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Impact of climate change on drought appearance in Slovenia and Southeastern Europe

Gregor Gregorič
Environmental Agency of Slovenia

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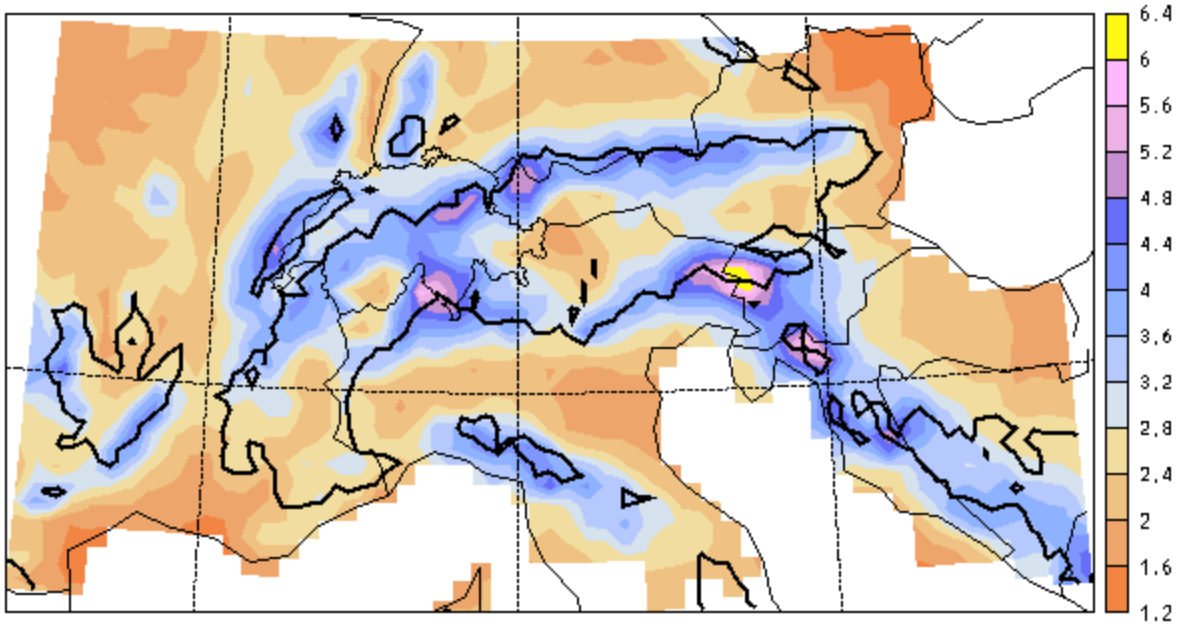
Alpine Precipitation Analyses from High-Resolution Rain-Gauge Observations

Christoph Frei, Institute for Atmospheric and Climate Science ETH (IACETH), Zuerich, Switzerland



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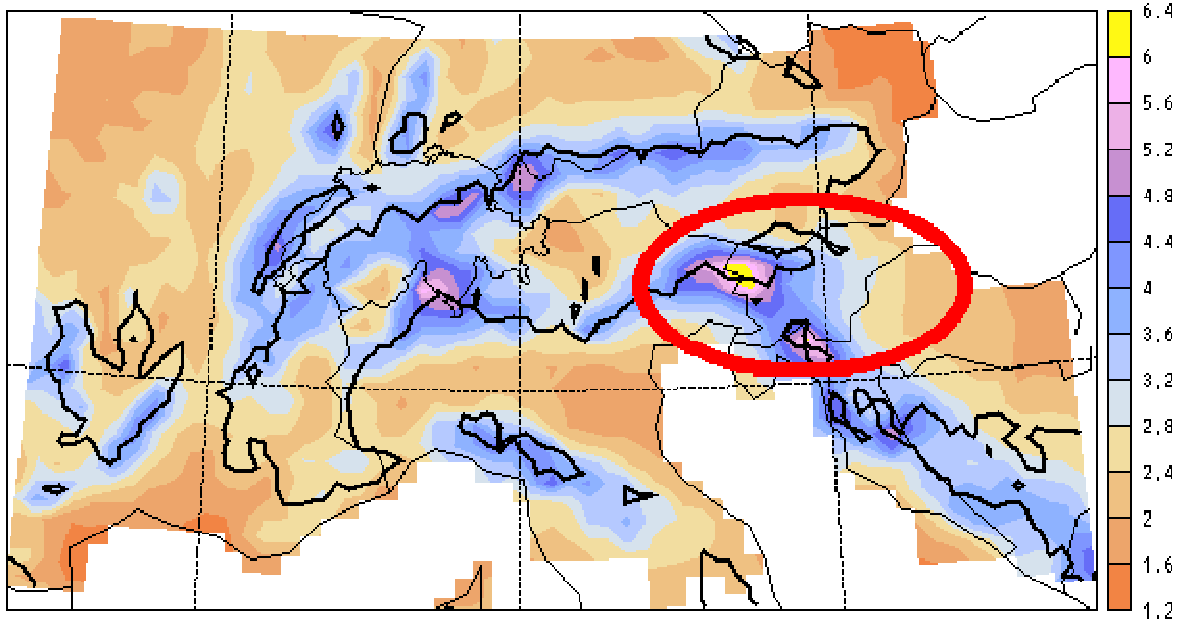
Yearly precipitation in Slovenia ranges from cca 800 mm (Coast, Pannonian plane) to almost 3000 mm (Julian Alps)



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Drought records – mainly in agriculture

Torek, 24. avgusta 1

Časopis za politiko, gospodarstvo, kulturo in

(061) 112 155
(061) 318 150

LXXVII/ st. 195

Najhujša suša v 103 letih

10 SLOVENEC GOSPODARSTVO

Suša najbolj pesti Pomurje

Ana Kos

Po podatkih Hidrometeorološkega zavoda Republike Slovenije je suša najbolj prizadela Pomurje. Prekmurje je imelo premalo padavin že v spomladanskih mesecih.

Kot nam je povedala Ana Žust iz Hidrometeorološkega zavoda Republike Slovenije, je v obdobju od 20. junija do 31. julija v Ljubljani padlo 90 litrov padavin na kvadratni meter. Dolgoletno povprečje za to v istem obdobju pa je v Ljubljani 175 litrov na kvadratni meter.

Na območju Murske Sobote je v istem obdobju padlo le 28 litrov padavin na kvadratni meter, kar je le 20 odstotkov siceršnjih padavin, dolgoletno povprečje za to obdobje je namreč 149 litrov na kvadratni meter.

V Portorožu je bilo v tem obdobju 57 litrov padavin na kvadratni meter, dolgoletno povprečje pa znaša 110 litrov na kvadratni meter.

Na Goriškem je bilo več nalivov z izdatnostjo več kot 20 litrov na kvadratni meter kar pa ne da realnega podatka.

Celjsko področje je imelo 85 litrov padavin na kvadratni meter, dolgoletno povprečje znaša 149 litrov na kvadratni meter.

Mariborje imel v tem obdobju 49 l padavin na kvadratni meter, dolgoletno povprečje znaša 159 litrov na kvadratni meter, kar pomeni, da je padlo le 31 odstotkov siceršnjih padavin.

Na območju Murske Sobote je bilo kar nekaj padavin v prvi in drugi dekadi junija. Te padavine pa niso mogle nadoknaditi pomanjkanja padavin v pomladanskem obdobju.

G. Ervin Fitz iz Kmetijske zadruge Panonka je povedal, da se je stanje poljičin po 28. juliju letos bistveno poslabšalo.

Poseben komisija pri Veterinarskem živinorejskem zavodu v Murski Soboti je namreč 28. julija opravila strokovni ogled. Ugotovila je, da bo pridelek koruze in krompirja za 30 do 40 odstotkov, v izjemnih primerih za 80 odstotkov manjši. Sladkorne pese bo 20 do 30 odstotkov manj, ponekod do 50 odstotkov.

Košnja bo 60 do 30 odstotkov (do 70 odstotkov) manjša. Vrtnin bo 20 do 30 (tudi do 40 odstotkov) manj. Sadja bo 20 do 30 odstotkov manj (ponekod 40 odstotkov), tudi pridelek buč bo 20 do 30 odstotkov, ponekod celo do 80 odstotkov manjši.

Strniščni dosevki (repica, ogrščica...) sploh niso vzklili, kar pa ih je, ih je suša pokgala.

V zadnjih dveh dneh dosegajo dnevne temperature v Pomurju 34 do 35 stopinj C, nočne od 18 do 20 stopinj C. Visoka nočna temperatura onemogoča nastajanje rose ali megle, ki bi tudi nekoliko pomagali posevkom.

Težave imajo tudi z vodo. Poljedelski vodnjaki so presahnili, tako da s cisternami dovažajo vodo za ljudi in za živino.

Na Hidrometeorološkem zavodu v Ljubljani so še povedali, da so iz severovzhodnega dela Slovenije že dobili podatke o škodi, ki je nastala na poljih, medtem ko ostali deli Slovenije ne navajajo škode.

V zadnjih podatkih je na Kopreskem križčno, posebno tam, kjer ne namakajo. Najbolj so prizadete vrtnine: paradižnik, paprika, fižol, v nekaterih primerih bo pridelek do 50 odstotkov manjši.

Vipavsko dolino rešujejo nevihte. Suša je prizadela predvsem pridelke na peščenih tleh, koruza ima že porjavele spodnje liste, porjaveli pa so tudi travniki. Ponekod zalivajo že sadovnjake in vinograde.

