



Understanding better the environmental and landscape impacts of drought on the Horn of Africa Drylands

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Droughts cause major impacts on the Horn of Africa Drylands (HAD), but the factors that determine the magnitude of these impacts are not well understood. The focus is mostly on socio-economic impacts, but environmental and landscape impacts are often overlooked, in part because they are not always immediate, or their direct or indirect linkage to drought is not apparent. However, drought-induced natural resources and landscape degradation can hinder agricultural activities, livestock farming, tourism, etc., causing socio-economic problems as well. Therefore, it is important to study environmental drought risk and its drivers.

In this research, we adopt a machine learning approach to estimate the chance of experiencing environmental and landscape impacts, specifically: degradation or loss of vegetation cover, significant land-use changes, increased number and severity of fires and poor air quality events related to dust concentration, in Ethiopia, Kenya and Somalia. We will use fast and frugal trees to link accumulated water deficits, calculated using several meteorological and hydrological drought indices, with observational data on past drought impacts on the landscape and the environment. Impacts are detected with high-resolution remote sensing imagery products (Copernicus Global Land Cover Layers, WAPOR, Sentinel-5P NRTI AER AI and several MODIS products, among others), which have the advantage of providing continuous long-term information at large scales.

The applied supervised machine learning approach objectively selects drought hazard indices (including their time and severity thresholds) with the best predictability for observed impacts, capturing the relationships between hazard indices and impacts in the HAD administrative divisions. This modelling approach allows for the identification of region-specific issues while it guarantees comparability. This makes it particularly useful for this case study, as the studied environmental and landscape impacts may be context- or location-specific and could arise from a mixture of different drought types.

The method aims at understanding if, when and how environmental and landscape impacts occur simultaneously or successively and allows us to uncover their interlinkages with each other and with the different drought types.