegetation, and how climate affects agriculture and water resources. Seasons are defined by temperature: summers are the six warmest months (April–September in the Northern Hemisphere, October–March in the Southern Hemisphere), while winters are cooler. This distinction is essential for farming, water management, and disaster preparedness. To track climate change, historical climate maps (1991–2020) are based on high-resolution climatology, showing past trends. Future climate projections (2041–2070 and 2071–2099) are generated using CMIP6 climate models and Shared Socio-economic Pathways (SSPs)—scenarios that explore different future emissions and socio-economic conditions: SSP585 – a high-emission scenario with severe climate impacts and SSP245 – a moderate-emission scenario with more controlled warming. These projections help predict climate shifts and their impact on agriculture, water availability, and infrastructure, guiding policymakers in planning for future climate risks.

Main Takeaways:

- Under SSP245, many parts of central and western Ethiopia are likely to see a shift from temperate to tropical by 2050 and 2100.
- Under SSP585, many parts of central and western Ethiopia are likely to see a shift from temperate to tropical by 2050 and 2100, while the Somali and Afar regions will see a slight shift from arid, desert to temperate dry climate.
- The western part of the country will remain and shift more towards a tropical climate, while Somali and Afar will see a shift from arid, desert to temperate climate.

Data Sources:

Climate Classification: High-resolution (1 km) Köppen-Geiger maps for 1901–2099 based on constrained CMIP6 projections, Version 2, Beck et al. (2023)
Administrative Boundary: UN OCHA, 2024.
World Countries Boundary: Geoboundaries, 2020.
Coordinate Reference System: WGS, 1984.

Disclaimers:

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Contact Information: reach.mapping@impact-initiatives.org

Funded by:

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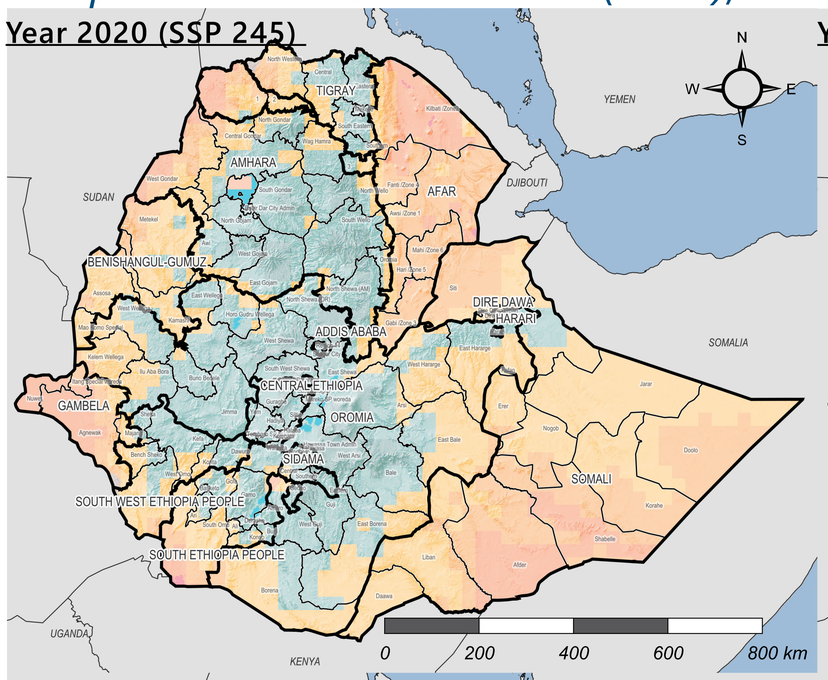
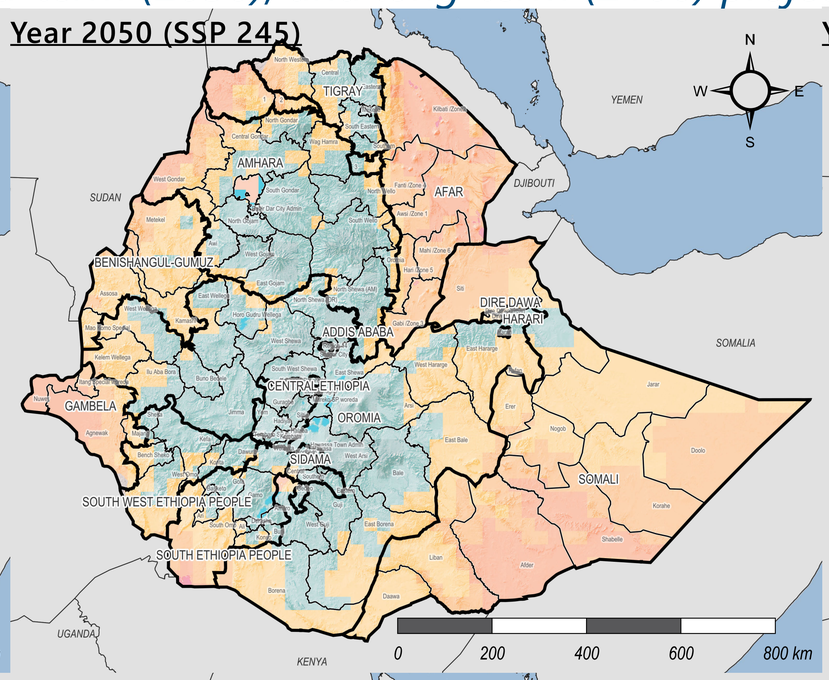
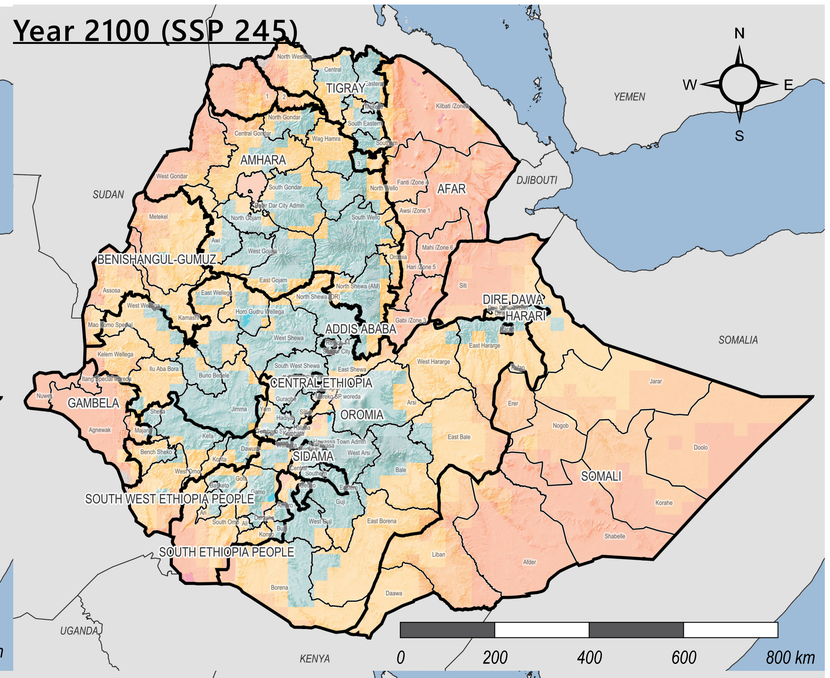
ETHIOPIA - CLIMATE HAZARD EXPOSURE AND IMPACT