Na Dolenjskem suša najbolj pesti Šentjernejsko polje, prizadete pa so vrtnine in travniki.

Največ škode imajo krmežje, ki niso uspeli pravočasno opraviti prve košnje.

Ana Žust je še povedala, da je letošnja suša v Sloveniji podobna tistim iz leta 1983 in leta 1988. Na murskosoboškem področju je celo huje kot leta 1983.

Po podatkih znašajo povprečne dnevne temperature na ljubljanskem področju od 22 do 23 stopinj, ponekod do 25,5 stopinje, dolgoletno povprečje pa znaša od 19 do 20 stopinj C.

V Pomurju manjši pridelek koruze Foto: Primož Predalič

Drought records in 20th century: Trontelj, 1997; Natek, 1983; Matajc, 2001; Žust in Sušnik, 1995; Gams, 1999; Žiberna, 2001, Sušnik, 2003,...

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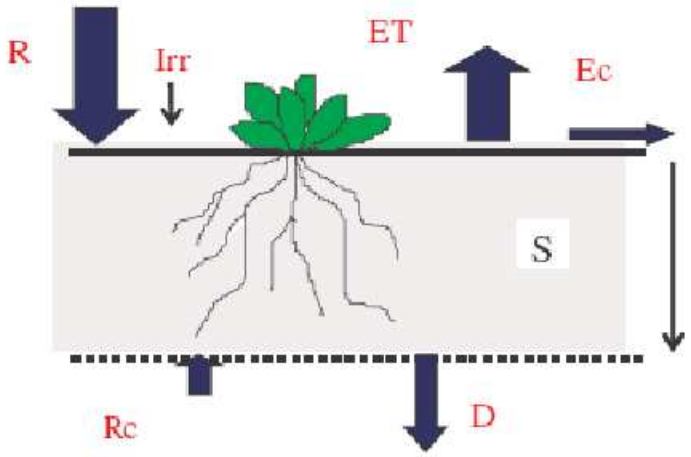
Agricultural Drought

Estimation of surface water balance terms:

Precipitation (R)

Evapotranspiration (ET)

Percolation (D)



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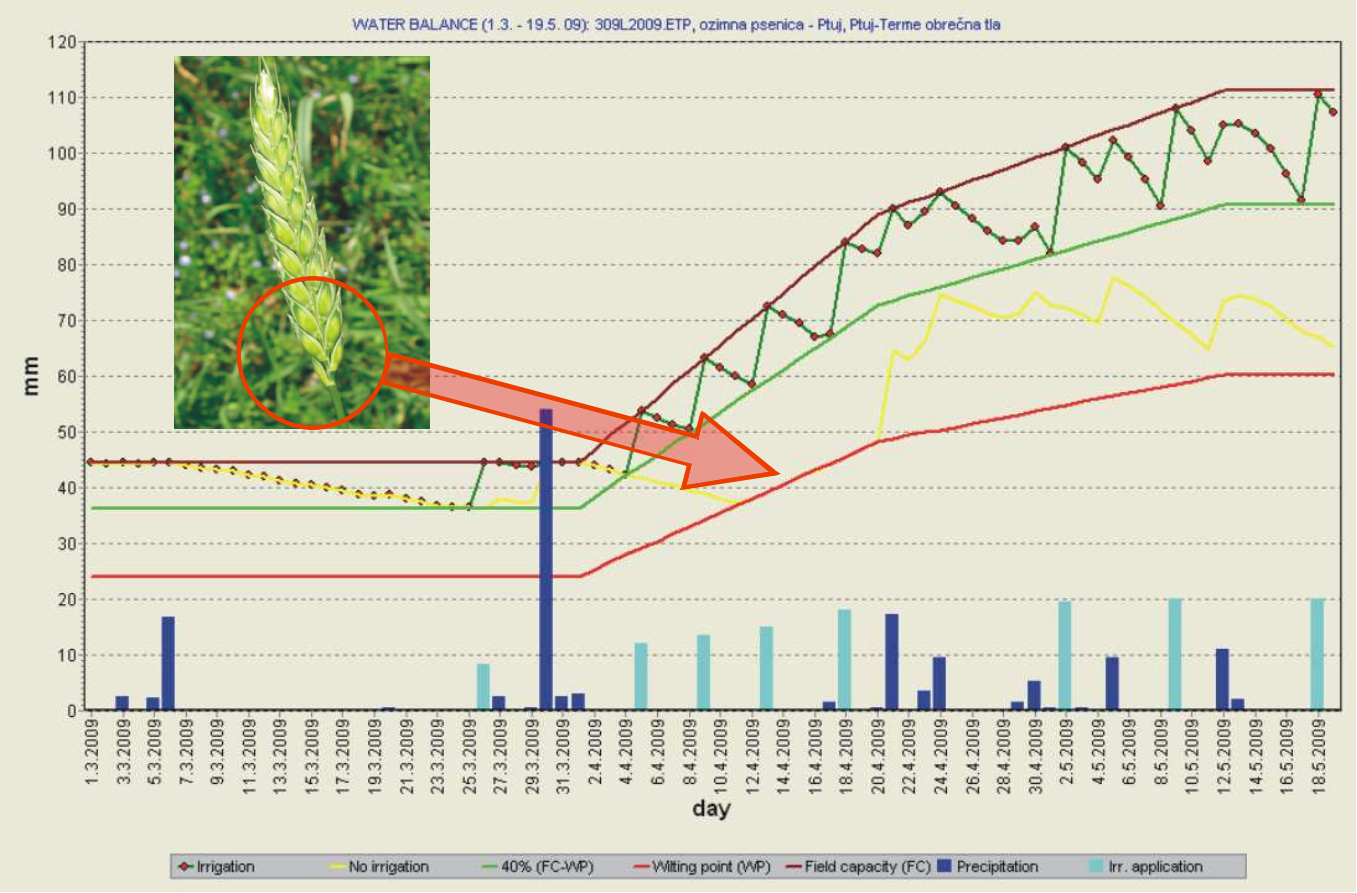
Agricultural Drought

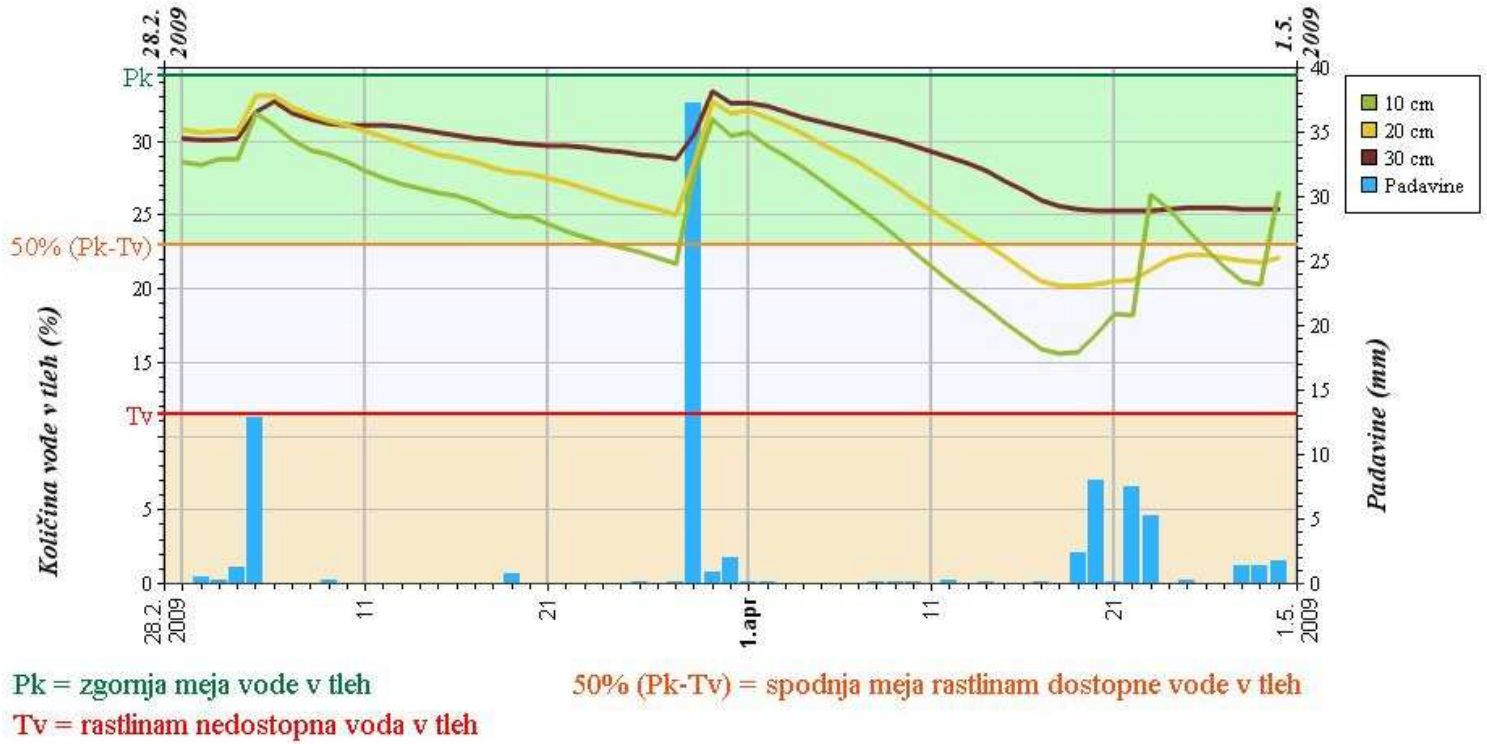


The IRRFIB model is a decision support tool in the frame of agrometeorological information system and enables quick and accurate transfer of information on crop water balance to farmers.

