Decision systems for nature based solutions to mitigate floods

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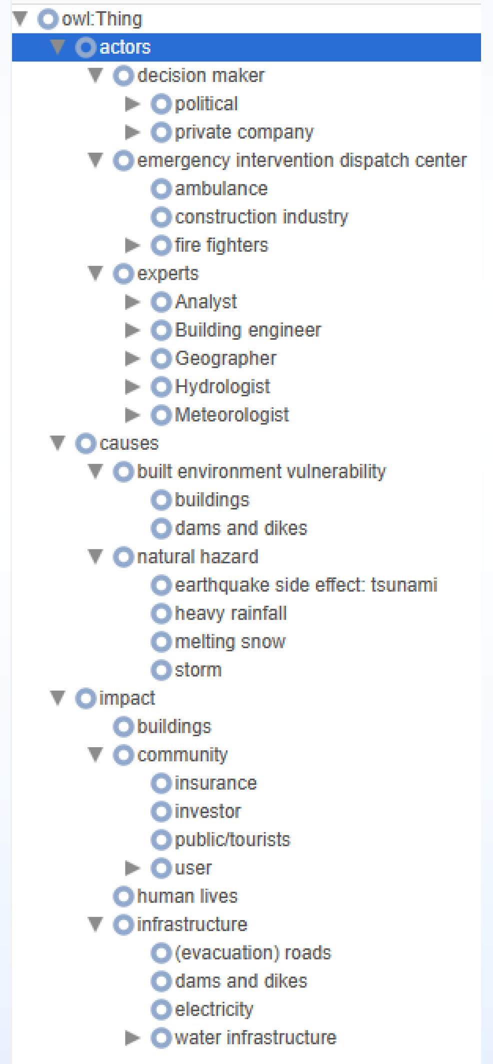
In the 20th century often the solution to mitigate floods was putting a corset of reinforced concrete to rivers. An example is one of the case studies in our project which we will detail, the Vidraru dam on Arges river, where a neighbourhood was built after the 1940 floods.

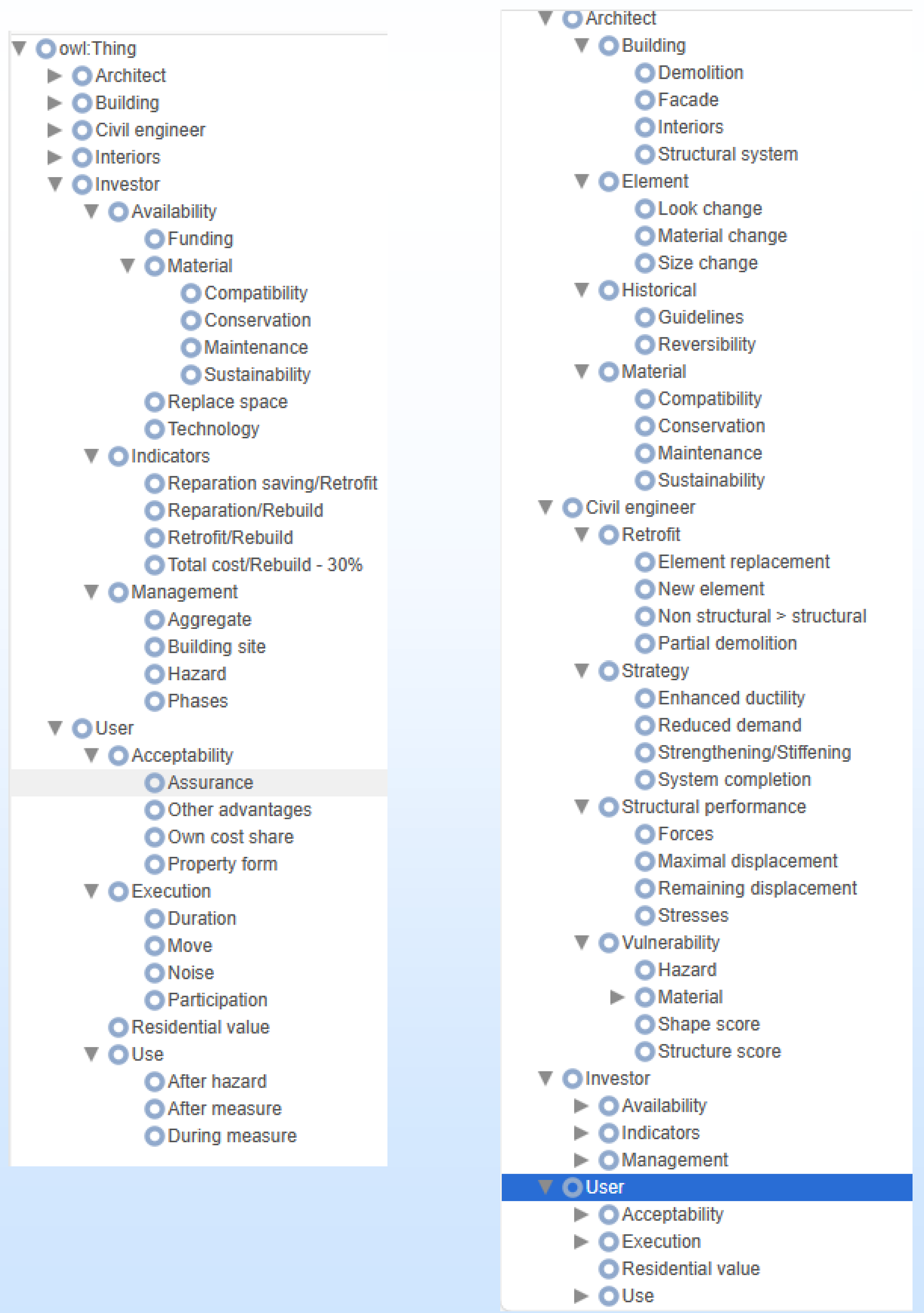
Ontology of the decision system for hazard management
Overview of the whole scheme



