Constructing customized modelling guidelines

A Participatory Integrated Assessment and Modelling example

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Integrated assessment and modelling

Stage 1

Conception
From late 1960s

- Maturity → a number of best practice guidelines

Stage 2

Formation
1990s

- Strong focus on biophysical modelling
  - Many modelling guidelines
  - Best practices focusing on model as tool to assess bio-physical issues
- Socio-economic aspects have received less attention
  - Stakeholder involvement has become almost a “must”

Stage 3

Practice
2000s

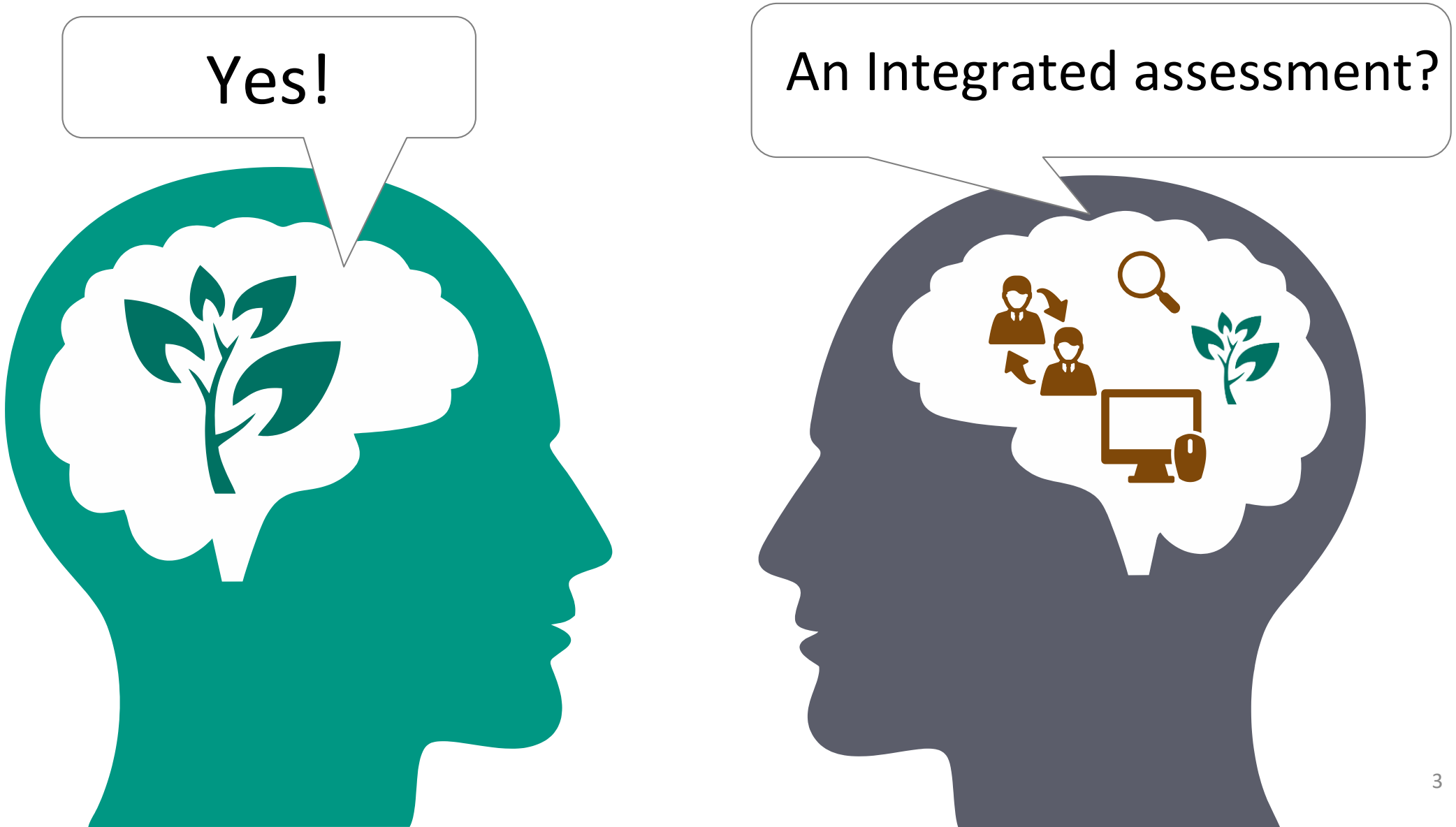
- Standard guidelines → setting expectations for repetitive tasks
- Many problems require a flexible, adaptive approach
  - Analysts cannot simply follow a single guideline
  - Need draw on several to construct a process to address their problem.

