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Designing Nature-based Solutions in a Participatory Way: Usability of Tools for Water Professionals

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25/5/22

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Open Access Article

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Sustainability **2022**, *14*(9), 5562; **https://doi.org/10.3390/su14095562** - 05 May 2022

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Abstract Participatory processes provide opportunities for water professionals such as scientists and policymakers and other stakeholders such as the local communities and farmers to meet, exchange information, deliberate, and share values. There is a diversity of rapidly evolving participatory methods, here defined, as tools [...] Read more.

(This article belongs to the Special Issue **Spotlight on Nature-Based Solutions against Natural Hazard**)

▼ Show Figures

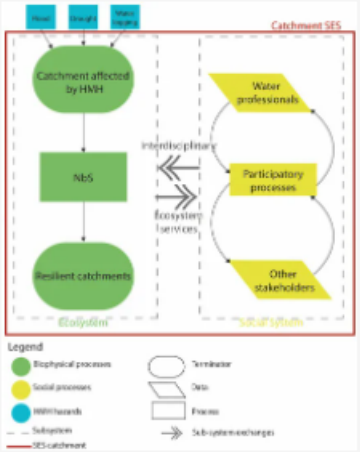

Figure 1

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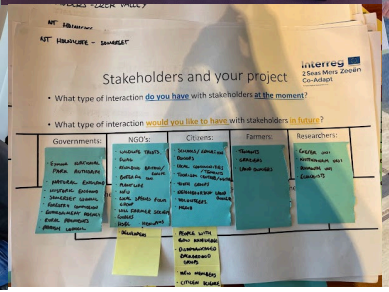
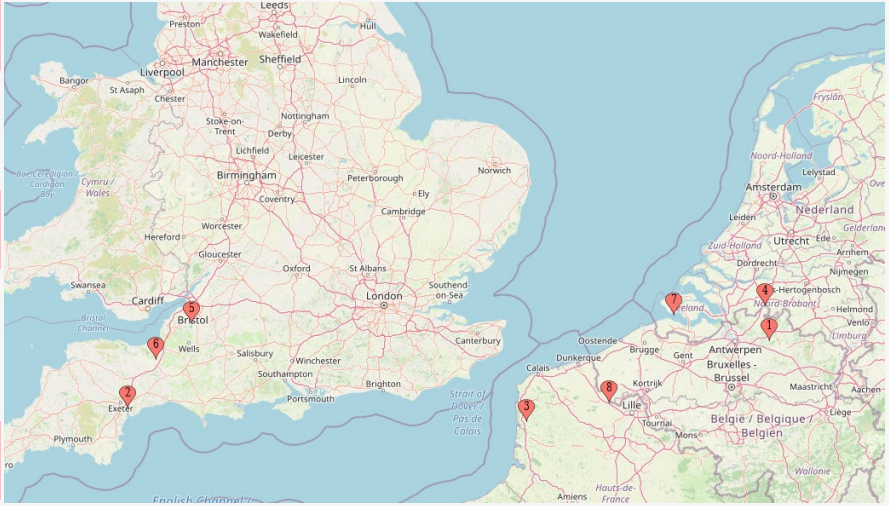
How can water professionals make an informed decision on which tools to use when designing NbS with stakeholders?



The challenge

No.	Catchments	Country	Key Characteristics
1	Laakbeek	Belgium	Small brook passes through the semi-urban village with flooding history. Not much space for adaptation measures.
2	The Culm	The United Kingdom	Brook passes a new ‘green’ development area and main railway. Flooding is the main HMH causing deterioration in water quality.
3	Liane	France	Brook passes a rural area with urbanized banks causing flooding and soil erosion.
4	Aa of Weerijs	The Netherlands	Brook passes a rural area with a high density of tree nurseries for export. Main HMH is drought due to high water demand and flooding in moments of peak flows.
5	Porlock Vale	The United Kingdom	Brook passes a steep valley, creating a high risk of flooding in several villages.
6	Somerset Levels and Moors	The United Kingdom	Flooding at lower reaches in several villages.
7	Vlissingen	The Netherlands	Channelized brooks pass through the new ‘green’ development area. Flooding is the main HMH.
8	West Flanders	Belgium	Brook passes between two villages and has a history of flooding.



