



MASTER THESIS

Socio-Ecological Resilience: 'Weaving' to scale Nature-based Solutions

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»In a real sense all life is inter-related. All men are caught in an inescapable network of mutuality, tied in a single garment of destiny. Whatever affects one directly, affects all indirectly. [...] This is the inter-related structure of reality.«

— *Martin Luther King Jr.*





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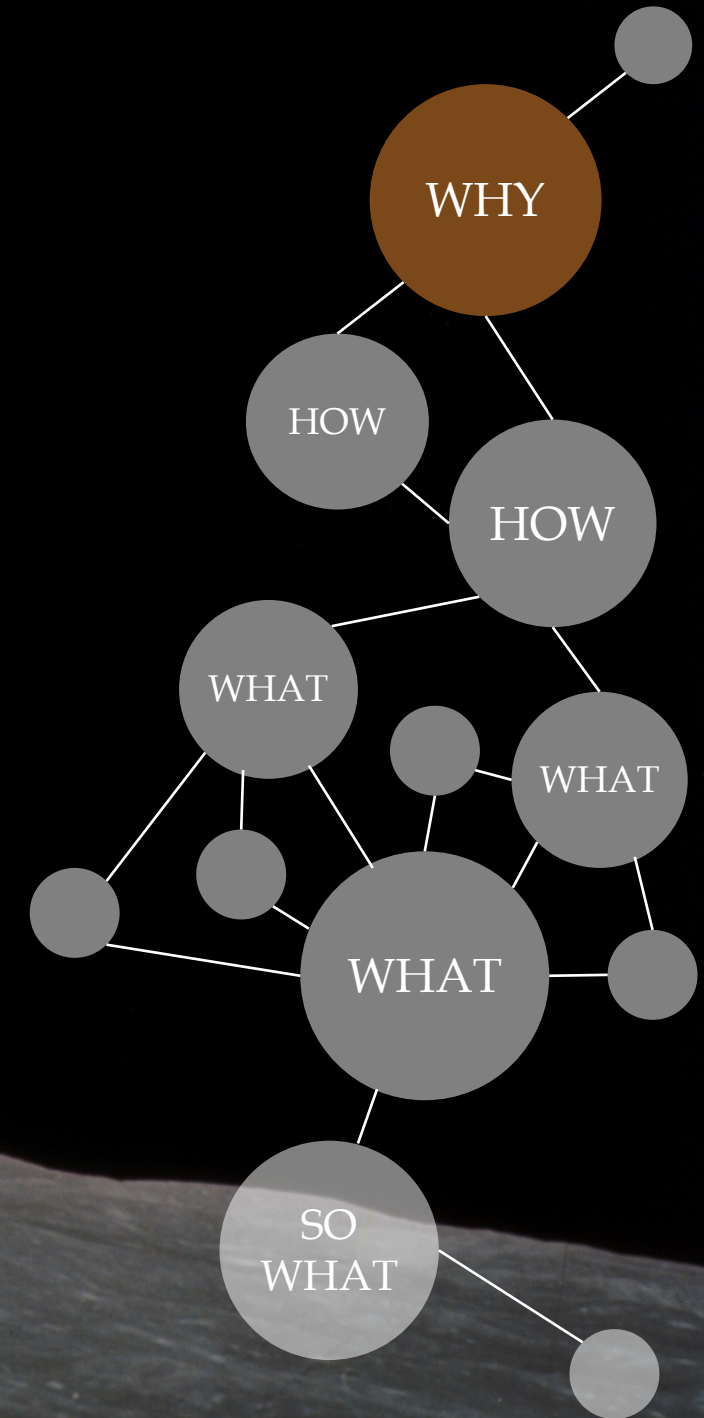
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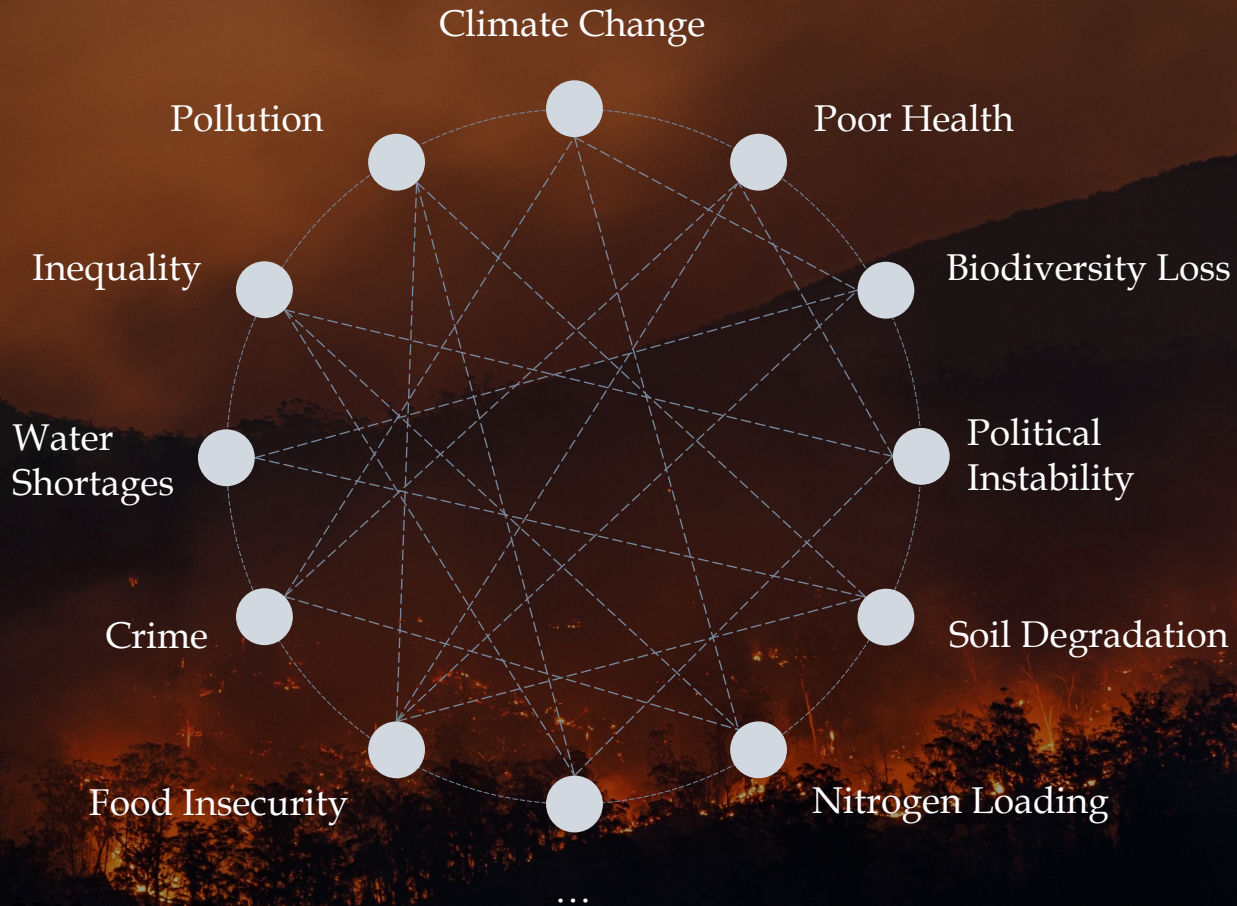