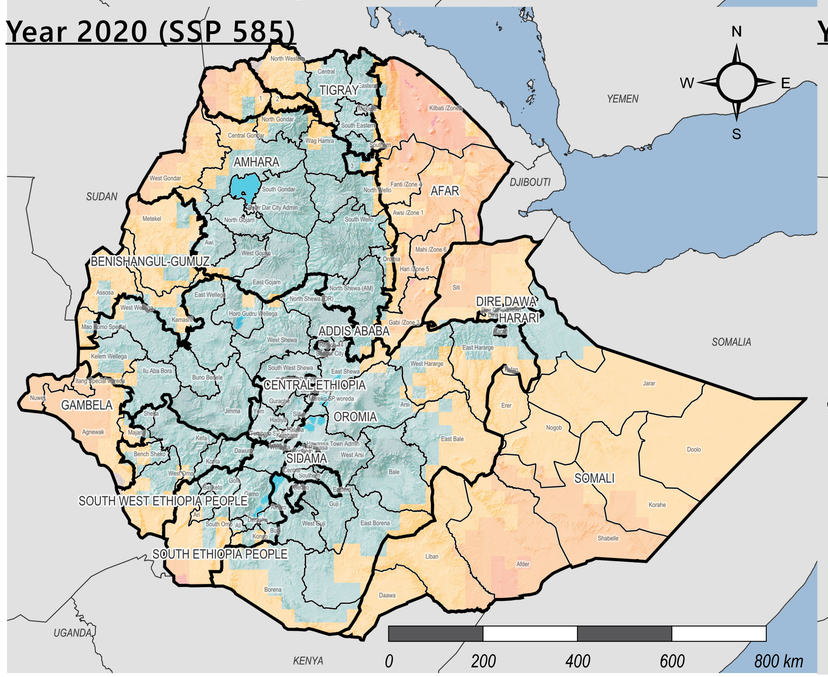
Temperature trends: historical (2020), mid-term (2050), and long-term (2100) projections

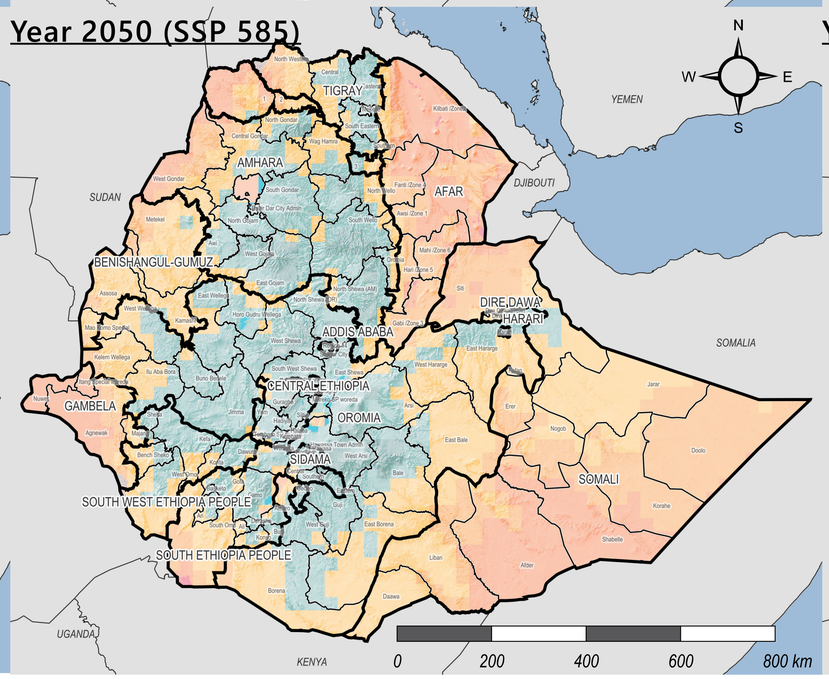
For Humanitarian Purposes Only
Production date: 26 February 2025

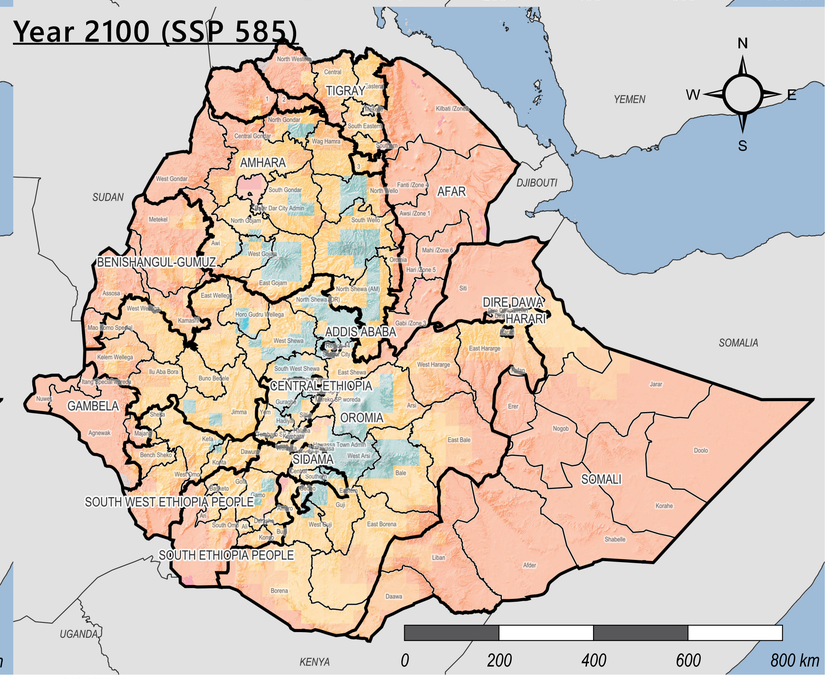












World countries boundary
Region boundary
Zone boundary

Temperature (°C)
- < 18
- 18.01- 23.00
- 23.01 - 28.00
- 28.01 - 30.00
- > 30

Map Information:

These maps display historical and projected surface temperatures for the years 2020, 2050, and 2100. The dataset was developed by NASA Earth Exchange Global Daily Downscaled Projections (NEX-GDDP) and has been processed using the Google Earth Engine platform. The annual mean surface temperatures for the selected years have been calculated from daily data. The data includes outputs from CMIP6 model and is available for two Shared Socioeconomic Pathways (SSPs): SSP245 and SSP585.