Cereals spikelets development suffered due to drought in northeastern Slovenia in April 2009.

Agricultural Drought

northeastern Slovenia, March-April 2009



Recently soil moisture measurements on different soil types became available

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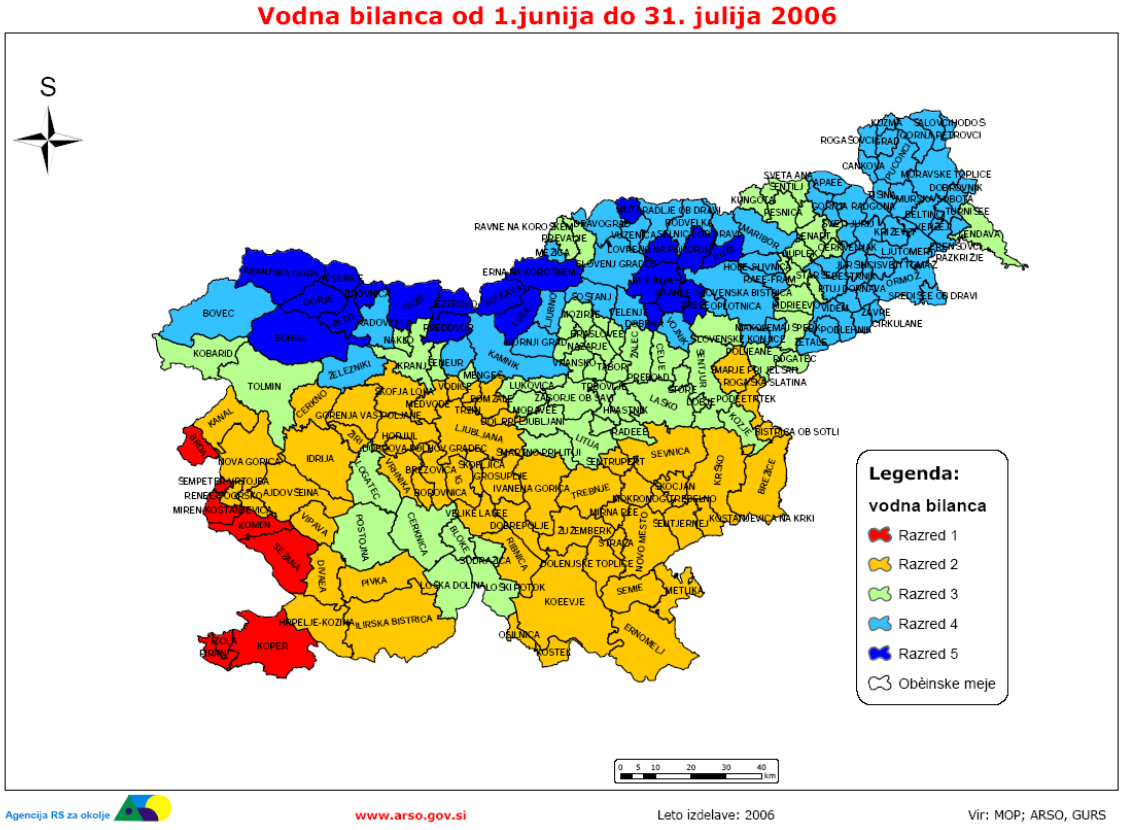
Agricultural Drought

Drought aftermath

(example from 2006):

- Sum of surface water balance deficit over specified period of time
- Application of geostatistical methods to obtain spatial distribution



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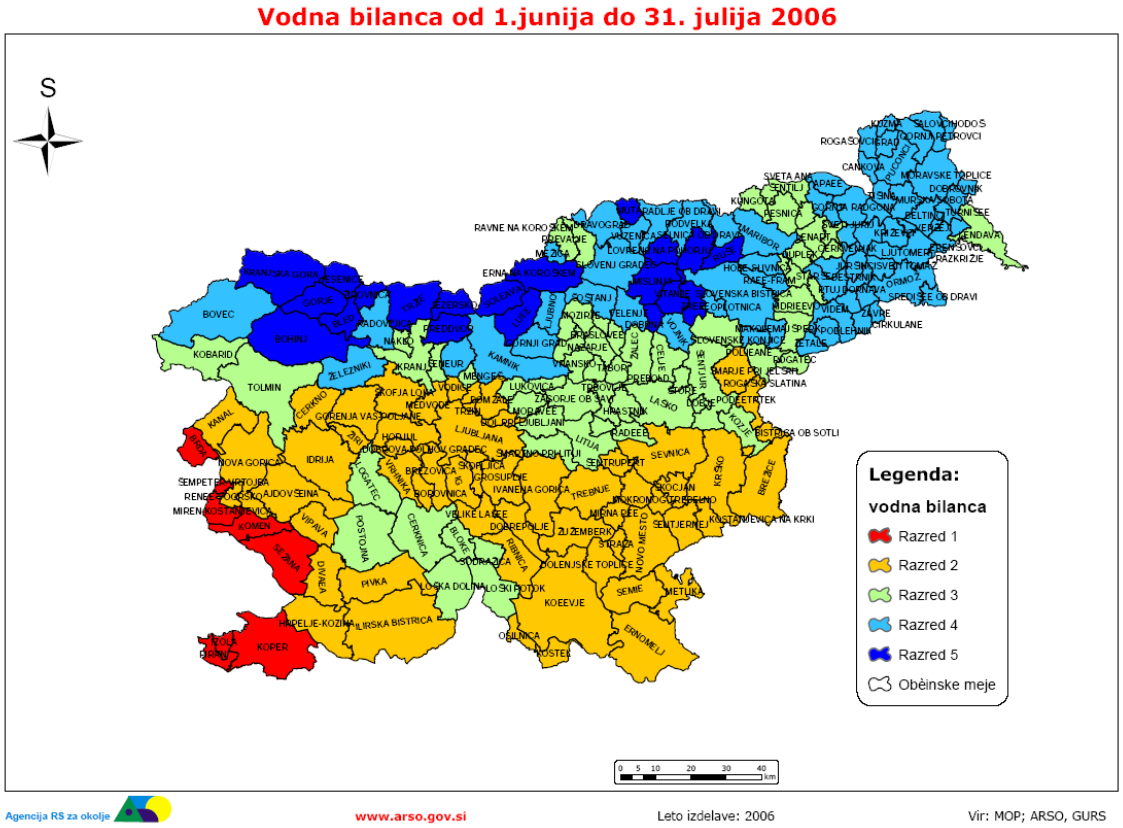
Agricultural Drought

Drought aftermath

(example from 2006):

- Aggregation to administrative units and limited number of classes
- **> Preparation of report for Administration for civil protection and disaster relief**



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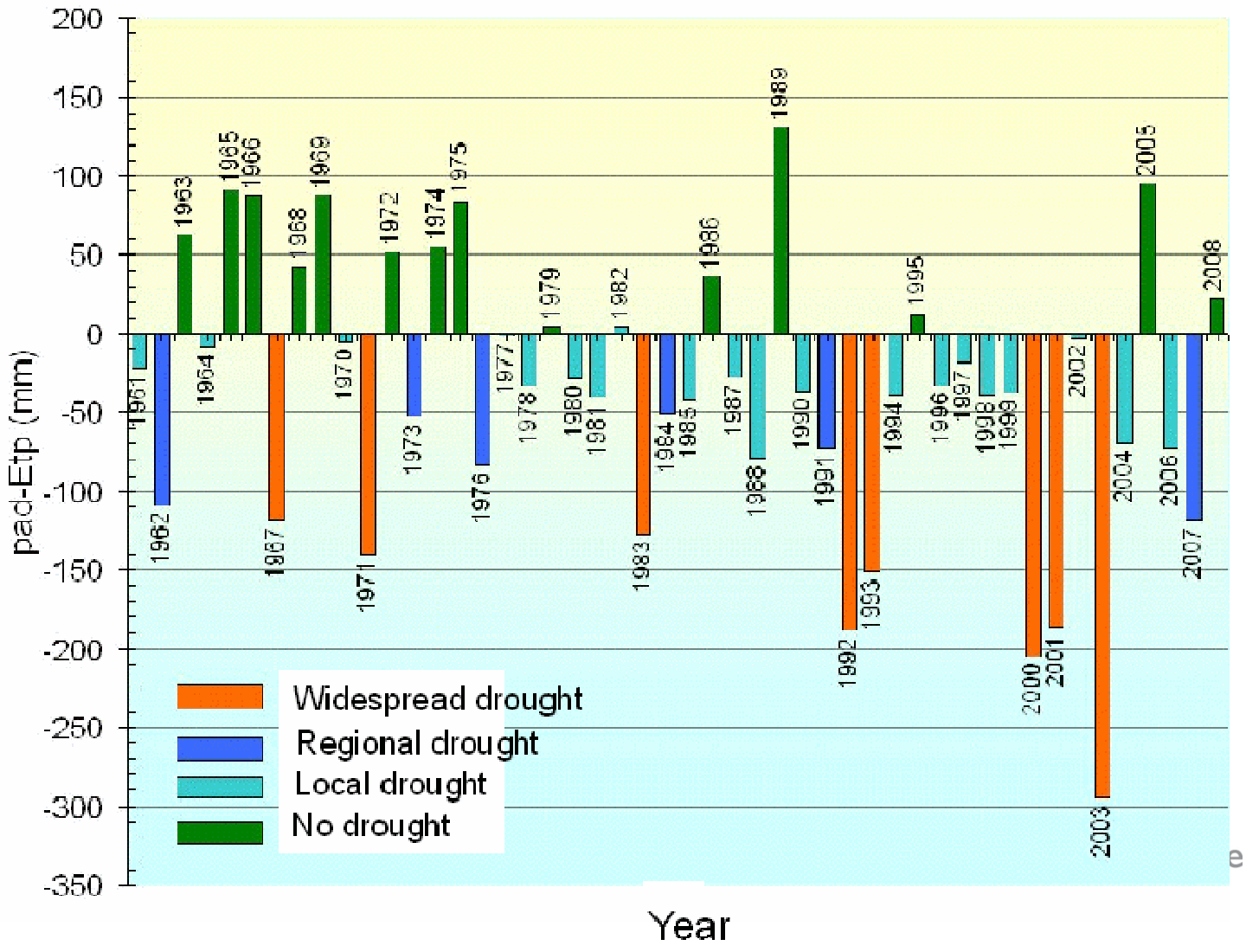
Agricultural Drought – Climate change



