ARSO METEO
Slovenian Environment Agency

Interreg
Danube Transnational Programme
DriDanube

DriDanube project – overview of the project development

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Project co-funded by European Union funds (ERDF, IPA)

WHY?
Current status

Monitoring
- untimely delivery
- cross-border inconsistencies
- lack of integration of risk and impact data
- increase in the number and duration of droughts in the Danube region in last decades (in 2003, 2007, 2015, 2016, 2017)

Impacts and risk assessment
- no systematic collection of drought impacts
- lack and incomparable drought risk assessment methodologies
- despite the impacts on the economy and welfare of people, mainly in agriculture, drought is still not considered an issue of high priority

Management
- reactive, dealing mainly with losses and damages
- cooperation between key actors is missing
- formal legislation does not exist

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Motivation for the DriDanube project

Drought is becoming one of the major challenges in water management in the Danube region.

Drought Risk in Danube Region - DriDanube

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- Project budget: 1.974.750,00€
- Project financed by European regional development fun (85%)
- Duration: 30 months **(January 2017 – June 2019)**
- Lead partner: ARSO/DMCSEE

7 EU countries
3 non-EU countries
15 partners
8 strategic partners

Lead Partner:
- Slovenian Environment Agency (ARSO), Slovenia

Partners:
- EODC Earth Observation Data Centre for Water Resources Monitoring GmbH (EODC), Austria
- Global Change Research Institute CAS, (CzechGlobe), Czech Republic
- Global Water Partnership Central and Eastern Europe (GWP CEE), Slovakia
- Hungarian Meteorological Service (OMSZ), Hungary
- Vienna University of Technology (TU Wien), Austria
- Szent Istvan University (SZIU), Hungary
- National Meteorological Administration (NMA), Romania
- Centre of Excellence for Space Sciences and Technologies (SPACE-SI), Slovenia
- Meteorological and Hydrological Service (DHMZ), Croatia
- Slovak Hydrometeorological Institute (SHMU), Slovakia
- Faculty of Agriculture, University of Novi Sad (FAUNS), Serbia
- Republic Hydrometeorological Service of Serbia (RHMSS), Serbia
- Institute of Hydrometeorology and Seismology (IHMS), Montenegro
- Republic Hydrometeorological Service of Republic of Srpska (RHMZ RS), Bosnia and Hercegovina

Associated Strategic Partners:
- International Commission for the Protection of the Danube River (ICPDR), Austria
- Administration of the RS for Civil Protection and Disaster Relief (URSZR), Slovenia
- The State Land Office (SLO), Czech Republic
- Agricultural Station/Forecasting and Warning Service of Serbia in plant protection (PIS), Serbia
- Environment Agency Austria (EAA), Austria
- Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW), Austria
- Ministry of Environment and Energy, Water management directorate (MZOIE), Croatia
- Ministry of Agriculture (FM), Hungary

Slovenia - 2
Czech Republic - 1
Slovakia - 2
Austria - 2
Hungary - 2
Romania - 1
Croatia - 1
Serbia - 2
Montenegro - 1
Bosnia and Herzegovina - 1

DriDanube - main objective and outputs

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Improved drought emergency response and better cooperation among operational services and decision-making authorities in the Danube region.

Monitoring

Drought User Service

An innovative tool integrating all available data, including large volume of remote sensing products and serving the authorities to monitor, forecast and respond during drought development faster and with higher precision.

Impacts and risk assessment

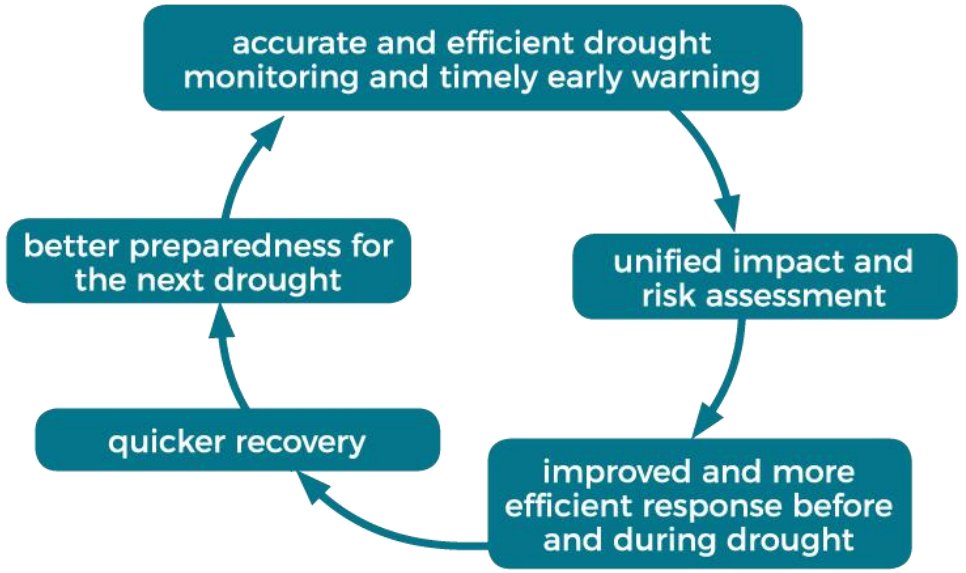
Methodologies for drought impact and risk assessment

Unification and cross-border coherence of drought Risk and Impact assessments. Establishment of network of reporters as additional source of information for drought impacts in agriculture.

Management

DriDanube Strategy

A clear guidance for overcoming the gaps in the drought decision-making processes and improvement of drought emergency response in the Danube region.



