ASSESSING VULNERABILITY TO DROUGHT AT A PAN - EUROPEAN SCALE

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Drought is a recurring natural phenomenon that can cause important damages and that is likely to become more frequent and severe in many parts of Europe. Analyzing past impacts of drought and looking at factors that determine the vulnerability of a given system will contribute to the understanding of what can be done to make Europe more resilient to drought. A factor-based approach for the assessment of vulnerability to drought at a Pan-European scale has been developed and is being tested. Factors are organized in two main components: Sensitivity and Adaptive Capacity, while Exposure is defined through the characterization of those droughts that, according to past records, are likely to cause impacts in four European macro-regions.

Systematic review of vulnerability frameworks & models

➢ **10 vulnerability models analyzed**

Variety of:

Research areas: Risk-hazard, Climate Change, Sustainability, etc
Concepts: Vulnerability, Resilience, Adaptability, Exposure, etc
Main focii: Biophysical, Social, Holistic
Components: Exposure, Sensitivity, Adaptive Capacity
Biophysical, Social, Economic, Technological

PAST DROUGHT IMPACTS

Past drought episodes → **SPI Standard Precipitation Index**

Past Impacts reported → **EDII European Drought Impact Inventory**

Characteristics of past droughts that caused a certain level of impacts across Europe

Systematic review of applied assessments of vulnerability to drought

➢ **28 assessments reviewed**

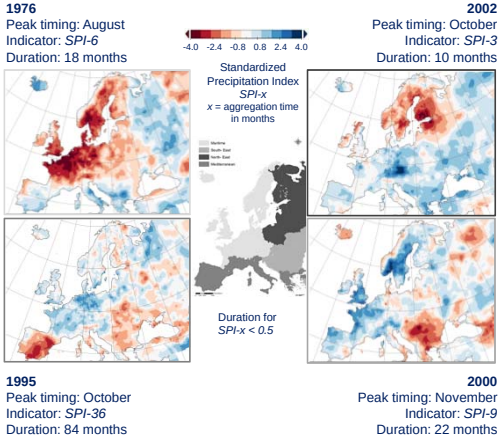
Variety of:

Approaches: Factor-based, perception-based, impact-based
Scales: Local, regional, national, transboundary, continental, global
Scopes: Sector-specific, comprehensive
Data: Quantitative, qualitative, mixed

VULNERABILITY TO DROUGHT: METHODOLOGICAL APPROACH

STEP 1: Characterization of **Drought Hazard**

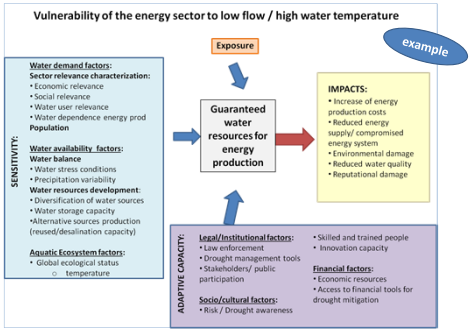
Characterization of a "typical" drought
for a given region, different hazards are common and likely to cause specific impacts.



Droughts in a given region are generally described by their duration, frequency, severity and season of occurrence. Mediterranean countries tend to be affected by prolonged, multi-year droughts. Maritime, North-Eastern and South-Eastern European macro regions are affected by shorter droughts, which accentuate the intra-annual seasonality.

STEP 2: Identification of **situations of vulnerability**

Whose vulnerability is being assessed? Vulnerability to what type of impact?



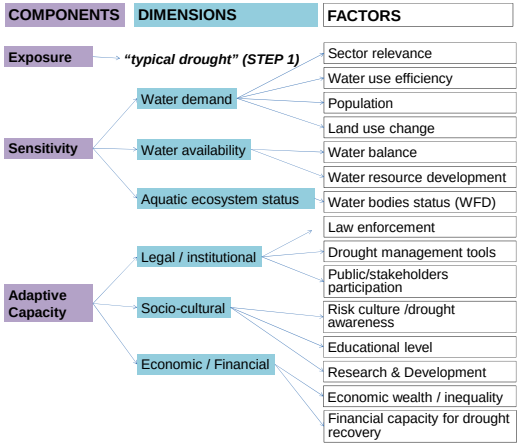
Situations of vulnerability of:

1. **Domestic water supply** to *water shortages*
2. **Irrigated agriculture** to *water restrictions*
3. **Energy sector** to *low flow / high water temperature*
4. **Manufacturing sector** to *water shortages or low flow*

The description of these situations for specific sectors facilitates the identification of key vulnerability factors as well as internal causal relations. These four hypothetical situations were defined based on the past impacts identified in the EDII (European Drought Impacts Inventory).

STEP 3: Identification of **vulnerability factors**

Vulnerability factors influence vulnerability of specific sectors exposed to a given drought



Factors are derived from the 'vulnerable situations' (STEP 2) and are validated by an extensive literature review and expert opinion. The analysis of factors that influence vulnerability to drought attempts to understand why a given sector in a given region is vulnerable to a "typical" drought and what can be done to make it more resilient.

STEP 4: Generation of **drought vulnerability maps**

Indicators design

Data gathering & processing

Examples of data sources:
- Eurostat
- EEA/WISE
- AQUASTAT
- Eurobarometer
- World Bank

examples

Dam Capacity
(quantitative data from Aquastat, 2010)

WFD Ecological Status
(quantitative data from EEA/WISE, 2010)

Economic Wealth & Equity
(quantitative data from Eurostat, 2010)

Risk culture & information
(qualitative data from Eurobarometer, 2012)

The main expected output is the identification of "potential vulnerable sectors/areas" across Europe

ACKNOWLEDGEMENTS
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Upcoming related contributions at EGU:
Kohn et al.: *Impact of European Drought Events: insights from an international inventory*, Poster R280, Wednesday
Blauhut et al.: *Towards Drought Risk Mapping at the Pan-European Scale*, Oral, Friday 4pm, Room G8

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