Vidraru dam and the reconstruction of the village
Photos by the author

In the 21st century however the approach is different. Several years ago a communication session was dedicated to achieving more flood resilience through floodplains on the Danube (review by the author Bostenaru Dan, M. and Gheorghe, D.: Workshop summary: "Floods, state, dams and dykes in modern times: Ecological and socio-economic transformations of the rural world", Web Ecol., 15, 29–31, https://doi.org/10.5194/we-15-29-2015, 2015), and also several years ago a doctorate was concluded at the Karlsruhe Institute of Technology in Germany on landscape architecture solutions to mitigate floods on the Rhine ("Risikolandschaft Oberrhein. Hochwasser und Klimawandel als räumlich-strukturelle Herausforderung für die Landschaft am Oberrhein", Jan Dieterle, 2016). The geographic areas are different, and so are the localities and the early 20th century constructions which might be affected by floods and their relationship to the city - ex. peripheral *Siedlung* in Germany.

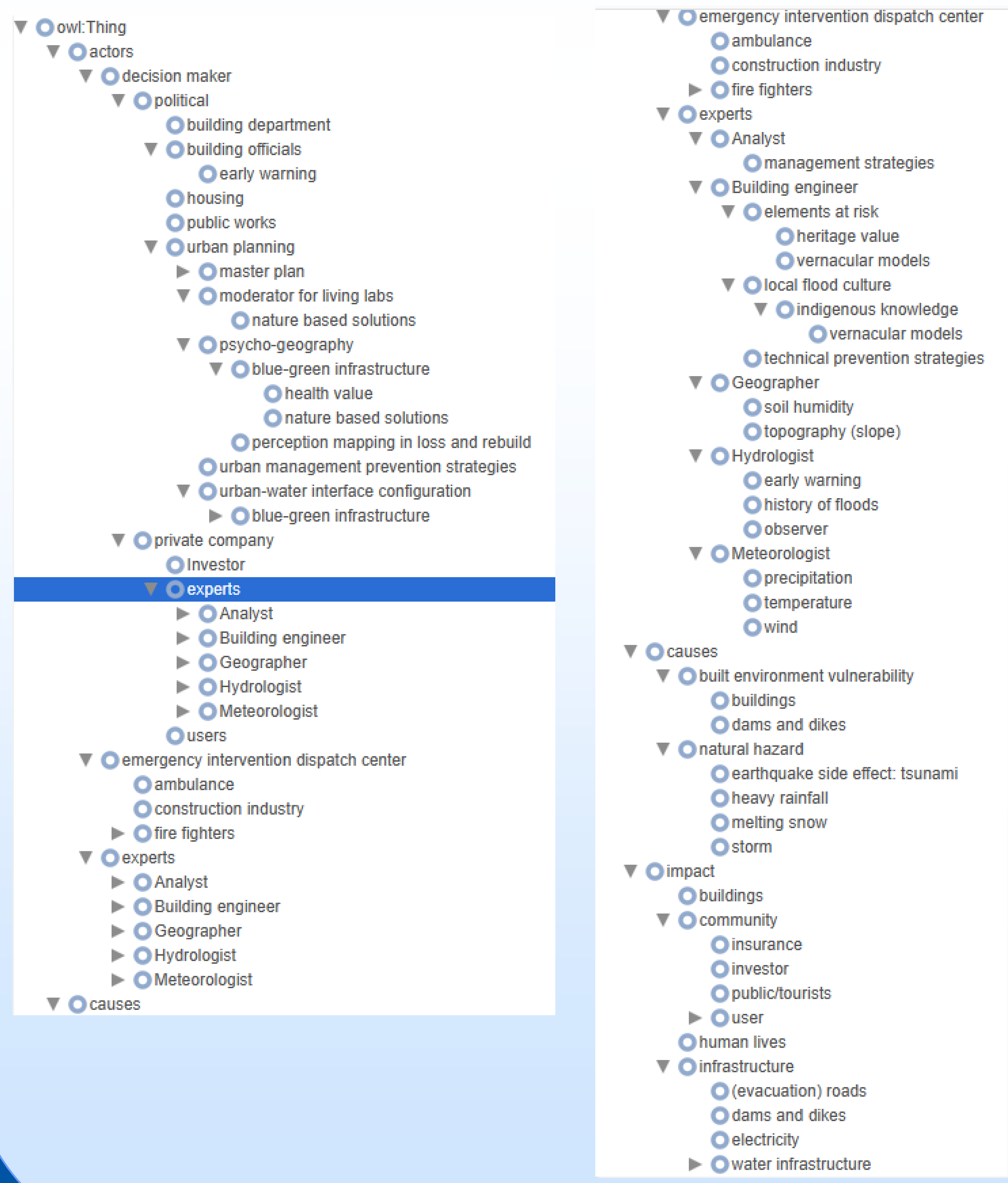
Ontology of the decision system for hazard management
Focus on the buildings



