

**COST Action 733 – Harmonisation and application  
of weather type classifications in Europe  
FINAL WORKSHOP - Vienna, 22-24 November 2010**

**EUROPEAN PROCEDURES FOR FLOOD  
FREQUENCY ESTIMATION  
(FloodFreq, COST Action ES0901)**

Attilio Castellarin

[attilio.castellarin@unibo.it](mailto:attilio.castellarin@unibo.it)

<http://www.unibo.it/docenti/attilio.castellarin>

# FloodFreq - ES0901

(Start date: 29/10/2009 - End date: 28/10/2013)

Thomas Kjeldsen (Chair)  
Centre for Ecology & Hydrology  
United Kingdom

Jan Szolgay (Vice-Chair)  
Slovak Technical University  
Slovakia

Michel Lang (WG1 Chair)  
Cemagref  
France

Attilio Castellarin (WG2 Chair)  
Univ. Bologna  
Italy

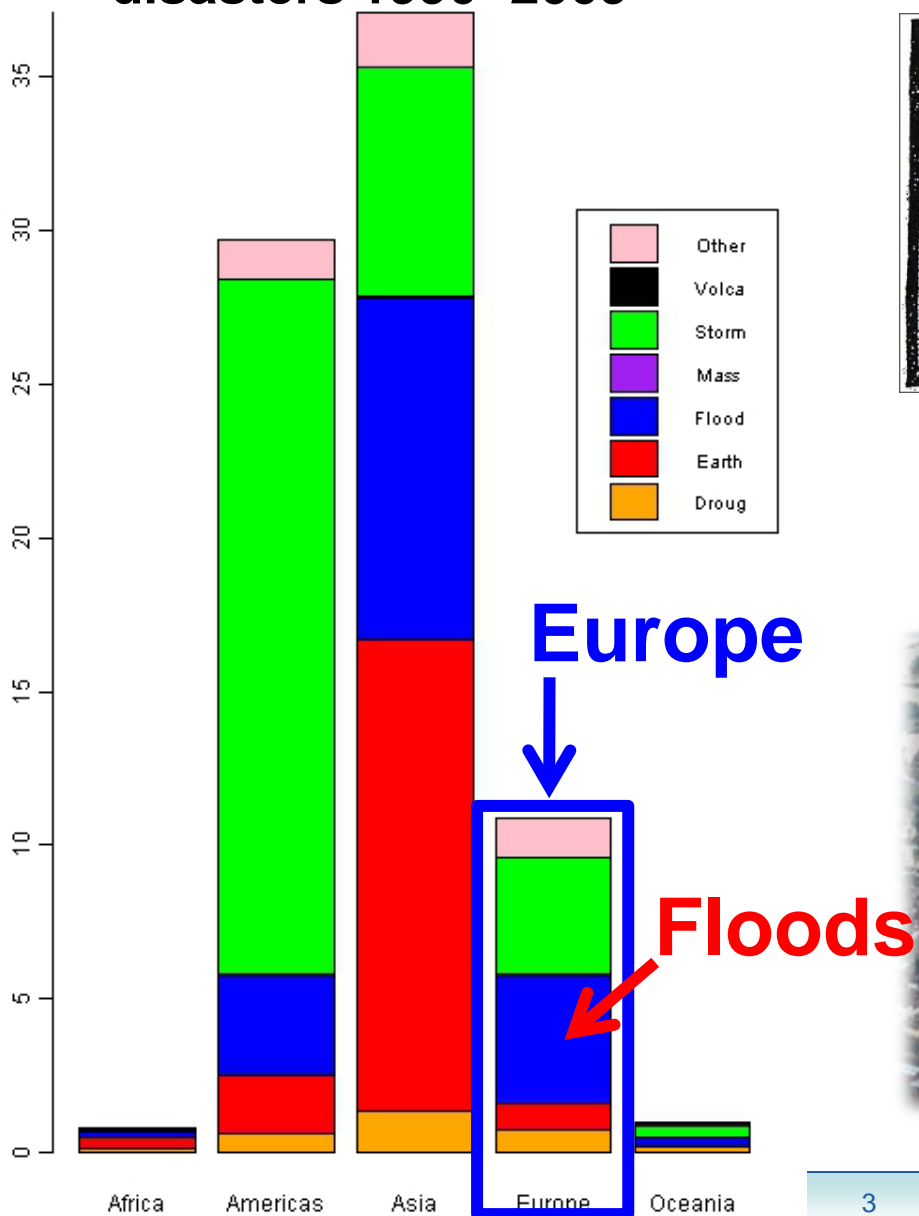
Sarka Blazkova (WG1 Chair)  
T.G. Masaryk Water Research. Inst.  
Czech Republic

Henrik Madsen (WG4 Chair)  
DHI  
Denmark

# Average annual damages (US\$ billion) caused by natural disasters 1990- 2009

## Background

"EM-DAT: The OFDA/CRED International Disaster Database" [www.emdat.be](http://www.emdat.be)



## ORIGIN OF THE ACTION

# Background

The idea for the FloodFreq COST Action was born out of a plenary meeting of scientists with an interest in flood frequency analysis held during the European Geophysical Union (EGU) General Assembly in Vienna, 24-29 April 2005.

