It takes a village to run a model

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RESEARCH ARTICLE
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It Takes a Village to Run a Model—The Social Practices of Hydrological Modeling

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Key Points:

- Fourteen hydrological modelers were interviewed about their modeling decisions
- Experience from colleagues was the main motivation to make certain decisions
- The way in which a model is selected and configured is time and place dependent

Supporting Information:

Supporting Information may be found in the online version of this article.

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Abstract Computer models are frequently used tools in hydrological research. Many decisions related to the model set-up and configuration have to be made before a model can be run, influencing the model results. This study is an empirical investigation of the motivations for certain modeling decisions. Fourteen modelers from three different institutes were interviewed about their modeling decisions. In total, 83 different motivations were identified. Most motivations were related to the team of the modeler and the modelers themselves, "Experience from colleagues" was the most frequently mentioned motivation. Both institutionalization and internalization were observed: a modeler can introduce a concept that subsequently becomes the teams' standard, or a modeler can internalize the default team approach. These processes depend on the experience of the modeler. For model selection, two types of motivations were identified: experience (from colleagues or the modelers themselves), and model vision (the model has assets that align with the modeling vision). Model studies are mainly driven by context, such as time constraints, colleagues, and facilities at the institute, rather than epistemic (such as aligning with the modeling vision). The role of local context in the construction of and the value assigned to models shows that models are social constructs, making model results time, and place dependent. To account for this context in the estimation of the robustness of model results, we need a diversity of opinions, perspectives, and approaches. This requires transparent modeling procedures and an explicit modeling vision for each model study.

Perceptual/conceptual model
Deciding on the processes

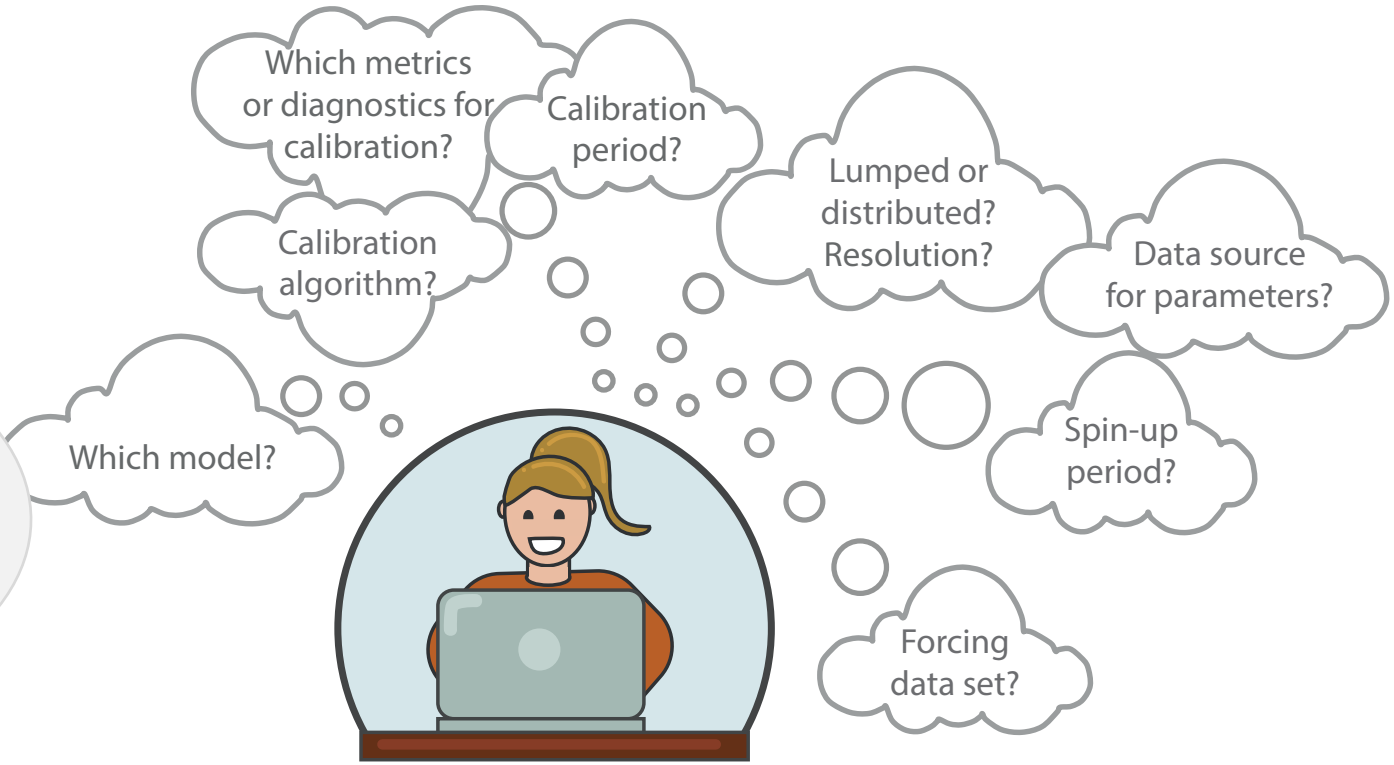
Mathematical model
Deciding on the equations