SSP245: A 'middle pathway' for future greenhouse gas emissions, projecting a radiative forcing of 4.5 Watts/m² by 2100. This scenario assumes moderate climate protection measures and a balance between fossil fuel use and renewable energy adoption.
SSP585: A high-emission scenario, projecting a radiative forcing of 8.5 Watts/m² by 2100. This scenario assumes continued high reliance on fossil fuels and minimal climate mitigation efforts, leading to significant increases in greenhouse gas emissions.

Main Takeaways:

In Ethiopia, temperatures are expected to rise, but not evenly across the country. The central regions will likely remain cooler, while the northern, eastern, southern, and western areas will see significant warming.

- The Somali and Afar regions in the east face the highest risk of heat stress and drought-related shocks.
- Western Amhara and Gambela are also vulnerable to rising temperatures and extreme heat.
- Overall, areas along the country's periphery will experience higher temperature increases than central Ethiopia.

These trends highlight the urgent need for targeted climate adaptation strategies to protect communities from heat stress and drought.

Uses and Limitations:

The aim of this map is to help planners and decision-makers identify priority areas for interventions. It is not designed as a standard tool for detailed site planning decisions. Map results need to be ground-verified and decisions combined with specific on-site evaluation and appropriate technical expertise. Results are derived from computational modeling; they are not ground-proofed and are inherently limited by the quality of the input data or model assumptions. Temperature maps focus solely on temperature changes and do not provide information on other critical factors such as precipitation, humidity, or wind patterns.

Data Sources:

Temperature: NASA Earth Exchange Global Daily Downscaled Projections (NEX-GDDP).
Administrative Boundary: UN OCHA, 2024.
World Countries Boundary: Geoboundaries, 2020.
Coordinate Reference System: WGS, 1984.

Disclaimers:

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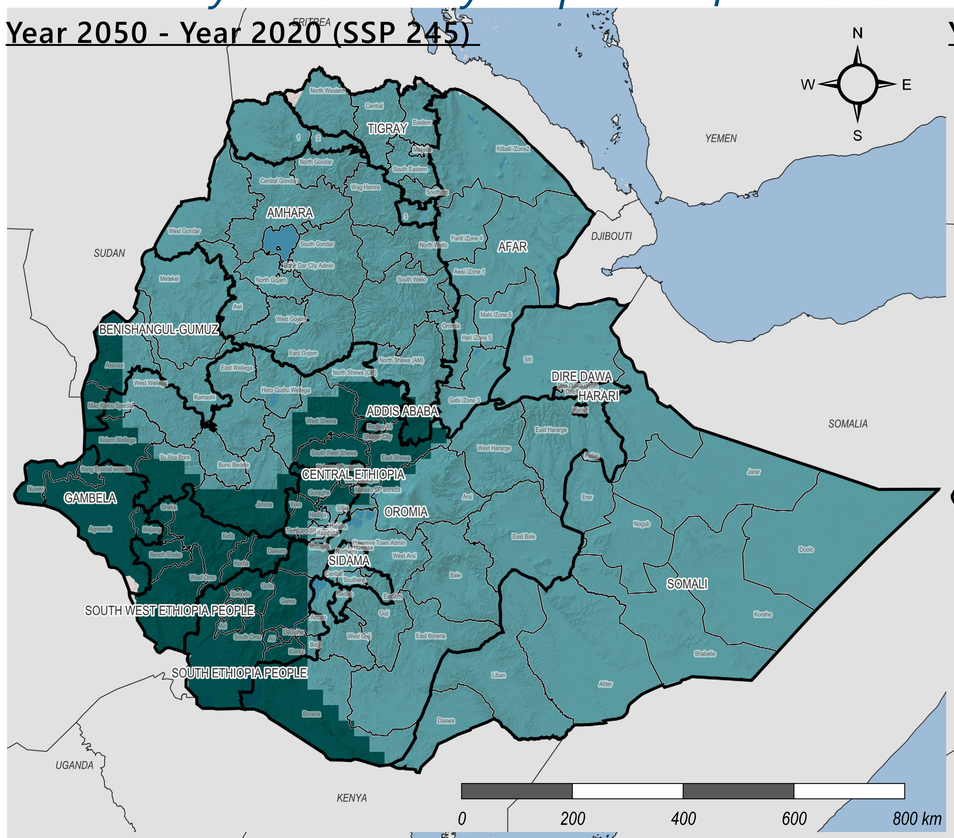
ETHIOPIA - CLIMATE HAZARD EXPOSURE AND IMPACT

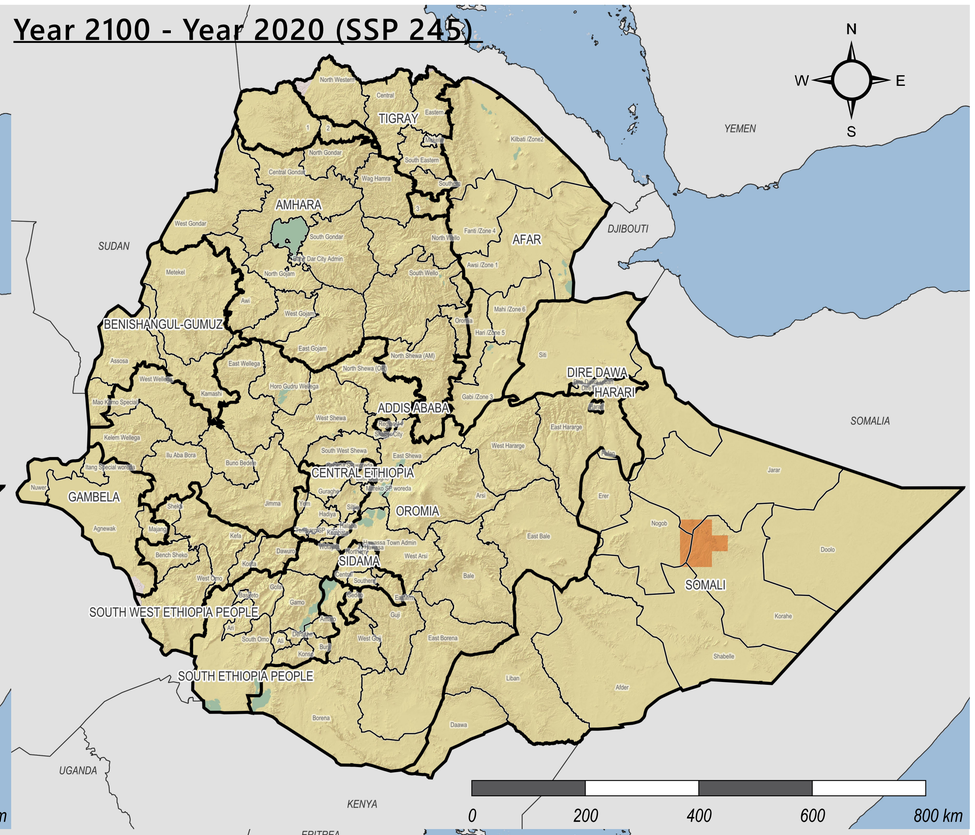
Temperature trends: changes over 30-year and 80-year periods from 2020