About the Sustainability Challenge



The world is facing **interconnected** wicked problems.



From climate change, poor health, biodiversity loss, and political instability to soil degradation, inequality, and pollution, the challenges that humanity is facing today are wickedly interconnected. Trying to address one element of one problem in isolation risks causing unintended consequences in several others.

With the severity of problems increasing, the adaptive capacity and resilience of the socio-ecological system is radically declining. Standard problem-solving techniques, mechanistic thinking, and siloed approaches are inadequate in the face of the immensity, urgency and complexity of the challenge.

Needed is an approach that is both strategic and systemic in nature.

WHY
Sustainability
Challenge



Nature-based solutions
are key for addressing
the complexity and
interconnectedness
of the challenge.

However,
NbS are not scaling
to the **landscape level**.

Nature-based solutions (NbS) have widely been acknowledged as one of the most critical and promising solutions to tackle the complexity of interconnected sustainability challenges.

The International Union for Conservation of Nature (IUCN), which has been at the forefront of NbS work since 2009, defines them as *“Actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits.”*

With their inherently systemic approach, NbS have the potential to contribute to strategically moving towards sustainable development, and helping to strengthen the adaptive capacity and resilience of the Earth’s socio-ecological system.

But despite their critical potential, NbS are not yet mainstreaming on a larger landscape level, that is required for them to unfold their full potential.

WHY
Research Gap
NbS





Weaving is believed to help cohere fragmented change-making efforts and increase the adaptive capacity of socio-ecological systems.