Water deficit:

Averaged over whole territory

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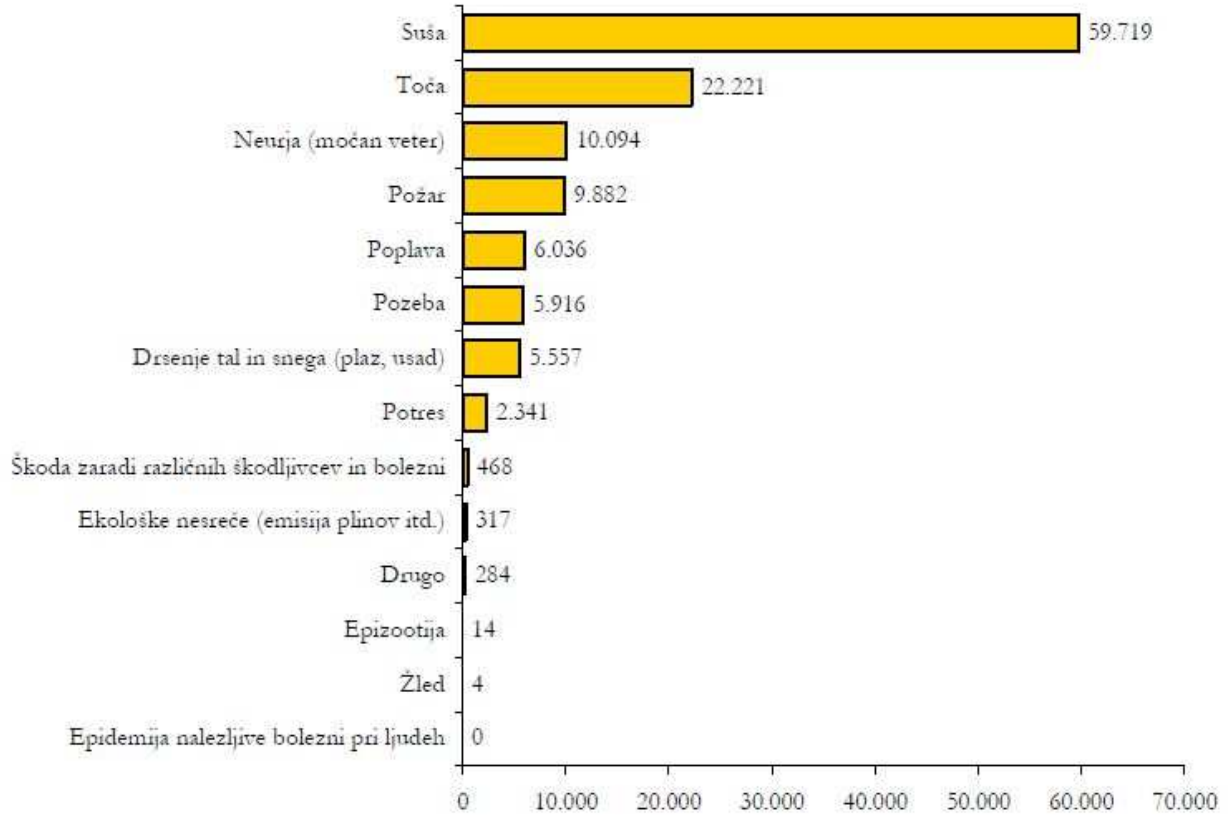
Agricultural Drought

Report on damages:

Drought is responsible for more damage than all other disasters <u>together</u>



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Court of Audit

Revision report on

Drought mitigation

Measures

"Importance of this revision lies mainly in expected changed conditions in the future"

Court of Audit – revision report

"Damages due to drought in years 2000 – 2006 summed up to 247 M€;

86 M€ were allocated in national budget and spent for recovery measures;

3 M€ were allocated for prepardness measures.

This ratio is not acceptable from public finances' point of view "

Court of Audit – revision report

Conclusions:

- Irrigation systems are underdeveloped (economical justification of investments should be reconsidered)
- Other infrastructure (i.e. river reservoars) should be put in function for drought mitigation where possible
- Drought monitoring and possibly early warning should be improved
- Public risk fund or subsidies for drought insurance should be considered

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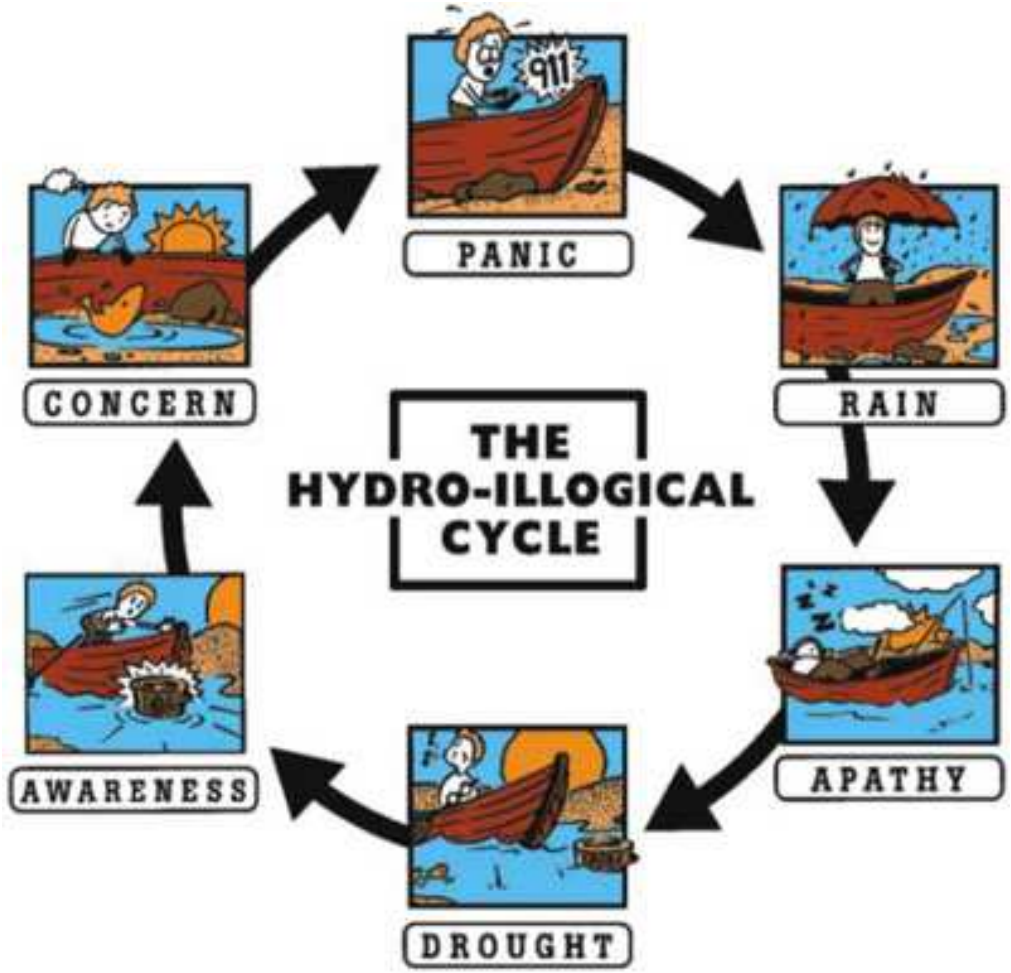

