Supporting a multi-levels participatory modelling process for floods and droughts co-management

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Context

The European Integrated Project (IP) Aquastress (2005-2009 - www.aquastress.net) aims at designing, testing and evaluating new strategies to cope with water stress in Europe and the Mediterranean area. Combination of technical and non technical (institutional, economic, education) options are integrated and tested in 8 sites, with an intensive participation of local stakeholders groups.
In this context, the Local Public Stakeholder Forum (LPSF) of the Bulgarian test site has required in 2005 to address the issue of crisis management, after a very serious flood event in the same summer and series of droughts in the past decade. Next focus workshops have reshaped the question into the **design and assessment of new strategies to cope jointly with floods and droughts (F&D) hazards, including prevention (*ante crisis*), crisis management and remediation (*post crisis*)**. The rationale is to coordinate the assets and constraints of both options' sets for mutual benefit, and individual and institutional capacity building about risk.
The target area is the Iskar basin which flows from the Rila mountains (~3000m) above Sofia, through the central Iskar Dam, to Sofia high plain and downstream into the Iskar Defile, including the inlets. Sofia (1,3 Mpx) has already suffered from severe water shortage, worsened by a deprecated urban network. Flooding from Iskar and its inlets has impacted many villages, and has induced a political crisis. The transition from the past communist regime since 15 years has led to significant reduction in agriculture, less controlled maintenance of infrastructures, and some individualization in the civil society.

Objectives

This process aims at supporting the Iskar population, intermediary stakeholders and policy makers in considering, shaping and assessing new strategies to cope with F&D. These plans should be actually discussed, improved and accepted by the different actors, in order to facilitate their future implementation and relevance for the actual stakeholders life cycle. Meanwhile they should be efficient and should address the relevant problems encountered by the citizens. They should also be robust and coherent with the current and projected coping capacity of the system's components.
It is especially intended to ensure that mutual benefits and constraints of actions for F&D are considered, assessed and combined. It's a significant factor of innovation, with the background expectation that a culture and generic institutions for risks are developed, while dual-purpose infrastructures and plans are implemented.
The project also focuses on the demonstration and evaluation of participatory (or "group") modelling processes as an efficient tool for such process.
Finally it should trigger the development of dedicated knowledge engineering techniques and tools to cope with large scale participatory modelling, including a meta-model of F&D options pluggable on a strategic system and actor model.

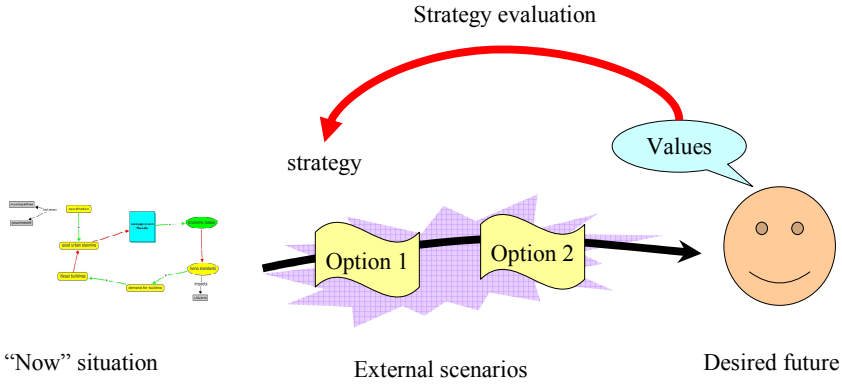
Process

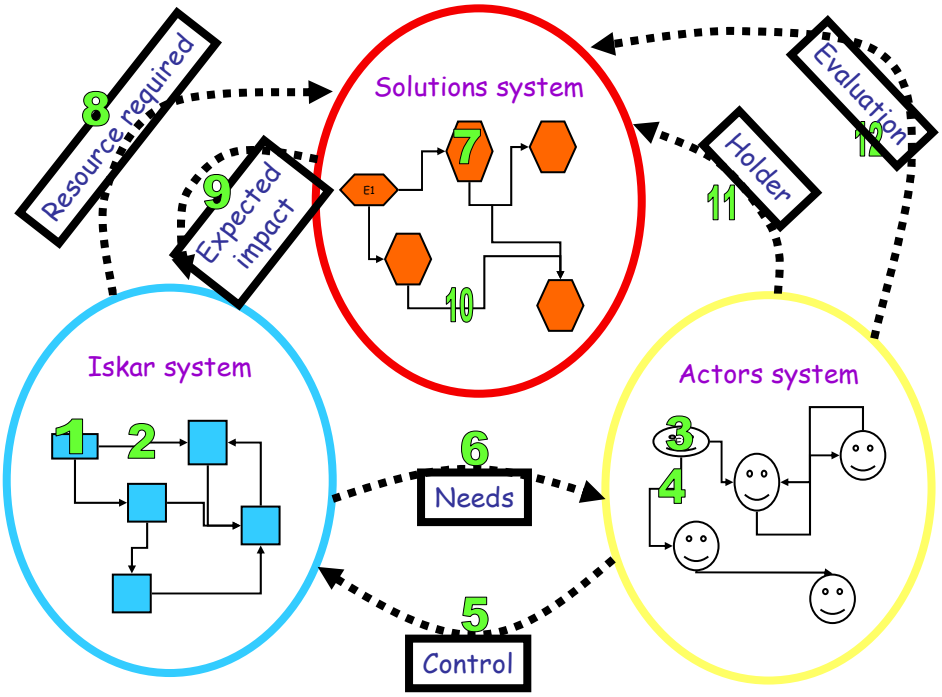
The process lasts from February 2006 to January 2008. It associates two research teams specialized in decision support and analysis, and water management. It is supervised by a local steering committee including 15 high level stakeholders. One group of national policy makers, including deputies and ministers, three groups of regional secondary stakeholders (majors, NGOs…) and two groups of citizens participate in the workshops.
The process establishes a step by step dialogue between the groups, supporting their expression, exchange and convergence of viewpoints:

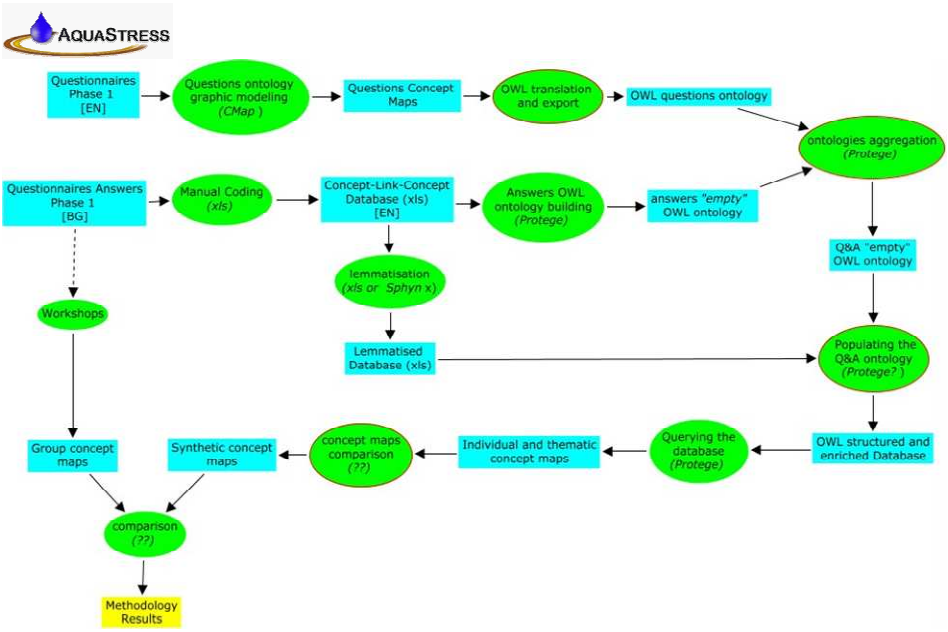
1. A reference model and a database of 41 F&D options have been designed by the expert group.
2. A full test of the protocol has been made with a student group.
3. All participants have been individually interviewed to collect their perception of the water system, the F&D issues and its control by stakeholders. Results are gathered in semi-open questionnaires or cognitive maps. A knowledge engineering process has been used to extrapolate cognitive maps from the interviews, using semantic processing, generalization with ontologies, and maps redraw.
4. Policy makers have, in a first workshop, discussed their models (maps) and generated compromise models about the system and the issues.
5. Other 5 groups have, in the next workshops, also expressed their common view on the actors and actions to prevent, manage and repair F&D events, followed by an allocation game to show their distribution of preferences among sub-regions and activities. Expectations have been collected.
6. Policy makers will receive these results and express their own allocation of preferences and visions for the future
7. Public training courses will present and discuss the F&D options with the participants.
8. The options cards will be discussed and organized in timed strategies by each group.
9. All strategies will be submitted to an external jury, responsible for tackling their coherency, requirements and impact. A sub set will be selected.
10. An expert group proposes reference external scenario for climatic, economic and political forcing events
11. A multicriteria assessment dialogue will finally inform the selected strategies and qualify their relative interest for the groups.

All stages are evaluated under a common scheme addressing procedural, cognitive, normative, relational and operational dimensions. Regular public information is disseminated.
The process generates initially 100 sub-models of the system-actors, gathered in synthesis views. The options discussed are made compatible (“pluggable”) on these models using a common ontology of requirements and impact features. Models are used as causal maps to assess triggered issues.

