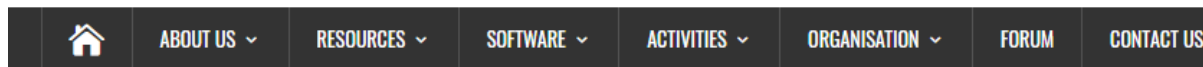


*Fostering European Drought Research  
& Science Policy Interfacing  
(2011–2015)*



**E**UROPEAN  
**D**ROUGHT  
**C**ENTRE

# European Drought Centre



European Drought Centre > News > European Drought Impact Report Inventory (EDII) and European Drought Reference (EDR) database

## European Drought Impact Report Inventory (EDII) and European Drought Reference (EDR) database

News

Clima

### European Drought Reference (EDR) database:

- To learn more about **historical drought events**, view the EDR database: [Click Here](#)

- To view **drought indicator (SPI)** values on a given date: [Click Here](#)

### European Drought Impact Report Inventory (EDII):

- To **query the EDII** and find reported impacts: [Click Here](#)
- To **submit a drought impact report**: [Click Here](#)

## Summary of Major European Droughts

The EDR database was compiled as part of the EU funded [DROUGHT R&SPI Project](#). The database is designed to provide a single, publicly available site to disseminate detailed information about historical drought events in Europe. For additional information on this project and data collection, see the [Project Overview](#). Major European droughts identified by the [EU funded DROUGHT-R&SPI Project](#) are listed below. Links provide detailed meteorologic and hydrologic drought indices, as well as information regarding economic, social, and environmental impacts.

Search:

Year	Location	Approx. Duration	Climatological (SPI-6)			Hydrological		
			Peak Date	Area (%)	Area (10 <sup>6</sup> km <sup>2</sup> )	Peak Date	Area (%)	Area (10 <sup>6</sup> km <sup>2</sup> )
1959	<a href="#">Northern Europe</a>	5/1959-2/1960	17/10/1959	52.6	3,900			
1972	<a href="#">Northern/Eastern Europe</a>	12/1971-7/1972	25/3/1972	57.6	4,268	20/3/1972	54.6	4,045
1973	<a href="#">Central Europe</a>	1/1973-7/1973	20/2/1973	41.7	3,090	18/11/1973	50.2	3,724
1975-1976	<a href="#">Europe</a>	11/1975-2/1977	27/7/1976	61.0	4,521	1/7/1976	71.2	5,277
1989-1990	<a href="#">Mediterranean</a>	2/1989-10/1990	23/2/1989	43.8	3,248	11/5/1990	66.8	4,951
1991-1995	<a href="#">Mediterranean</a>	2/1992-10/1994	11/6/1993	45.5	3,373	5/5/1993	57.9	4,291
1996-1997	<a href="#">Northern Europe</a>	4/1995-7/1996	31/3/1996	49.6	3,674	4/3/1996	66.9	4,961
2000	<a href="#">East/Southeast Europe</a>	1/2001-3/2001	23/1/2001	30.5	2,261	26/6/2000	54.0	4,004
2003	<a href="#">Europe</a>	4/2003-11/2003	12/8/2003	54.8	4,063			
2004-2007	<a href="#">Iberian Peninsula</a>	7/2004-6/2007	25/2/2006	38.0	2,817			
2007	<a href="#">Eastern Europe</a>	2/2007-8/2007	30/4/2007	21.3	1,579			

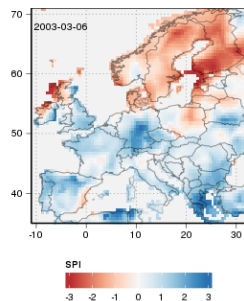
## Drought of 2003

Europe

**Progression of climatological (SPI-6) drought.** Climatological drought is defined by the SPI-6, which sums precipitation over the previous 6 months and transforms this value to the standard normal distribution. Negative SPI values (shown in red) represent dry conditions, measured in standard deviations from typical conditions. Percent area in drought is calculated by summing all cells less than the 20th percentile (SPI < -0.84).

### Drought Event Summary

The 2003 drought event is considered exceptional precipitation deficits with record-setting heat and evapotranspiration. At its peak, nearly all of Europe, the Balkan peninsula and the far eastern Mediterranean, and extremely low discharge levels of rivers were



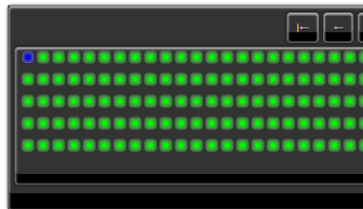
### Climatological Drought

The 2003 drought event began with a precipitation deficit located in Poland. Climatological drought remained to cover most of Europe. This rapid expansion was

The most severe precipitation deficits, which occurred at that point. This greatly increased evapotranspiration

The meteorological drought began to quickly reach France.

**Progression of climatological (SPI-6) drought** transforms this value to the standard normal distribution. Percent area in drought is calculated by summing all cells less than the 20th percentile (SPI < -0.84).



### Drought Impacts

In terms of impacts the European drought of 2003 affected an area spreading from Portugal to Romania and Bulgaria (Demuth, 2009; EEA, 2010). It was characterized by diverse and far reaching effects resulting from an exceptional rainfall deficit combined with extended heat wave conditions (EurAqua, 2004).

Agriculture was particularly affected in Southern and Central Europe: French, Italian, German, Austrian, Swiss, Slovakian, Spanish and Portuguese agriculture but also Eastern countries have been among the most affected by the drought and the heat wave in 2003 (COPA-COGECA, 2004; Swiss Re, 2004). In many countries of the South-Eastern European region, like Hungary, Slovenia, Croatia, Serbia and Montenegro 2003 was among the major agricultural droughts in recent years (AUA, 2011). The International Disaster Database EM-DAT registered drought disasters in 2003 in Bosnia and Herzegovina, Croatia and Hungary. Significant decreases in yields compared to previous years were common, however with big variations per region. According to COPA-COGECA (2004), European livestock farmers were hit due to the big impact on green fodder supply. Agricultural losses were estimated to amount to more than 10 billion Euros (COPA-COGECA, 2004; Swiss Re, 2004). Governmental measures to mitigate the effects for the farmers were taken in several countries and also by the European Commission.