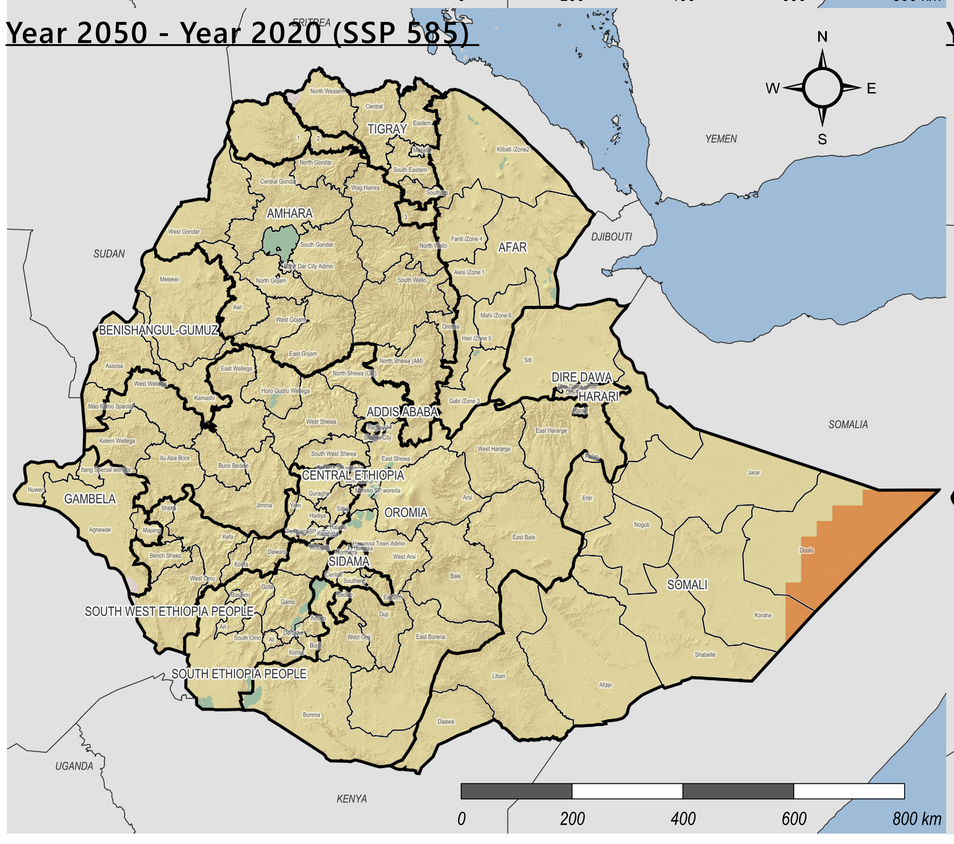
For Humanitarian Purposes Only
Production date: 26 February 2025

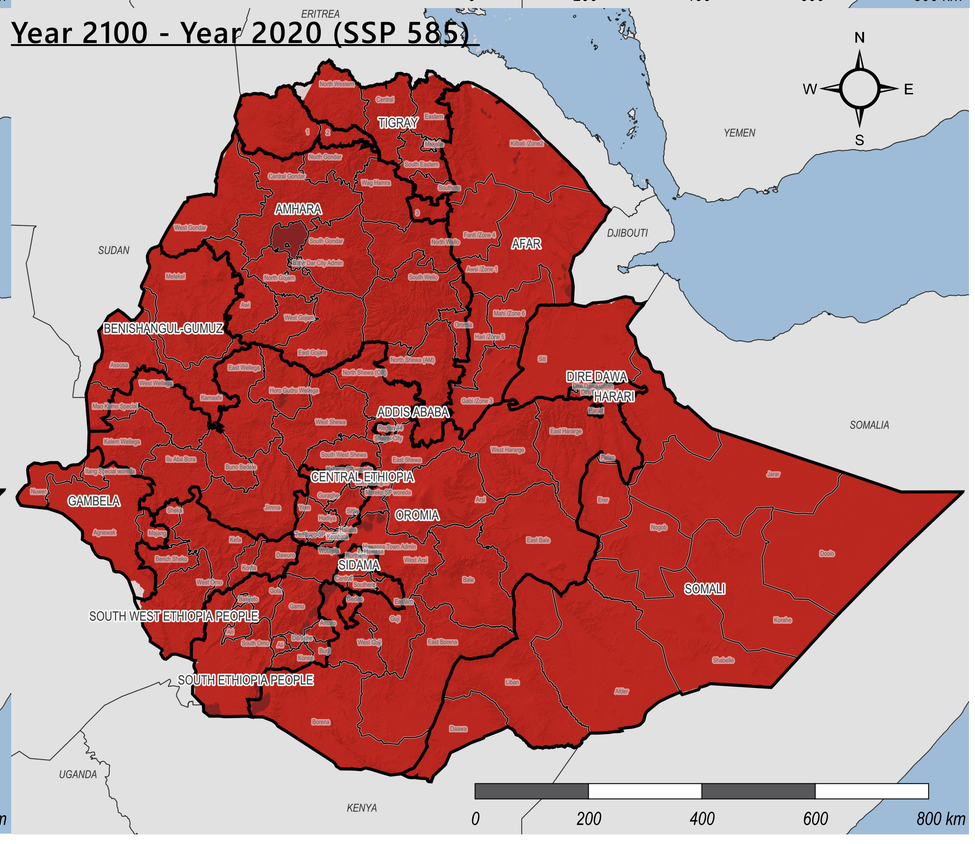
World countries boundary
Region boundary
Zone boundary

Temperature changes
Degree celsius [°C]
- <= 0.00 (Slight cooling)
- 0.01 - 1.00 (Low)
- 1.01 - 2.00 (Moderate)
- 2.01 - 4.00 (High)
- > 4 (Extreme)









Map Information:
The maps show historical and projected surface temperature differences between the 30-year and 80-year periods from 2020. Dataset from NASA Earth Exchange Global Daily Downscaled Projections (NEX-GDDP) was processed using Google Earth Engine. It includes projections for 30-year and 80-year periods from 2020, derived from CMIP6 models.

The model outputs are provided for two Shared Socioeconomic Pathways (SSP): SSP245: A 'middle pathway' projecting a radiative forcing of 4.5 Watts/m² by 2100. SSP585: An upper boundary scenario projecting a radiative forcing of 8.5 Watts/m² by 2100.

Main Takeaways:

SSP245 Scenario:

- By 2050, temperatures will decrease in Addis Ababa, Gambella, South, and Southwest Ethiopia, while the rest of the country will warm by 1 to 2°C.
- By 2100, all regions will experience a 1 to 2°C temperature increase.