Report

**For Organizers & PC only:** [Organizer Session Form](#), [Support Ranking](#), Contributions, Session Organization, Oral Draft Programme, Poster Draft Programme

---

**HS26** **Regional frequency analysis of hydrological extremes - Poster only session & Open Forum in a splinter meeting room (co-listed in NH)**

**Convener:** Castellarin, A.  
**Co-Convener:** Blöschl, G.; Montanari, A.; Rosbjerg, D.; Szolgay, J.

**Links:** [Information](#), [Organizer](#), [Schedule](#), Abstract Submission, Abstract Submission with Support Application, [Accepted Contributions](#), Oral Programme, [Poster Programme](#), [Publication](#), Report

**For Organizers & PC only:** [Organizer Session Form](#), [Support Ranking](#), Contributions, Session Organization, Oral Draft Programme, Poster Draft Programme

---

**HS27** **Times series analysis in hydrology (co-listed in NP)**

**Convener:** Grimaldi, S.  
**Co-Convener:** Piccolo, D.; Koutsoyiannis, D.; Napolitano, F.

The open-forum discussion clearly highlighted the need for a **European based forum for research in flood frequency analysis.**

# Scientific context and objectives

- **Problem statement:**

- Determine the magnitude and frequency of extreme flow at any place on a river, whether data from a gauging station are available or not.
- Create European research network with involvement of institutions with operational/policy responsibilities
- Promote pan-European and synergic approach to flood frequency analysis as requested by Directive 2007/60/EC

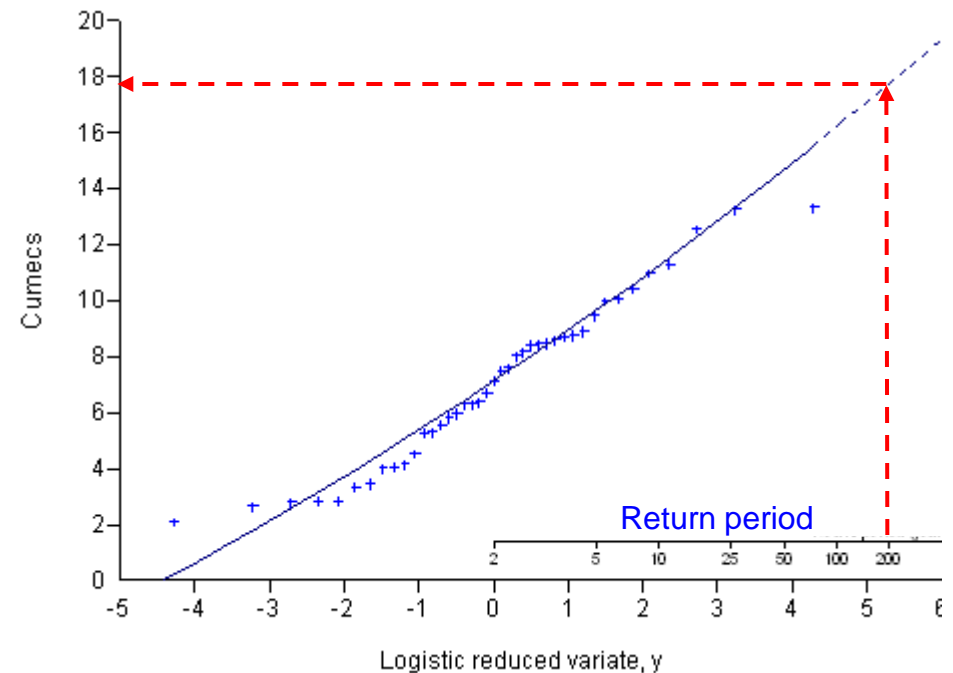
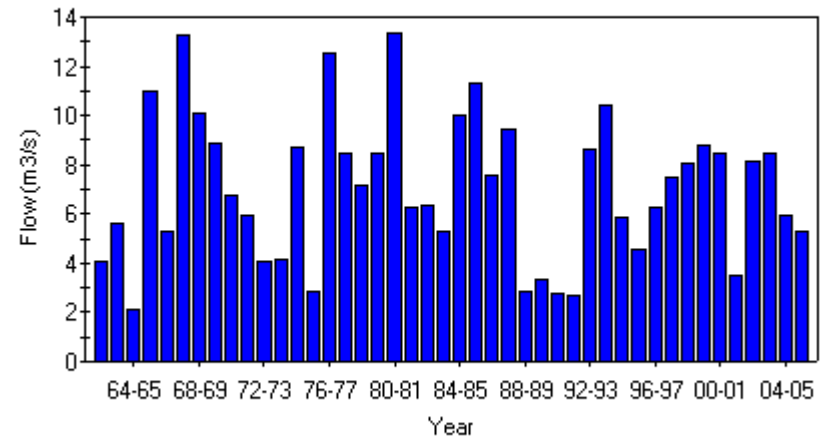
- **Brief reminder of MoU objectives:**

- Pan-European comparison of methods for flood frequency estimation
- Predict impact of environmental change on flood frequency characteristics
- Disseminate findings to end-user community

# Flood frequency estimation

- Probability of exceedance
- Extrapolate if no or short time series available
- Environmental change?
  - Climate change
  - Land-use
  - Urbanisation

