

## Review of the paper NHESD- 7521-2014

### General comments

The paper presents development of an index of susceptibility to flooding as component of a vulnerability index for the continental territory of Portugal. The problem is adequately stated and the work is based on good geographical datasets. The analysis, however, is flawed by some serious limitations, namely the absence of clearly defined procedures for assigning the weights to the variables used for developing the susceptibility index and for the definition of the susceptibility classes. I am reporting detailed comments below.

### *Datasets*

Why the flow number was preferred to the SCS Curve Number, which is internationally well-known and potentially suitable for the application of the proposed method to other areas? It is worth noting that the SCS soil types are used for computing the flow number.

### *Methods*

Page 7531, lines 8-12

The authors claim that the application on the entire Portuguese territory of a variable spatial aggregation method is one of the main innovative aspects of this work. The method, however, is not described and the reference provided points to a paper in Portuguese published in the proceedings of a conference. The spatial aggregation method should be described. This would also permit evaluating the innovativeness of its application to a large territory.

### *Weights for the definition of FSI (pages 7533-7534)*

It seems that the weights have been assigned to the three variables of FSI in a merely empirical way “comparison with flood area maps for the main rivers and expert consultation”. A research paper would require presentation and discussion of a clearly defined and repeatable procedure.

Not surprisingly, the weight related to the flow number is rather low. The authors could consider evaluating the performances of a susceptibility index based only on flow accumulation and cost distance. Actually the flow number, which is based on land cover and hydrological soil types, is likely very relevant as an indicator of runoff production, whereas it seems much less relevant as an indicator of river floods (regardless if flash floods or “progressive” floods). Local soil permeability could be important in the case of pluvial floods (ponding).

### *Susceptibility classes (page 7534)*

The two classes of higher susceptibility correspond to areas within the limits of 100 year flood area, but no information is provided about the discrimination between these two classes.

The remaining classes were defined “by visual interpretation of the spatial distribution of the index values when compared with maps of the original variables”.

The overall process for the definition of the susceptibility classes is based on empirical evaluations and relies essentially on visual recognition: the lack of a systematic procedure that could be proposed for application in other areas is a serious limitation in the classification of flood susceptibility.

The authors discuss the variable intervals for the four susceptibility classes but they do not seem to be aware of the possible consequences of the narrow ranges of the classes 2 (low) and 3 (high). As an example, a value of 0.46 would correspond to low susceptibility (class 2), whereas 0.5 indicates very high susceptibility (class 4). Small differences in FSI (4% of the FSI range in the example proposed), caused by approximations in the estimation of the variables, may thus lead to dramatic differences in the classification of a given area.

### *Structure of the paper*

The central part of the paper is not properly organised. The analysis presented in the section 3.4, entitled “Validation”, is actually a part of FSI development (comparison with the DISASTER hydro-geomorphologic database). FSI development (identification of the variables weights and definition of susceptibility classes) continues in section 4, entitled “Results and discussion”. An unique section presenting FSI development is recommended.

### *References*

Several references are in Portuguese and not easily accessible to an international audience. In some cases (e.g., the variable spatial aggregation method mentioned in the general comments) the content of the cited works should be briefly recalled.

### Specific comments

The term progressive floods as opposite to flash floods should be checked, possibly with reference to the literature. If progressive floods refer to long duration floods caused by large rivers, the appropriate term could be “fluvial floods”.

Page 7531

The normalisation of the variables, presented at the lines 1-3, is repeated at the lines 24-25.

Page 7532, line 19

Why a resolution of 83 m? The resolution at which FSI was assessed should be reported before (Datasets or Methods sections).

Page 7533, lines 8-9

Unit of measure for and frequency and density of flood occurrences: the letter “N” should not be used as it is the symbol of newton in the International System of Units.