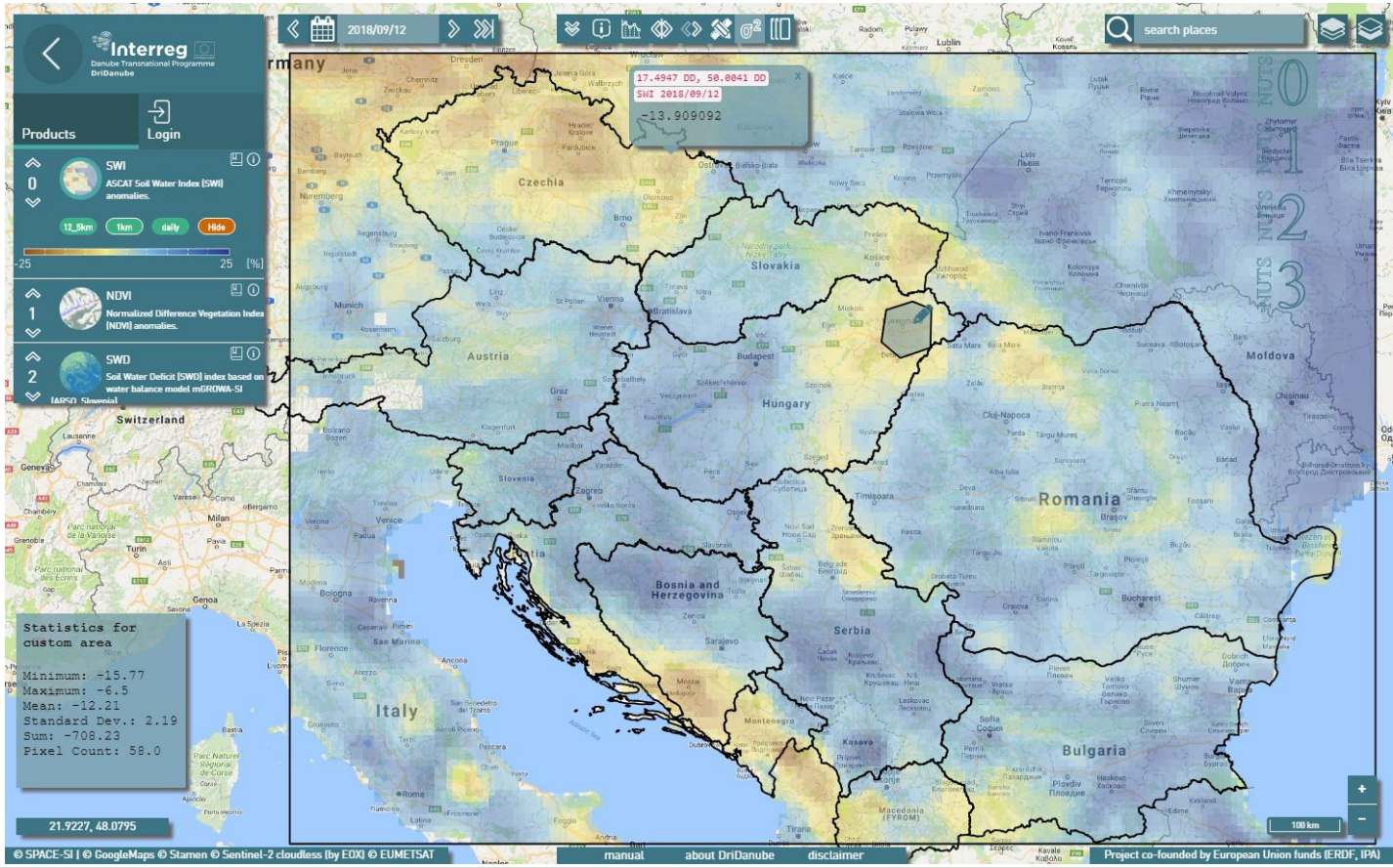
Result 1: Drought User Service – DUS

Web-based interctive tool for real-time drought monitoring through different drought indices.

Source of data: satellite (Big Data), meteorological data

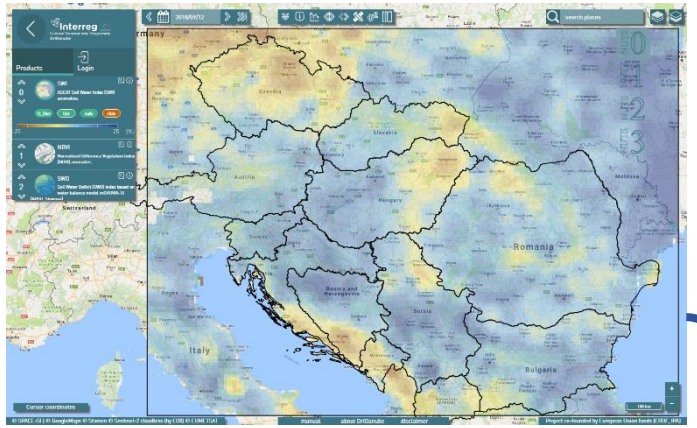
Some integrated products/drought indices:

- **SWI** anomalies – relative soil moisture saturation (daily)
- **NDVI** anomalies – relative vegetation greenness (decadal)
- **SWB** – Surface Water Balance from numerical weather prediction model (decadal accumulation from April 1)
- **SWDSLO** – Soil Water Deficit based on water balance model mGROWA for the territory of Slovenia (daily)
- **SWDA** – no. of accumulated days with negative SWI anomaly
- **VegCon1** – Relative Vegetation Condition for crops and grasslands (weekly)
- **VegCon2** – Relative Vegetation Condition for all vegetation types (weekly)