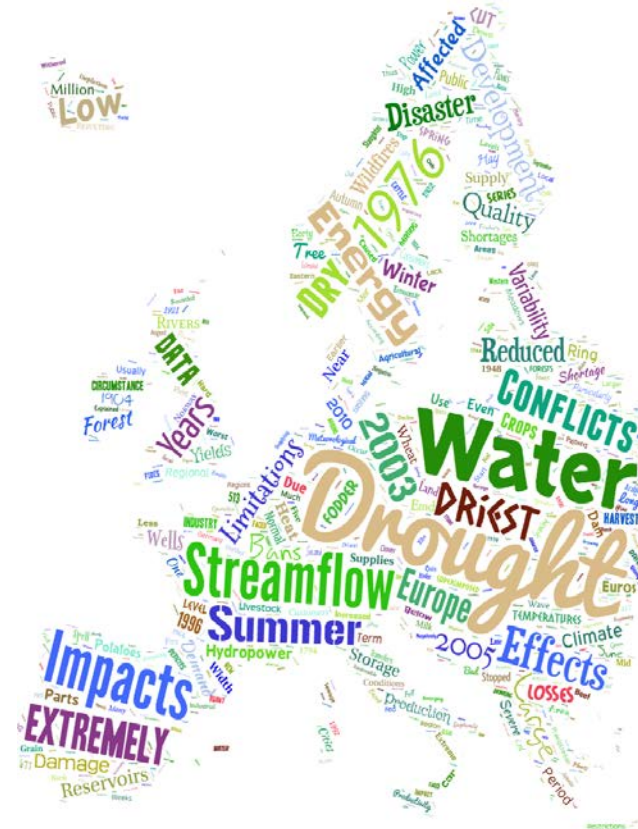
Local limitations and serious shortage problems in public water supply in Germany. A few communities and single farms, which had been supplied by emergency actions. However, immense demands during the depletion of resources, i.e. dried up springs and boreholes, extremely Austria authorities initiated the construction of additional (large scale)

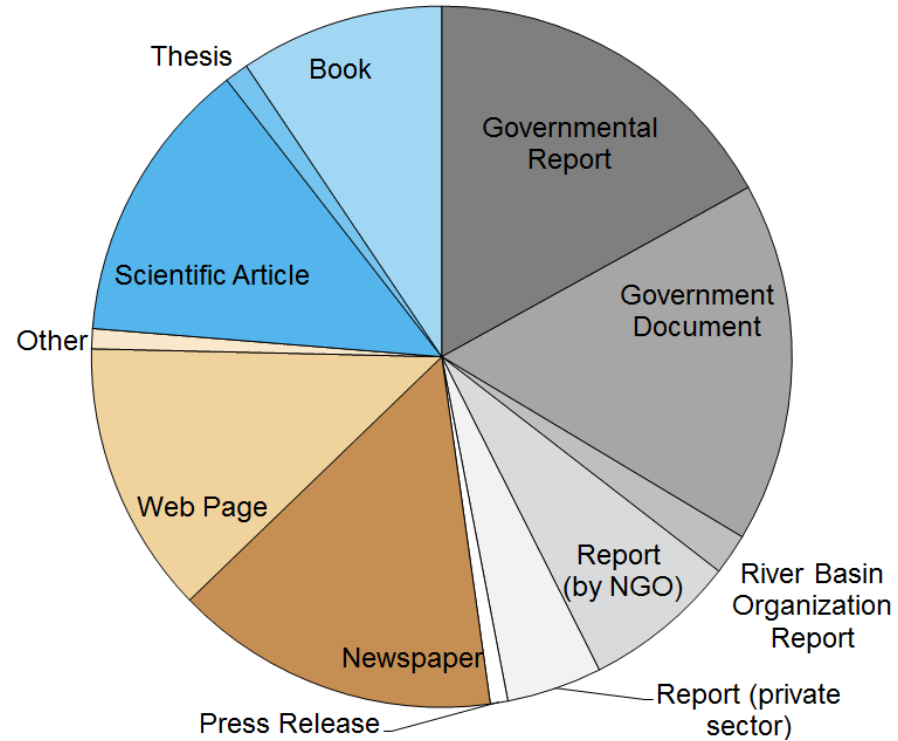
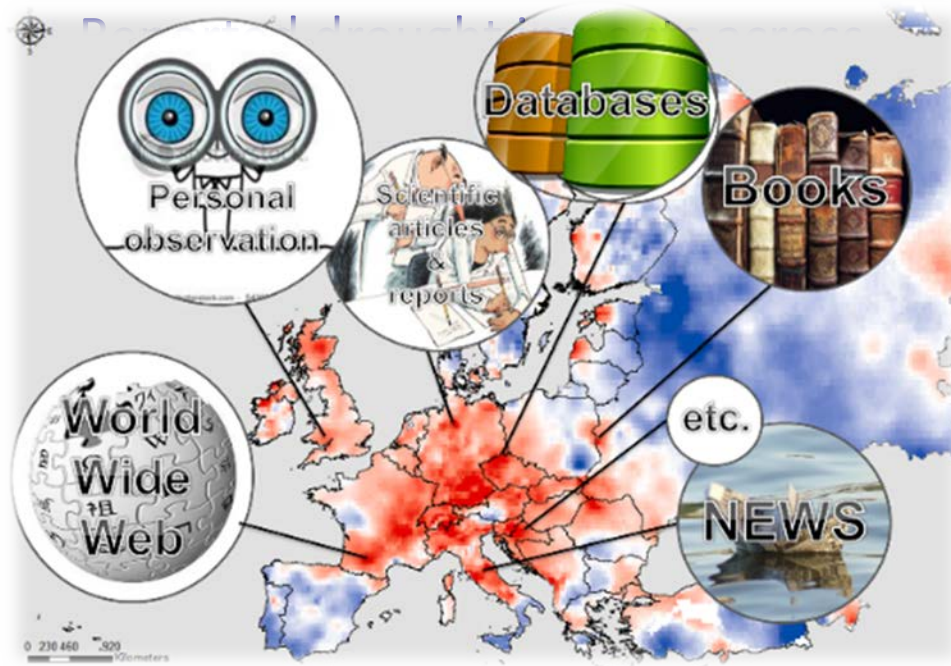
### Impact Detail Table

10 records per page

Search:

Drought Event	Country	Start Date	End Date	Impact	Impact Category	Impact Description	NUTS 1	NUT
2003 Europe	Magyarország	4/2003		1.1	Reduced productivity of annual crop cultivation: crop losses, damage to crop quality or crop failure due to dieback, premature ripening, drought-induced pest infestations or diseases etc.	Almost no precipitation since April, several plants are affected in their growth. Crop yield are estimated to be about 25% less than the year before. The government has announced that they would carry out assistance payments of about 240 Mio €.		
2003 Europe	Deutschland	6/2003		1.1	Reduced productivity of annual crop cultivation: crop losses, damage to crop quality or crop failure due to dieback, premature ripening, drought-induced pest infestations or diseases etc.	first damages due to drought were evident in June, accelerated maturing process, furthermore, drought caused damages on corn and beet	Schleswig-Holstein; Hamburg; Bremen; Niedersachsen; Mecklenburg-Vorpommern;	
2003 Europe	Italia	6/2003	8/2003	1.1	Reduced productivity of annual crop cultivation: crop losses, damage to crop quality or crop failure due to dieback, premature ripening, drought-induced pest infestations or diseases etc.	Reduction of agricultural production caused	Nord-Est; Nord-Ovest;	





EDII information source types (July 2017)



16. August 2015  
Leserservice 08 00/222 42 24 02 - www.der-sonntag.de

## Der Sonntag in Freiburg

### Water Supply

*At the waterworks "Ebnet" well site, groundwater level has dropped below the threshold for abstraction (...) therefore water is now pumped from the "Hausen" wells to Freiburg (...)*

### Ecosystems

*(...) trees shed leaves (...)*

## Die Folgen der Dürre

Wochenlang Hitze und kaum Regen: Südbaden kämpft mit der **TROCKENHEIT**

Landwirte beklagen Ernteausfälle, Förster warnen vor Waldbränden und die Wasserversorger haben alle Hände voll zu tun. Auch wenn die Hitzewelle in Südbaden vorerst beendet ist: Ihre Auswirkungen werden noch lange zu spüren sein.

Das Schlimmste, was passieren kann, ist Kalk in den Kochtöpfen. Mit dieser Botschaft wandten sich die Stadtwerke Müllheim-Staufen diese Woche an ihre Trinkwasserkunden. Denn die wochenlange Trockenheit bereitet dem kommunalen Versorger Probleme: Die höher gelegenen Quellen geben nicht mehr genug Wasser her. Deshalb setzen die Stadtwerke stärker auf die Tiefbrunnen in der Rheinebene. „Wir haben kein Mengenproblem, weil wir an einem der größten Grundwasserspeicher Europas leben“, sagt der technische Leiter der Stadtwerke, Michael Sattler. Allerdings werde das Wasser härter, was zu Kalkablagerungen führen kann. Das Rheintalgrundwasser ist mineralienreicher als das weiche Quellwasser aus dem Schwarzwald.

Auch in Freiburg sind die Auswirkungen der Dürre zu spüren. „Unsere Wassermeister haben derzeit sehr viel zu tun“, sagt Yvonne Schweickhardt, Sprecherin des Regionalversorgers Badenova. Beim Wasserwerk Ebnet sei der Grundwasserspiegel so weit gesunken, „dass wir ihn nicht ohne Not weiter absenken wollen“, sagt Schweickhardt. „Deshalb pumpen wir mehr Wasser aus Hausen nach Freiburg.“

Hitze und Trockenheit führen zum einen dazu, dass Wasser fehlt. Kleinere Flüsse trocknen aus. Der Neumagen, der normalerweise von Münsental nach Bad Krozingen fließt, ist nur noch ein Kieselbett. Zum anderen wird mehr Wasser verbraucht. Vor allem durch Gartenbesitzer und Landwirte. Anfang Juli hat Badenova einen neuen Rekord-



Ausgetrocknet: die Dreisam bei March.

FOTO: SEGER (DPA)

verbrauch festgestellt. „Wir haben an einem Tag 71 000 Kubikmeter Wasser nach Freiburg gepumpt, so viel wie noch nie“, sagt Unternehmenssprecherin Schweickhardt. Die durchschnittliche Tagesförderung betrage etwa 48 000 Kubikmeter.

#### Landwirte unterschiedlich stark betroffen

Als Werner Rappke, Präsident des Bauernverbandes BLHV vom Kaiserstuhl, in dieser Woche nach Freiburg kam, wunderte er sich über den „starken Blätterwurf der Zierbäume wie im Herbst“. Die Bäume werfen einen Teil ihrer Blätter aus Wassermangel ab, um die übrigen ausrei-

mit sandigen, wenig speicherfähigen Böden haben massive Probleme. Andere, mit ausreichend Humus, erleben einen zwar heißen, aber doch einigermaßen normalen Sommer. Am massivsten betroffen ist der Maisanbau. Auf vielen Feldern in der Rheinebene haben die Pflanzen nicht einmal Kolben ausgebildet. In Schwanau bei Lahr haben Landwirte ihre Maisfelder jetzt als Futter für Biogasanlagen abgeerntet, um wenigstens noch etwas zu verdienen. „Die Ernte“, sagt BLHV-Kreisvorsitzender Karl Silberer, „ist der Jahreslohn der Landwirte.“ Besser sieht's dagegen beim Getreide in Südbaden aus. Die vielen Niederschläge im Frühjahr haben die Ernte gerettet. In Nordbaden seien die Landwirte nicht so glimpflich davongekommen, sagt Silberer.

Auch die Forstwirtschaft muss mit Einbußen rechnen. „Die anhaltende Trockenheit lag in der Hauptwachstumszeit“, sagt Südbadens Forstpräsident Meinrad Joos. „Das Jahr 2015 wird an den Bäumen in hundert Jahren noch ablesbar sein.“ An den Jahresringen. „Aber dieser wirtschaftliche Schaden ist in der langfristigen Denke der Forstwirtschaft zu verkraften.“

Problematisch könne allerdings noch der Borkenkäfer werden. Bernhard Schirmer, neuer Forstdirektor in Bad Säckingen, erklärt, warum: „Bohrt sich der Schädling in den Baum, schüttet der zur Abwehr Harz aus und ertränkt damit den Käfer. Können sich die Bäume in den Monaten vorher nicht ausreichend mit Wasser versorgen, produzieren sie zu wenig Harz.“ Da es im Winter und im Frühling viel geregnet hat, ging bis jetzt alles gut. „Der Borkenkäfer hat sich viel weniger ausgebreitet, als ich befürchtet habe. Das kann aber noch kommen“, sagt Schirmer.