Stage 4

Maturity
2010s

Reference: Zare, F., et al., 2017. Integrated water assessment and modelling: A bibliometric analysis of trends in the water resource sector. Journal of hydrology

Shared understanding



Customized modelling guidelines

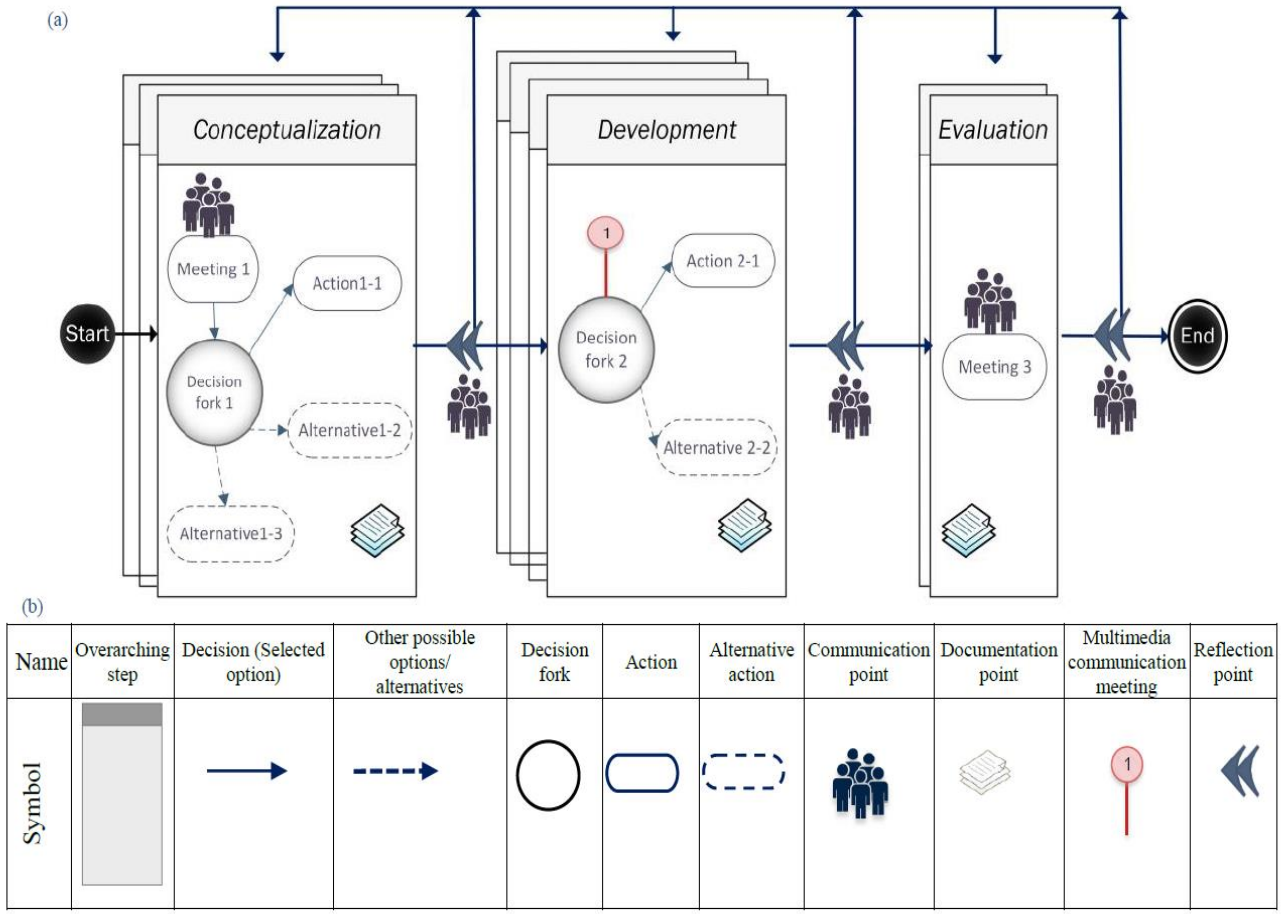
Used two artifacts (designed tools) to combine multiple guidelines in a way that provides a customizable modelling process and facilitate the communication to reach common understanding