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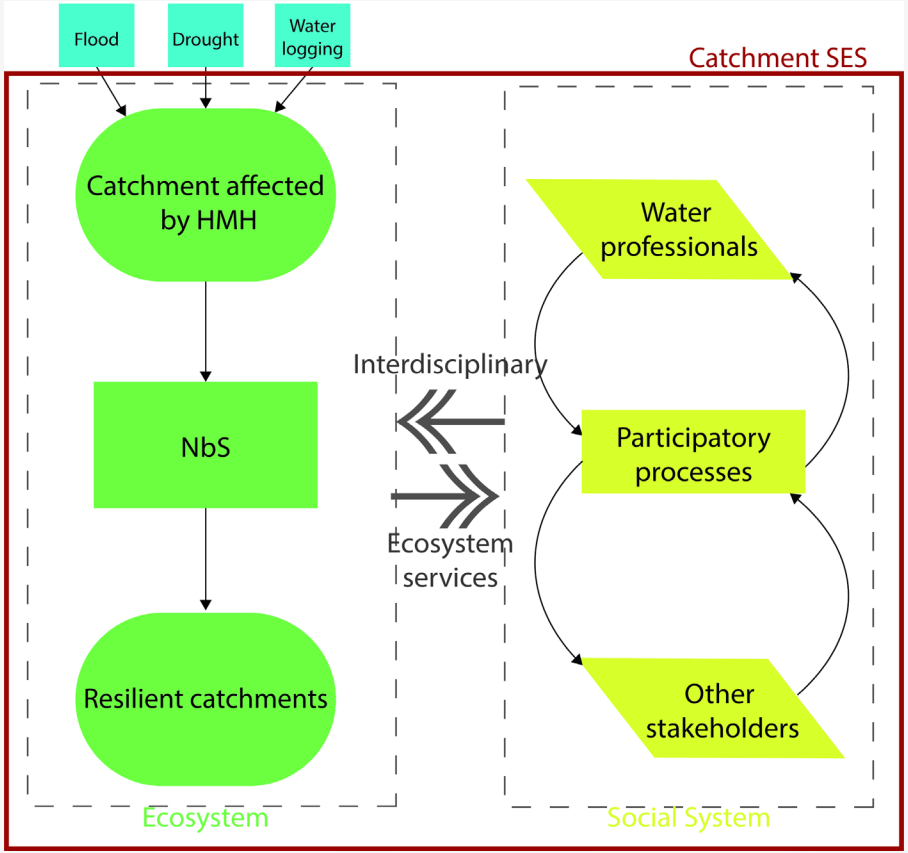
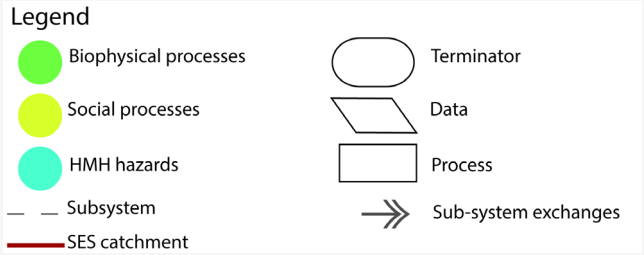
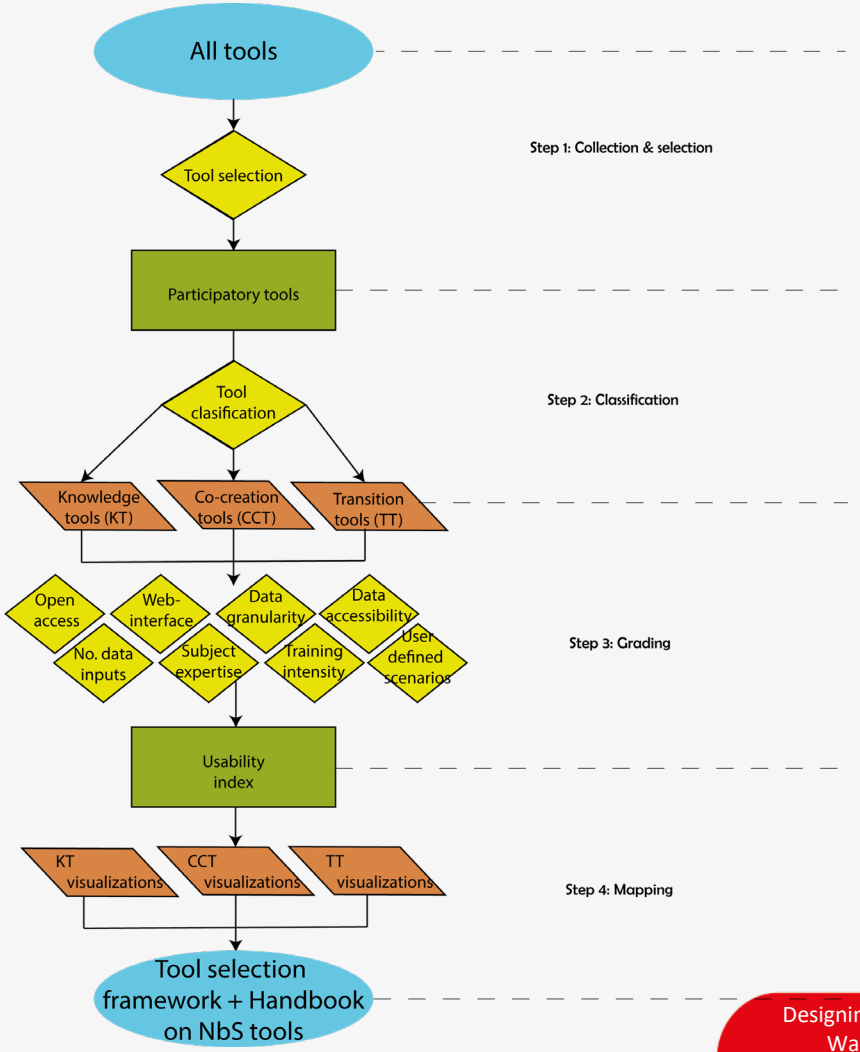
The Research Area