Forstpräsident Joos warnt außerdem vor der hohen Waldgefährdung im Anfang März bis Ende Oktober herrscht grundsätzlich Rauchverbot im Wald. Das einzuhalten, ist dieses Jahr besonders wichtig.

DAG, RIX, NIL

### Livestock farming

*(...) Failure of the third cut of grass; emergency cattle sales necessary for some farmers(...)*

### Agriculture

*(...) corn crops are most heavily affected. On many fields plants have not produced cobs(...)*

### Forestry

*(...) Effects in growth reduction **expected** (...)*

*(...) high **forest fire** danger...*

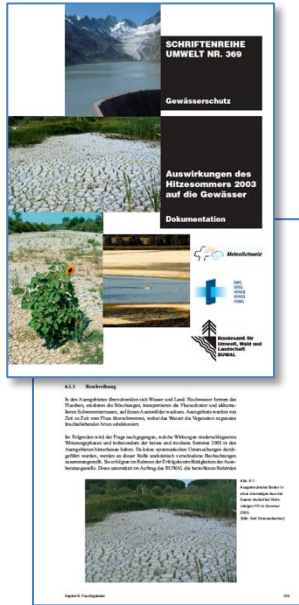
## Information Source





## Information Source

## Region Location



NUTS geocode,  
location, streams

## Nomenclature des Unités Territoriales Statistiques



Eurostat 2007 edition

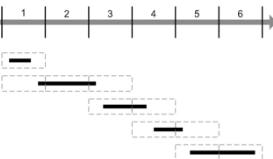
**Region**  
**Location**

## Time of Occurrence

## Impact Categorisation



NUTS geocode,  
location, streams



year,  
month or season



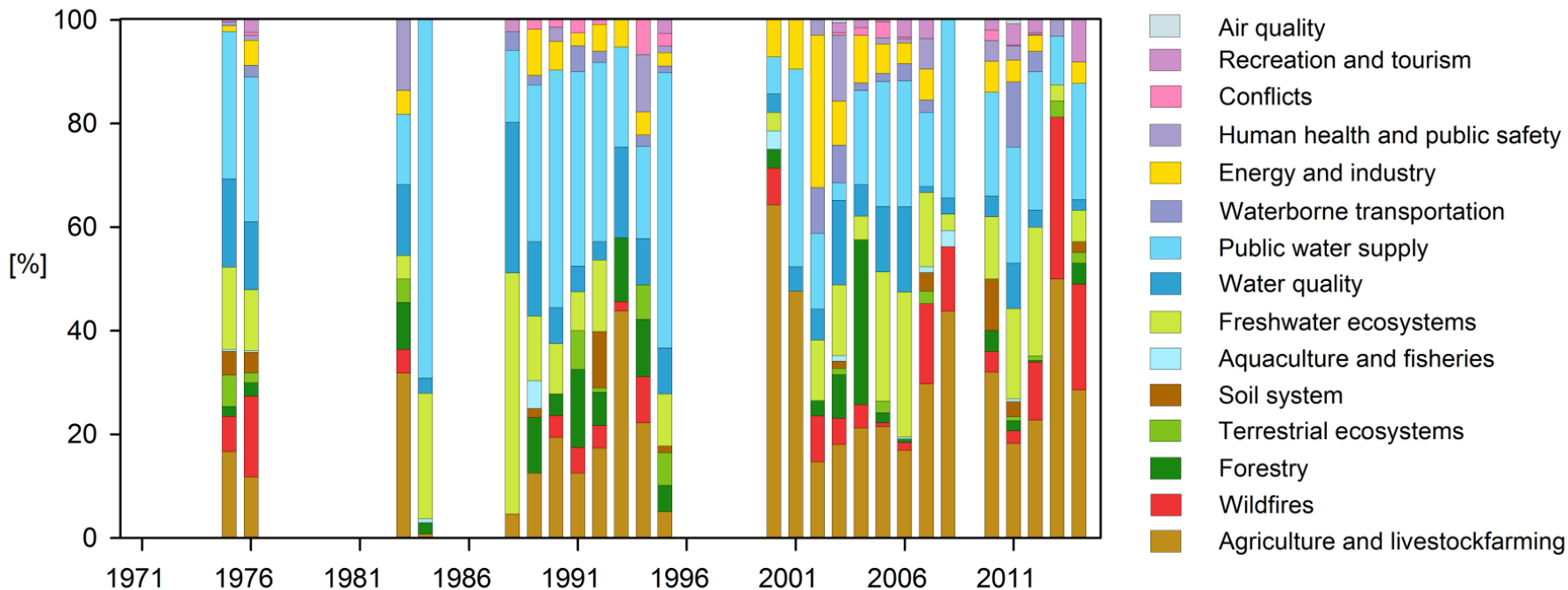
# Archiving impact reports: impacts categories