Procedural model
Get code running on a computer

Calibration
Sensitivity analysis

Evaluation
Compare output with observations

Many decisions have to be made while modelling. How do we make these decisions?



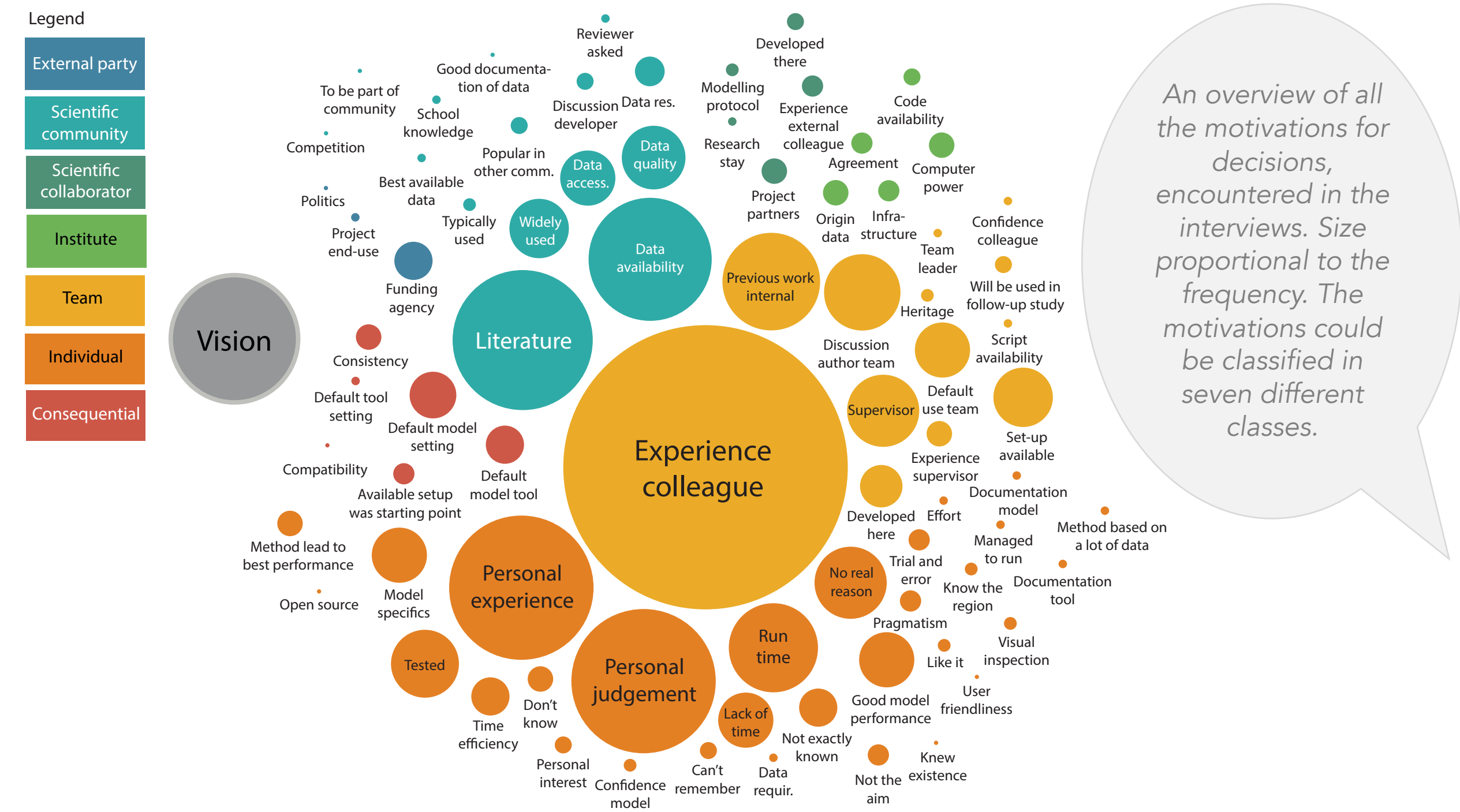
Investigating the modeller...

