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Flood risk analysis model in the village of St. George/Danube Delta

I. Armas (1), S. Dumitrascu (2), and D. Nistoran ()
(1) (iuliaarmas@yahoo.com), (2) (dumitrascu.silvia@gmail.com)

River deltas may have been cradles for prehistoric civilizations (Day et al. 2007) and still represent favoured areas for human habitats on the basis of their high productivity, biodiversity and favourable economical conditions for river transport (Giosan and Bhattacharya 2005).
In the same time, these regions are defined through their high vulnerability to environmental changes, being extremely susceptible to natural disasters, especially to floods. The Danube Delta, with an area of 5640 km2, is the largest ecosystem of the European humid zones. Its state reflects environmental conditions at both local and regional levels via liquid and solid parameters and has to ensure the water supply for the local economy and communities.
Flooding of the delta is important for the dynamics of the entire natural system. Floods sustain both alluvial processes and the water supply to deltaic lakes. In addition, flooding frequency is important in flushing the deltaic lake system water, ensuring a normal evolution of both terrestrial and aquatic ecosystems. For human communities, on the other hand, floods are perceived as a risk factor, entailing material damage, human victims and psychological stress.
In the perspective of risk assessment research, every populated place faces a certain risk engaged by a disaster, the size of which depends on the specific location, existent hazards, vulnerability and the number of elements at risk.
Although natural hazards are currently a main subject of interest on a global scale, a unitary methodological approach has yet to be developed. In the general context of hazard analysis, there is the need to put more emphasis on the problem of the risk analysis. In most cases, it focuses only on an assessment of the probable material damage resulted from a specific risk scenario. Taking these matters into consideration, the aim of this study is to develop an efficient flood risk assessment methodology based on the example of the village of St. George in the Danube Delta. The study area is situated at the mouth of the St. George river branch, which suffered a series of interventions resulting with the shortening with 31 km (period 1984-1988). As a direct result, the medium speed of the water grew along with the both liquid and solid flows. In fact, this is only an example of the human activity that took place in the Danube Delta starting with the second half of the last century that influenced the hydrological system for a better use of the natural resources offered by the delta.
The study is structured in two stages: the analysis of the hydrological hazard together with the simulation of a series of scenarios concerning floods at various flows and the risk analysis, expressed in the shape of the calculus of the material damage.
In the study of the hazard, the methodology was based on the analysis of water depth and velocity maps, done in various flow scenarios, to which were added correlations between flood risk maps with satellite pictures, cadastral plans and field data by using GIS functions. In addition, the field investigations conducted in September 2008 focused on collecting the data necessary in the assessment of the buildings. The observations that synthesize the features of each construction included in the analysis were also stored in ArcGis in the shape of a table of attributes. This information reveals the indicators used in the analysis of the vulnerability of the residences: number of floors, height, construction type, infrastructure and price per property.
The analysis revealed an increased degree of the area visibility, pointing out not only certain sectors affected by floods, but also the problems that occurred at the more detailed level of the residences. In addition, the cartographic material plays also an important part in the development of a proper public awareness strategy.