AMAX data for Lymn @ Partney





# Working groups

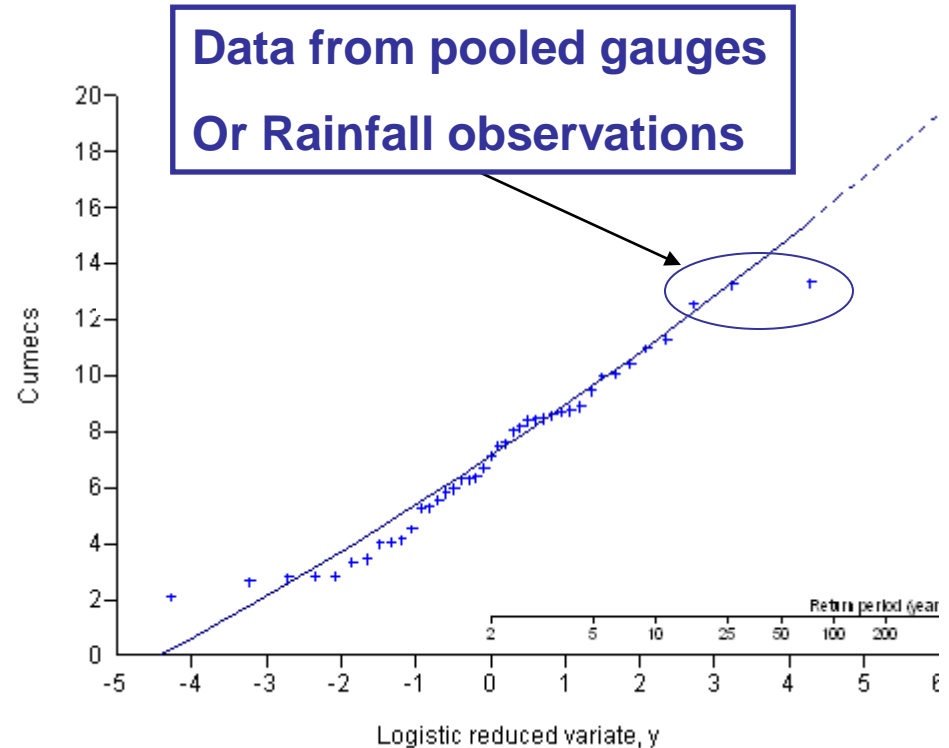
- **WG-1:** Inventory of data and methods and compilation of benchmark datasets
- **WG-2:** Assessment of statistical methods for flood frequency estimation
- **WG-3:** Use of rainfall-runoff models for flood frequency estimation
- **WG-4:** Impact of environmental change on flood frequency estimates
- **WG-5:** Dissemination of results

# Working groups

## WG2 - Statistical analysis

### Reducing uncertainty

- Pooling data from other catchments with similar flood behaviour (FEH, UK)
- Add rainfall data to see how risk increased when catchment saturated (GRADEX, France)

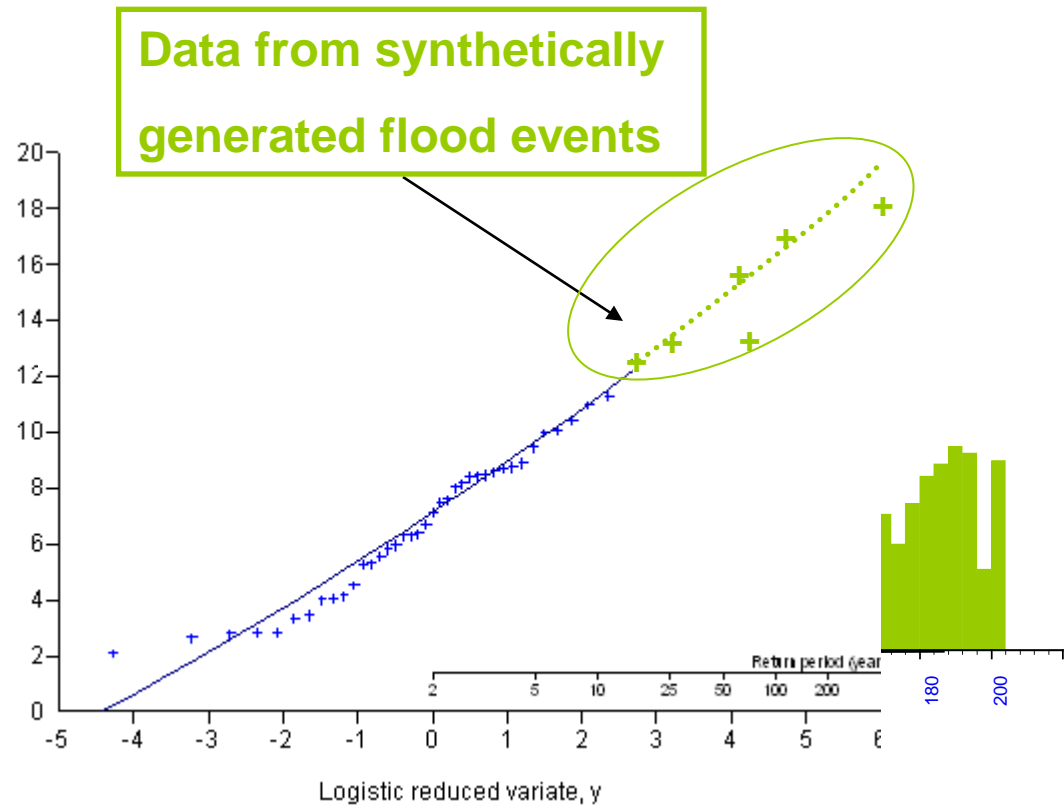
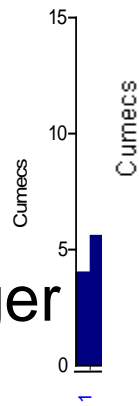