SSP585 Scenario:

- By 2050, temperatures will rise by more than 2°C across Ethiopia.
- By 2100, the increase will exceed 5°C, significantly intensifying climate risks.

Climate Impacts: Under SSP585, nearly all regions will face severe heat stress and climate-related challenges, emphasizing the need for urgent adaptation measures.

Data Sources:
Temperature: NASA Earth Exchange Global Daily Downscaled Projections (NEX-GDDP)
Administrative Boundary: UN OCHA, 2024.
World Countries Boundary: Geoboundaries, 2020.
Coordinate Reference System: WGS, 1984.

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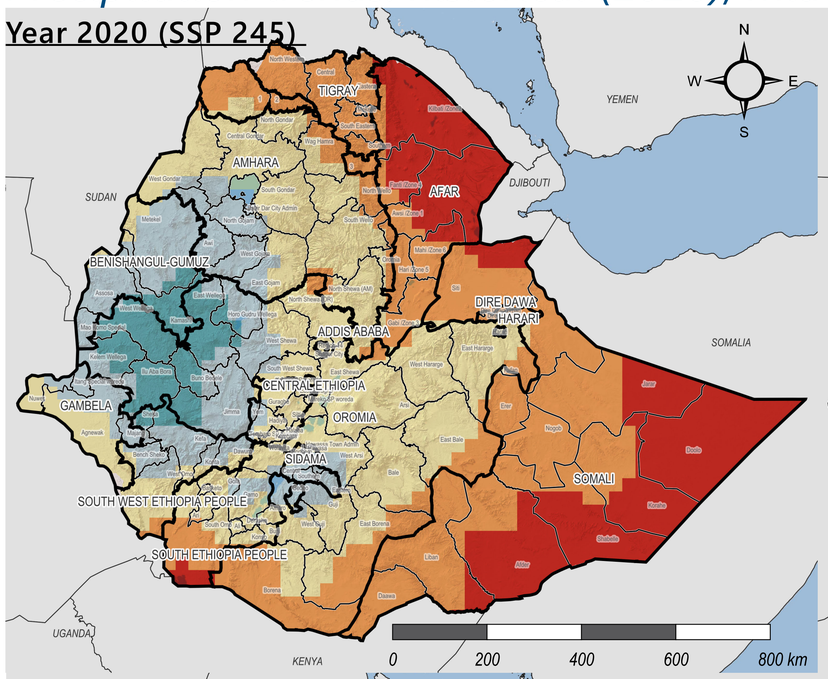
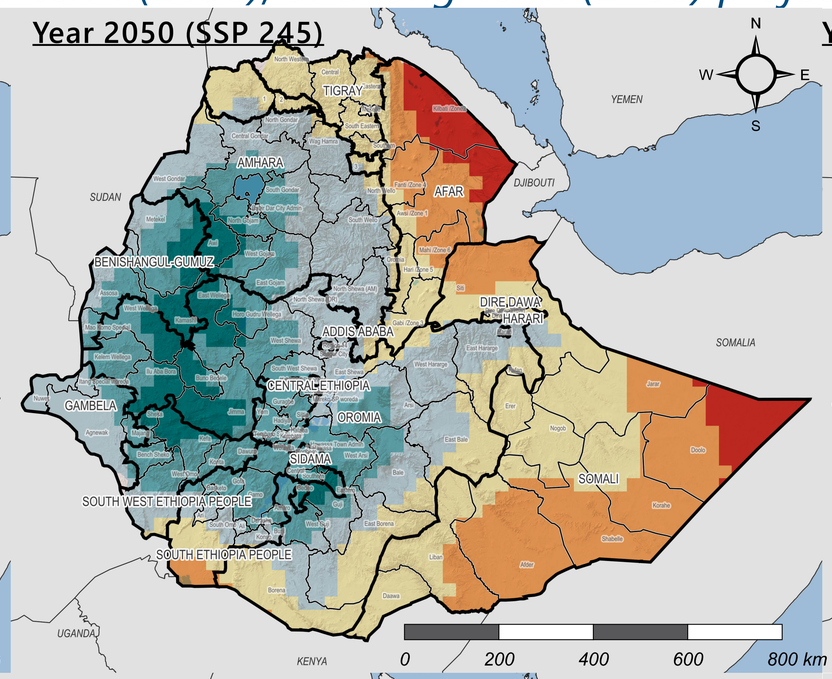
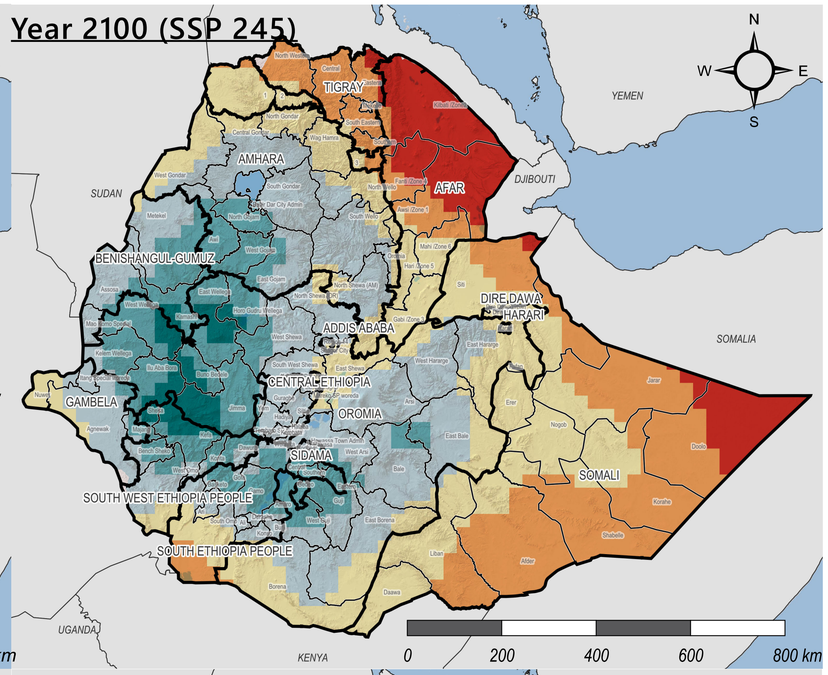
ETHIOPIA - CLIMATE HAZARD EXPOSURE AND IMPACT