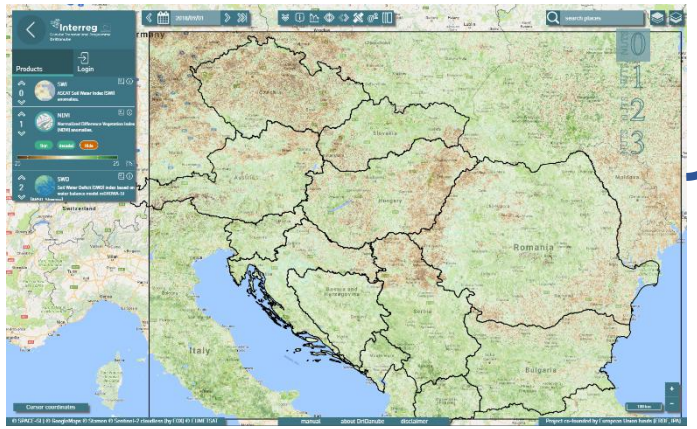


... Drought User Service

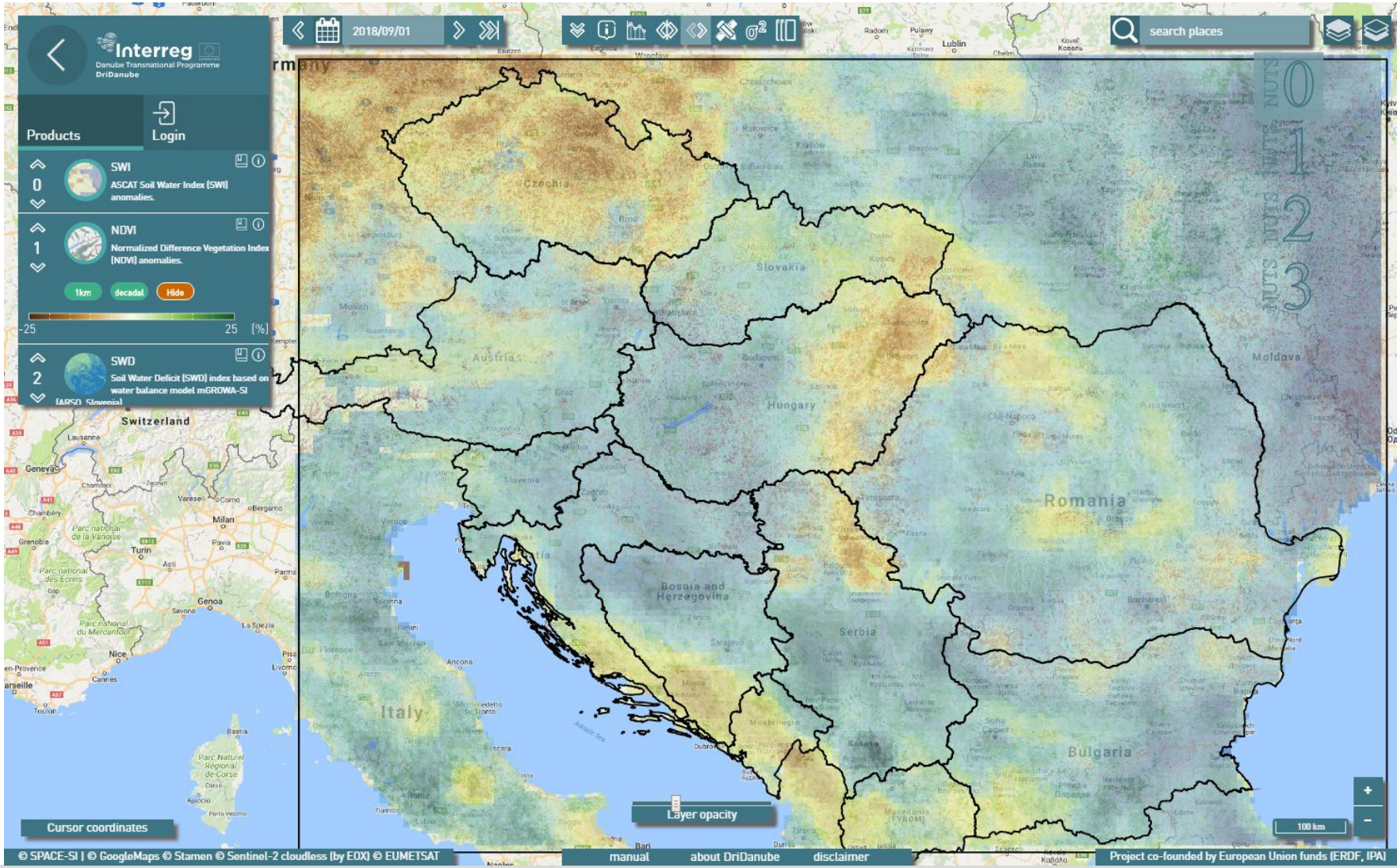
SWI index on 01.09.2018



NDVI index on 01.09.2018

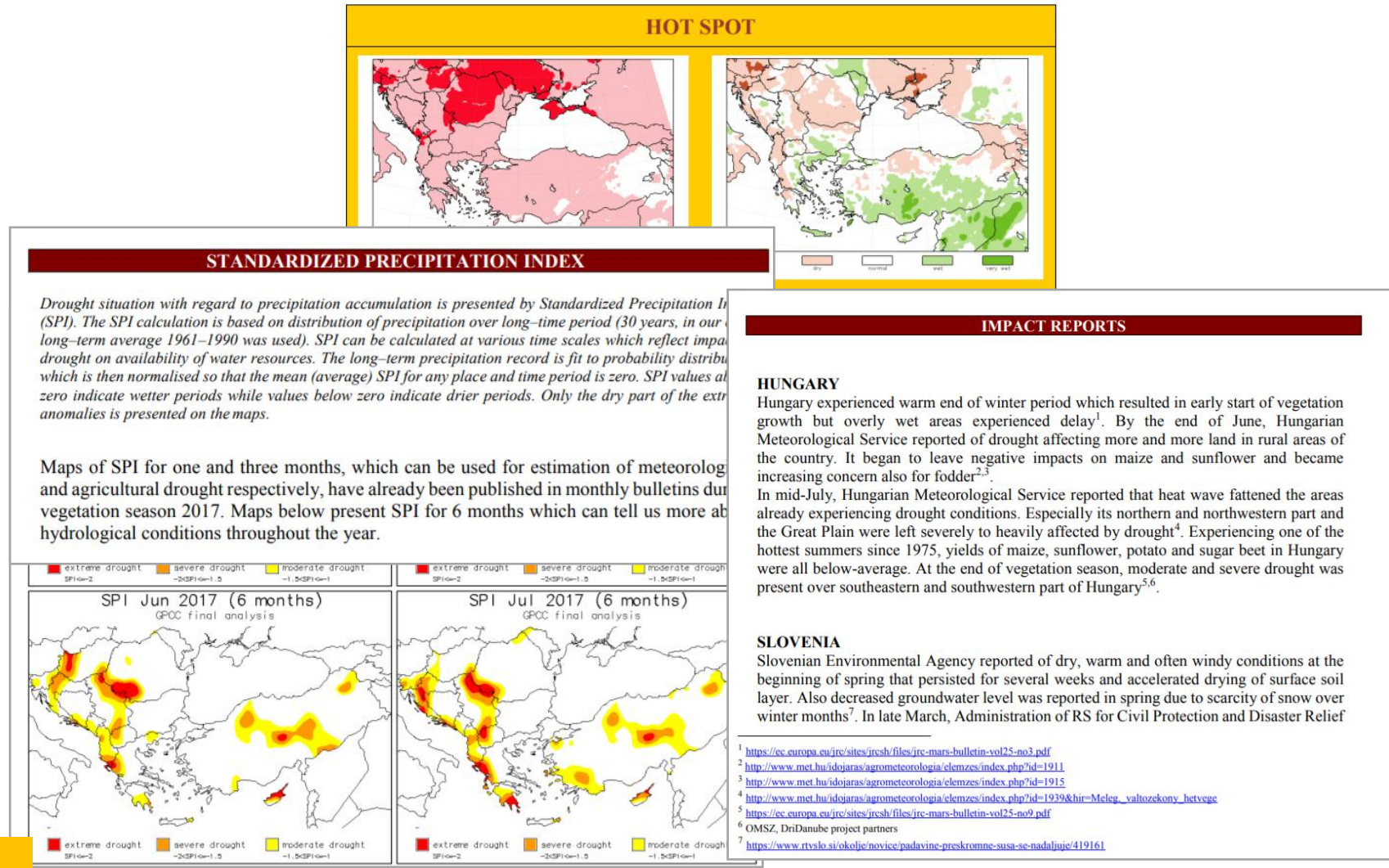


Simultaneous view of SWI and NDVI on 01.09.2018



Monthly drought bulletin in SE Europe

- **Hot spot** - short summary, short insight of possible circumstances of drought at the time of issue.
- Additional and auxiliary information (such as methodology used, more detailed information on water balance or temperature situation)
- **Report on drought impacts** (scarce info about drought impacts in the region!)
- **Outlook**



DROUGHT MONITORING BULLETIN

Overview from February to September 2017

HOT SPOT

STANDARDIZED PRECIPITATION INDEX

Drought situation with regard to precipitation accumulation is presented by Standardized Precipitation I (SPI). The SPI calculation is based on distribution of precipitation over long–time period (30 years, in our long–term average 1961–1990 was used). SPI can be calculated at various time scales which reflect impa drought on availability of water resources. The long–term precipitation record is fit to probability distribu which is then normalised so that the mean (average) SPI for any place and time period is zero. SPI values a zero indicate wetter periods while values below zero indicate drier periods. Only the dry part of the ext anomalies is presented on the maps.

Maps of SPI for one and three months, which can be used for estimation of meteorolog and agricultural drought respectively, have already been published in monthly bulletins du vegetation season 2017. Maps below present SPI for 6 months which can tell us more ab hydrological conditions throughout the year.

SPI Jun 2017 (6 months)
GPCC final analysis

SPI Jul 2017 (6 months)
GPCC final analysis

IMPACT REPORTS

HUNGARY

Hungary experienced warm end of winter period which resulted in early start of vegetation growth but overly wet areas experienced delay[1]. By the end of June, Hungarian Meteorological Service reported of drought affecting more and more land in rural areas of the country. It began to leave negative impacts on maize and sunflower and became increasing concern also for fodder[2,3].
In mid-July, Hungarian Meteorological Service reported that heat wave fattened the areas already experiencing drought conditions. Especially its northern and northwestern part and the Great Plain were left severely to heavily affected by drought[4]. Experiencing one of the hottest summers since 1975, yields of maize, sunflower, potato and sugar beet in Hungary were all below-average. At the end of vegetation season, moderate and severe drought was present over southeastern and southwestern part of Hungary[5,6].