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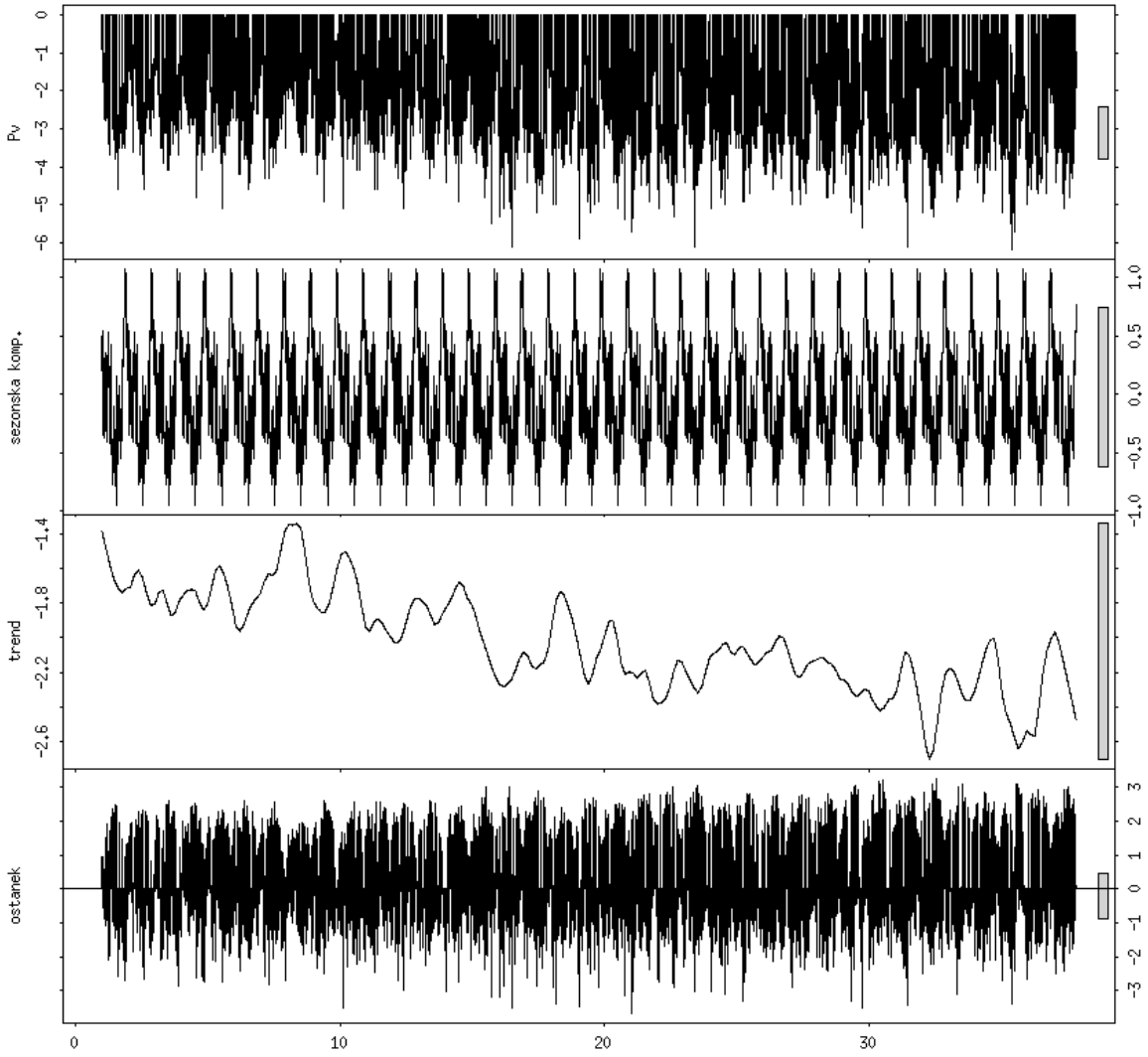
Agricultural Drought – Climate change



Is there a trend?

Seasonal decomposition of daily water deficit

Bilje, W Slovenia,

1966-2008

Trend is negative,

-0.2 mm/10 years

However – trend explains small part of total variance!

common future

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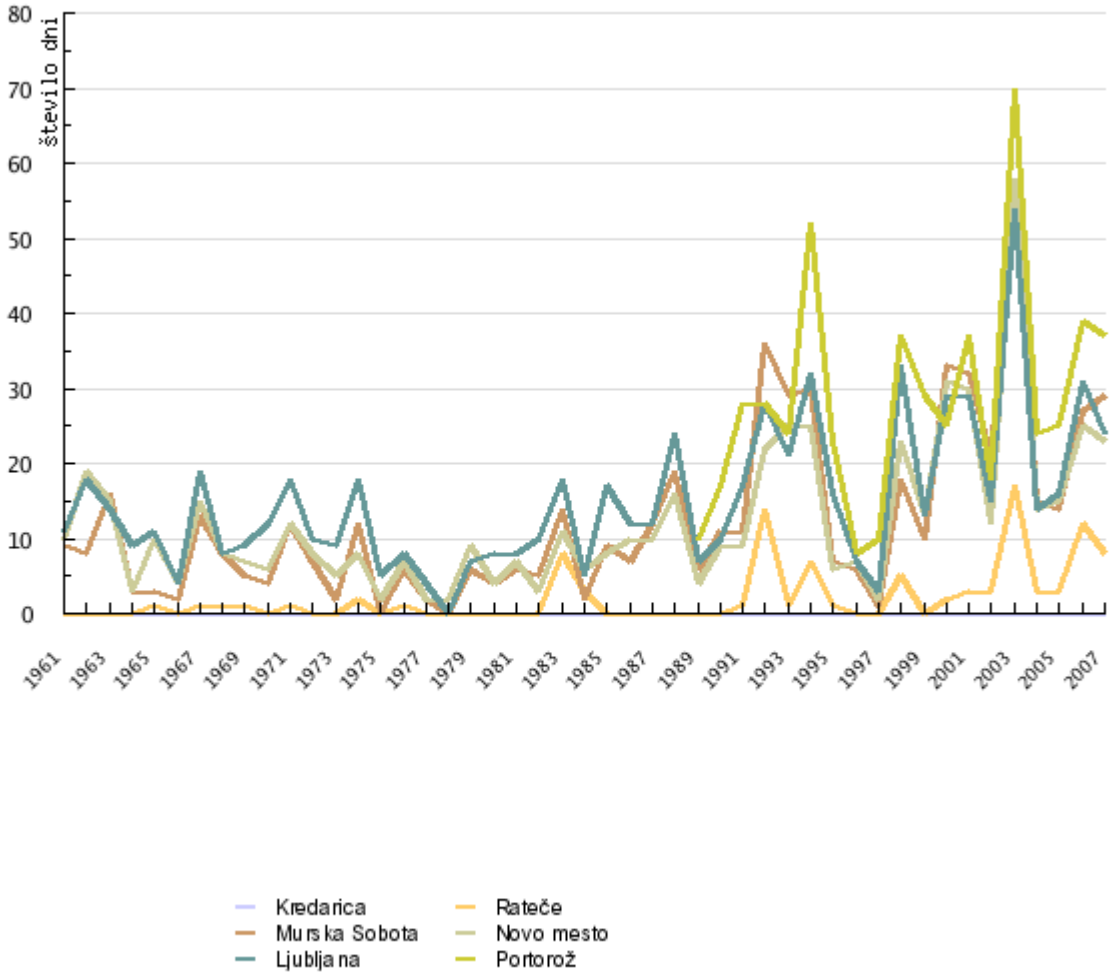
Agricultural Drought – Climate change



Another example:

Number of hot days

mmon future

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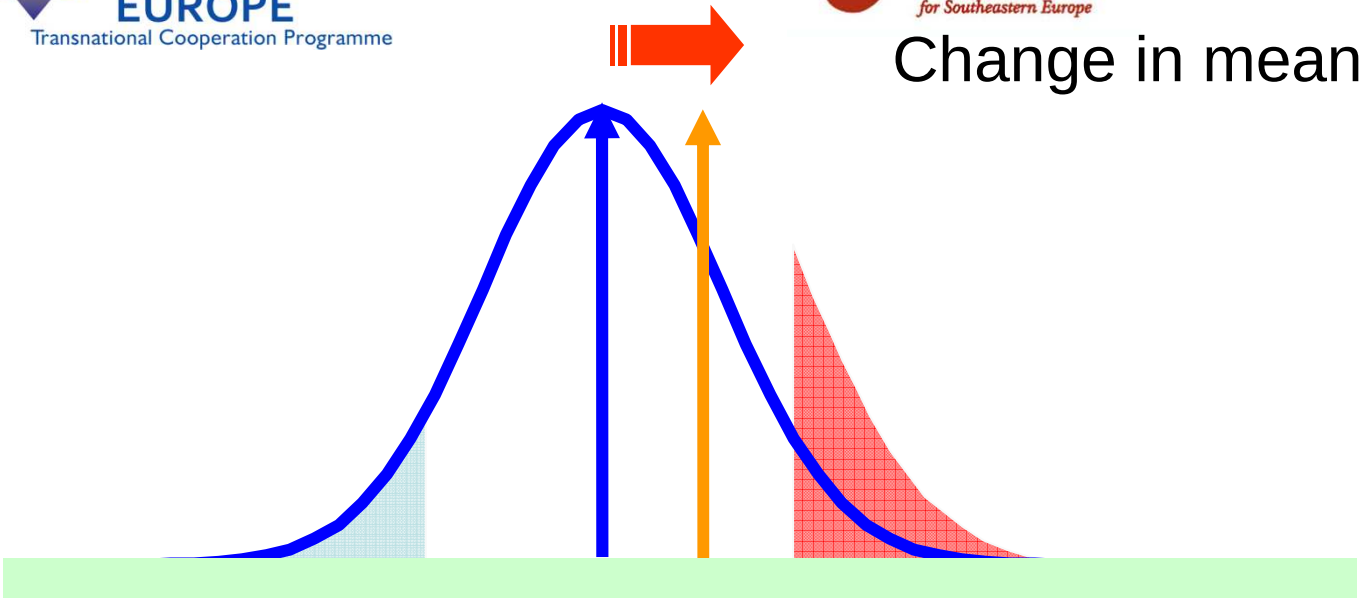
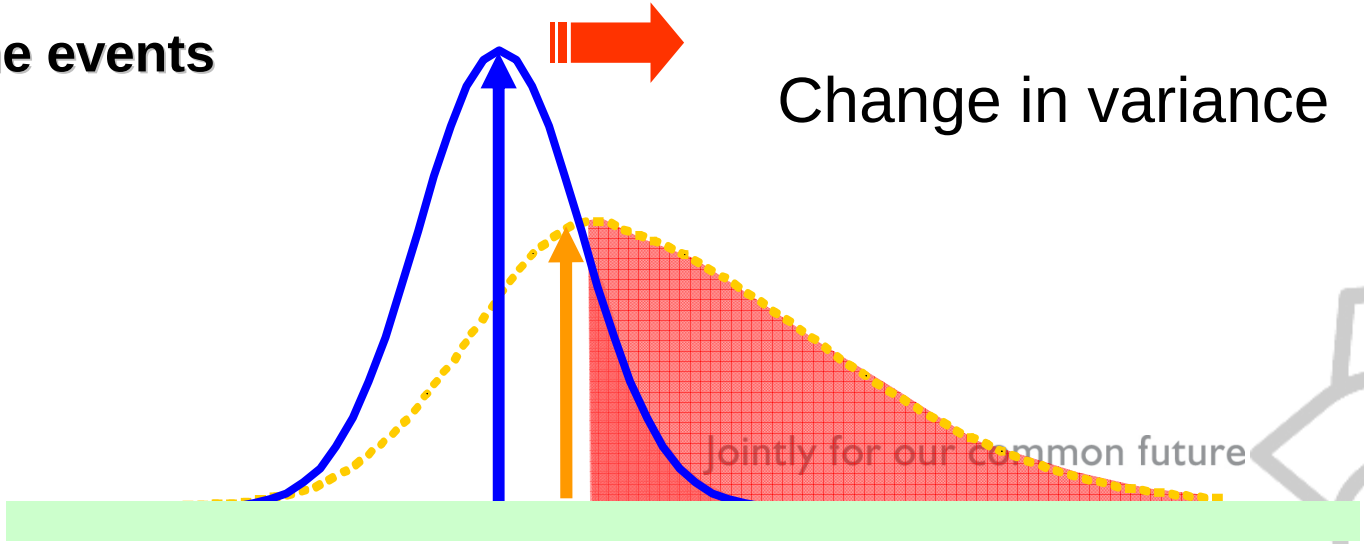
Change in mean



Change in variance is <u>more important</u> for increased probability of extreme events

Change in variance



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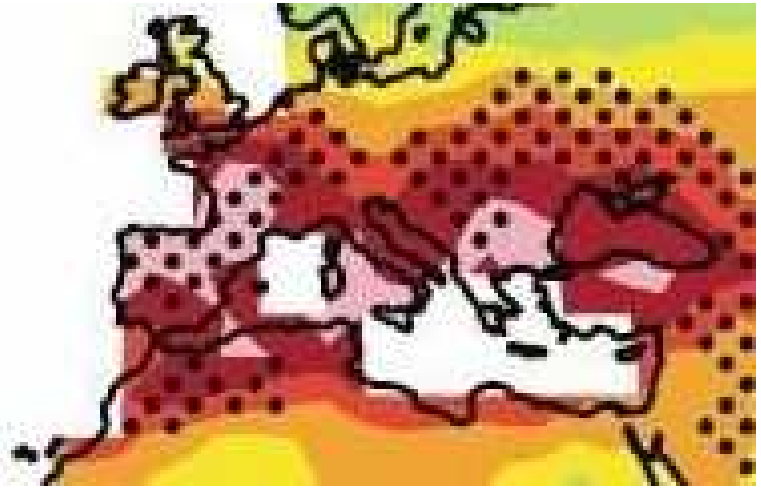
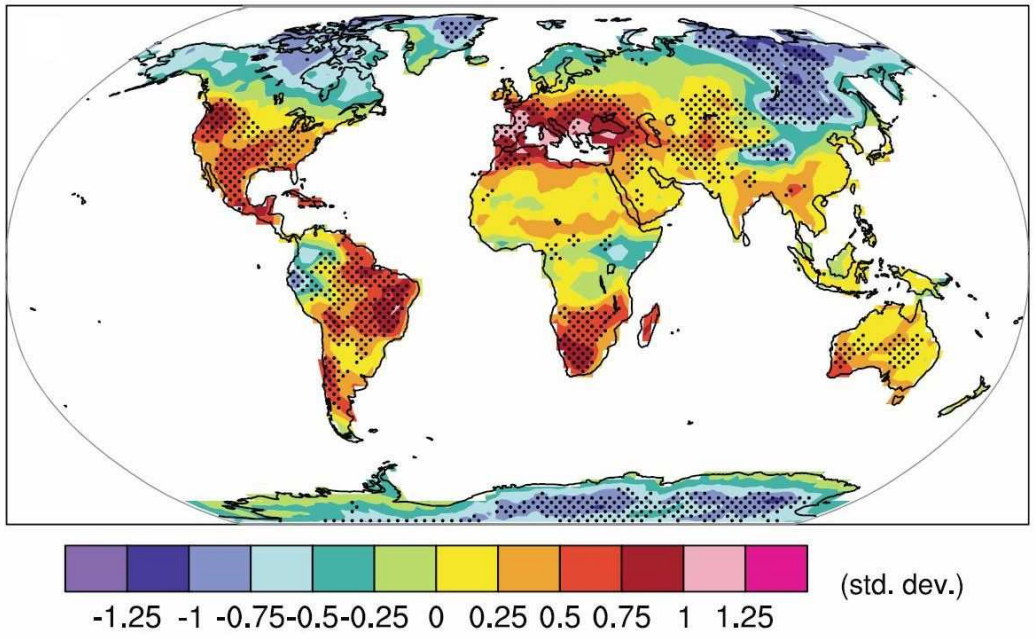
Agricultural Drought – Climate change

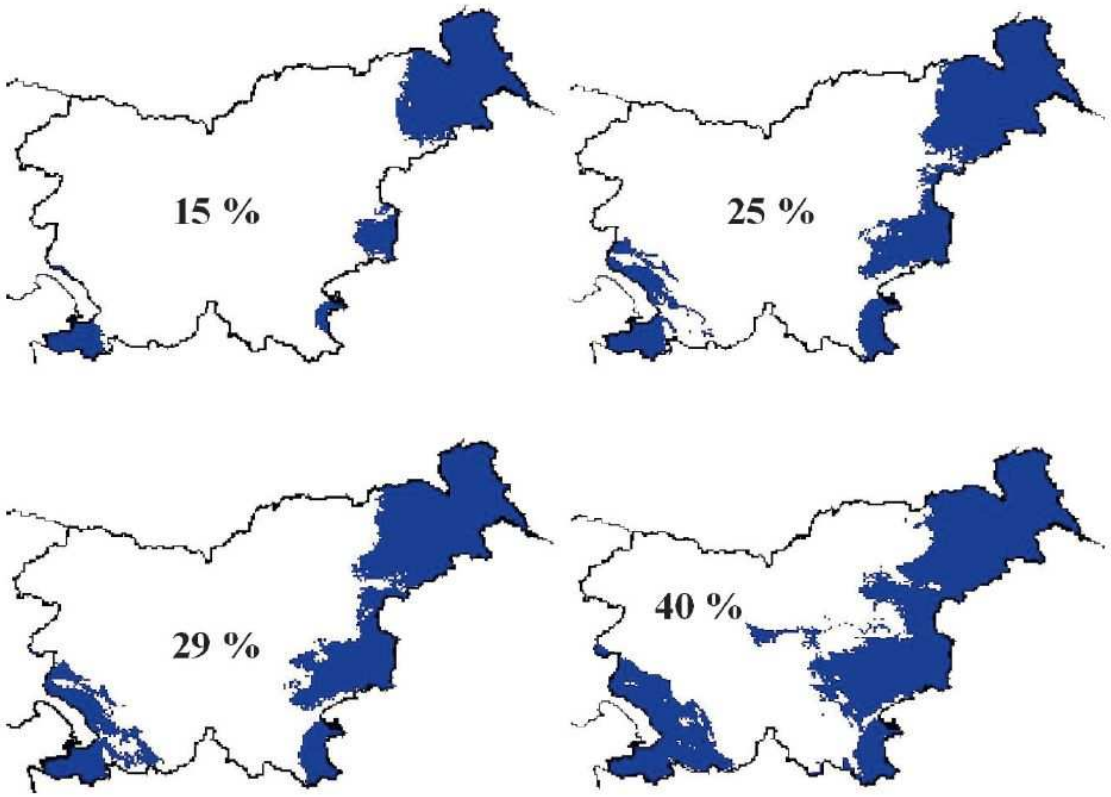
IPCC 4th assessment report





Projection of normalized change of dry days between 2080-2099 and 1980-1999 (in standard deviation units).

Agricultural Drought – Climate change



Spatial distribution of summer (JJA) PSMD areas in Slovenia a) based on long term average data (1961-1990), b) in the case of a T rise of 2 °C, c) in the case of a reduction in RR of 10 % and d) the combined effect of a T rise of 2 °C and a reduction in RR of 10 %.

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What is DMCSEE?

vulnerability of economy to shortages of water supply, especially in agriculture.