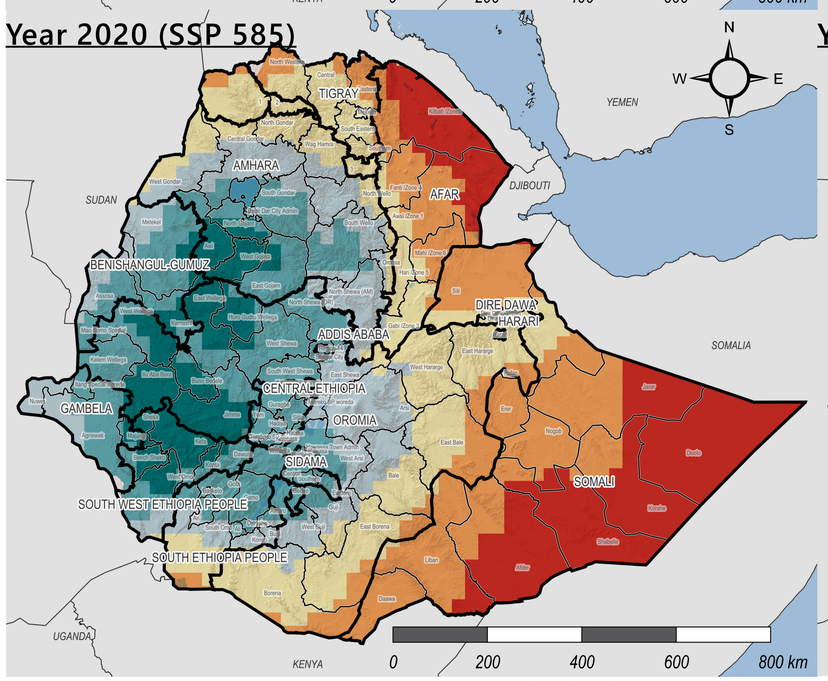
Precipitation trends: historical (2020), mid-term (2050), and long-term (2100) projections

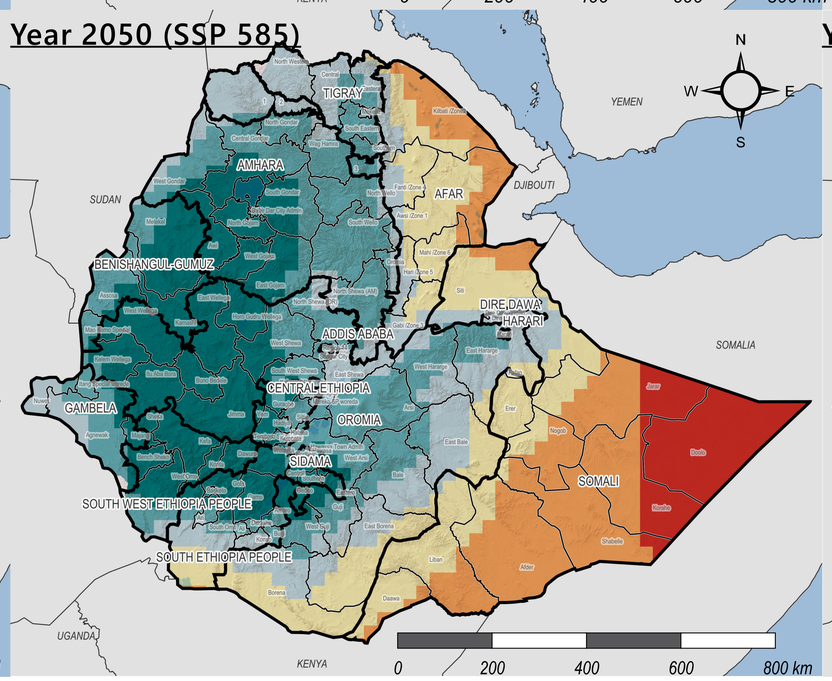
For Humanitarian Purposes Only
Production date: 26 February 2025

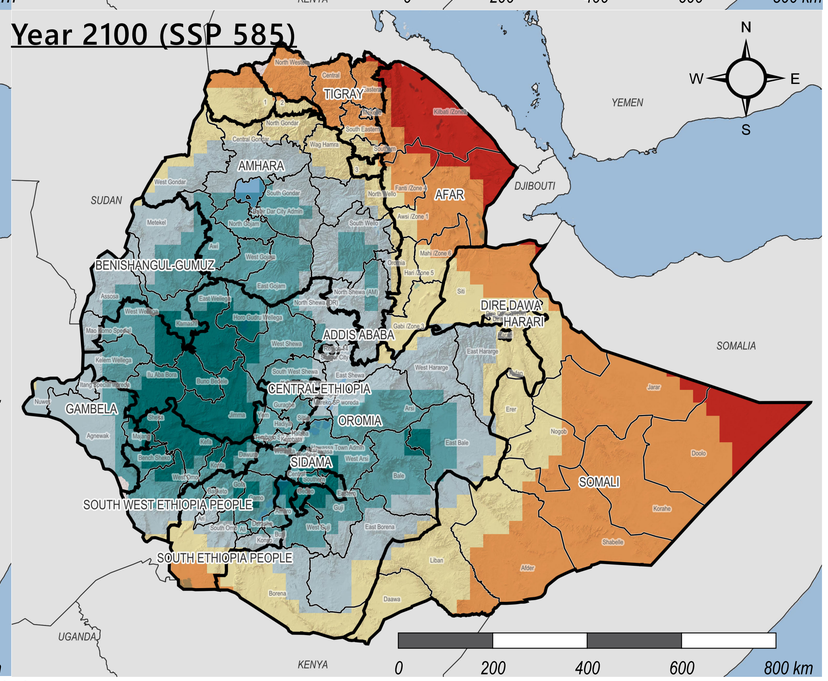












World countries boundary
Region boundary
Zone boundary

Precipitation (Millimeters/Day)
- < 0.77 (Very light)
- 0.77 - 1.50 (Light)
- 1.01 - 2.00 (Moderate)
- 2.01 - 3.00 (Moderately heavy)
- 3.01 - 4.00 (Heavy)
- > 4.01 (Very heavy)

Map Information:

These maps display historical and projected precipitation for the years 2020, 2050, and 2100. The dataset was developed by NASA Earth Exchange Global Daily Downscaled Projections (NEX-GDDP) and has been processed using the Google Earth Engine platform. The precipitation data for the selected years have been calculated from daily data. The data includes outputs from CMIP6 model and is available for two Shared Socioeconomic Pathways (SSPs): SSP245 and SSP585.

SSP245: A 'middle pathway' for future greenhouse gas emissions, projecting a radiative forcing of 4.5 Watts/m² by 2100. This scenario assumes moderate climate protection measures and a balance between fossil fuel use and renewable energy adoption.
SSP585: A high-emission scenario, projecting a radiative forcing of 8.5 Watts/m² by 2100. This scenario assumes continued high reliance on fossil fuels and minimal climate mitigation efforts, leading to significant increases in greenhouse gas emissions.

Main Takeaways:

In Ethiopia, precipitation is expected to rise, but not evenly across the country. The central and western parts of the country will likely increase by 2 mm/day, while the northern, eastern, southern, and western areas will see significant changes.

- Under SSP245, central and western Ethiopia are likely to see increased precipitation by 2050 and 2100.
- Under SSP585, precipitation will decrease in the western part of Ethiopia, except for the eastern Oromia region.
- The western part of the country, Amhara, and Gambela are also vulnerable to decreasing precipitation and may have a significant impact on agricultural crops.
- Overall, areas along the country's periphery will experience a higher precipitation decrease than the Oromia region of Ethiopia.