Framework


All tools
Step 1: Collection & selection
Tool selection
Participatory tools
Step 2: Classification
Tool clasification
Knowledge tools (KT)
Co-creation tools (CCT)
Transition tools (TT)
Step 3: Grading
Open access
Web-interface
Data granularity
Data accessibility
No. data inputs
Subject expertise
Training intensity
User defined scenarios
Usability index
Step 4: Mapping
KT visualizations
CCT visualizations
TT visualizations
Tool selection framework + Handbook on NbS tools

Step 1: Collection & Selection

Step 2: Classification

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Co-Creation

- Online ideation
- Landscape Planning
- Final NbS design presentation
- Individual farm visits
- Digital Collaboration tools
- The Forum
- 6-3-5
- The walking app
- Adaptation Pathways tool

Knowledge

- F2F meeting
- Public citizen meeting
- Knowledge co-creation workshop
- Technical stakeholders F2F meetings
- Hydrological model
- 'View on climate issue' survey
- Knowledge transfer website & newsletter
- F2F field visits
- Adaptation Pathways tool
- The walking app

Transition

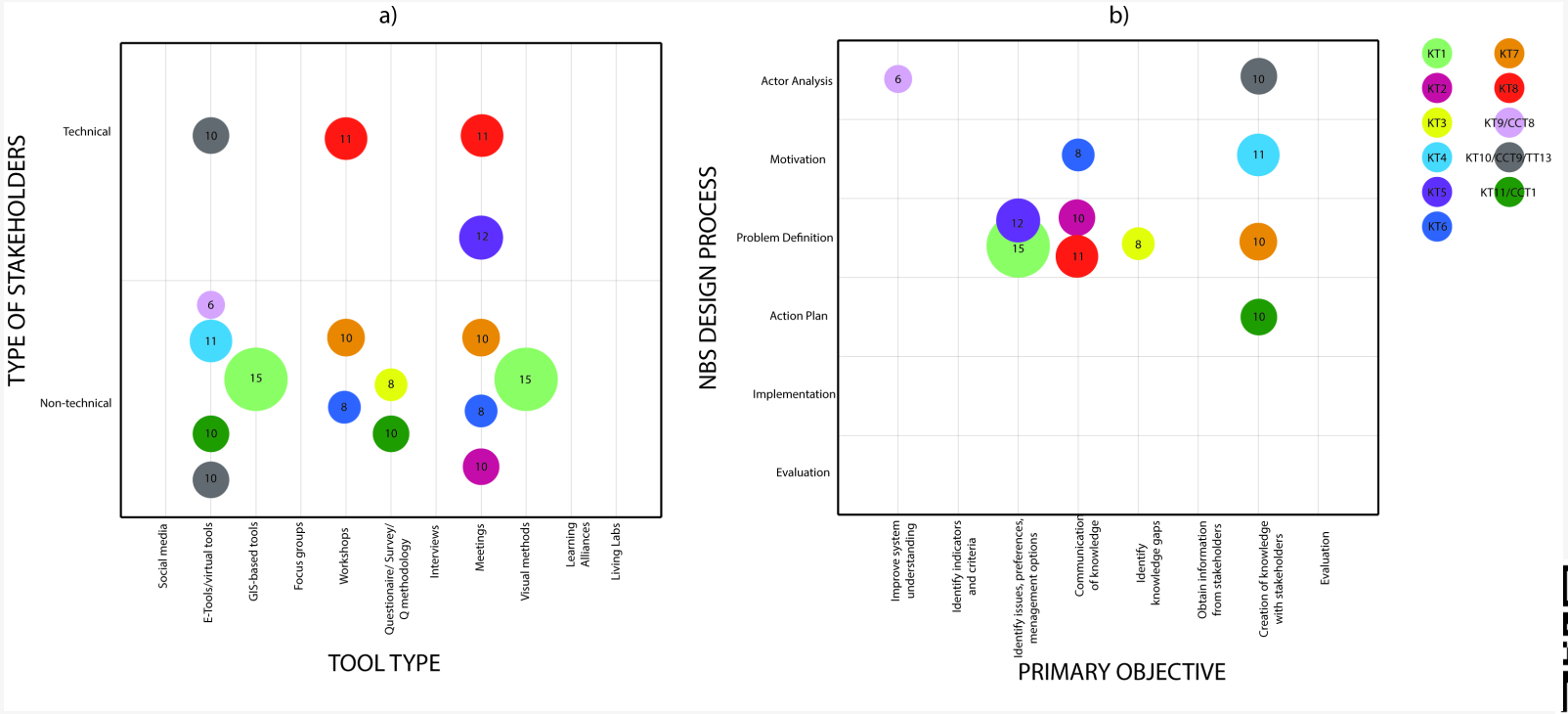
- Flyer for planned future events
- Stakeholder forum / Round table
- Information plaques
- Educational trainings & materials
- Maptionnaire
- Citizen Science
- Storymaps
- Travel Maps
- Design Thinking / Embassy of Water
- Public Citizen meetings
- Adaptation Pathways Tool