1. ***Pathway diagram***

2. ***Steps' ID card***

Pathway Diagram

- Is based on path perspective; a **pathway** involves a sequence of steps, decision forks, choices, points for reflection and iterations
- Adapted from tools in other disciplines, e.g. “activity diagrams”
- Adaptive to changes: Go in circles and branch out, be prepared to go back, reiterate and refine
- Regular reflective communication helps to improve the efficiency and effectiveness of the project during these iterations.



A pathway example (a) and legend (b), demonstrating the use of the pathway diagram components (Zare et al., 2019)

Steps' ID card

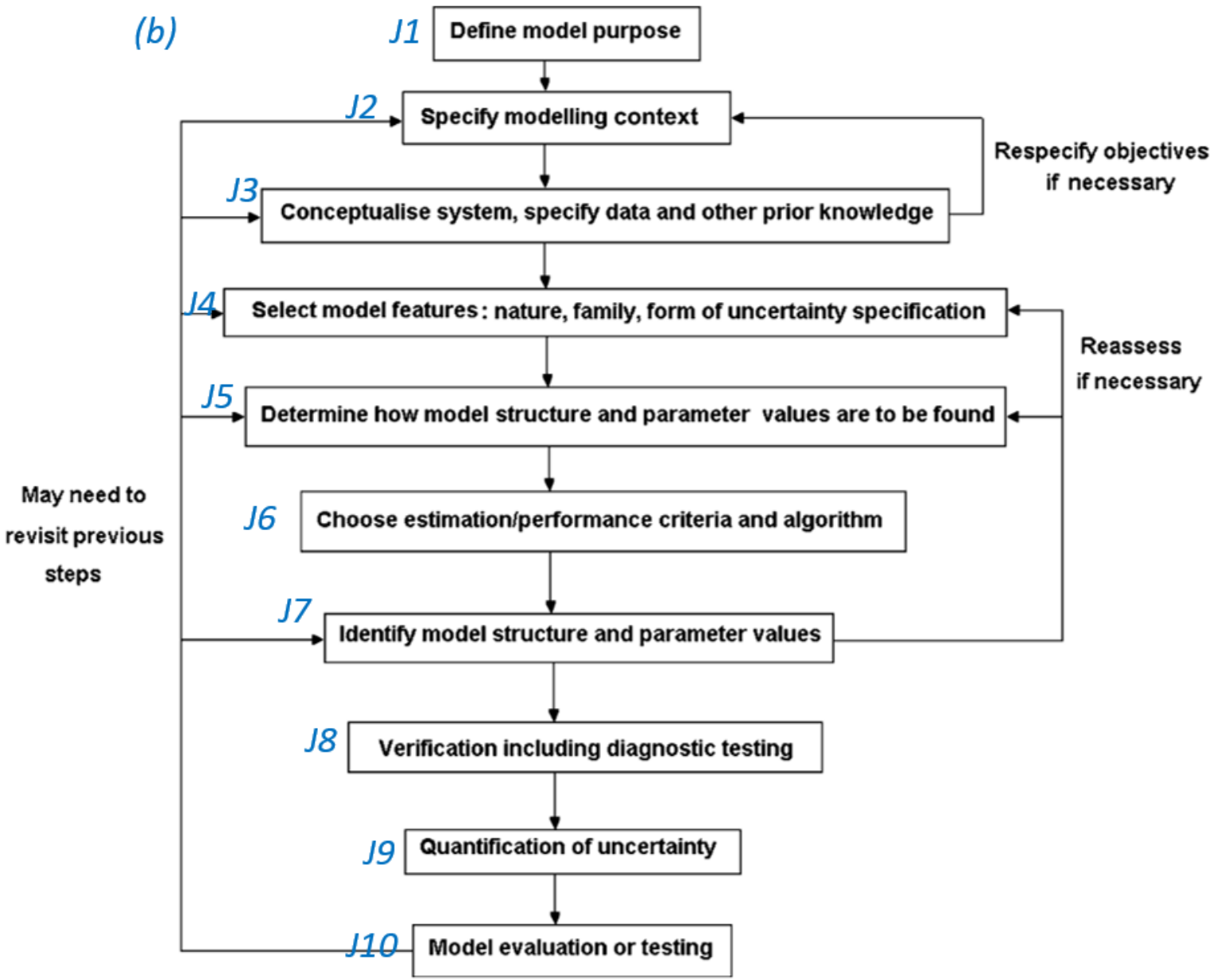
- Collection of statements which show categorized information about the necessary steps of the modelling process and can be used as a common story to provide a better understanding of the process between modellers and stakeholders
- Quick summary of what is known and what has been said about a step across multiple guidelines
- An individual/group's customized summary of the state of knowledge about a step
  - common language
  - point of interaction for thinking about and discussing what steps can be inserted into a pathway and why

