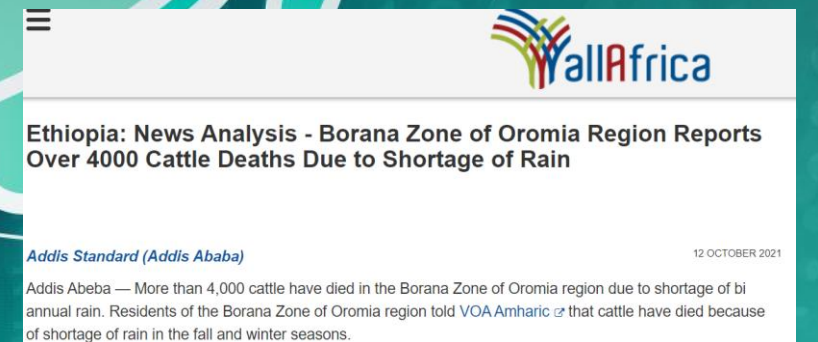
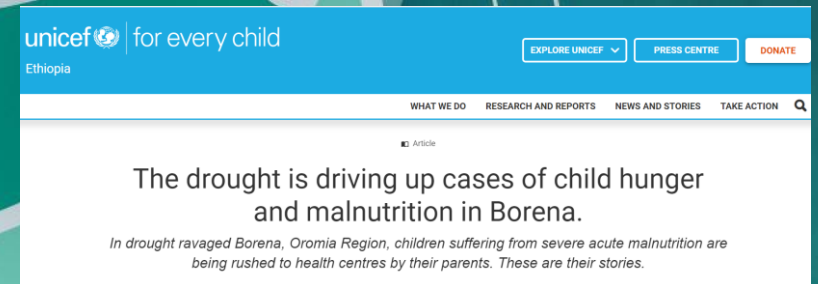


# An early warning system for drought detection in Borena, Southern Ethiopia using multi-sourced and publicly-available EO data



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## MOTIVATIONS

- Frequent and severe drought has become a major climate disaster throughout the Borena region, located in southern Ethiopia.
- This area has recently endured severe drought events due to consecutive years of minimal precipitation, severely impacting the region's ecosystem services, and livestock production.