## WG3 - Rainfall-runoff modelling

### Reducing uncertainty

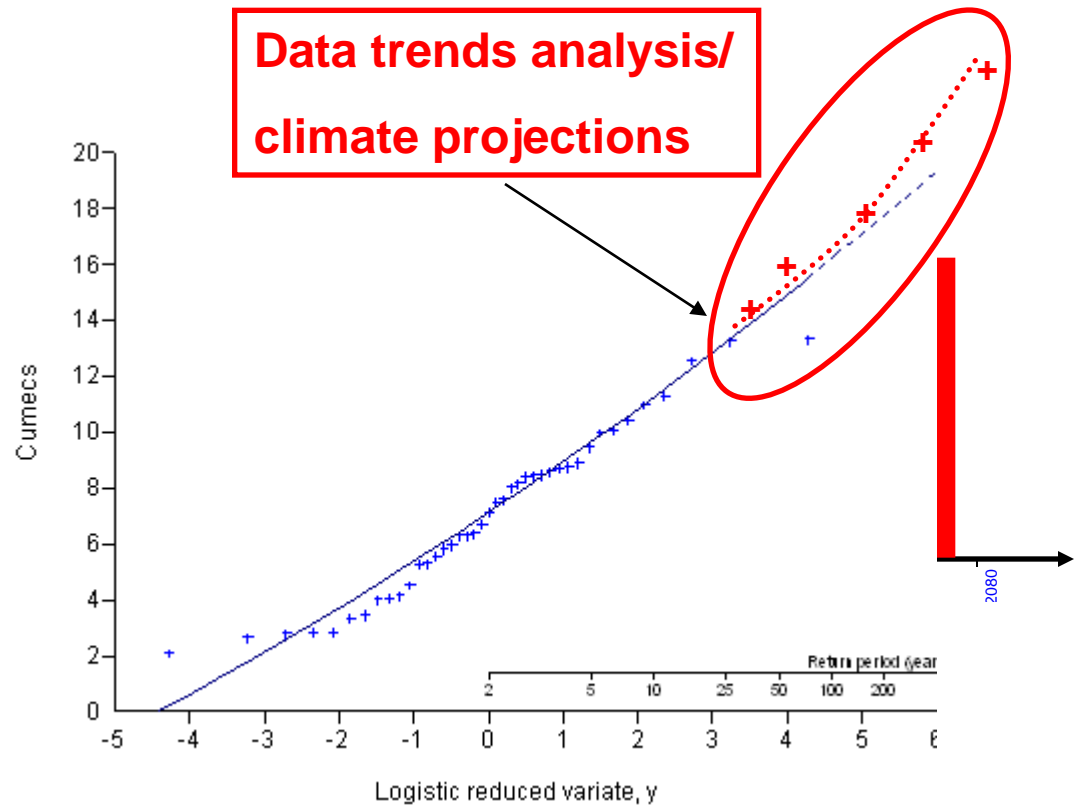
- Stochastic rainfall series
- Used to simulate long time series
- Flood frequency curve fitted on longer time series, better estimation of extremes



# Working groups

## WG4 - Environmental change

- Investigate trends in flood series
- Understand impact of projections on future flood peaks
- Use the knowledge to modify flood frequency estimates