Participatory Integrated Assessment and Modelling

- Examined the idea to develop a Participatory Integrated Assessment and Modelling
- Based on two streams of guidelines**:**
  - the more quantitative, ‘natural science’ approach to modelling (Jakeman et al., 2006)
  - the more qualitative, ‘social’ approach with focus on stakeholder involvement (Voinov et al., 2018; Voinov and Bousquet, 2010)

Ten iterative steps in development and evaluation of environmental models

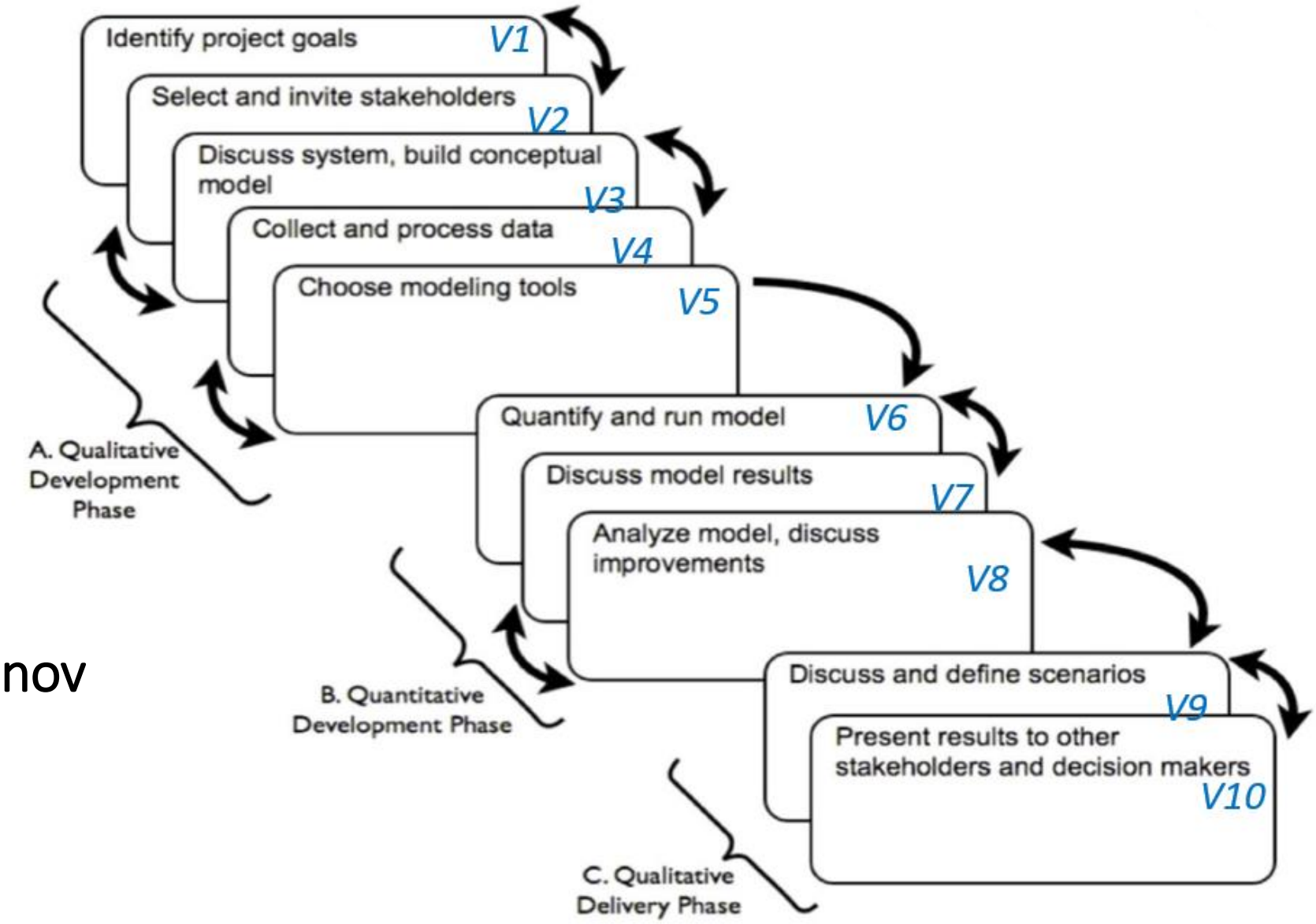
(Jakeman et al 2006)