Information  
Source

Region  
Location

Time of  
Occurrence

Impact  
Categorisation



# Archiving impact reports: impact category subtypes

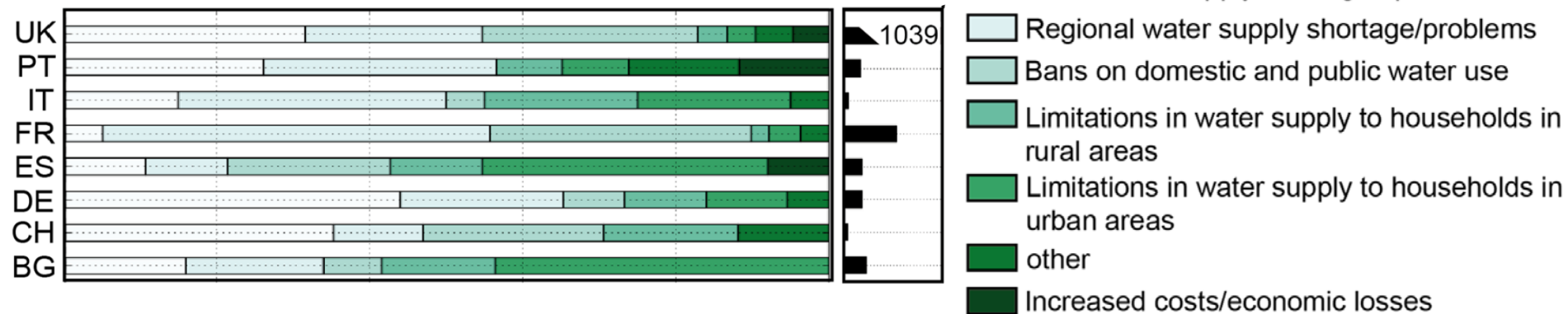
Information  
Source

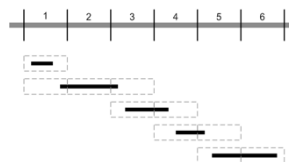
Region  
Location

Time of  
Occurrence

Impact  
Categorisation

## Public water supply



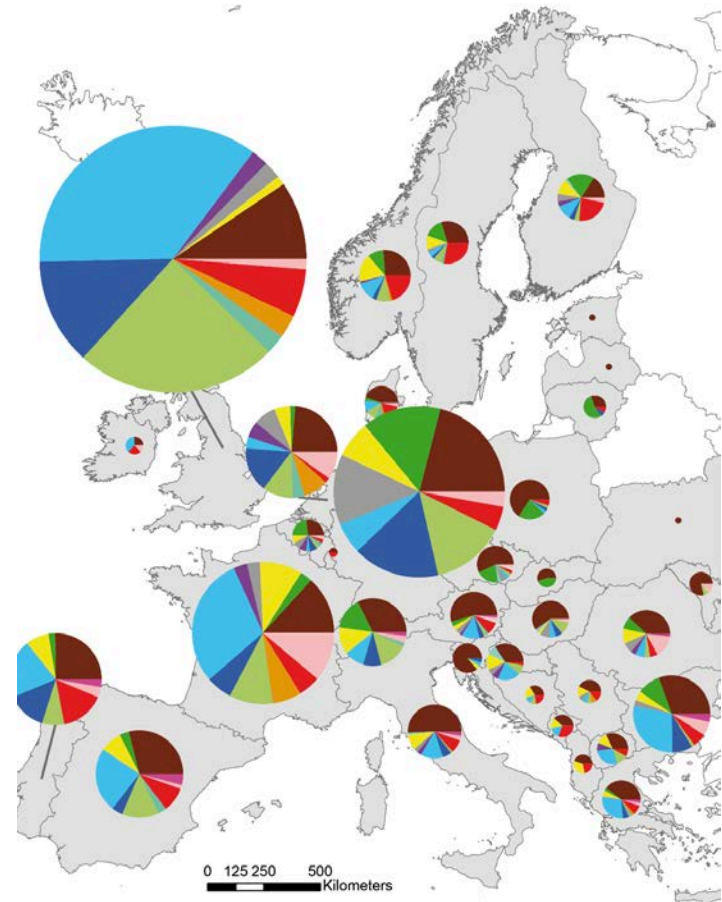
EDII  
Archive

ID	Location		
	Country	NUTS 1	NUTS 2
bf_1	Switzerland	Switzerland	Espace Mittellan
ik_1	Switzerland	Switzerland	Nordwe
		NUTS 3	Location
bf_1	Bern		nuclear power plant Mühleberg in Mühleberg
	Aargau		nuclear power plant Beznau in Döttingen (Zurzach)
	Bern-Luzern:		several parts of

Impact details			
YYYY	category	type	description
2003	4	4.2;	Due to a lack of cool were needed to redu
2003	4	4.2;	Due to a lack of cool were needed to redu and August 2003.
	7	7.3;7 .4	Limitations and bans the lawn, filling of po actions were necess



- ~**6000** impact report **entries**  
with ~ 9000 impact types
- for **38 countries**
- far from being exhaustive and  
with biased coverages  
yet still a unique resource



- as text-based archive – **anecdotal evidence, narratives**  
see EDR



**EUROPEAN DROUGHT CENTRE**

**Drought of 1975-1976**

Central and Northern Europe

**Drought Event Summary**

The 1975-1976 event was brought about by a relatively dry, mild winter with below average precipitation. The precipitation deficit developed during spring and summer and became Europe-wide in late February in SE England. Only the Mediterranean and the north-west of Ireland were unaffected. Throughout May and June, the drought spread north and eastward resulting in a strongly concentrated cluster around east Central Europe that peaked in July 1976, when also a high incidence of fires among the forests, suggesting a strong influence of the common burning and a relative result. This is confirmed by Stahmer et al. (2003) who found the maximum period for daily temperature drought to occur in July.

**Drought Statistics**

**Approx. duration:** 11/1975-21/1977

**Date of 95th edile:** 2/1976

**Date of hydrological year:** 7/1976

**Affected regions:** Central and

**Drought Impacts**

In parts of Northwestern Europe already the growing season (May to September) of 1975 was characterized by markedly below average rainfall. By June 1975 large-scale barns had been imposed throughout South-West England and were extended to substantial parts of England and Wales during the following months (Drozdov & March, 2011). Newspapers also reported on record number of forest, health and field fires in Denmark and adjacent Northern Germany as well as on shortage of fodder in Eastern parts of Norway leading to slaughtering of cattle and stampings of milk from the West.

Then, the drought conditions in 1976 combined with a heat wave in late July particularly in France and the UK but resulted in widespread socio-economic and environmental impacts throughout Western Europe. Agriculture was extensively affected. Due to insufficient grazing availability and low hay and fodder crop yields livestock and especially dairy farming severely suffered from feed shortages during the heat sensitive period. This caused early slaughter of livestock at unprecedented rates (DSE, 1976). Particularly France, Great Britain and Denmark (all of them having faced drought conditions since 1970) reported unusually fallen milk production. In parts of Great Britain and the Netherlands large incursions contributed to agricultural damage (Drozdov & March, 2011; Massaretto et al., 2013). Households were impacted through sharply increased prices especially for potatoes and fresh vegetables together with the loss of their own garden produce (Kulakovskiy et al. 1977; Dörflinger et al. 1980; Drozdov & March, 2011).

The impact on public water supply services varied spatially. In England and Wales the seriousness of the water supply situation due to prolonged droughts was a major problem: despite diverse mitigation measures for a period from beginning of August daily shortages had to be applied which truly affected over a million consumers (Drozdov & March, 2011; Dörflinger et al., 1980). In France limitations in water supply affected urban and rural areas in particular in the East, in Brittany and in southern areas and the West, but not as severe as in the beginning of the summer (Drozdov, 1976). While the need for a reduction in demand, including sometimes also outdoor water use restrictions (Drozdov, 2016), was given also in large parts of the Rhine basin, critical regional water shortages and failures of supply remained limited mainly to rural areas where in some cases emergency supply had to be realized by trucks and even helicopters (Gehard et al. 1983).

