DriDanube

“Drought Risk in the Danube Region”

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Budapest, 26 April 2017
Globally averaged temperature has already increased by almost 1°C since the time of first systematic weather recordings.

https://www.ncdc.noaa.gov/
Warming Trend in Austria

Temperatur Anomalien, Österreich: 1768 to 2014

- 21-jähriger Gauß-gefilterter Trend
- bisheriges Maximum +2.0 K (1994)
Adverse weather conditions for European wheat production will become more frequent with climate change

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Europe is the largest producer of wheat, the second most widely grown cereal crop after rice. The increased occurrence and magnitude of adverse and extreme agroclimatic events are considered a major threat for wheat production. We present an analysis that accounts for a range of adverse weather events that might significantly affect wheat yield in Europe. For this purpose we analysed changes in the frequency of the occurrence of 11 adverse weather events. Using climate scenarios based on the most recent ensemble of climate models and greenhouse gases emission estimates, we assessed the probability of single and multiple adverse events occurring within one season. We showed that the occurrence of adverse conditions for 14 sites representing the main European wheat-growing areas might substantially increase by 2060 compared to the present (1981-2010). This is likely to result in more frequent crop failure across Europe. This study provides essential information for developing adaptation strategies.
General information

Project: DriDanube - “Drought Risk in the Danube Region”

Reference No: DTP1-182-2.4 - DriDanube

Programme: Danube Transnational Programme (DTP)

Priority Area 2 (PA2): Environment and culture responsible Danube region

Specific Objective (SO2.4): Improve preparedness for environmental risk management

Duration: January 2017 – June 2019 (30 months)

Project budget: 1,974,750,00 EUR
Partnership

Lead partner: Slovenian Environment Agency
ERDF & IPA partners (15)
Associated Strategic Partners (ASP) (8)

7 EU countries:
Austria (2)
Czech Republic (1)
Croatia (1)
Hungary (2)
Romania (1)
Slovakia (2)
Slovenia (2)

3 non-EU countries:
Bosnia and Herzegovina (1)
Montenegro (1)
Serbia (2)
Project: aim and objectives

• Project **aims** to increase the capacity of the Danube region to adapt to climatic variability by **enhancing resilience to drought** with recently developed tools and data sets;

• **Objectives:**
  • Develop a new operational drought monitoring service;
  • Prepare a unified drought risk protocol based on the Civil Protection Mechanism;
  • Improve drought emergency response in the Danube region.
Project: target groups

• Hydro-meteorological national services
• Emergency response authorities
• Non-governmental organisations
• Water and farmer communities/chambers
• Industries
Project: outcomes

Main deliverables:

• Drought User Service
• Methodology for drought impact assessment and forecast
• Methodology for drought risk assessment
• Strategy to improve drought response

Improve drought emergency response and enhance the cooperation between operational services and decision making authorities in the Danube region.
Drought User Service

An operational service based on exploitation of Earth Observation (EO) data:

• Easy-to-use interface:
  • Access in browser (operating system-independent)
  • Responsive interface (selecting different products, dates, geographic region)

• Functionality:
  • Display a suite of drought-related Earth Observation indices (vegetation, soil moisture, yield forecast, etc.)
  • Visual comparison between different products

• Specifications:
  • Region: Danube catchment
  • Temporal resolution: weekly images
  • Spatial resolution: 12.5km to 1km
Drought EO-based characterisation

Monthly anomalies of soil moisture (ASCAT, EUMETSAT) and NDVI (Modis, NASA)

(a) Moldova
- Year 2007 with the most severe drought ever recorded
- Cereal production ~70% lower than average of previous 5 years (FAO)

(b) India
- Wet soil provided suitable condition for plant growth,
- Lead to record harvest yield in April

Drought User Service - EO data sets

**Input data:**

**METOP-A/B ASCAT**
- Surface Soil Moisture data, 12.5km Swath Grid
- 2007-now
- Originating from EUMETSAT

**Sentinel-1A/B CSAR L1**
- Radar backscatter data, 25x25m pixel spacing
- 2015-now
- Originating from Copernicus Global Land Service

**TERRA MODIS**
- Surface Reflectance, 250m
- 2000-now
- Originating from NASA

**Auxiliary data:**

**Sentinel-2A MSI L1C**
- Top of atmosphere reflectance
- 10m spatial resolution
- 2016-now
- Originating from Copernicus Global Land Service

**HWSD (Harmonised World Soil Database) v1.2**
- Global
- Vector format
- Originating from FAO

**Output/Results:**

**Soil Water Index (SWI) images**
- Plant Available Water (in %), including anomaly from long-term mean minimum: 10-day product (“dekadal”) at 12.5 km resolution, optimum: daily product, at 1km resolution

**Normalised Difference Vegetation Index (NDVI) and Enhanced Vegetation Index (EVI)**
- Weekly images
- 5 km resolution
- With difference maps to previous week

**Yield forecast maps**
- 7-day trend, 5 km resolution
- Based on vegetation indices (e.g. NDVI, EVI)
Example output:

• Major drought event reported in the Danube region in August 2015

• SWI anomaly image (difference from long-term mean value) with a spatial sampling of 0.1 degrees (top)

• NDVI anomalies with a spatial sampling of 1/112 degrees (~1km) (bottom)

(WGS84/Pseudo Mercator projection (EPSG: 3857))
Drought User Service (draft design)
Build on previous developments
Summary

Improve drought emergency response in the Danube region:

• With an operational monitoring service based on EO data
  • New EO-based data included: soil moisture from ASCAT

• Take advantage of the technological development, e.g. cloud services:
  • Process, analyse and display results of multiple large data sets (EO, meteorological data, in-situ data) and their combination
  • Facilitate interaction between stakeholders

• Facilitate trans-border information exchange on good practices in drought management between all stakeholders at national and regional level

• Implement drought management policies in the existing frameworks (e.g. in the Danube River Basin Management Plan)
Info and updates:
www.interreg-danube.eu/dridanube