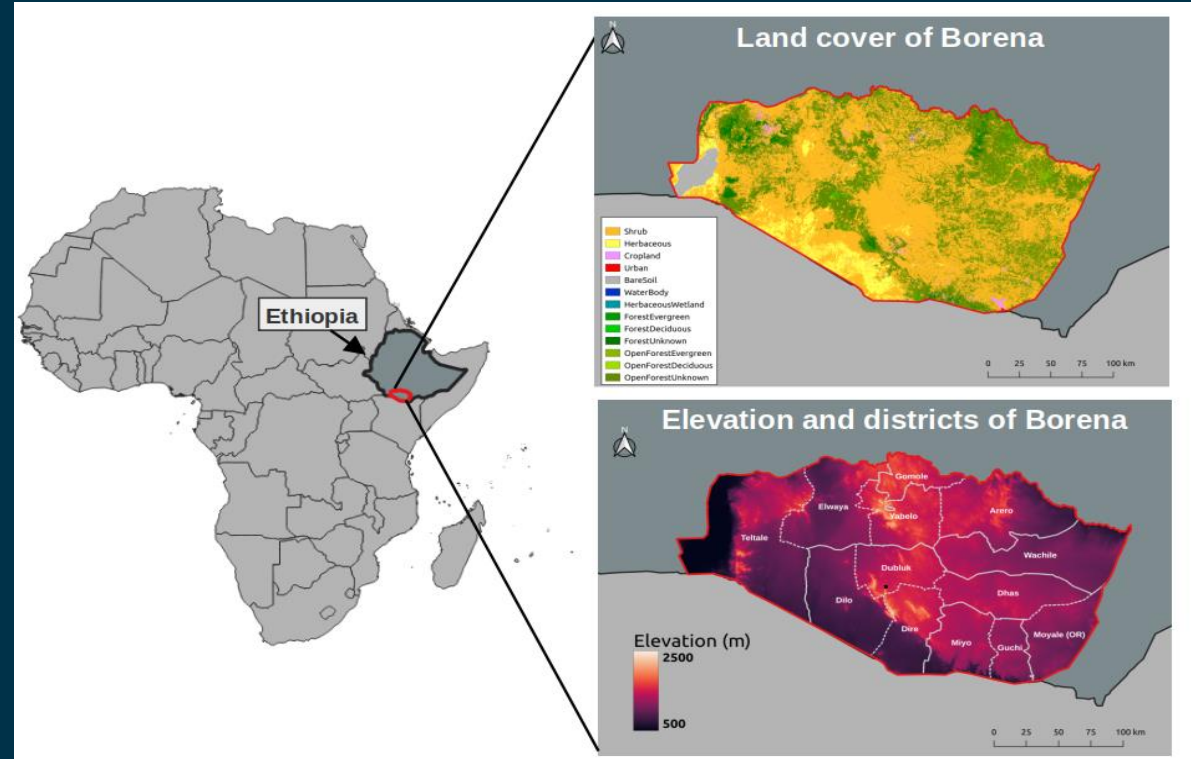
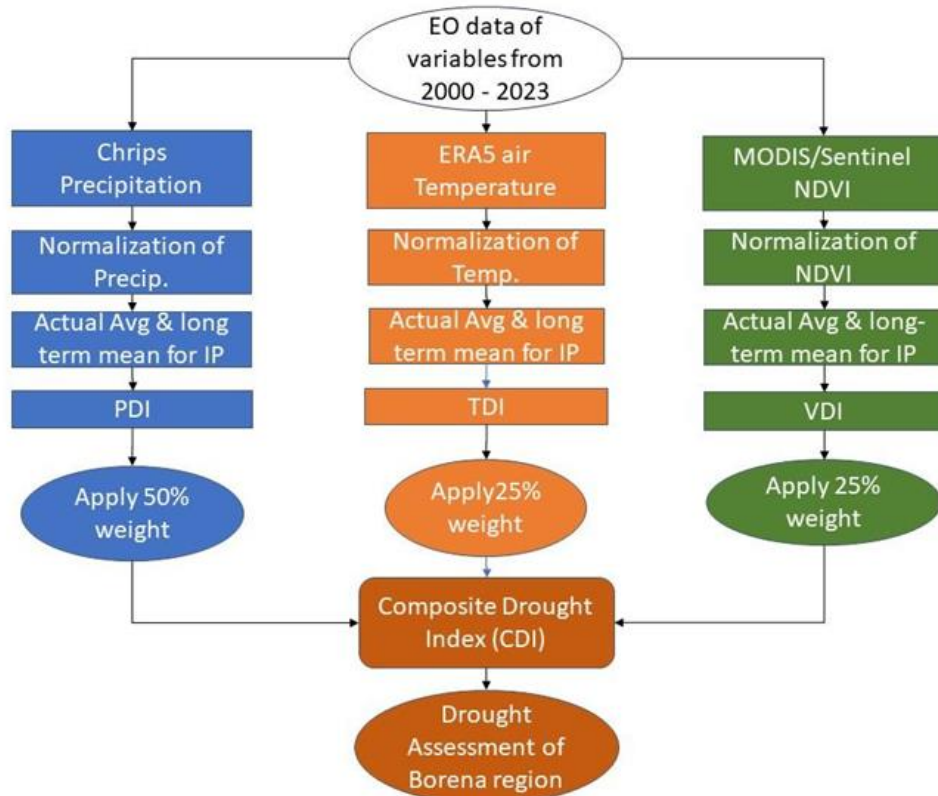
## EO DATA Sources