Because of low stream flows reduced hydropower production and impaired production of thermal and nuclear power plants were common problems for the energy sector. Further, inland navigation on the Rhine and other important transnational routes was heavily impaired sometimes until mid 1977 but not the Rhine. 1976, Germany et al. 1980, 8024, 2000. According to 8024 (2001) 1976 belongs to the top five years of largest economic loss for the navigation sector in the Netherlands (ranked 10th after the years 1921, 1948, 1949 and 1970). In mid-July of Southern and Eastern European land subsidence was experienced on a scale not previously recorded leading to substantial property damage (Dörflinger et al. 1980).

Among the reported environmental impacts of the drought and heat wave in 1976 are impacts on freshwater ecosystems, i.e. the temporary deterioration of bio-fresh water quality (mainly eutrophication phenomena), algal blooms, extreme water temperatures, depletion of dissolved oxygen for critical biota, massive proportions of sewage effluents, saline intrusions, fish kill events (mainly due to excessive wildlife for agricultural irrigation), drying up of stream sections with effects on aquatic species and especially migratory fish (Dörflinger et al. 1980; Gehard et al. 1983; Drozdov & March, 2011). In the Dutch delta area an outbreak of water louse (over 80,000 culicids counted) was attributed to the prevailing low water levels, water quality problems combined with the high temperatures during summer (Gehard et al. 1983). The considerable loss of groundwater levels had a particular impact on oligotrophic wetland habitats in the Netherlands (but not the Rhine). 1976, Sphar, 1975. Novel (dis)occurrence of the drought on sites of nature conservation interest in Britain were documented by Heams & Gillett (1977) in Dörflinger et al. 1980. Deseasoning wildfires were widespread not in the summer of 1976, again Southern England but in the fall number of fires in 1976 Dörflinger et al. 1980 and regions in Northern France (three fold area burnt compared to a reference year, Drozdov et al., 1977) were severely affected. Besides direct fire damage, European woodlands and forests suffered from the prolonged drought stress and increased incidence of diseases such as the Dutch elm disease, in particular increased dieback of beech and birch was observed (Kulakovskiy et al. 1977, van der Heijde 1977, Dörflinger et al. 1980; Gibbs & Greg, 1977).

**Impact Detail Table**

10 records per page

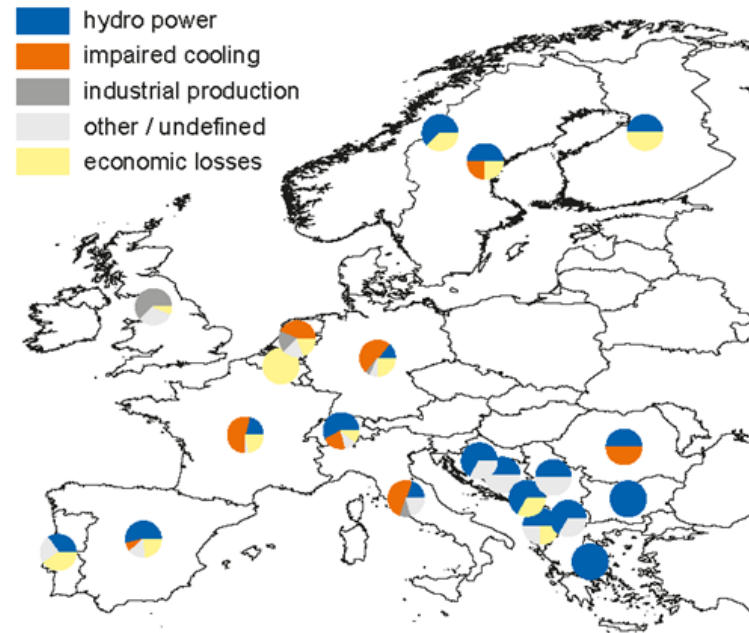
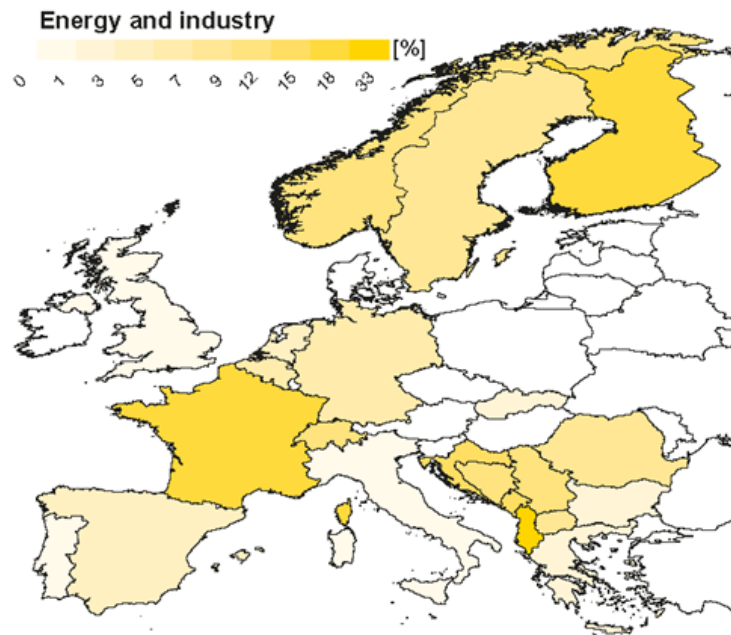
Brought Event	Country	Start Date	End Date	Impact	Impact Category	Impact Description	NUTS 1	NUTS 2
1975-76 Europe	United Kingdom	7/1976	7/1976	A.3	Restoration/Rehabilitation of industrial production processes (due to a lack of process water and/or environmental legislation/restrictions for discharges into streams)	Robotic in SW Wales means process water to a lack of process water and/or environmental legislation/restrictions for discharges into streams	Wales	West Wales and Valleys
1975-76 Europe	United Kingdom	7/1976	8/1976	A.3	Restoration/Rehabilitation of industrial production processes (due to a lack of process water and/or environmental legislation/restrictions for discharges into streams)	There were severe limitations for industrial water users lasting 4 weeks from mid-July	Wales	West Wales and Valleys
1975-76 Europe	United Kingdom	7/1976	9/1976	A.3	Restoration/Rehabilitation of industrial production processes (due to a lack of process water and/or environmental legislation/restrictions for discharges into streams)	Shortages in water supplies led to reduced industrial productions in some districts, from mid-July, lasting 10 weeks	Wales	
1975-76 Europe	United Kingdom	9/1976	9/1976	A.3	Restoration/Rehabilitation of industrial production processes (due to a lack of process water and/or environmental legislation/restrictions for discharges into streams)	Some factories had to reduce their working shift, but even in those water resources had		