SLOVENIA

Slovenian Environmental Agency reported of dry, warm and often windy conditions at the beginning of spring that persisted for several weeks and accelerated drying of surface soil layer. Also decreased groundwater level was reported in spring due to scarcity of snow over winter months[7]. In late March, Administration of RS for Civil Protection and Disaster Relief

1 https://ec.europa.eu/jrc/sites/jrcsh/files/jrc-mars-bulletin-vol25-no3.pdf
2 http://www.met.hu/idojaras/agrometeorologia/elemzes/index.php?id=1911
3 http://www.met.hu/idojaras/agrometeorologia/elemzes/index.php?id=1915
4 http://www.met.hu/idojaras/agrometeorologia/elemzes/index.php?id=1939&hir=Meleg,_valtozekony_hetvege
5 https://ec.europa.eu/jrc/sites/jrcsh/files/jrc-mars-bulletin-vol25-no9.pdf
6 OMSZ, DriDanube project partners
7 https://www.rtvslo.si/okolje/novice/padavine-preskromne-susa-se-nadaljuje/419161

http://www.dmcsee.org/en/drought_bulletin/

Result 3: DriDanube Drought Strategy

Step 1	Appoint a drought task force
Step 2	State the purpose and objectives of the drought preparedness plan
Step 3	Seek stakeholder participation and resolve conflict
Step 4	Inventory resources and identify groups at risk
Step 5	Prepare/write the drought preparedness plan
Step 6	Identify research needs and fill institutional gaps
Step 7	Integrate science and policy
Step 8	Publicize the drought preparedness plan and build public awareness
Step 9	Develop education programs
Step 10	Evaluate and revise drought preparedness plan

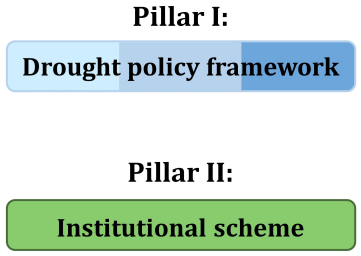
Result 3: DriDanube Drought Strategy

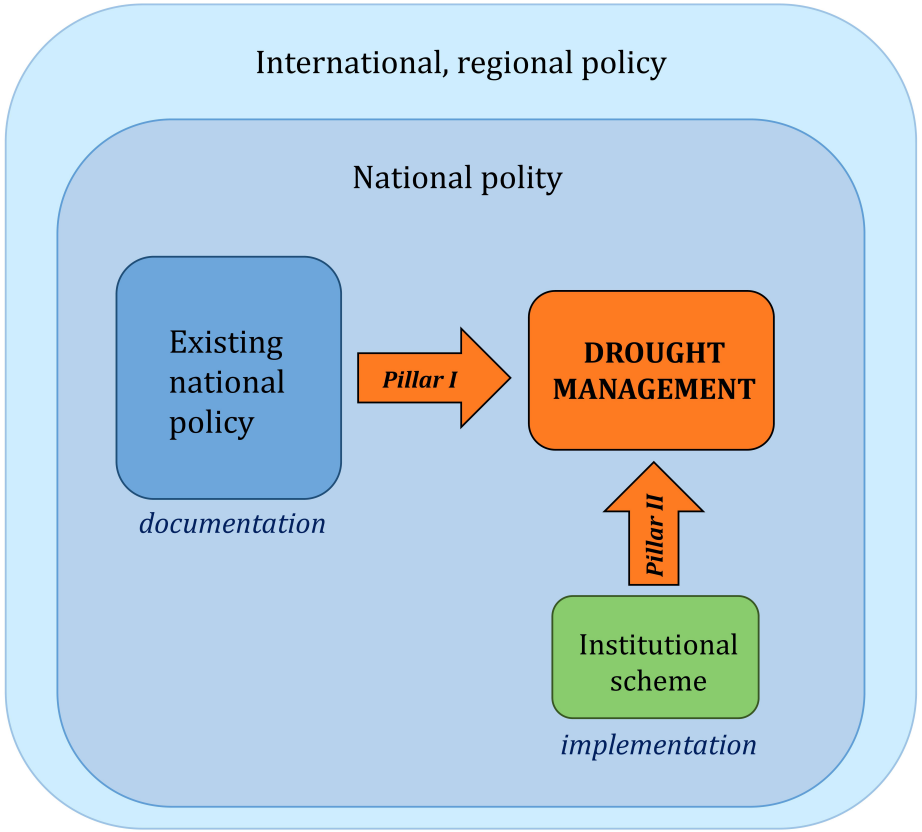
- **State-of-the-art** analysis country by country:
  - ways of determining drought,
  - legislation review (drought),
  - institutions involved in drought monitoring, management; communication and responsibility flow
  - process of drought evaluation and recovery,
  - research, education programmes or projects addressing drought