ALERTED

the public, governments, operational agencies to many socio-economic problems accompanying water shortage

NEED FOR

drought mitigation measures

DROUGHT MANAGEMENT CENTER FOR SE EUROPE

CONFIRMED

UNCCD ~ WMO agreed upon the core tasks

the idea elaborated by International Commission on Irrigation and Drainage (ICID) and UN Convention to Combat Desertification (UNCCD)

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Currently, DMCSEE is a TCP-SEE supported project!

15 partners from 9 countries

Total project budget 2.2 M€

Not all countries participate!

(not all countries are eligible)

Project kick-off meeting:

16-18 September 2009

Budapest

Moving to implementation

Environmental Agency of Slovenia	Slovenia	(lead partner)
Slovenian Institute of Hop Research and Brewing	Slovenia	
Hungarian Meteorological Service	Hungary	
VITUKI Environmental Protection and Water Management Research Institute	Hungary	
Directorate for Environmental Protection and Water Management of Lower Tisza District	Hungary	
Institute of Soil Science "Nikola Poushkarov"	Bulgaria	
National Institute of Meteorology and Hydrology	Bulgaria	
Agricultural university of Athens	Greece	
GEORAMA (non-governmental and non-profit organization)	Greece	
Meteorological and Hydrological Service	Croatia	
Republic Hydrometeorological Service of Serbia	Serbia	
Hydrometeorological Institute of Montenegro	Montenegro	
Hydrometeorological Service	FYROM	
Institute for Energy, Water and Environment	Albania	

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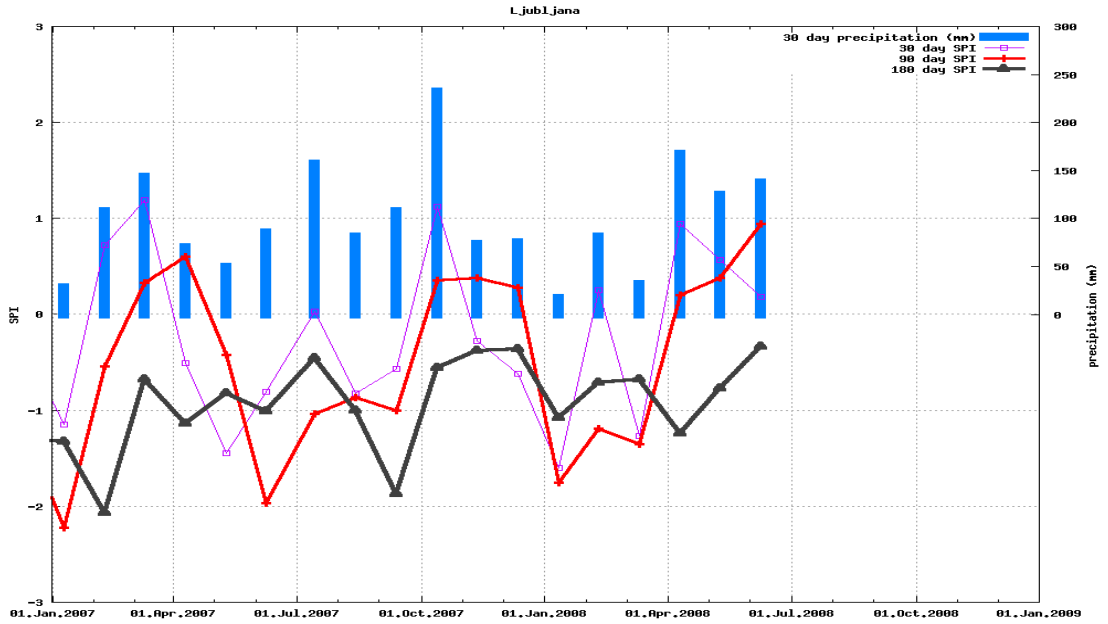
Foreseen outcomes of the TCP project

Implemented basic drought indices (such as SPI).

Emphasis is not put into development of i.e. new drought indices, rather on standardization of existing software



- Distribution of common software
- Agreement on operational procedures

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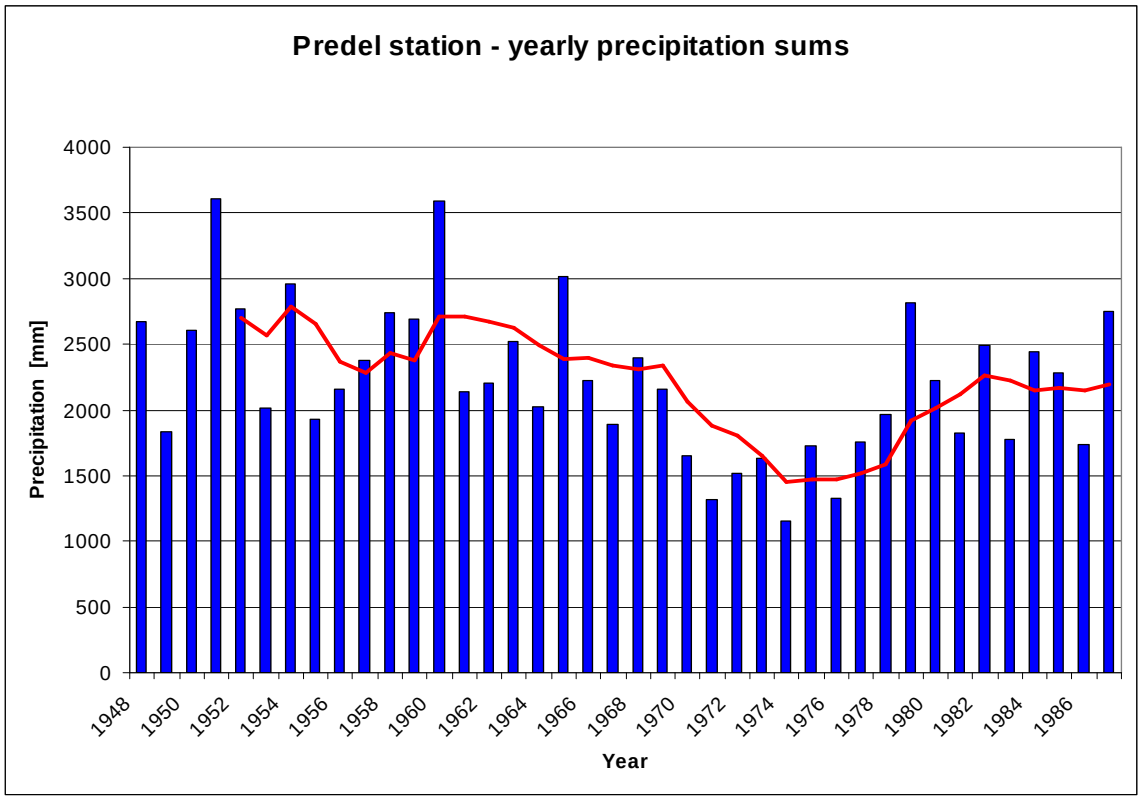
Foreseen outcomes of the TCP project

Implemented data quality and homogenization methods



Predel (precipitation station in W Slovenia)

Was there decade of drought 1970s?

No, ombrometer was leaking!!!

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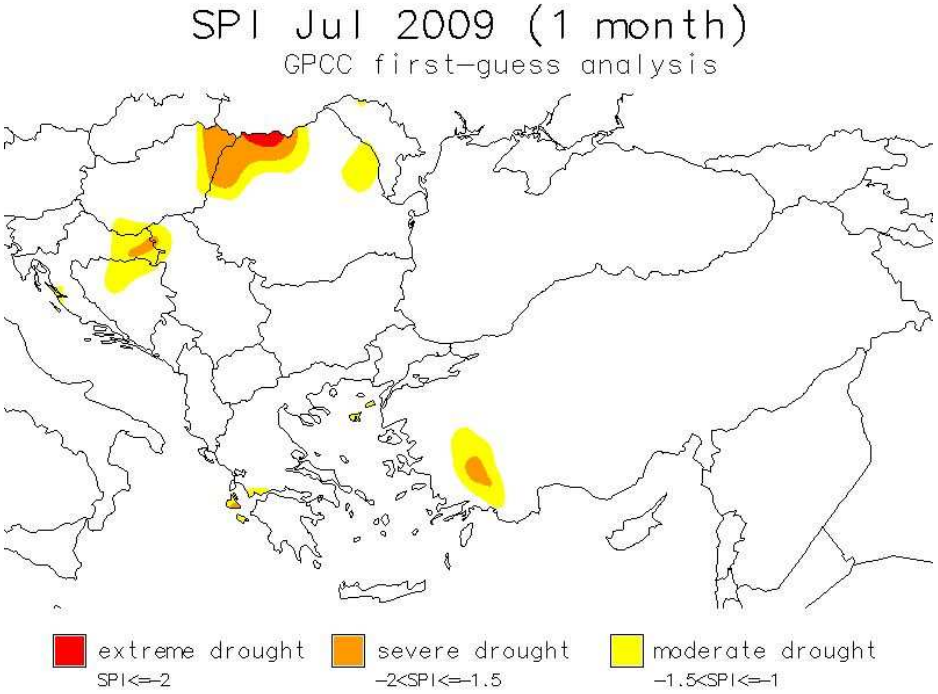
Foreseen outcomes of the TCP project

Overview of existing procedures for climatological mapping

Can we do better than just using global datasets (such as GPCC)?