Showing 51 to 60 of 1,447 entries

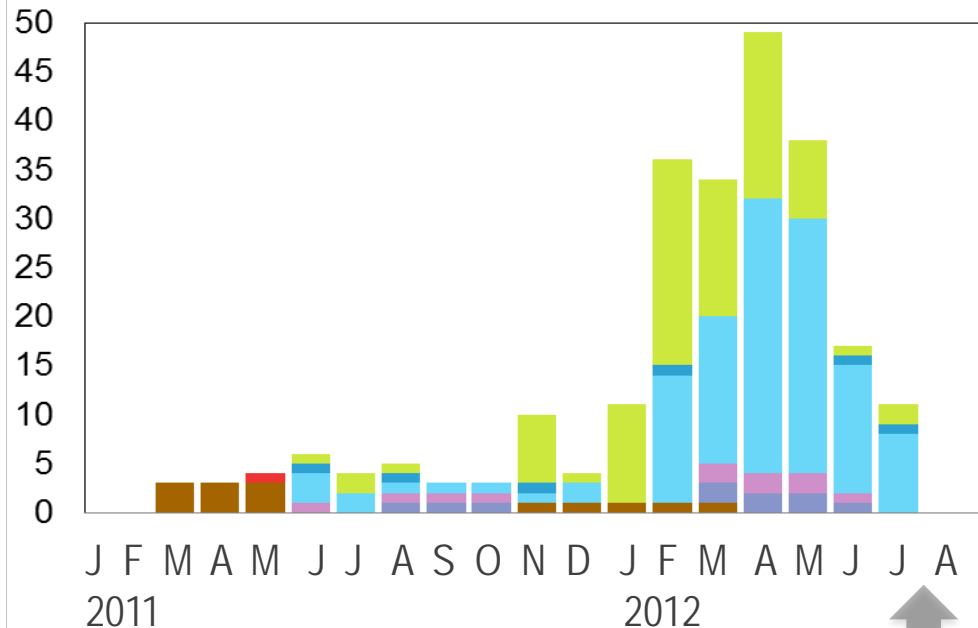


# EDII – possible applications

- as text-based archive – **anecdotal evidence, narratives**
- **visualisation**, impact/vulnerability assessment, impact profiles



## Reported impacts in SE England 2011–2012



*Olympics in London*



**Freshwater ecosystems**

- **Jan/Feb 2012: Fish deaths and distress** in River Meon and a lake in Hampshire. 30 mature sea trout and 6 salmon reported dead.



**Public water supply**

- **Mar 2012:** In some regions in the east and south east of England **several domestic wells dried up.**
- **Apr 2012:** 7 water companies in the south and east of England imposed **temporary water use bans on 20 million customers.**

- as text-based archive – **anecdotal evidence, narratives**
- **visualisation**, impact/vulnerability assessment, impact profiles
- analysing the **link between drought indicators and impacts**

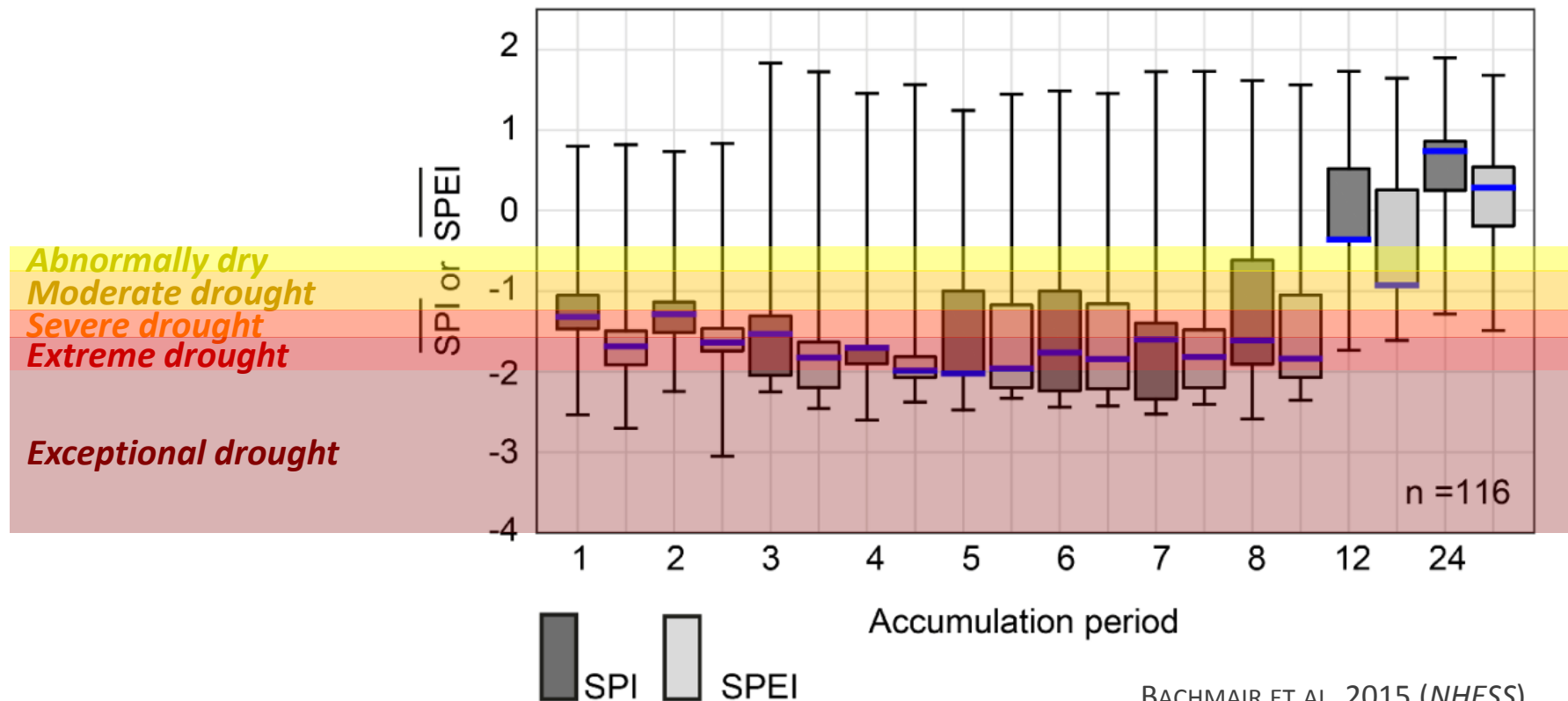
text-based drought impact information as