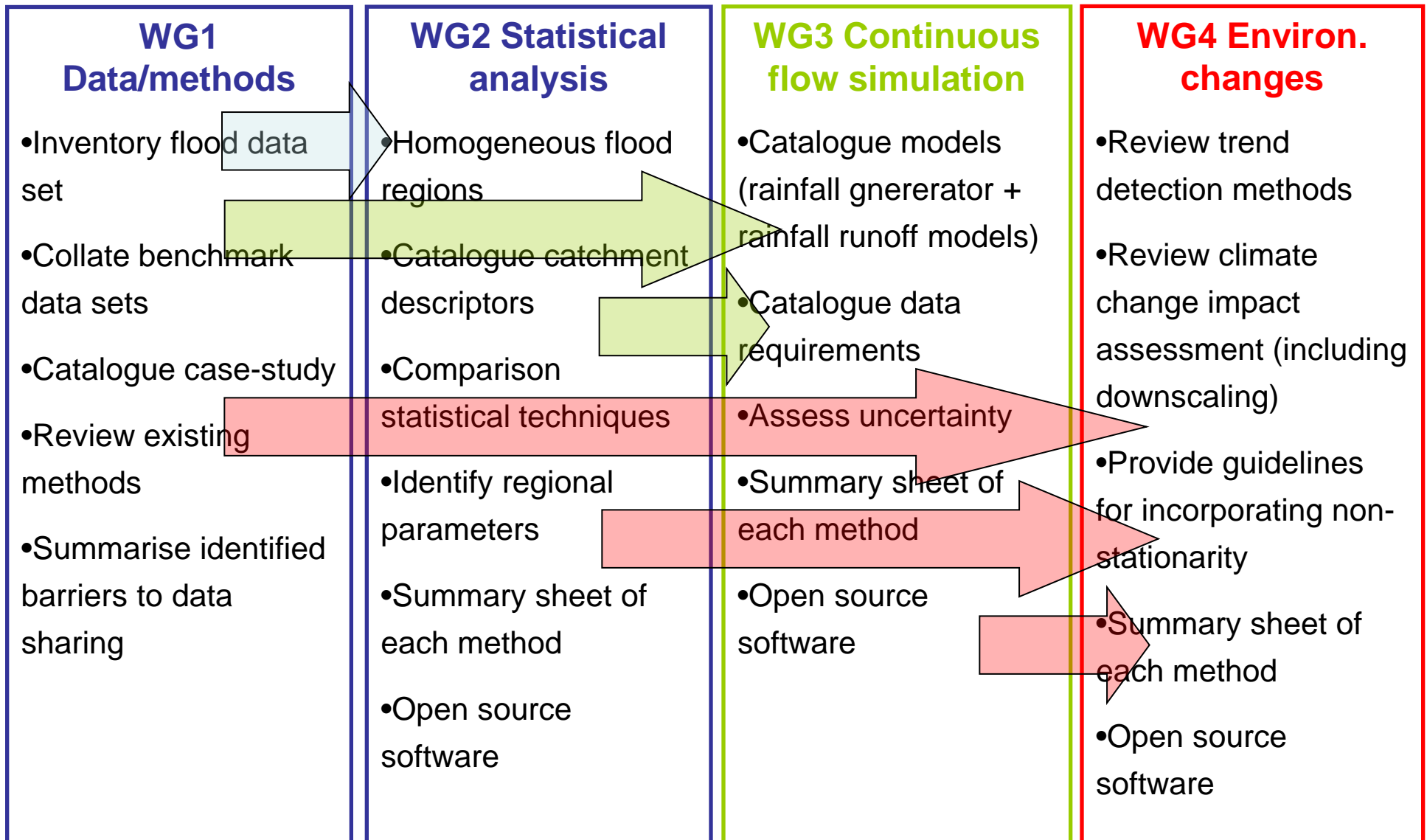
# Working groups

- **WG-1:** Inventory of data and methods and compilation of benchmark datasets
- **WG-2:** Assessment of statistical methods for flood frequency estimation
- **WG-3:** Use of rainfall-runoff models for flood frequency estimation
- **WG-4:** Impact of environmental change on flood frequency estimates
- **WG-5:** Dissemination of results

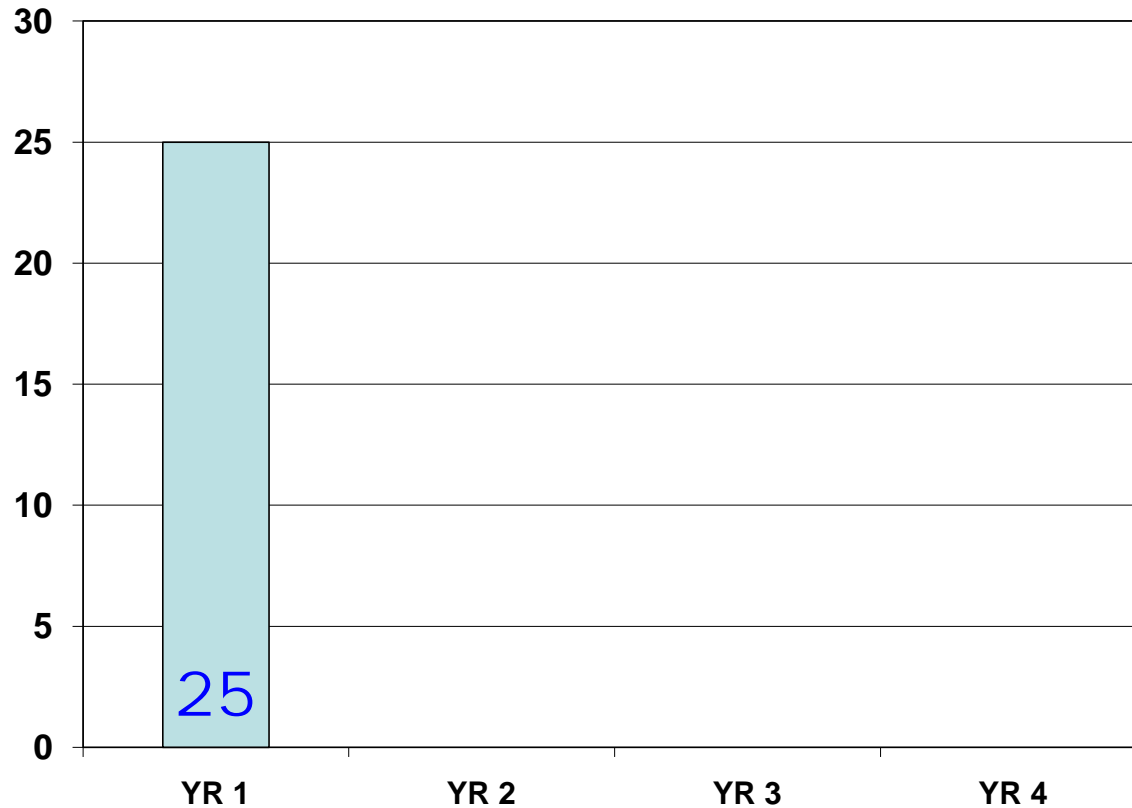
WGs 2, 3 and 4 will undertake the bulk of the scientific work, and the results from the research undertaken will provide the scientific basis for the guidelines to be drawn up in the next, and final, phase.

The state-of-the-art methods will be developed, implemented and applied to national data sets and tested through each of the WGs