- **www.dmcsee.org**
- Maps are updated twice per month.
- Final data maps with two months delay.
- First-guess maps are available after 5th day of the next month.
- For the period 1951-2000 maps are available on the DMCSEE web page.
- Monthly precipitation data from GPCC are used.

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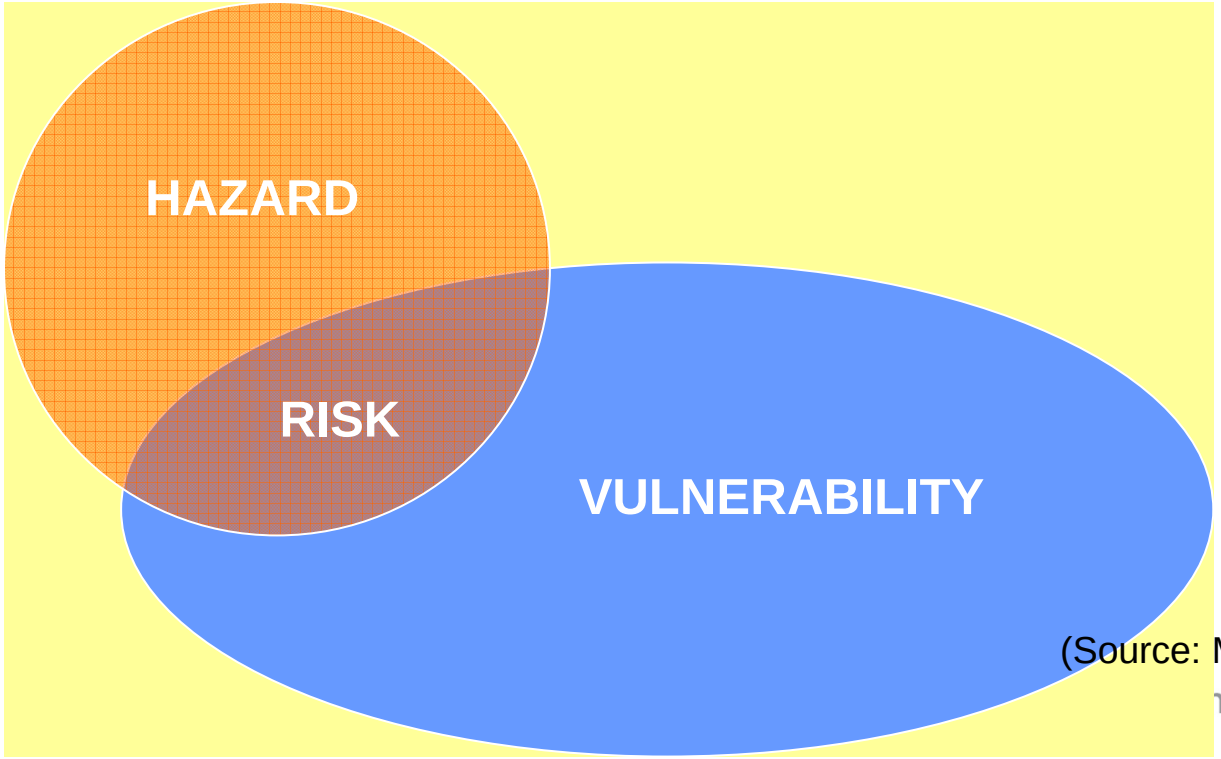
RISK CONCEPT:

risk = hazard x vulnerability



Both, natural hazard due to climate variability, and more subjective vulnerability, cause risk of drought impacts

(Source: MEDROPLAN)

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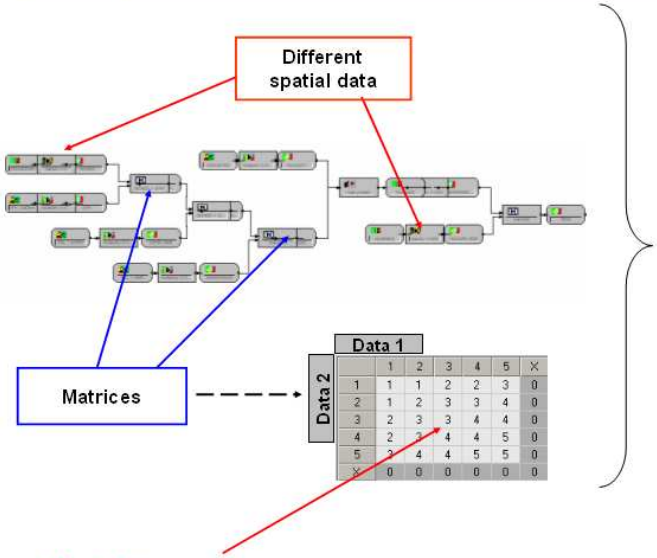
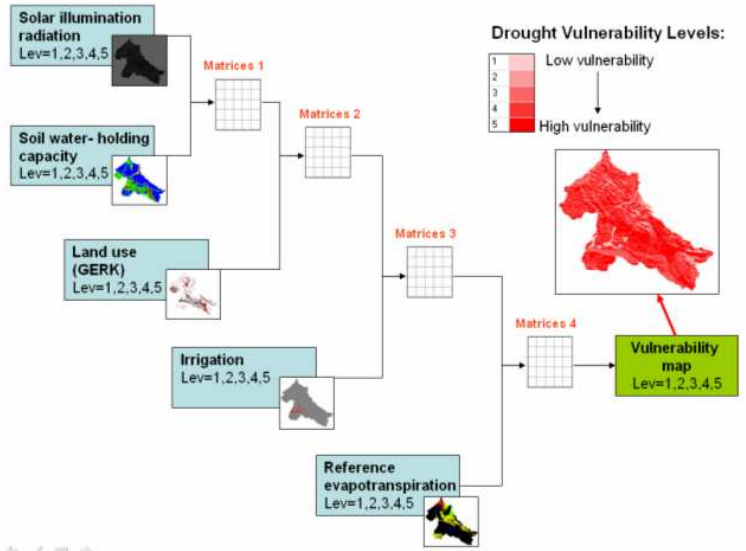
Foreseen outcomes of the TCP project

Vulnerability assessment using interaction matrices method

Composition of the model in a GIS software:





Weighting values for these parameters were obtained from expert judgement.

The technique combines an interaction matrix methodology with GIS map overlaying.

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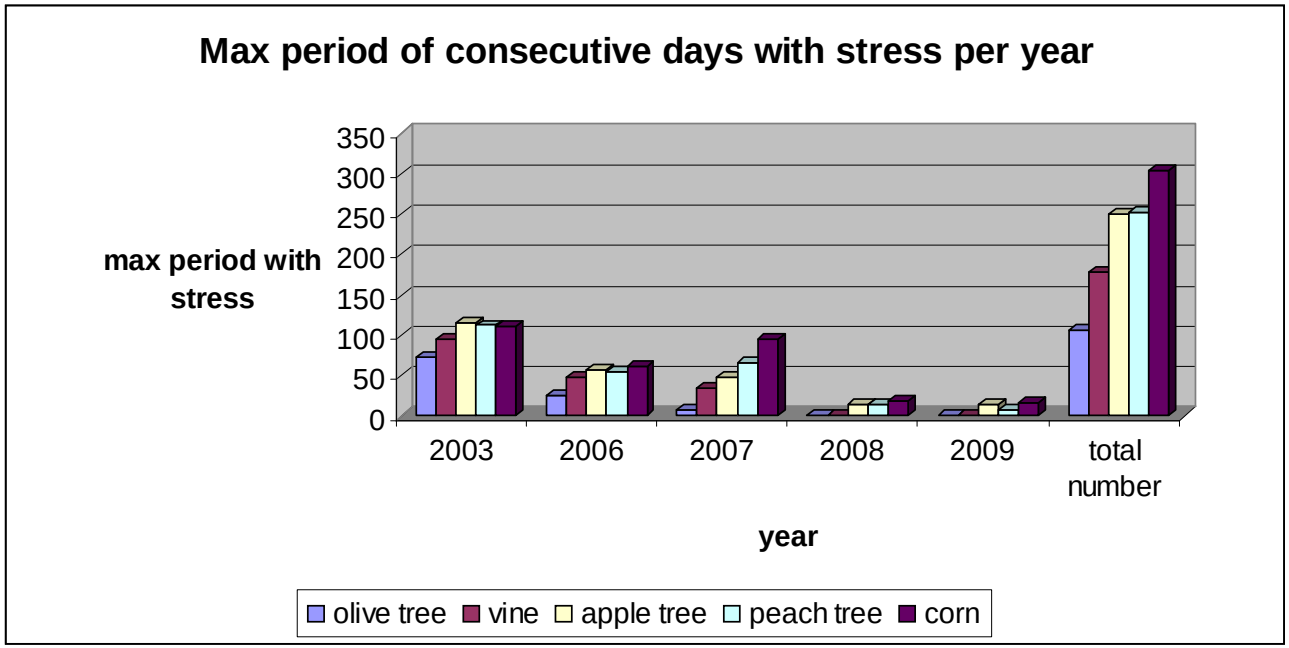
Foreseen outcomes of the TCP project

Vulnerability assessment using crop-yield model



Can crop-yield model simulations help us understanding vulnerability to drought in agriculture?

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Conclusions

- South-East Europe is among regions that will be severely affected by climate change
- Drought monitoring is important ingreedient of successful drought management
- DMCSEE goal: building capacity and assuring comparability of drought indicators in SE Europe
- Mitigation measures – can we learn from each other?