- ground-truth to **evaluate** indicators and trigger values used in **DMEWS**
- proxy for vulnerability / damage to **model drought risk**



# Are applied thresholds meaningful for impact occurrence?

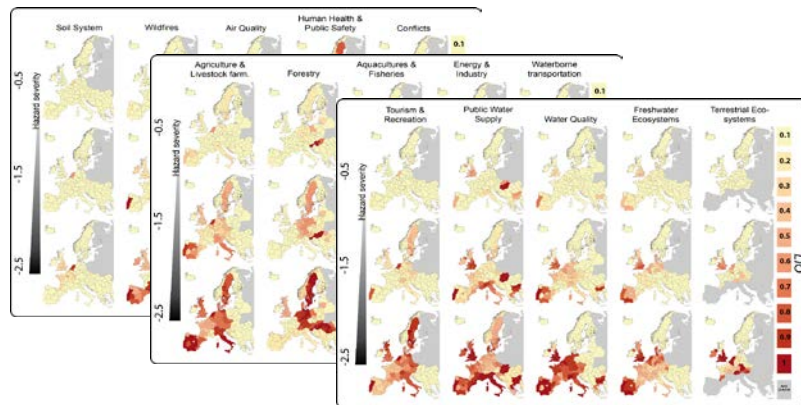
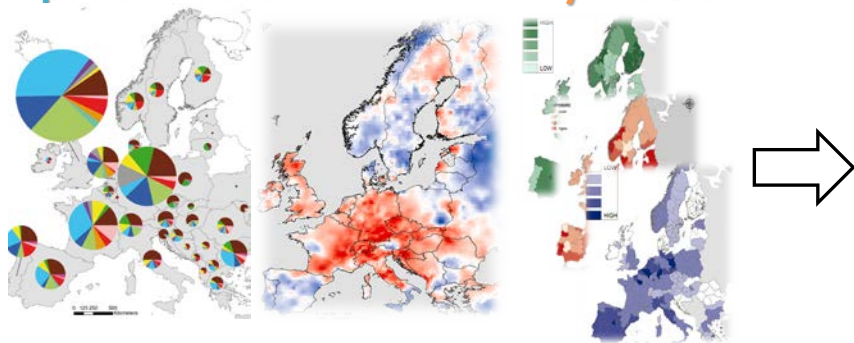
Indices values concurrent with impact onset in Baden-Württemberg



# Test indices on predictive skill, proxy for vulnerability, to model drought risk

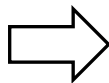
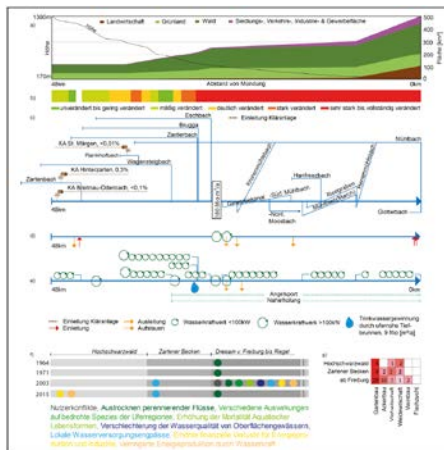
Impacts x Hazard x Vulnerability Factors = Risk

Likelihood of drought impact occurrence



(Blauhut et al. 2016)

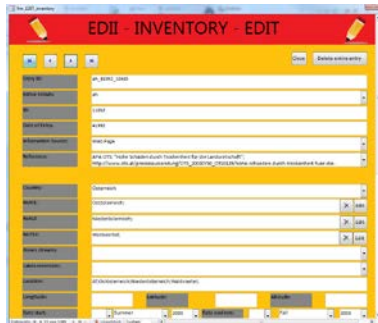
Low flow risk



(Blauhut et al. 2017)

## Offline working database

- currently in MS Access
- sub-set versions & regular updates possible
- easy to use → facilitates parallel working and checking by moderators



## Online EDII

- on the EDC website
- frozen versions at the moment
- good to share the data

[www.geo.uio.no/edc/droughtdb/](http://www.geo.uio.no/edc/droughtdb/)

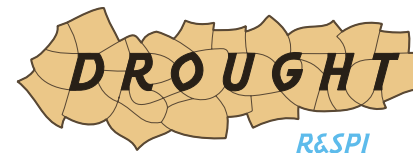


- Webcrawler
- Connection to national reporter systems → Czech republic
- Implementation to citizen science apps e.g. crow water



- **All EDII contributors and WP3 of DROUGHT R&SPI:**

Vanda Acácio, Carlo Bifulco, Lucia De Stefano, Susana Dias, Daniel Eilertz, Barbara Frielingsdorf, Lukas Gudmundsson, Eleni Kampragou, Lieke Melsen, Henny van Lanen, Anne Van Loon, Antonio Massarutto, Dario Musolino, Lena Tallaksen, Julia Urquijo, and many more...



- **DrIVER project team:**

Erik Tijdeman, Jamie Hannaford, Lucy Barker, Kevin Collins, Mark Svoboda, Cody Knutson, Neville Crossman, Ian Overton, and Mike Acreman





## EDII database, guidelines document, paper

- [www.geo.uio.no/edc/droughtdb/](http://www.geo.uio.no/edc/droughtdb/)
- [http://www.geo.uio.no/edc/droughtdb/img/Guidelines\\_EDII\\_Webversion.pdf](http://www.geo.uio.no/edc/droughtdb/img/Guidelines_EDII_Webversion.pdf)
- Stahl et al. (2016) Impacts of European drought events: insights from an international database of text-based reports. Nat. Hazards Earth Syst. Sci. 16, 801–809. doi:10.5194/nhessd-3-5453-2015

## Applications of EDII data

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