- Climate Hazards Group InfraRed Precipitation with Station Data (CHIRPS) - Precipitation
- MODIS/Sentinel - 3 NDVI
- ERA5-Land - Air temperature (Ta)

To mitigate the effects of droughts and to provide quick decision-making with timely information for an effective response, it is crucial to regularly analyze the information about its severity and its extent in terms of spatial and temporal pattern. This study analyzes drought events from 2000 to 2023, with a particular focus on the recent severe droughts between 2015 and 2022. To better understand and predict these droughts, the project introduces a novel tool called the Composite Drought Index (CDI) to provide a holistic monitoring of drought occurrences and impacts in the region.

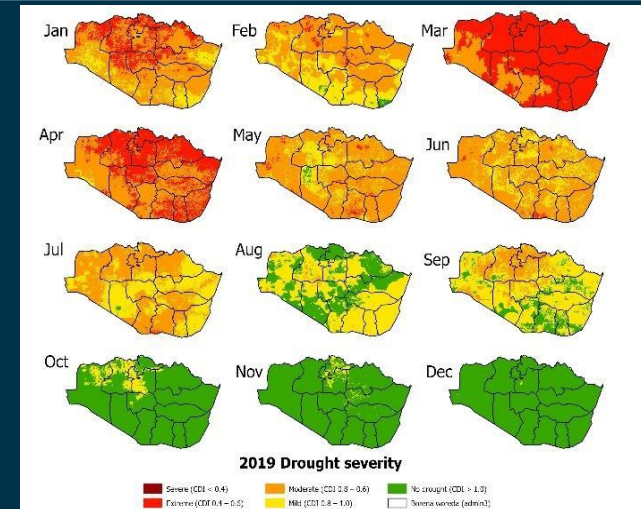
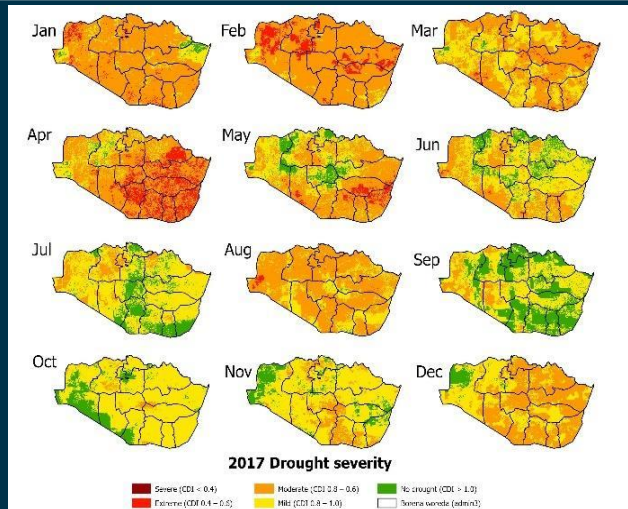
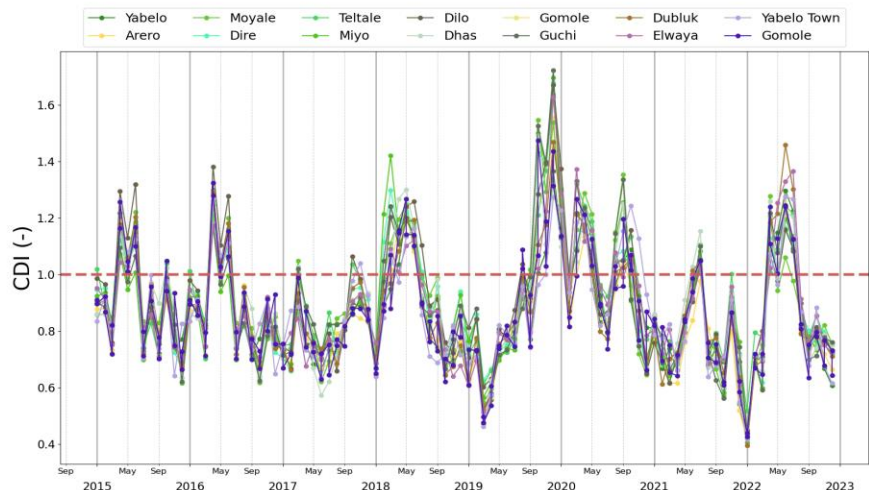
## Study Area