# Working groups and deliverables



# Action parties

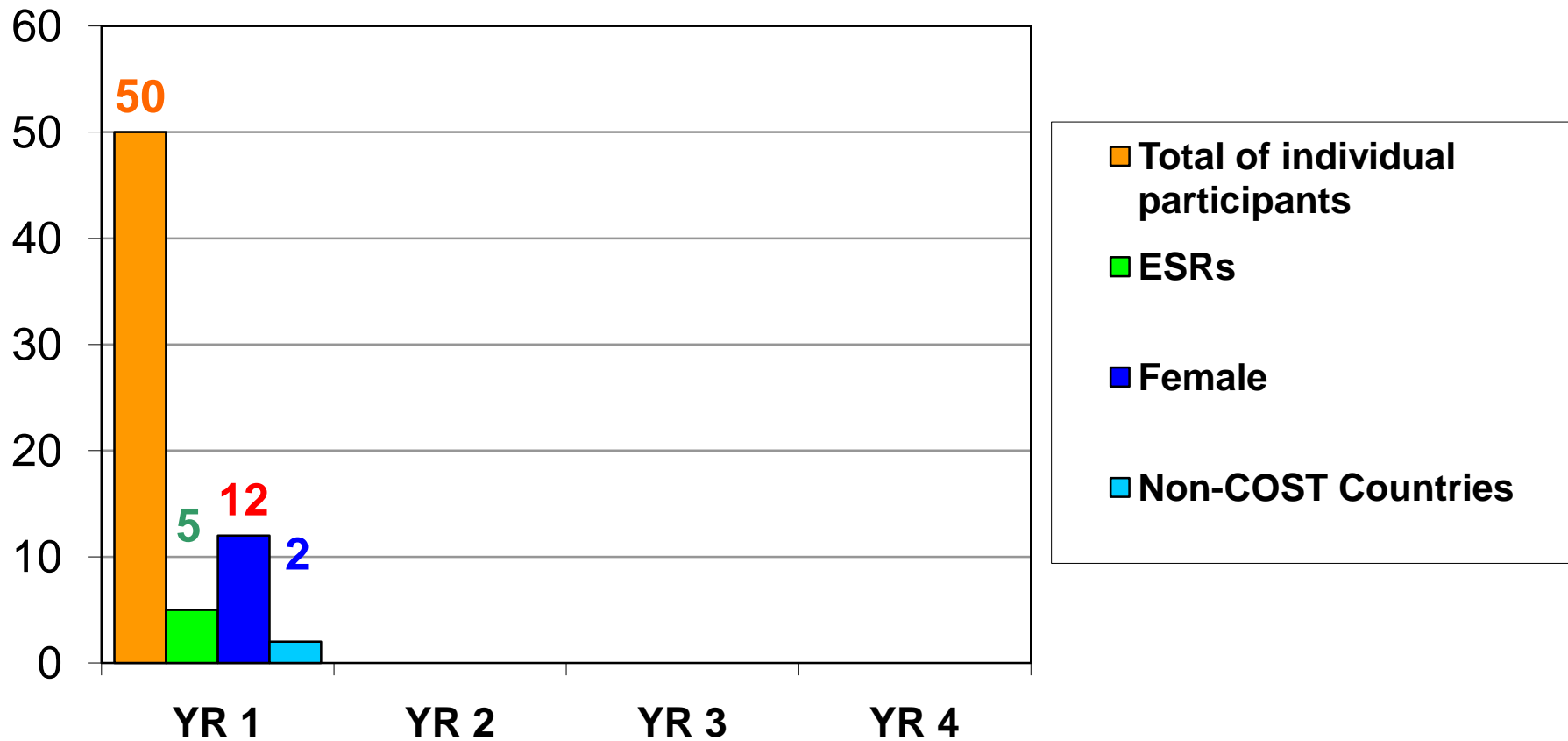


## Grant Holder:

Natural Environment  
Research Council  
(NERC)