- Modelling with stakeholders

- Tools and methods in participatory modeling

(Voinov et al., 2018; Voinov and Bousquet, 2010)



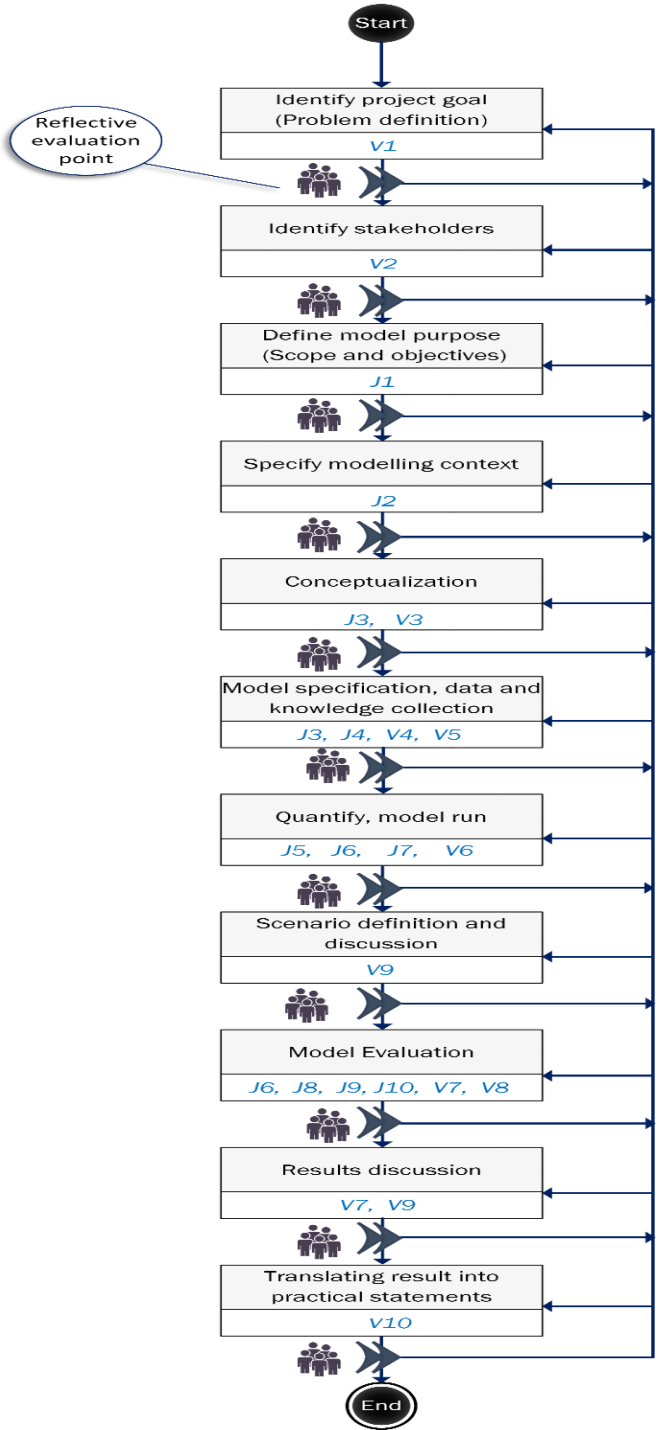
Three visualisations of pathways in terms of steps.