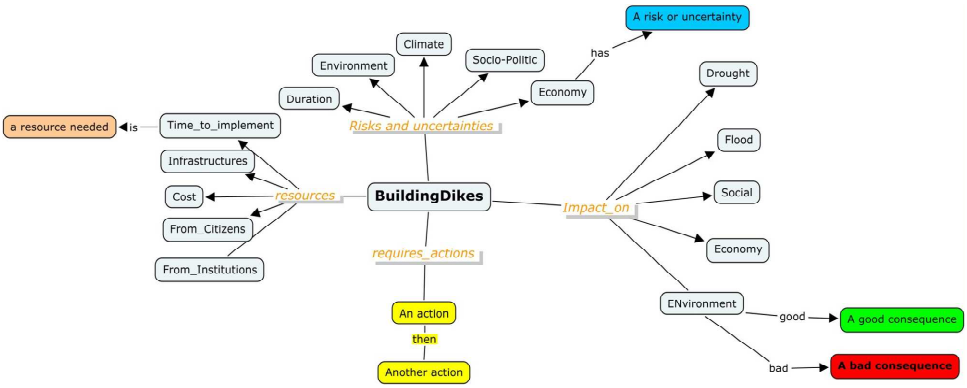
Overall design of the process







An option model



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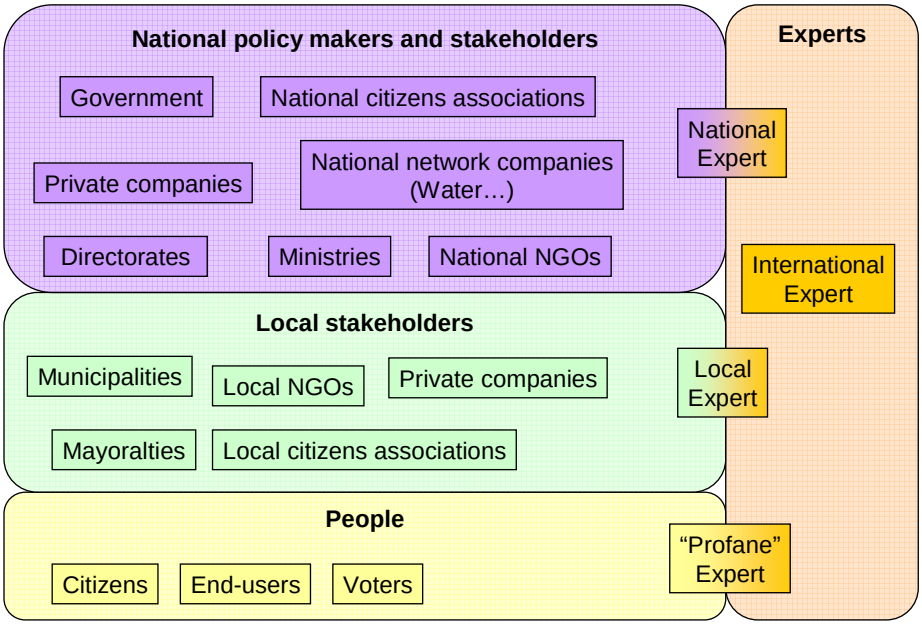

Results

As of November 2007, the process is terminated. An action plan has been designed by the group and will be submitted for implementation through structural funds bids. We are now reprocessing the whole set of data to bring in the diversity of the actors views and combine the induced models.

Keywords

Group model building, floods and droughts, public participation, strategic planning, crisis management

Discussion

1. How does this process advances knowledge of/innovation within the subject?

→ Group model building (GMB) and participatory modelling techniques [Daniell, K., Ferrand, N., 2006, Participatory Modelling For Water Resources Management And Planning, Aquastress Project Public Deliverable D3.8.2] rarely include diverse and heterogeneous groups of participants, with an exchange dialogue. Barriers are known to be initial levels of knowledge, mutual legitimacy, and protracted capacity to build a common vision. GMB usually doesn't include large external options sets to be integrated and tested against the situation model.

→ Floods and droughts hazards are often considered separately because expertise and issues are different. Recent consideration on floodplain management (negotiating flooding acceptance), infiltration area and wells and inter-annual management of reservoirs have increased research in the domain. However at public level issues and options are separated and the feasibility of addressing both together has not yet been explored, to our knowledge.

→ Integrated approach and modelling between prevention, crisis and remediation is not common, especially when it implies consideration both upon technical (infrastructures, management) and non technical (education, institutional and social change).
→ Techniques and tools used for causal modelling and the integration of the options sets in the system's models are quite innovative because they require to combine user friendliness and tractability, computability of causal chains, and openness (technical & non technical). We propose a meta-model integrated into a processing chain using content analysis (Sphinx), assertions management (Excel), ontologies processing (Protégé) and maps drawing (CMap).
→ Evaluation protocol is pervasive and multi-dimensional. It is considered as a key success factor in the process.

2. What are the practical applications of the contents of this process?

The process is an operational action addressing real issues and real stakeholders in a site. It is embedded into the current political and technical agenda of the managers. Major failure in the process could lead to serious trouble for the designers and implementers of this process. It is what Aquastress project designates as a "real test", hence a true practical application as such.

3. What is the replicability of the procedures or practices described in the process?

It can be asserted that the process design is replicable, given its procedural nature. However it is clear that as an action research protocol, and as a true stakeholders driven process, it cannot be fully mirrored. This issue of replicability should be however tested in the future in another country and another political context. We know by experience that the availability of local partners, the management of stakeholders contacts and networks, and the context of institutional change are critical for the success of such procedure.