  ⇒ common weaknesses & requirements for improvement

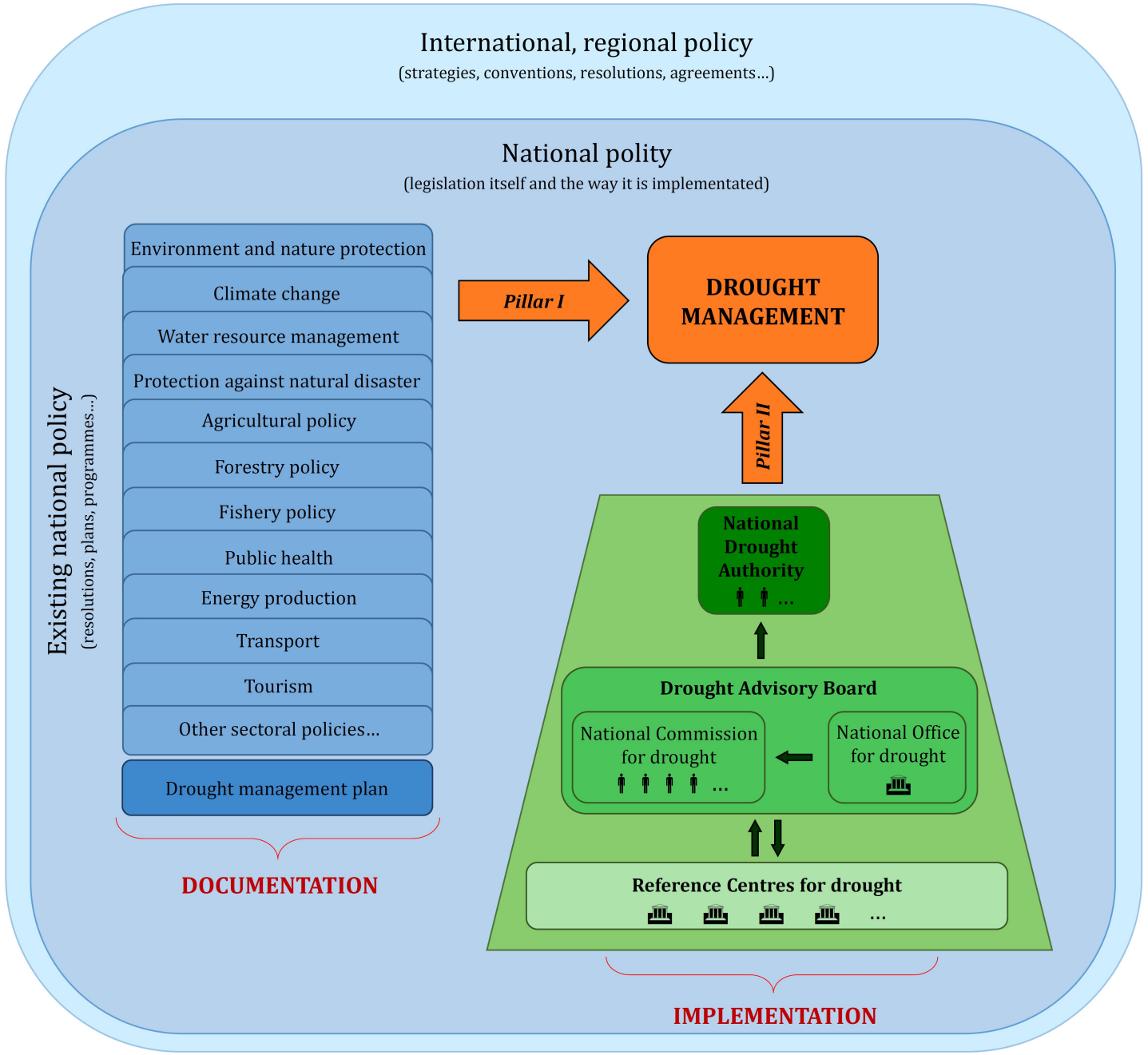
- Development of **optimal drought management model**:
  - Pillar I: drought policy framework,
  - Pillar II: institutional scheme of cooperation.

MODEL: drought management targets institutions defined in institutional scheme to collectively implement drought-related policies as detailed defined in drought management plan.





Optimal drought management model



Pillar I – Drought policy framework:

- Transnational policy
- National polity
- National policy
- Operational implementation policy

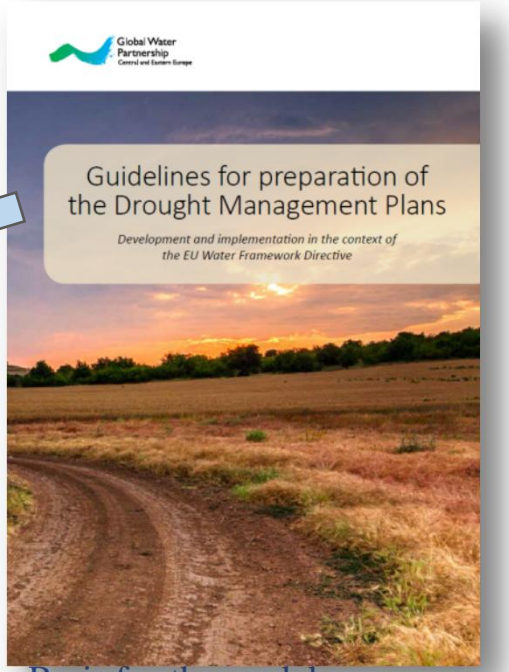
Pillar II – Institutional scheme:

- Decision-making national level
- Operational national level
- Stakeholders level