These trends highlight the urgent need for targeted climate adaptation strategies to protect communities from flood and drought.

Uses and Limitations:

The aim of this map is to help planners and decision makers identify priority areas for interventions. It is not designed as a standard tool for detailed site planning decisions. Map results need to be ground verified and decisions combined with specific on-site evaluation and appropriate technical expertise. Results are derived from computational modelling; they are not ground proofed and inherently limited by the quality of the input data or model assumptions. Precipitation maps focus solely on precipitation changes and do not provide information on other critical factors such as temparature, humidity, or wind patterns.

Data Sources:

Precipitation: NASA Earth Exchange Global Daily Downscaled Projections (NEX-GDDP).
Administrative Boundary: UN OCHA, 2024.
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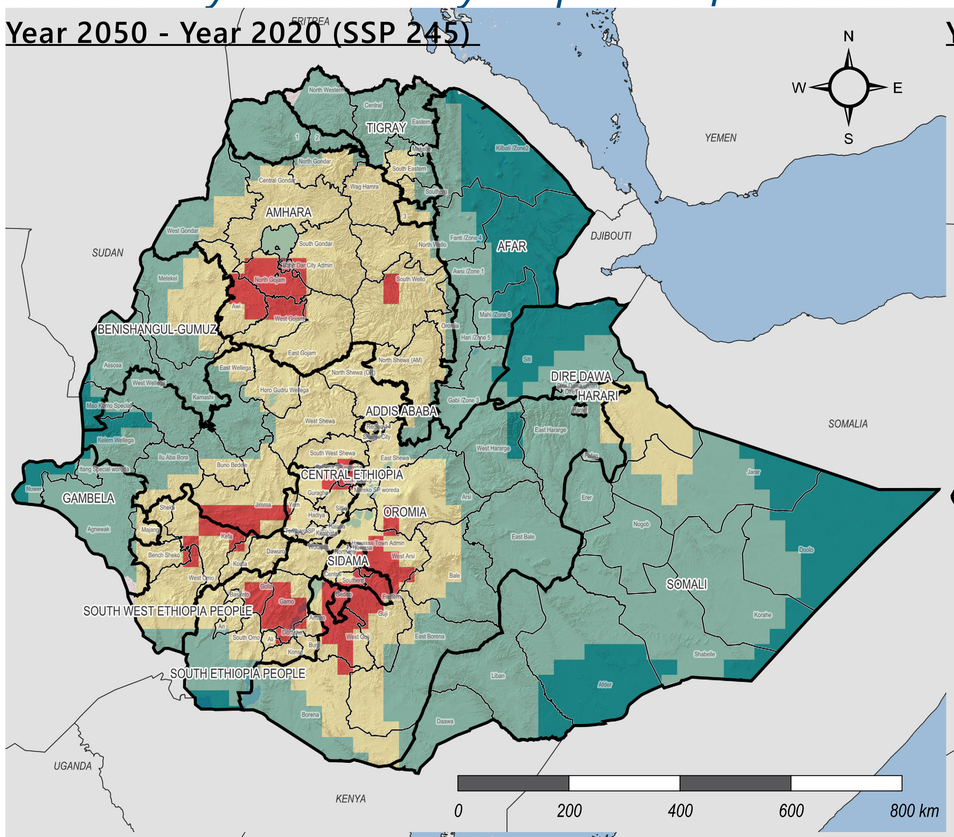
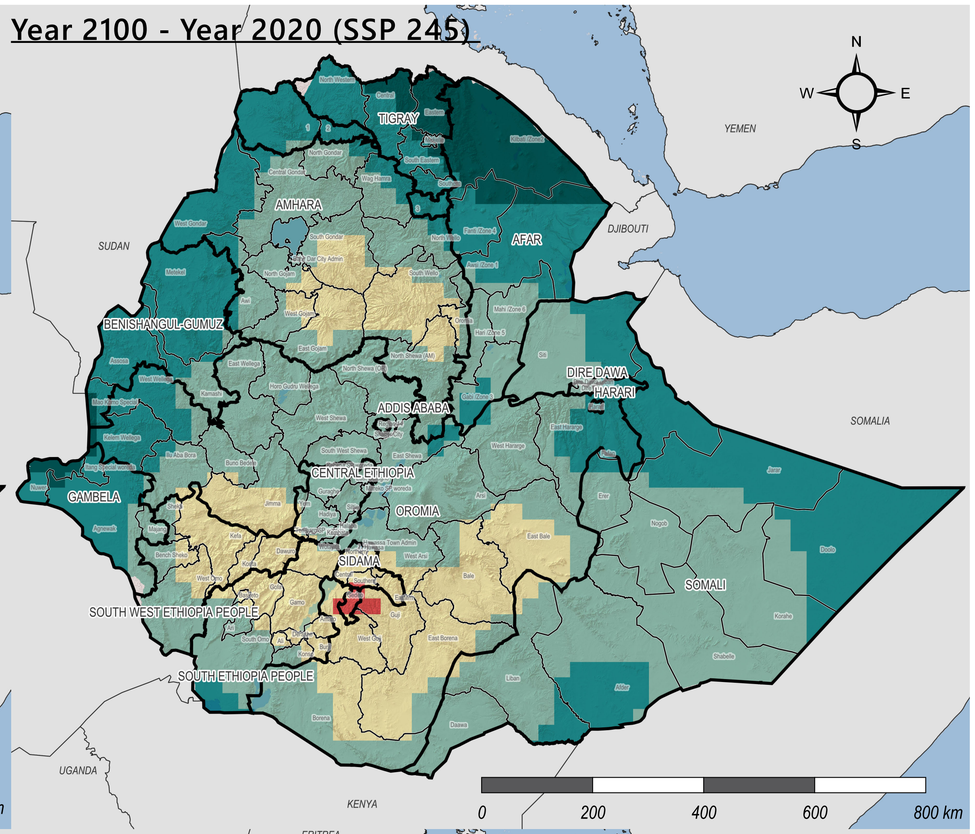
Precipitation trends: changes over 30-year and 80-year periods from 2020