Step 3: Scoring

NO.	CRITERIA	SCORE	DESCRIPTION	JUSTIFICATION
1	Open Access	0	Yes	Cost is an important consideration in defining the usability tools [45] hence the need for utilizing open access tools.
		1	No	
2	Web Interface	0	Yes	Tools with web interfaces reach larger and broader audiences which would translate to increasing the potential to discuss more outcomes and enhanced understanding of menagement measures such as NbS [44,45]
		1	No	
3	Data Granularity	1	High level; national level data	Data granularity refers to the extend of detali in a specific data point [40]. More granular data sllows more thorought system{s} modelling however it can be hard to find in open source environments [46].
		2	General data with sector specific information	
		3	Localized sector data and localized technical data	
4	Data Accessibility	1	Data available for most developed and developing countries	Data acessibility is an ongoing challeng specifically for accurate design of NbS. Acessibility is always connected to the granularity – hardly accessible data points are more likely to be detailed and difficult to measure.
		2	Data is hardly accessible for developing countries	
		3	Difficult to access data, derivation might require modelling tools	
5	Number of Data Inputs	1	0-15	Data inputs entail how many inputs a tool requires for the design of NbS.
		2	16-32	
		3	33+	
6	Needed Subject Expertise	1	Expertise not needed	The expertise needed for the users to be able to actively participate/use the specific tool.
		2	Needs an understanding of general subject matter	
		3	Expertise and high skill needed	
7	Training Intensity	1	1 day	Trainings come with additional costs, time and resources. They can include online tutorials, independent instructions, in-person trainings etc.
		2	2-3 days	
		3	1 week	
8	User-Defined Scenarios	1	Yes	User-defined scenarios give added value for the process of designing NbS however they add to the complexity of the tool.
		0	No/N-A	

Dargin et al. (2019)

Step 4: Mapping



Conclusions

- We developed and tested a stepwise tool selection framework that supports the water professionals toward the stakeholder-inclusive design of NbS;
- The subsequent visuals can influence prospective users (WPs) for identifying the tool(s) best suited for specific requirements;
- The established set of principles and lessons learned could be applied for participatory design in different sustainability contexts;
- Knowledge tools are central in the problem definition stage, particularly with non-technical stakeholders;
- Most anticipated co-creation tools are e-Tools/Virtual tools and workshops;
- Transition tools favour visual tools as a way of enabling the transition towards management practices;
- It it is up to us and our choices to determine whether social-ecological systems evolve in a resilient and integrated way or not.

THANKS FOR YOUR ATTENTION

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