(a) Ten iterative modelling steps (Jakeman et al., 2006)*,*

(b) Different stages of a participatory modelling process (Voinov et al., 2018)*,*

(c) Participatory integrated modelling pathway, combining and rewording elements of (a) and (b) to suit the practitioner's needs, allowing linking to ID cards

Views of pathways from multiple sources are reorganized and merged



Step ID Card

ID card name	Conceptualization of the system
Objective	• Project participants build conceptual, visual representations of the components of the problem being considered. • Conceptualisation refers to basic premises about the working of the system being modelled.
Rationale	• The conceptualisation step is important even if a model is not designed from scratch .. • …
Decisions/tasks	• The system being modelled should be defined clearly, including its boundaries …… • …..
Tools	Rich pictures (RP), Cognitive/concept mapping (CCM), Causal loop diagram (CLD), Cultural consensus (CC), Decision tree analyses (DTA)
Actors	Scientist (modellers and their clients), officials, other interested parties

References: Green statements are from *(Jakeman et al., 2006)* and black statements are from *(Voinov et al., 2018; Voinov and Bousquet, 2010)*

Conclusion

- Pathway diagram + Steps' ID card =
  - provide platform to use different guidelines as a source of information
  - develop a pathway with specific steps which fit our purpose
  - communicate pathway, revise it
  - reach and maintain shared understanding of the modelling pathway (process)

- Future research: scale up and improve the participatory integrated modelling pathway and the ID cards
  - reviewing more resources
  - maturing presentation and providing user-friendly tools
  - applying in some case studies

Thank you

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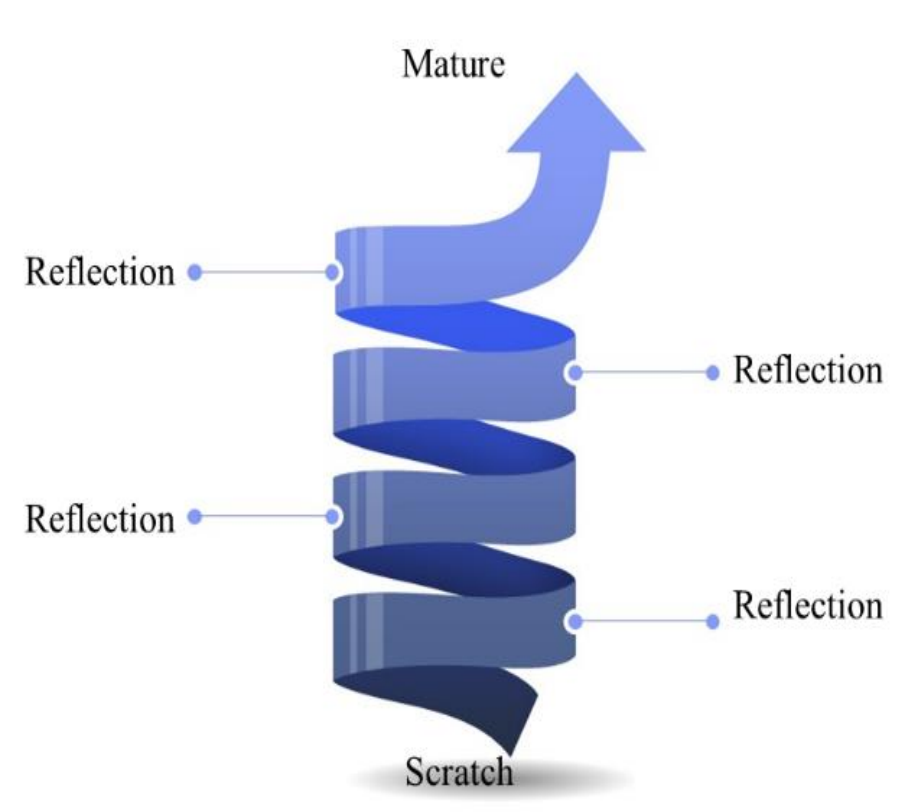
Path perspective

Integrated assessment and modelling as a **pathway** involves a sequence of steps, decision forks, choices, points for reflection and iterations

Reflective communication points are critical to confirm or debunk the results



Modelling as an adaptive spiral process

Customized modelling guidelines

- Transparent information about project progress requires common tool/language to:
  - speak and communicate among stakeholders,
  - help reach common understanding of steps and requirements
  - improve knowledge sharing.