Dr Thomas Kjeldsen  
United Kingdom

# Action participants



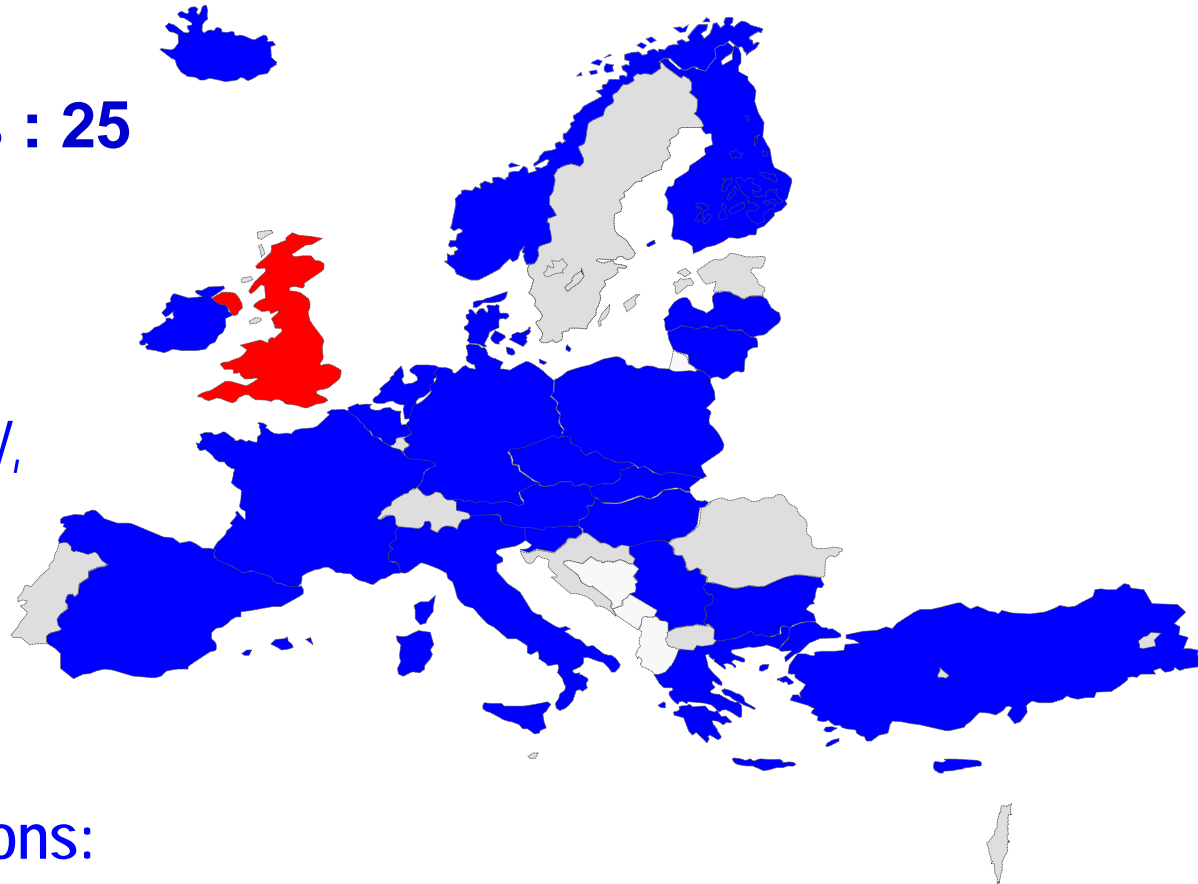
Chair country in red,  
others in blue

# Geographical impact

**COST Countries : 25**

Chair : **UK**

AT, BE, BG, CY, CZ,  
DE, DK, ES, FI, FR,  
GR, HU, IE, IT, LT, LV,  
NL, NO, PL, RS, SI,  
SK, UK, TR, IS



**Non-COST institutions:**

- South Africa, University of KwaZulu-Natal (pending)
- South Korea, Ministry of Lands, Water & Maritime Affairs (pending)



# Significant outcomes (so far)

- Initiated review process of relevant
  - Hydrometric data,
  - Catchment descriptor data (topography, soils, rainfall...), and
  - Methods for estimating T-year events
  - Considerations of non-stationary conditions
- Reporting forms circulated to WG participants
  - Review process should be completed by end-of-year

# Significant outcomes (so far)

## Example for WG2

### WG2: Assessment of statistical methods for flood frequency estimation

#### GRANT PERIOD 2010- 2011: DELIVERABLES

1. A report on previous studies that delineated homogeneous hydrometeorological areas across Europe with respect to flood frequency.
2. A catalogue of relevant information (e.g., catchment descriptors) recommended for use in flood frequency studies along with an indication of availability/unavailability across Europe.

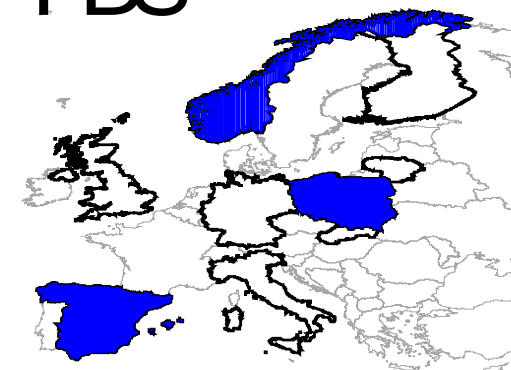
# LIST OF READILY AVAILABLE FLOOD DATA (Nationwide)

	AMS		PDS	
	Inst. Flood Peak	Daily discharge (or other timescale)	Inst. Flood Peak	Daily discharge (or other timescale)
Austria				
Belgium	X	X	X	X
Bulgaria				
Cyprus				
Denmark				
Finland		X		
France				
Germany	X	X		
Greece				
Hungary				
Italy	X	X		
Lithuania	X	X		
Norway	X	X	X	X
Slovakia	X	X		
Spain	X	X		X
United Kingdom	X	X	X	
Poland	X	X	X	X
<b>COVERAGE (WG2 members only)</b>	<b>64.3%</b>	<b>71.4%</b>	<b>28.6%</b>	<b>28.6%</b>
<b>Coverage (feedback only)</b>	<b>90%</b>	<b>100%</b>	<b>40%</b>	<b>40%</b>

AMS



PDS

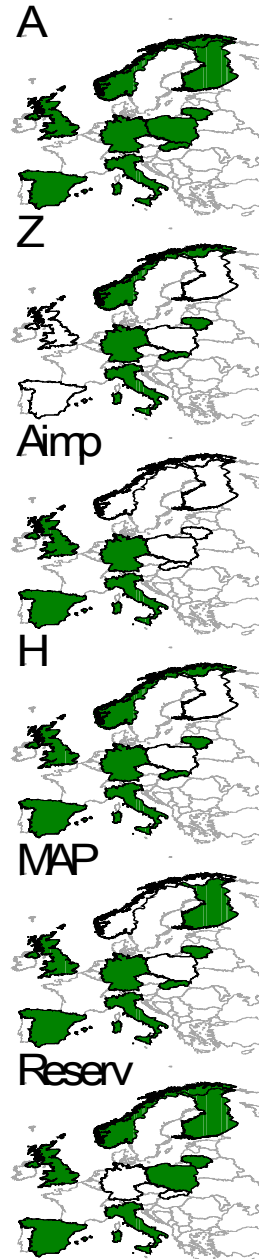


# LIST OF READILY AVAILABLE CATCHMENT DESCRIPTORS (Nationwide)

	x-coord	y-coord	z	A	Aimp	Hmax	Hmean	Hmin	MAP	Reserv.
Austria										
Belgium	X	X	X	X	X	X	X	X	X	
Bulgaria										
Cyprus										
Denmark										
Finland	X	X		X					X	X
France										
Germany	X	X	X	X	X	X	X	X	X	X
Greece										
Hungary										
Italy	X	X	X	X	X	X	X	X	x	X
Lithuania	X	X	X	X		X	X	X	X	X
Norway	X	X	X	X		X	X	X		X
Slovakia	X	X	X	X		X	X	X	X	
Spain	X	X		X	X	X	X	X	X	X
United Kingdom	X	X		X	X		X		X	X
Poland	X	X		X						X
<b>COVERAGE (WG2 members only)</b>	<b>71.4%</b>	<b>71.4%</b>	<b>42.9%</b>	<b>71.4%</b>	<b>35.7%</b>	<b>50.0%</b>	<b>57.1%</b>	<b>50.0%</b>	<b>57.1%</b>	<b>57.1%</b>
<b>Coverage (feedback only)</b>	<b>100%</b>	<b>100%</b>	<b>60%</b>	<b>100%</b>	<b>50%</b>	<b>70%</b>	<b>80%</b>	<b>70%</b>	<b>80%</b>	<b>80%</b>