We also reviewed literature in a nice part of this: decision systems to prioritise interventions based on cost-benefit to mitigate floods. This resulted in the decision tree of the main stakeholders with focus on buildings. On this basis, identifying gaps - the papers cover some of the aspects of this issue at once, not all of them - we elaborated a decision tree and its taxonomy according to criteria related to the building and the river landscape. This resulted in a scheme for floods, considering the stakeholders, the causes (hazards, vulnerability, elements at risk) and the impact, as this session builds on a long series of session regarding Natural Hazards' Impact on urban areas and infrastructure.

It can be converted into an ontology for software planning, as in numerous European projects related to protection of architectural and archaeological heritage protected from climate change with IT support which go even further, towards Internet of Things. The context of future possible projects will be shown in the discussion.

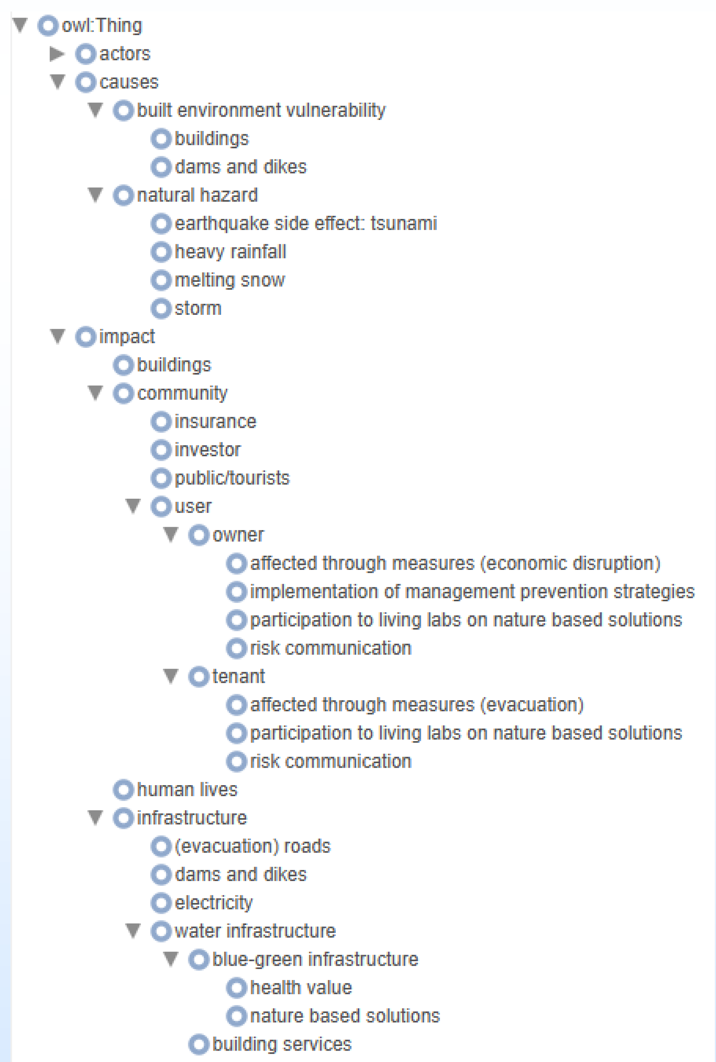
Ontology of the decision system for hazard management
Detail on the actors/stakeholders



Today one can look more systematically. A recent course of the European Commission offered insights to natural disaster mitigation through nature based solutions across the globe (SDGAcademyX: Nature-based Solutions for Disaster and Climate Resilience https://www.edx.org/learn/nature/sdg-academy-nature-based-solutions-for-disaster-and-climate-resilience).

This will be exemplified in case studies comprising Bucharest, Rome and Lisbon. For Bucharest we can consider the Emerald Necklace of the river Colentina, where dams created lakes and which is in a peripheral place of the city like Siedlungen. For Rome research was done in digital humanities centres of foreign academies for archive images of floods on the Tiber river. For Lisbon the tsunami in the aftermath of the 1755 earthquake was considered and also contemporary master plans and nature based solutions as documented on the oppla European platform.

Ontology of the decision system for hazard management
Detail on cause and impact



This way water is a dual element: blue-green infrastructure, and also urban-water interface causing hazards, but, besides rendering vulnerability of the building stock, it is also vulnerable as a habitat.