- New combined guidelines or meta-guidelines often

  add further complexity rather than solving the issue.

Conclusion

- Be adaptive and flexible, go beyond strict guidelines to confront complex issues and engage different stakeholders.
- Pathway diagram and ID cards are useful tools to develop common knowledge and to facilitate communication to reach a shared understanding of the modelling process
- Developing pathway and ID cards is an ongoing process of building a shared vision and understanding.
- One should not use them to force stakeholders into a predefined protocol and
- Future research could scale up and improve the participatory integrated modelling pathway and the ID cards by reviewing more resources, maturing presentation and providing user-friendly tools.

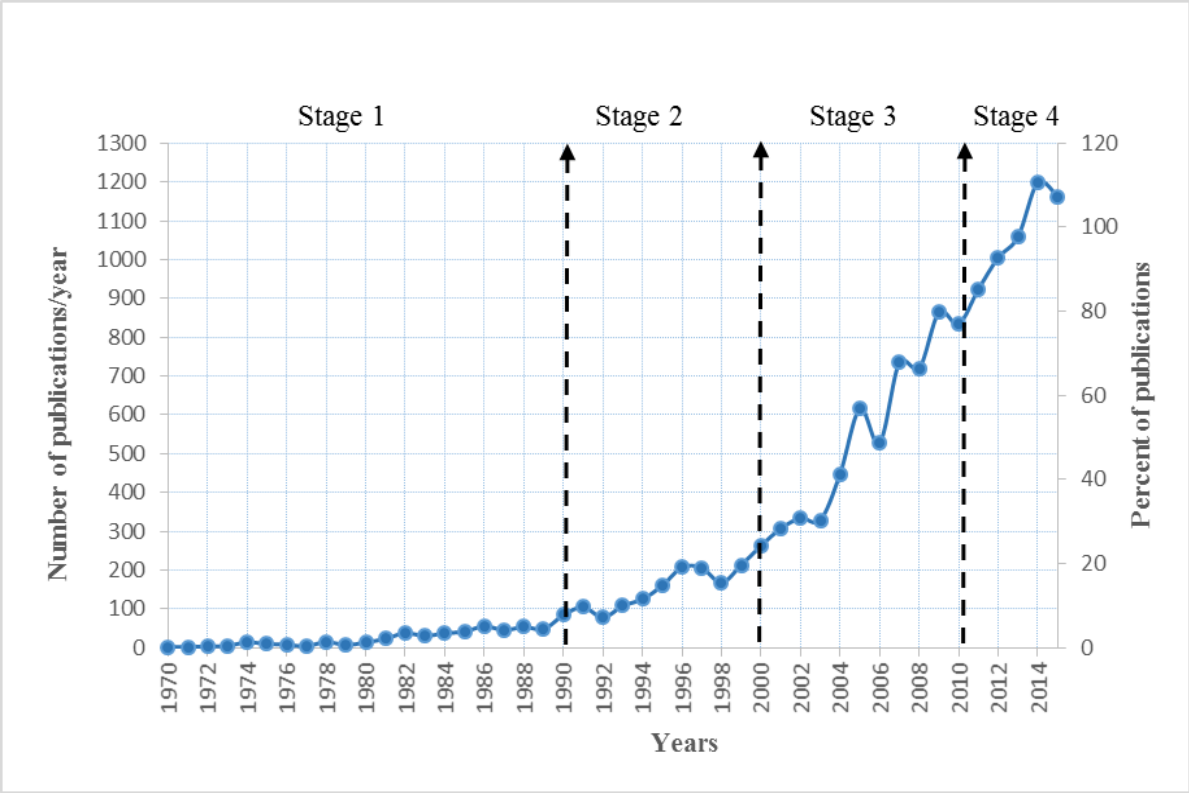
Integrated assessment and modelling

Stage 1 **Conception**

Stage 2 **Formation**

Stage 3 **Practice**

Stage 4 **Maturity**



Publishing trend in the area of integrated water assessment and modelling

Reference: Zare, F., et al., 2017. Integrated water assessment and modelling: A bibliometric analysis of trends in the water resource sector. Journal of hydrology