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Fuzzy Cognitive Map for ambiguity and conflict analysis in drought management

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Drought is largely considered as one of the major and most complex natural hazard. Empirical investigations emphasize the ambiguity in drought perception and definition. There is no unique definition of the problem, but each stakeholder has her/his own perception of drought situation, i.e. what drought is, what are its main impacts and how it should be handled. Ambiguity is considered in this work as a distinct type of uncertainty that results from the simultaneous presence of multiple valid and sometimes conflicting ways of framing a problem. Thus, ambiguity reflects the discrepancies in meaning and interpretation that exists among stakeholders. This is important because the way drought is defined and perceived influences a stakeholder's expectation of future occurrence, and leads stakeholders to adopt different behaviours and to act or react in different ways. As such, the presence of ambiguity presents a conflictive situation for decision-makers who have to make decisions in a context where it is not clear what the problems or its solutions are. Drought management requires methods and tools to support the detection, analysis and reduction of conflicts among the different decision-makers. This, in turn, requires to cope with ambiguity defining strategies that recognizes and allow to handle the differences in what individuals and group believe to be important. This work aims to demonstrate the role of ambiguity in conflict arising in drought management, and to define a methodology to support ambiguity and conflict management. To this aim, a multi-step process based on the use of Fuzzy Cognitive Map (FCM) was experimentally implemented in the Apulia Region, located in the Southern Italy. Due to the frequency and the intensity of drought phenomena, a drought risk management plan was developed by the Regional Authority in order to reduce the vulnerability of the regional socio-economic system. Although the main regional scientific experts in drought analysis and management were involved in the plan development process, its implementation was hampered by the strong opposition of many stakeholders – mainly municipalities and farmers. This leaded the regional authority to re-think the whole process of plan development and to involve stakeholders to reduce the level of conflict. Starting from these premises, FCM was implemented in this work to support the conflict analysis – i.e. the level and the main reasons of the conflict, the actors involved in the conflicting situation – and to assess the role of ambiguity. FCM was used to elicit and structure the drought understanding for each stakeholder and to define their own system of values and believes. To this aim, FCM analysis played a twofold role. On the one hand, FCM allowed to identify the key elements in stakeholders' drought understandings. The identification of key elements is fundamental to understand the stakeholders' values and believes. The assumption here is that the higher is the central degree of a concept, the more important is the concept in the stakeholders perception of the problem. On the other hand, FCM allowed to simulate the impacts of drought management plan on stakeholders' drought understandings. The detection of similarities and differences among stakeholders' understandings allowed us to analyze the ambiguity in drought understanding. Some interesting conclusion about the role of ambiguity in conflict arising in the selected case study were inferred comparing the results of ambiguity analysis and conflict measurement.