

## Study Project/Master Thesis Drought Hazard in Baden-Württemberg

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### Introduction

Drought is an extremely expensive and damaging hydrological extreme that may become more frequent and extreme in the future due to climate change. In order to better prepare for such futures, it is necessary to understand which areas are most at risk of drought. Risk is generally accepted to consist of two components: the hazard, or the probability of occurrence; and the vulnerability, or the effects. Maps of drought hazard in Baden-Württemberg must be created as a first step to understanding future drought risk. Despite its inherently multivariate nature, many contemporary hazard indices for drought are based on a single hydrological variable (e.g. precipitation, soil moisture) encompassing a singular type of drought (e.g. meteorological, hydrological, agricultural, socio-economic). While many multivariate drought indices currently exist, the creation of multivariate drought hazard indices is a burgeoning topic.

### Research Questions

- What areas of Baden-Württemberg suffer from high drought hazard?
  - Which areas have the highest hazard under different drought types (e.g. meteorological, hydrological, agricultural)?
  - Does a single multivariate index perform better than several univariate indices in assessing drought hazard?

### Tasks

- Literature review
  - Development of drought indices, including those for hazard, and previous uses
  - Study of drought as a multivariate phenomena
  - Previous droughts in Baden-Württemberg
- Analysis of drought hazard in Baden-Württemberg under historic conditions
  - Calculating different drought indices and hazard for different drought types using preselected remote sensing data (Global Land Evaporation Amsterdam Model (GLEAM), Climate Hazards Group InfraRed Precipitation with Station Data (CHIRPS), and Global Land Data Assimilation System (GLDAS)) for different hydrological variables
  - Identification of places with highest hazard in historic conditions through different types of drought
  - Evaluating multivariate drought hazard and comparing its usefulness to several individual hazard indices

### Desirable Skills

- Familiarity with data analysis using programming languages (e.g. MATLAB, Python) - Familiarity with remote sensing data

**Start Date:** Immediately or on agreement