physical person

institution, organisation

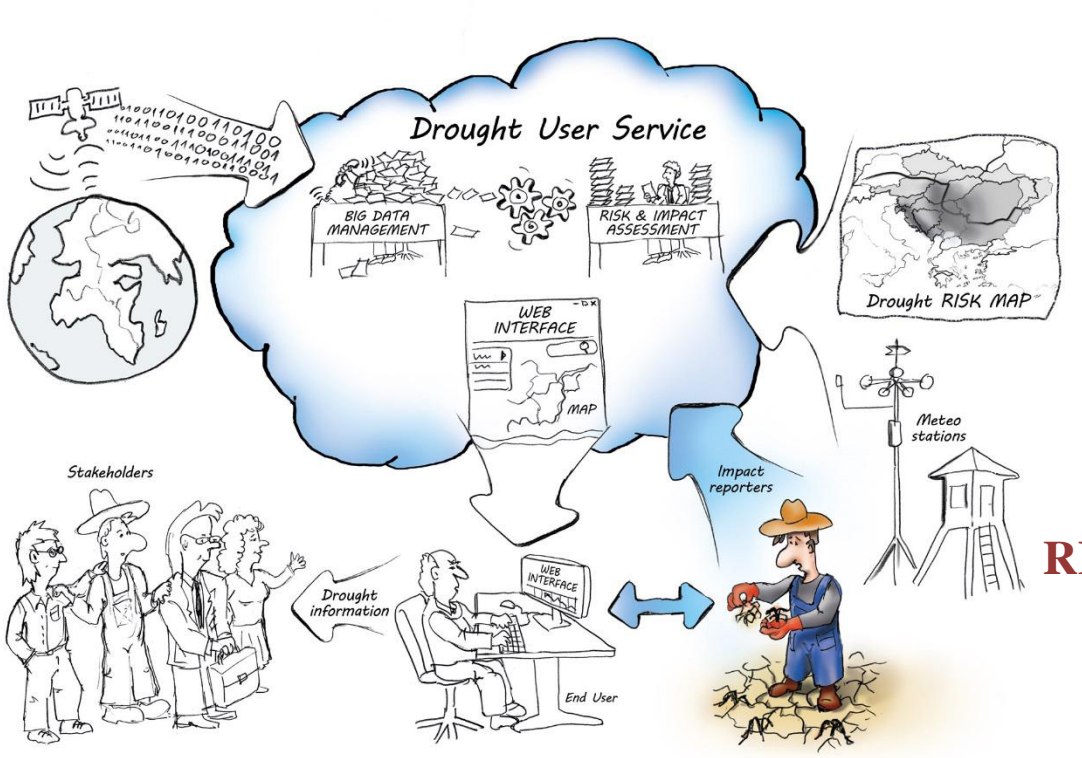
legal interactions between involved bodies



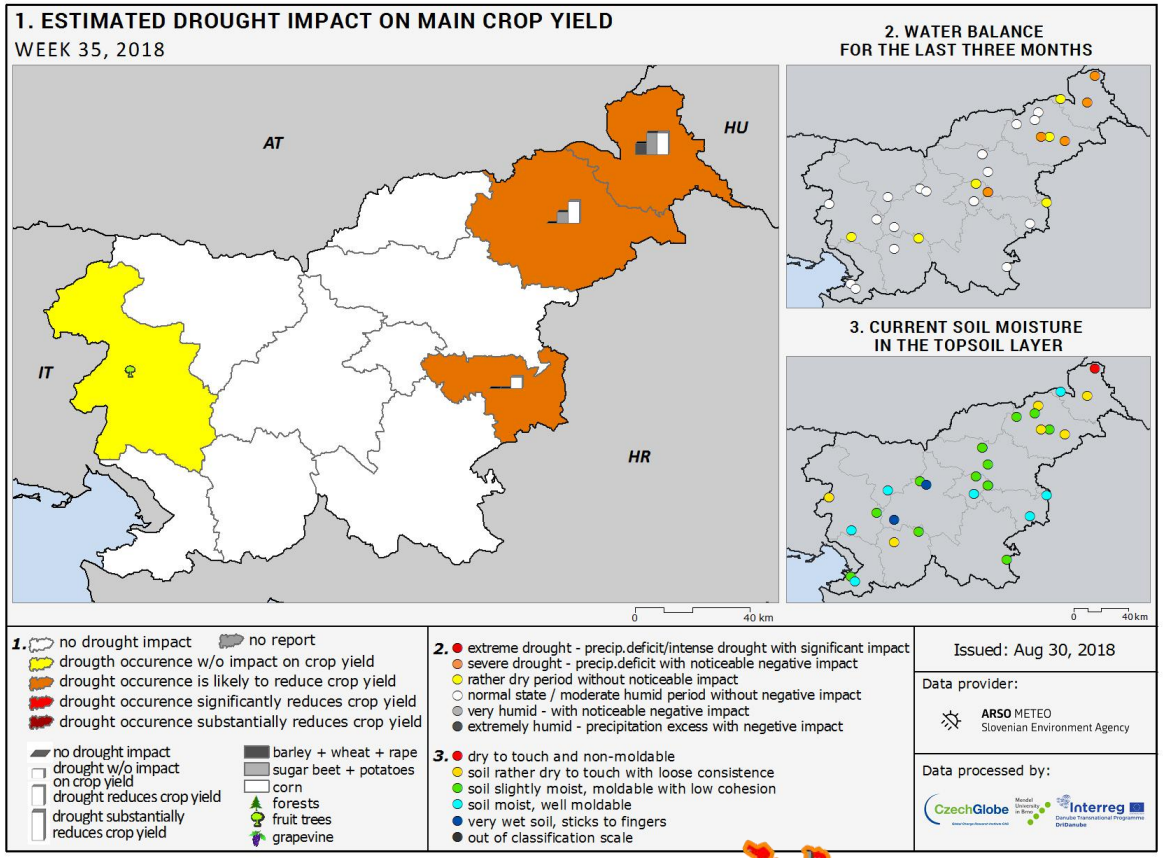
Basis for the model:

IDMP

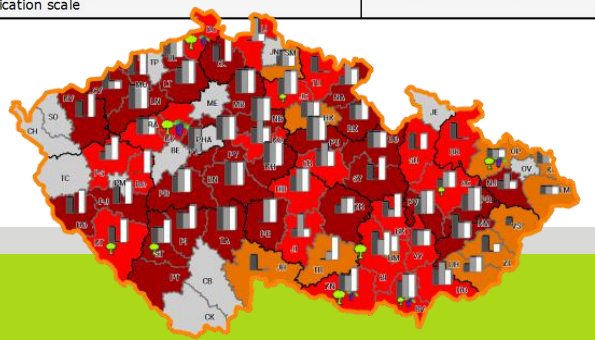
Result 2: Metodology for drought impacts assessment
– interactions with national reporters on weekly routine



