



PRELIMINARY FLOOD RISK ASSESSMENT OF FLASH FLOOD AND PLUVIAL FLOODING IN FRANCE

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Abstract

France has decided to carry out a preliminary flood risk assessment. This PFRA will be carried out on a large scale using available knowledge as a basis and will set methodological problems for flash flood and pluvial flooding. Care must be taken at this scale to understand very localised phenomena, knowledge of which is confused and incomplete, and for which historical flooding does not give an overall understanding of the country's vulnerability. The methodology proposed is based on the calculation of a global indicator of the risk of flash flood and pluvial flooding, that incorporates vulnerability and past events and that can thus supplement the knowledge about locations that have been seriously affected in the past.

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1 Introduction : flash flood and pluvial flooding in France: serious impacts, in association with a few dramatic events and the repetition of more regular events

France has experienced flooding of very diverse origins, including pluvial flooding and flash flood, that had in the past a serious impact, both on human life and on property. In the recent past, the events at Nîmes in 1988 (10 deaths, 500 million euros), Vaison-la-Romaine in 1992 (47 deaths, 250 million euros) and in the Gard in 2002 (24 deaths, 1.2 billion euros) are examples that are etched on the memory and have caused protection policy to be developed.

Even without considering these catastrophic events, the risk of pluvial flooding and flash flood has a serious impact in France due to the regular occurrence of less serious events over the whole country.

2 The challenges posed by the preparation of PFRA

Pluvial flooding and flash flood have the particular feature of being small-to medium-scale phenomena, that can be encountered just about anywhere in the country, caused by differing factors. Contrary to fluvial flood, it is therefore difficult, both in terms of knowledge and of representation, to gain an overall vision of this risk on the scale of a hydrographic district (scale on which the PFRA is prepared).

As the whole of France is potentially affected, the PFRA must allow locations to be identified where this risk seems to be greatest. So, the knowledge of zones that are likely to be flooded, available for most large watercourses, is very confused and incomplete for small watercourses and valley lines affected by the risk of pluvial flooding or flash flood.



3 Work on the methodology to prepare the PFRA

3.1 Gathering of historical information on flooding

The events of the past and their impact comprise the first source of information on potential risks. France has decided to take advantage of the preparation of the PFRA to create a national database on historical flooding. This database will cover all types of flooding, including pluvial flooding and flash flood.

In order to supplement this information, since the implementation of the natural disaster system in 1982, France now has information on events declared as natural disasters (CatNat) and on the extent of certain losses.

This information is essential, but did not seem to be sufficient for the preparation of the PFRA: past flooding provides information essentially on the locations where the heaviest storms have occurred and not on those locations that are most vulnerable to such phenomena. In order to supplement this knowledge, ways have been sought to find elements that characterise the vulnerability to pluvial flooding.

3.2 Search for elements representative of the hazards variables and the vulnerability associated with pluvial flooding and flash flood

The following data were examined:

1/ mapping of rainfall hazards records and of susceptibility to erosion

Maps of the quantiles of rainfall already cover the whole of France. This data shows a certain homogeneity of the phenomena at a national level, apart from the Mediterranean region and the Cévennes, where the intensity of flooding is substantially higher.

The susceptibility of the soil to erosion has also been mapped.

These various factors are indeed contrasted over the whole of France, but do not, alone, allow the consequences of the phenomena on the country



to be estimated. It can be seen, in particular, that they fail to explain the distribution of known major events.

2/ zones of concentration of flooding

Our knowledge of the hydrographic system, required for the identification of zones liable to flooding, is incomplete and lacks homogeneity over the whole country. In addition, maps of zones liable to flooding are only available for a small part of those watercourses potentially liable to flash flood. In order to increase our knowledge of the hydrographic system and of zones liable to flooding, CETE Méditerranée has developed the EXZECO method, which 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 method has been used to create an artificial layer of "low zones", that can be considered to be the most likely to be flooded.

3/ 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 the low zones and the ground area of buildings enables those communes to be identified that would seem to be the most sensitive, where a more detailed analysis should be carried out.

4 Methodology currently proposed to evaluate the potential negative consequences of future flooding

The principle is to cover the whole of France, but to stress only those locations that are potentially the worst affected, for which the first cycle of implementation of the flood directive will be carried out.

The selected method consists of:

1/ calculating, on a homogeneous basis and at a national level, that can be refined to a local level, an indicator for each commune of the risk of



pluvial flooding and of flash flood, for those national communes that exceed the respective thresholds of 4 CatNat records and 1,000 m² of built area affected:

*(CatNat No. 3)*built area affected.*

2/ examining in detail the case of communes brought to light by the indicator (threshold to be set according to the national flood risk management strategy), together with those communes known to have suffered significant flooding in the past.

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