14 in-depth interviews
3 different institutes (France, Belgium, Germany)
February – June 2020

3 Group leaders
4 Senior researchers
4 Post-docs
3 PhD-candidates

835 minutes of material (13.9 hours)
110.767 words (about 220 pages)

Inductive thematic content analysis
107 codes, 87 motivations



An overview of all the motivations for decisions, encountered in the interviews. Size proportional to the frequency. The motivations could be classified in seven different classes.

Epistemic

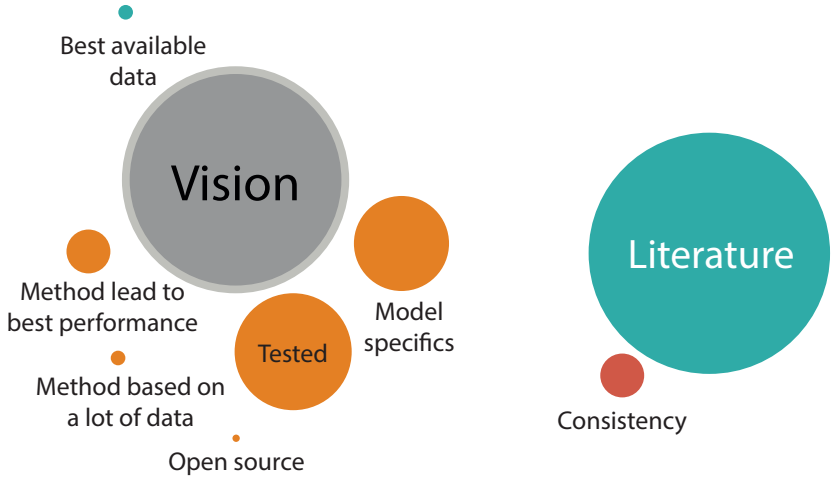
presumed to promote the truth-like character of science

Contextual

These motivations can be classified into epistemic and contextual motivations. Epistemic motivations have a science-based reasoning. Contextual refers to moral, personal, social, political and cultural values, and here also includes pragmatic motivations.

