



Automating the evaluation of flood damages: methodology and potential gains

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The evaluation of flood damage potential consists of three main steps: assessing and processing data, combining data and calculating potential damages. The first step consists of modelling hazard and assessing vulnerability. In general, this step of the evaluation demands more time and investments than the others. The second step of the evaluation consists of combining spatial data on hazard with spatial data on vulnerability. Geographic Information System (GIS) is a fundamental tool in the realization of this step. GIS software allows the simultaneous analysis of spatial and matrix data. The third step of the evaluation consists of calculating potential damages by means of damage-functions or contingent analysis. All steps demand time and expertise. However, the last two steps must be realized several times when comparing different management scenarios. In addition, uncertainty analysis and sensitivity test are made during the second and third steps of the evaluation. The feasibility of these steps could be relevant in the choice of the extent of the evaluation. Low feasibility could lead to choosing not to evaluate uncertainty or to limit the number of scenario comparisons.

Several computer models have been developed over time in order to evaluate the flood risk. GIS software is largely used to realise flood risk analysis. The software is used to combine and process different types of data, and to visualise the risk and the evaluation results. The main advantages of using a GIS in these analyses are: the possibility of "easily" realising the analyses several times, in order to compare different scenarios and study uncertainty; the generation of datasets which could be used any time in future to support territorial decision making; the possibility of adding information over time to update the dataset and make other analyses. However, these analyses require personnel specialisation and time. The use of GIS software to evaluate the flood risk requires personnel with a double professional specialisation. The professional should be proficient in GIS software and in flood damage analysis (which is already a multidisciplinary field). Great effort is necessary in order to correctly evaluate flood damages, and the updating and the improvement of the evaluation over time become a difficult task. The automation of this process should bring great advance in flood management studies over time, especially for public utilities.

This study has two specific objectives: (1) show the entire process of automation of the second and third steps of flood damage evaluations; and (2) analyse the induced potential gains in terms of time and expertise needed in the analysis. A programming language is used within GIS software in order to automate hazard and vulnerability data combination and potential damages calculation. We discuss the overall process of flood damage evaluation. The main result of this study is a computational tool which allows significant operational gains on flood loss analyses. We quantify these gains by means of a hypothetical example. The tool significantly reduces the time of analysis and the needs for expertise. An indirect gain is that sensitivity and cost-benefit analyses can be more easily realized.