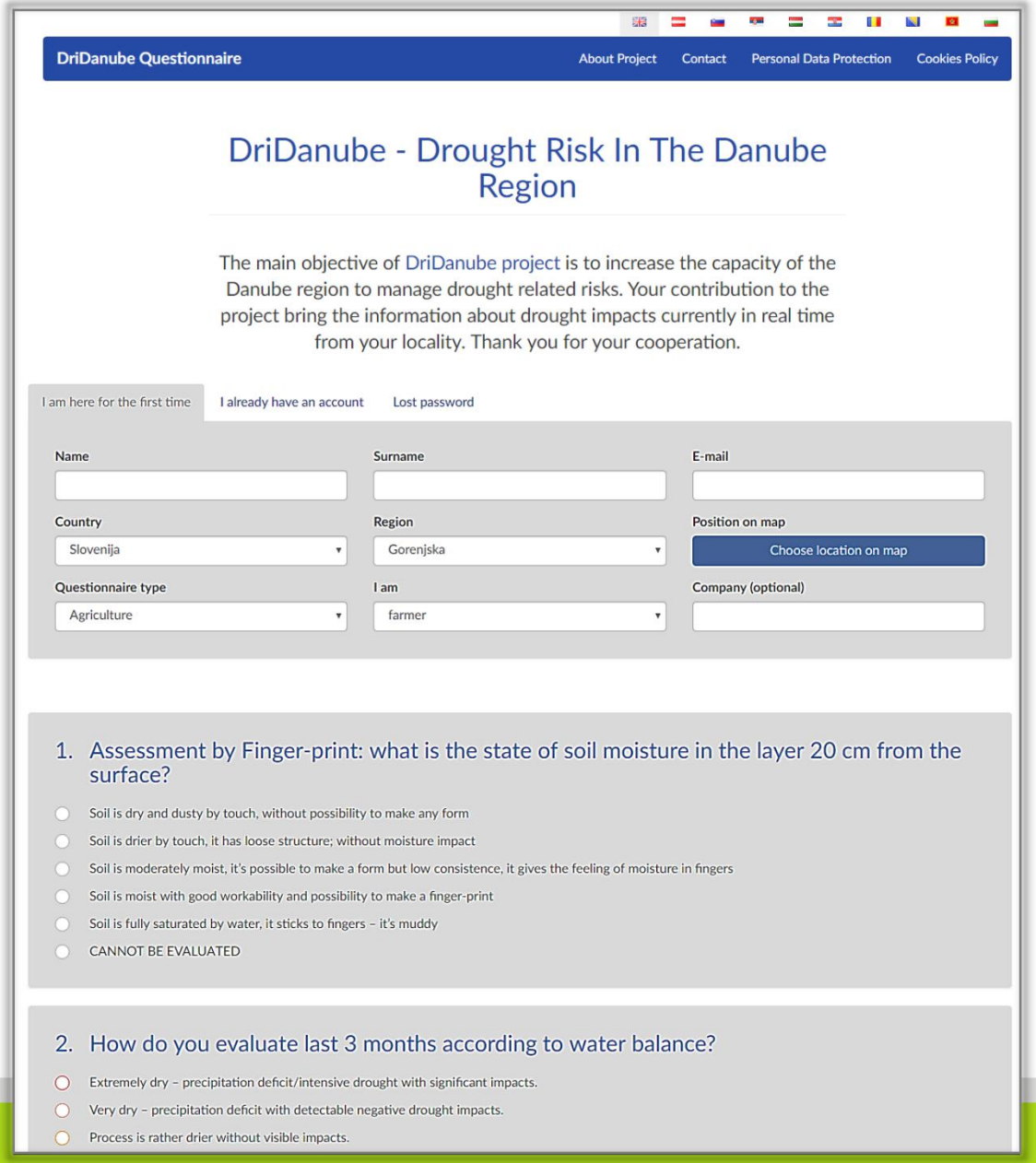
WEEKLY REPORTING PROCESS



Networks of national reporters:
- regular in-situ feedback on current vegetation status (systematic impact database),
- validation and complementation of satellite data.



DriDanube Questionnaire for reporters - entry



http://questionnaire.intersucho.cz/en/

Simple methods to weekly check the state of soil & crops on a selected non-irrigated area using online questionnaire.

3 types of questionnaire (prevailing land use on observed area):

- agriculture,
- fruit growing, viticulture, olive growing,
- forestry.

Questionnaire has 12 single-choice questions:

- general info on **soil moisture**,
- subjective **rate of damage** on different crops,
- additional info on **need of use of irrigation systems.**

Engaging **impact reporters:**

- existing pheno observers,
- agri advisory services,
- drought-prone companies,
- interested individuals.

Result 2 (continued): Methodology for drought risk assessment

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Risk algorithm and mapping: -> talk by T. Szentimrey

Analysis of extreme rainless periods: -> talk by B. Srdjevic

Output available in the Drought User Service portal:

- **Maps:**
  - Risk maps prepared by RED method for maize, wheat, barley and rape
  - Maps of rainless periods prepared with ZT method
- **RED software and manual**

To be discussed:

- combination of hazard component (ATM model/remote sensing) with risk maps
- spatial aggregation / raster maps

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Thank you

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