### Workflow



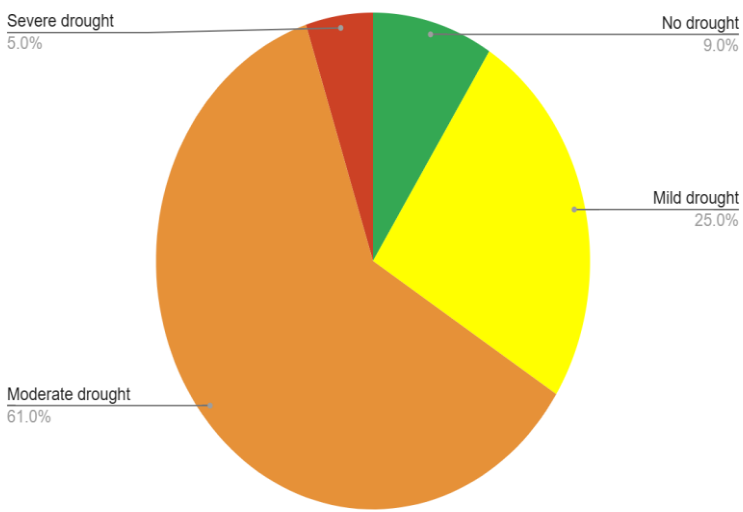
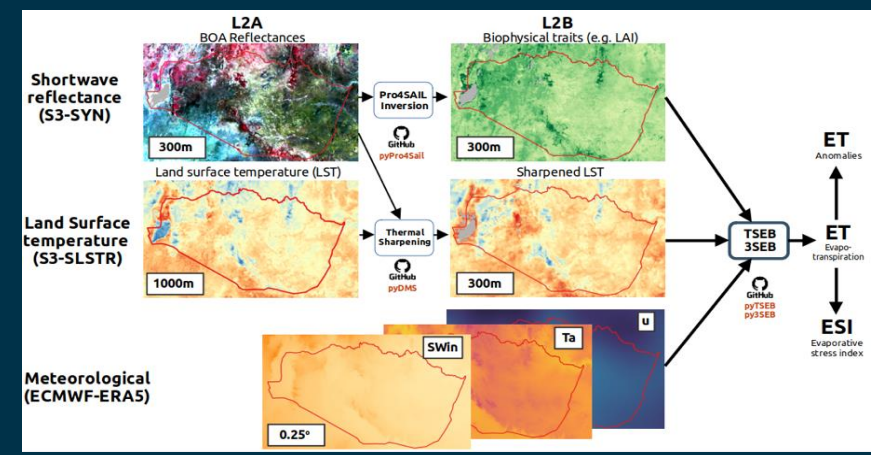
$$CDI_{i,m} = w_{PDI} * PDI_{i,m-2} + w_{TDI} * TDI_{i,m-2} + w_{VDI} * VDI_{i,m}$$

# Results



## Further work

Incorporate actual evapotranspiration estimates for faster detection of water stress in vegetation.



- Borena is extremely vulnerable to drought, with a noticeable decline in precipitation patterns observed since 2015. In both 2021 and 2022, the area received less than 200 mm of precipitation
- The findings revealed a higher occurrence of severe and moderate drought in in the years 2015, 2016, 2018 , 2021 and 2022. 2021 compared to 2017. Particularly, severe drought episodes were often caused by a lack of rainfall during the main rainy season of the months of March, April, and May.