



# FLASH FLOODS AND PLUVIAL FLOODING



**ISPRA**

Istituto Superiore per la Protezione  
e la Ricerca Ambientale



**REGIONE AUTONOMA  
DELLA SARDEGNA**



**MINISTERO DELL'AMBIENTE  
E DELLA TUTELA DEL TERRITORIO E DEL MARE**

## Working Group F Thematic Workshop

PFRA of flash flood and pluvial flooding in  
France

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MEEDDM

*26<sup>th</sup>-28<sup>th</sup> May 2010, Cagliari, Italy*



# PFRA of flash flood and pluvial flooding in France

- **Pluvial Flooding and flash flood :**
  - Very localised events but can occur almost everywhere
  - Impacts can be very strong
- **Objective of PFRA :**
  - At the scale of the river bassin district : to get an overview of this phenomena and their potential adverse consequences
  - To identify areas of potential significant flood risk
- **Difficulties :**
  - Contrary to flooding from rivers, incomplete knowledge of potential flood extent
  - Past floods : incomplete overview of the potential vulnerability of the territory

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Preliminary flood risk assessment of flash flood and pluvial flood in France :  
work on methodology  
A. Néron<sup>1</sup>, F. Martin<sup>2</sup> and O. Payastre<sup>3</sup>

**1 Past floods : an essential, but insufficient source of information**

Flash flood and pluvial flooding in France : local, but dramatic events, incomplete knowledge

The events at Nîmes in 1988 (10 deaths, 500 million euros), Valson-la-Romaine in 1992 (47 deaths, 250 million euros) and in the Gard in 2002 (24 deaths, 1.2 billion euros) are etched on the memory and have led to the development of protection policy. Feedback has been gathered about these events, for the most part very localised, and the flooded zones mapped.

But, for the country overall, mapping is only available for the main watercourses. Very few phenomena of flash flooding and of pluvial flooding are mapped.

France will soon have a database of historical flooding events that will enable information on the main events, for example on death rates, to be put to good use. The French meteorological office already has a database of intense rainfall events dating back to 1950.

In addition to these catastrophic events, the risk of pluvial flooding and flash flood has a serious impact due to the regular occurrence of less serious events over the whole country. The number of records of "natural disaster" events per commune is an indicator of this repetition (number of "Cat nat").

However, this information did not seem to be sufficient for the preparation of the PFRA : past floods provide information essentially on the locations where the storms have occurred and not on those locations that are most vulnerable to such phenomena. In order to supplement this knowledge, more representative information on vulnerability to pluvial flooding and flash flood has been sought.

**2 Hazards and zones of concentration of flooding**

Among the data examined : rainfall, flow rates and the sensitivity of the ground to erosion do not, alone, provide an explanation of those locations known to be vulnerable due to an analysis of past floods.

The sensitivity of the ground to erosion    Rainfall hazards    Discharge hazards

Source : INRA    Source : Cemagref

In order to supplement what is known about zones liable to flooding, which is very incomplete, a method has been developed by CETE Méditerranée - EXZECO (extraction of drainage areas). This consists of pointing out zones of low altitude in relation to valley lines, on the basis of the processing of the DTM available for the whole of France. This approach is currently the one that makes it easiest to identify those sectors that are most likely to be flooded.

**Example of EXZECO application to the Gard**

Source : CETE Med

This method will be implemented for PFRA 2011, in order to supplement existing information on the precise mapping of zones liable to flooding.

An artificial layer of "low zones" is thus constructed, combining the knowledge that already exists and the results of EXZECO.

**Example of a calculation of a pluvial flooding / flash flood risk indicator**

**3 Assessment of Vulnerability**

For these very localised phenomena, the most simple indicator, and the one that incorporates the most impacts that can be calculated, is the ground area of buildings in a zone liable to flooding.

The overlapping of low zones and the built area potentially affected enables those communes to be identified that would seem to be the most sensitive, where a more detailed analysis should be carried out.

This overlapping has to be carried out without taking into account those zones liable to flooding that have already been identified and analysed under river flooding studies.

**Method proposed : calculation of a global indicator of the risk of flash flood and pluvial flooding for each commune, that incorporates vulnerability and past events**

An indicator will be produced homogeneously at a national level, based on both the number of records of natural disasters and the built area potentially affected in the low zones, if that area exceeds the respective thresholds of 4 records and 1000 m<sup>2</sup> of built area involved.

(Nb of Catnat - 3) \* built area potentially affected

This indicator will have only a role of information and will have to be supplemented by local knowledge available about the hydrographic districts, that will supplement, in particular, the identification of the communes affected by major historic events

<sup>(1)</sup> Ministry of Ecology, Energy, Sustainable Development and Sea - General Directorate for Risk Prevention  
<sup>(2)</sup> LCPC - Laboratoire Central des Ponts et Chaussées



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# PFRA of flash flood and pluvial flooding in France

- **Work on methodology : two majors issues**
  - Test of different indicators, looking for an explanation of the variability of the phenomena and their impacts
  - What is the most relevant scale of aggregation to the analysis and undersanding of the phenomena ?
- **Method proposed :**
  - An indicator combining number of past events and buit area in the thalwegs, calculated at the scale of the commune
  - This indicator, combined with other local knowledge, will facilitate the identification of APSFR.



Flash flood and pluvial flooding in France : local, but dramatic events, incomplete knowledge

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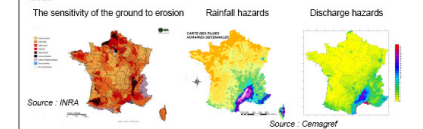


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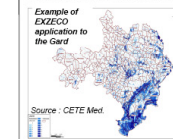
Additional information analyzed :

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In order to supplement what is known about zones liable to flooding, which is very incomplete, a method has been developed by CETE Méditerranée : EXZECCO (extraction of drainage areas). This consists of pointing out zones of low altitude in relation to valley lines, on the basis of the processing of the DTM available for the whole of France. This approach is currently the one that makes it easiest to identify those sectors that are most likely to be flooded.



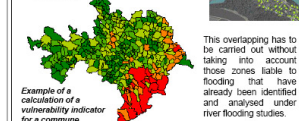
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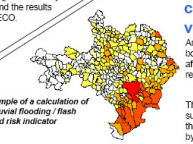
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Example of a calculation of a pluvial flooding / flash flood risk indicator



Our thanks to the whole workshop: LCPC, CETE Méditerranée, Météo France, Cemagref, INRA, SCHAPI, LROP, CETE NC.

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