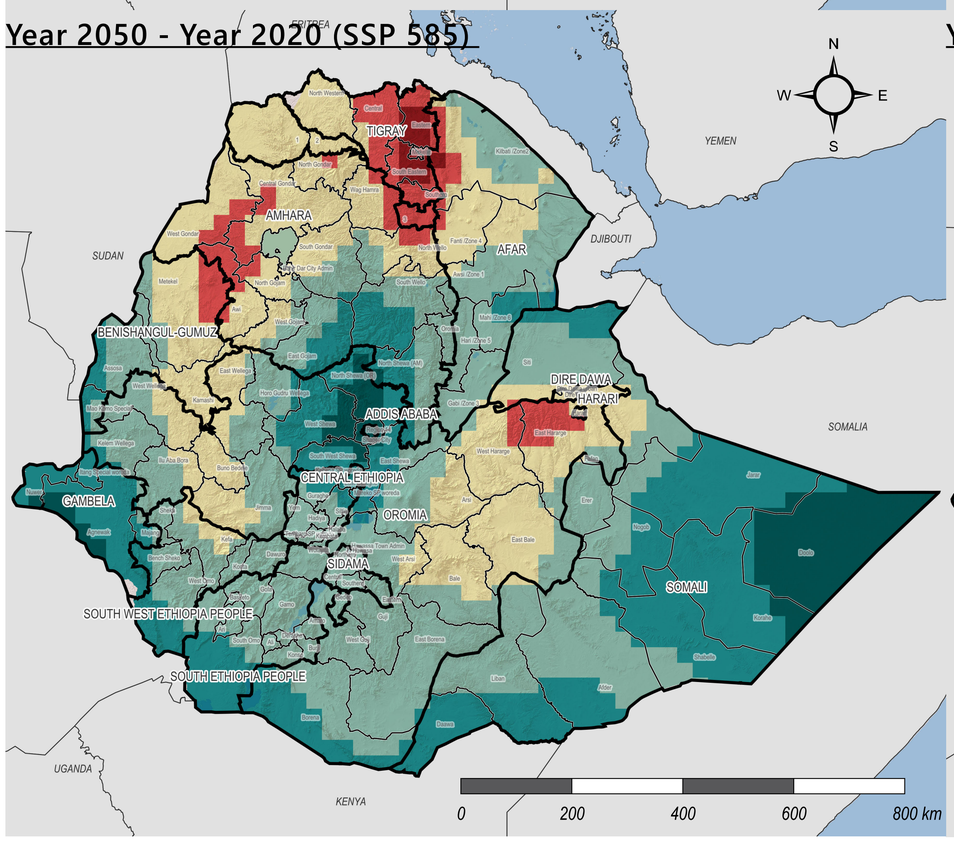
For Humanitarian Purposes Only
Production date: 26 February 2025

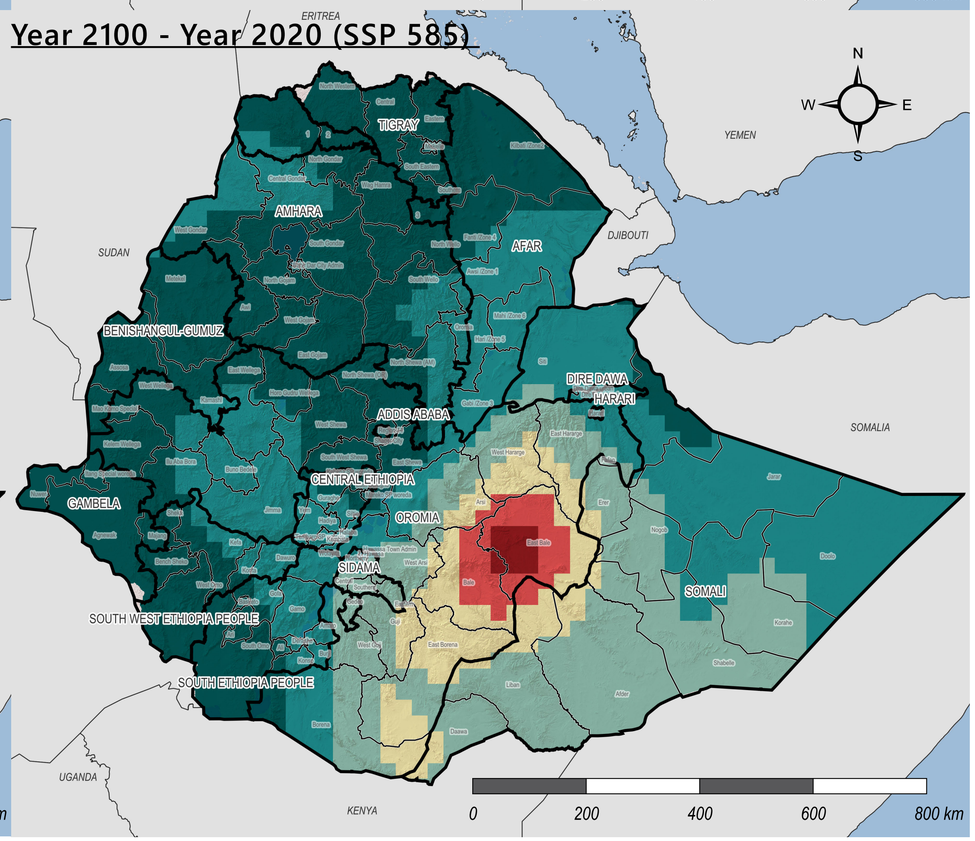
World countries boundary
Region boundary
Zone boundary

Precipitation changes (Millimeters/Day)
- < 0.00 (Slight decrease)
- 0.01 - 0.50 (No change)
- 0.51 - 1.00 (Slight increase)
- 1.01 - 1.50 (Moderate increase)
- 1.51 - 2.00 (Significant increase)
- 2.01 - 3.00 (High increase)









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The model outputs are provided for two Shared Socioeconomic Pathways (SSP): SSP245: A 'middle pathway' projecting a radiative forcing of 4.5 Watts/m² by 2100. SSP585: An upper boundary scenario projecting a radiative forcing of 8.5 Watts/m² by 2100.

Main Takeaways:
SSP245 Scenario:

- By 2050, precipitation will increase in Addis Ababa, Gambella, Central Ethiopia, Sidama, and Southwest Ethiopia regions by 1 to 2 mm/day or more.
- By 2100, precipitation will sligly decrease in the north, northwest, and northeast of the country by 0.2 mm/day or less.

SSP585 Scenario:

- By 2050, precipitation will increase in Tigray, Amhara, Oromia, and Benishangul-Gumuz by 1 to 2 mm/day.
- By 2100, the north, northwest, and northeastern parts of the country will experience a decrease in precipitation by 0.2 mm/day or more, while the Oromia region will see an increase in precipitation.

Climate Impacts: Under SSP585, nearly all regions will face a severe decrease in precipitation and climate-related challenges, emphasizing the need for urgent adaptation measures.

Uses and Limitations:
The aim of this map is to help planners and decision makers identify priority areas for interventions. It is not designed as a standard tool for detailed site planning decisions. Map results need to be ground verified and decisions combined with specific on-site evaluation and appropriate technical expertise. The map does not provide any information about water flow. Results are derived from computational modelling; they are not ground proofed and inherently limited by the quality of the input data or model assumptions. Precipitation maps focus solely on precipitation changes and do not provide information on other critical factors such as temparature, humidity, or wind patterns.

Data Sources:
Precipitation: NASA Earth Exchange Global Daily Downscaled Projections (NEX-GDDP).
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World Countries Boundary: Geoboundaries, 2020.
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