**Suggested**

<b>T</b>	mean annual temperature
<b>R</b>	mean annual runoff
<b>Soil type</b>	HOST soils data
<b>FPEXT</b>	ratio between 100-year flood plain and total catchment area
<b>P<sub>T</sub></b>	precipitation quantiles
<b>f</b>	infiltration rate
<b>t<sub>c</sub></b>	time of concentration
<b>S<sub>b</sub></b>	mean basin slope
<b>S<sub>r</sub></b>	mean river slope



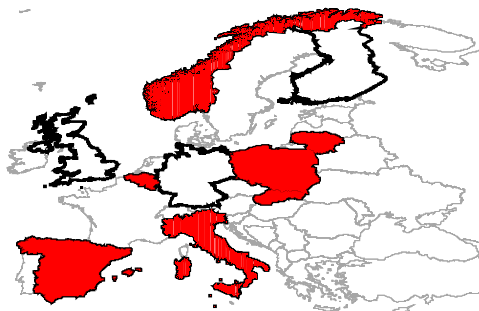
# SUMMARY OF REPORTS

## (1<sup>ST</sup> year deliverables)

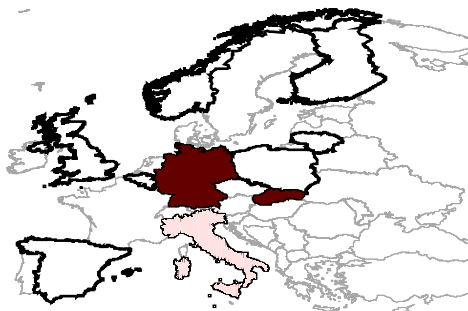
### Delineation of homogeneous hydrometeorological areas

	Fixed Geographical Regions	Cluster Analysis	Focused Poling (ROI)
Austria			
Belgium	3 Regions		
Bulgaria	No indications in the report		
Cyprus	No indications in the report		
Denmark			
Finland	Not available		
France			
Germany		X	
Greece			
Hungary			
Italy	Hierarchical	(locally)	(locally)
Lithuania	3 Regions		
Norway	Annual Seasonal		
Poland	4 Regions		
Slovakia	Env. Curves, Reg. Repr.	X	Reg. Repr., HW
Spain	Several Regions		
United Kingdom			X

Fixed Regions



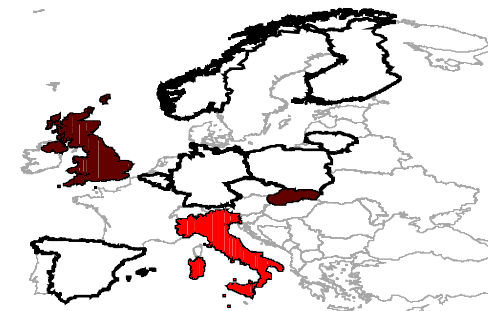
Cluster Analysis



### Regional parent distributions

AMS	PDS
	GPD
No indication in the report	
No indication in the report	
EV1	
GEV	GPD
EV1	
TCEV (GEV)	GPD (locally)
GEV, EV1	
EV1, LN, GEV	
P3, EV3, LN3, LP3	
GEV	
GEV, TCEV	
GLO	

ROI



# Possible interactions with COST 733

Possible applications of weather type classification within FloodFreq context:

- Statistical downscaling of circulation models' output (WG3 and WG4)
- Supporting the identification of hydro-climatic regions (WG2)
- Assessing the impact of climate change on flood occurrence (WG4)
- ...

# Information on the Action FloodFreq

## Websites:

- <http://w3.cost.eu/index.php?id=205&action number=ES901>
- <http://www.cost-floodfreq.eu/>



**FLOODFREQ** COST Action ES0901  
European Procedures for Flood Frequency Estimation

News: Information STSM ES0901 - Wednesday, 09 June 2010 07:28

HOME

OBJECTIVES

STRUCTURE

WORK PROGRAMME

ACTIVITIES

FORUM





# Information on the Action FloodFreq

## Websites:

- <http://w3.cost.eu/index.php?id=205&action number=ES901>
- <http://www.cost-floodfreq.eu/>

## Contacts:

- Thomas Kjeldsen ([trkj@ceh.ac.uk](mailto:trkj@ceh.ac.uk))
- Jan Szolgay ([szolgay@svf.stuba.sk](mailto:szolgay@svf.stuba.sk))
- WG1 Michel Lang ([lang@cemagref.fr](mailto:lang@cemagref.fr))
- WG2 Attilio Castellarin ([attilio.castellarin@unibo.it](mailto:attilio.castellarin@unibo.it))
- WG3 Sarka Blazkova ([Sarka\\_Blazkova@vuv.cz](mailto:Sarka_Blazkova@vuv.cz))
- WG4 Henrik Madsen ([hem@dhigroup.com](mailto:hem@dhigroup.com))