Epistemic

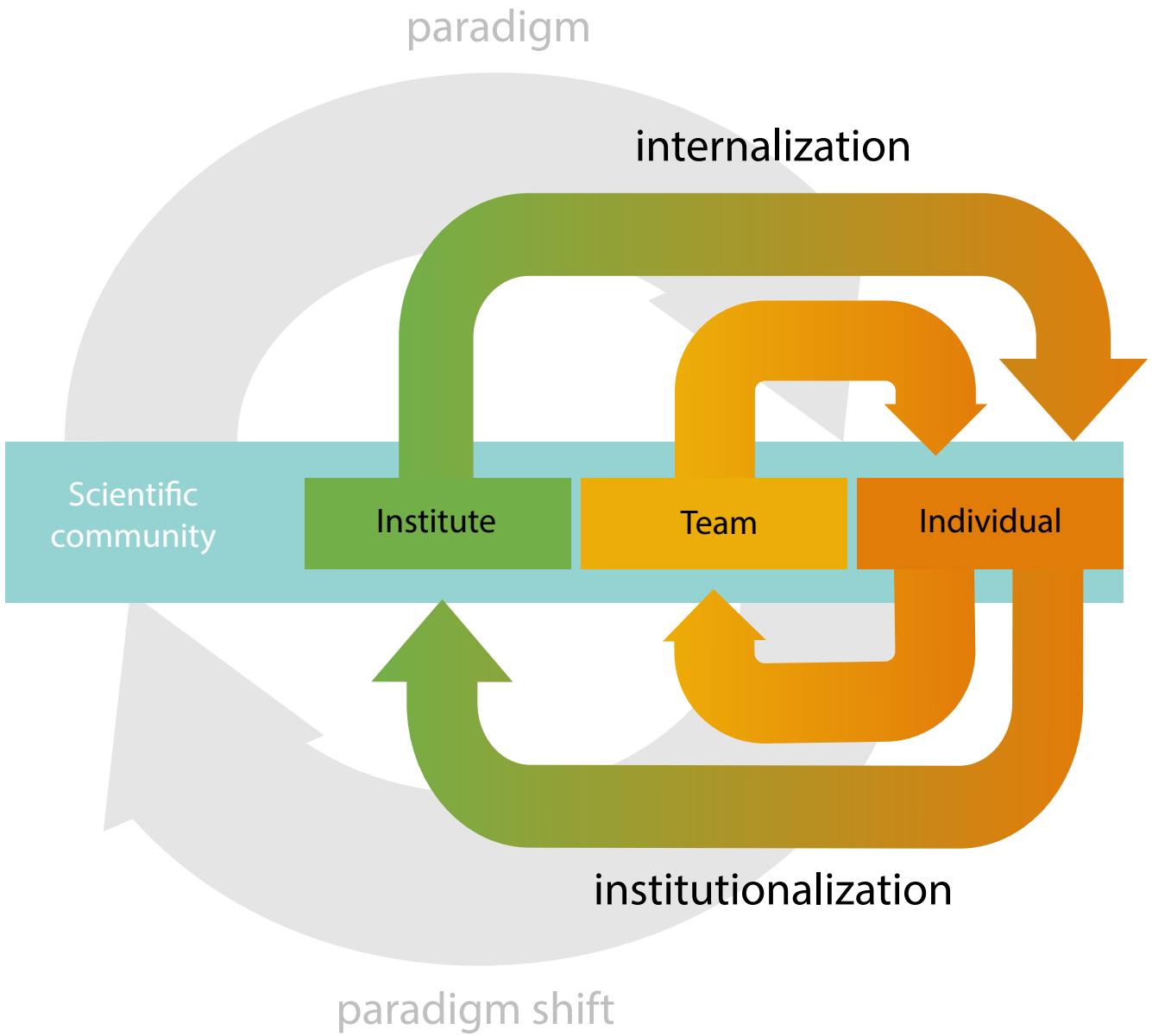
presumed to promote the truth-like character of science



The vast majority of the identified motivations to make modeling decisions are contextual.

Contextual

Furthermore, internalization and institutionalization were observed: a person can internalize the team standard and defend it as their own choice, or a person can introduce a new method to the team and have this method institutionalized.



The way models are configured is time and place dependent

This makes model results time and place dependent

This means that we need multiple ways of approaching the same problem, to get insights into the robustness and validity of the results

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Thank you!

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