However, scientific research on *Weaving* and NbS is scarce and studies on their intersection are non-existent.

Today, change-making efforts are often “largely fragmented and unconnected, with few ways of cohering, coordinating, and connecting to amplify their intended positive impacts or truly bringing about the purposeful system change that is desired” (Waddock and Waddell 2021, 166). To counteract further fragmentation, a new role has emerged among sustainability and systems-thinking practitioners, referred to as the ‘weaver’.

Weaving as an emerging leadership practice that is believed to help cohere fragmented change-making efforts. It seems to strengthen the socio-ecological fabric and the system’s resilience by addressing the vital and relational aspects of trust, common meaning, capacity for learning, and capacity for self-organisation.

Despite these promising first insights from the field, academic literature on the concept is scarce and a clear, non-wordsmithed definition as well as a validated description of concrete *Weaving* practices is still missing.

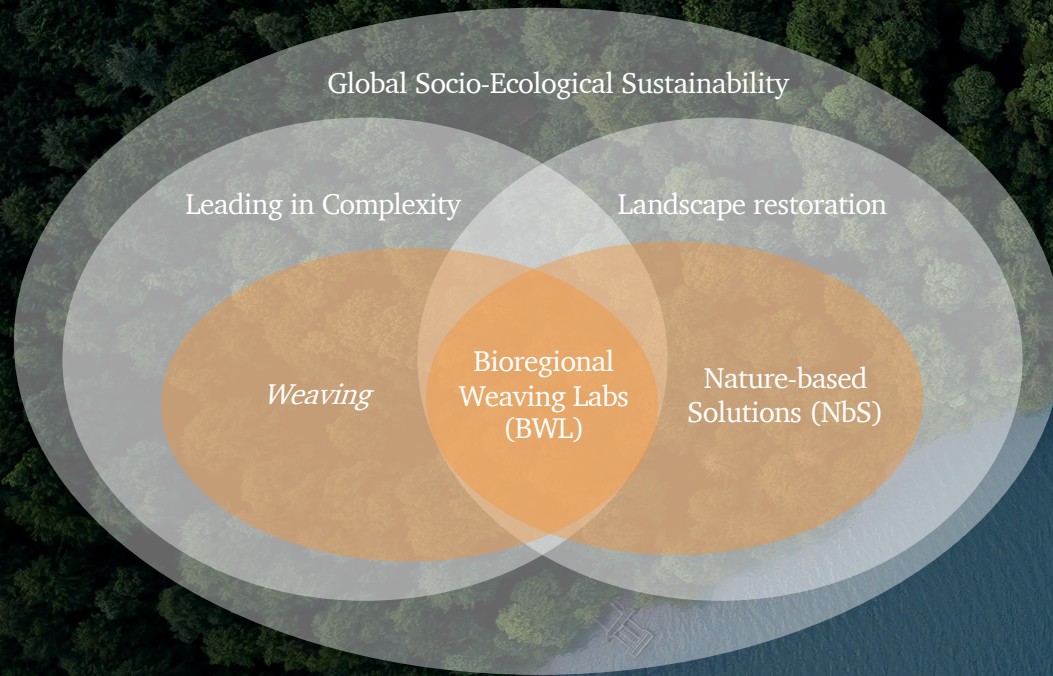
Studies on the intersection of *Weaving* and NbS are non-existent.

WHY
Research Gap
Weaving





The Bioregional Weaving Labs (BWL) Collective works at the intersection of NbS and *Weaving*.



Working at the intersection of *Weaving* and NbS, the Bioregional Weaving Labs collective (consisting of 25+ international system-changing organisations) is an example of a community of practice that aims to tackle the complexity of the sustainability challenge holistically by bringing together the element of leading in complexity through the practice of *Weaving* and large-scale landscape restoration through NbS. Through “geographically grounded and carefully curated multi-stakeholder partnership process[es]”, the labs “weave together people and solutions, equipping and helping them to organise for transformative change” (Ashoka 2022, 6).

The collective works towards regenerating one million hectares of land and sea in Europe by 2030. BWL have been a core anchor point and source of data for this study and its conclusions.

WHY
Research Gap
Intersection





About the Focus and Methods of this Research Project





RQ: How could *Weaving* foster the conditions for scaling **NbS** to the landscape level?

SQ 1: What are Barriers and Enablers for scaling **NbS** to the landscape level?

SQ 2: What is *Weaving* and what are *Weaving* practices?

Scientific Discourse

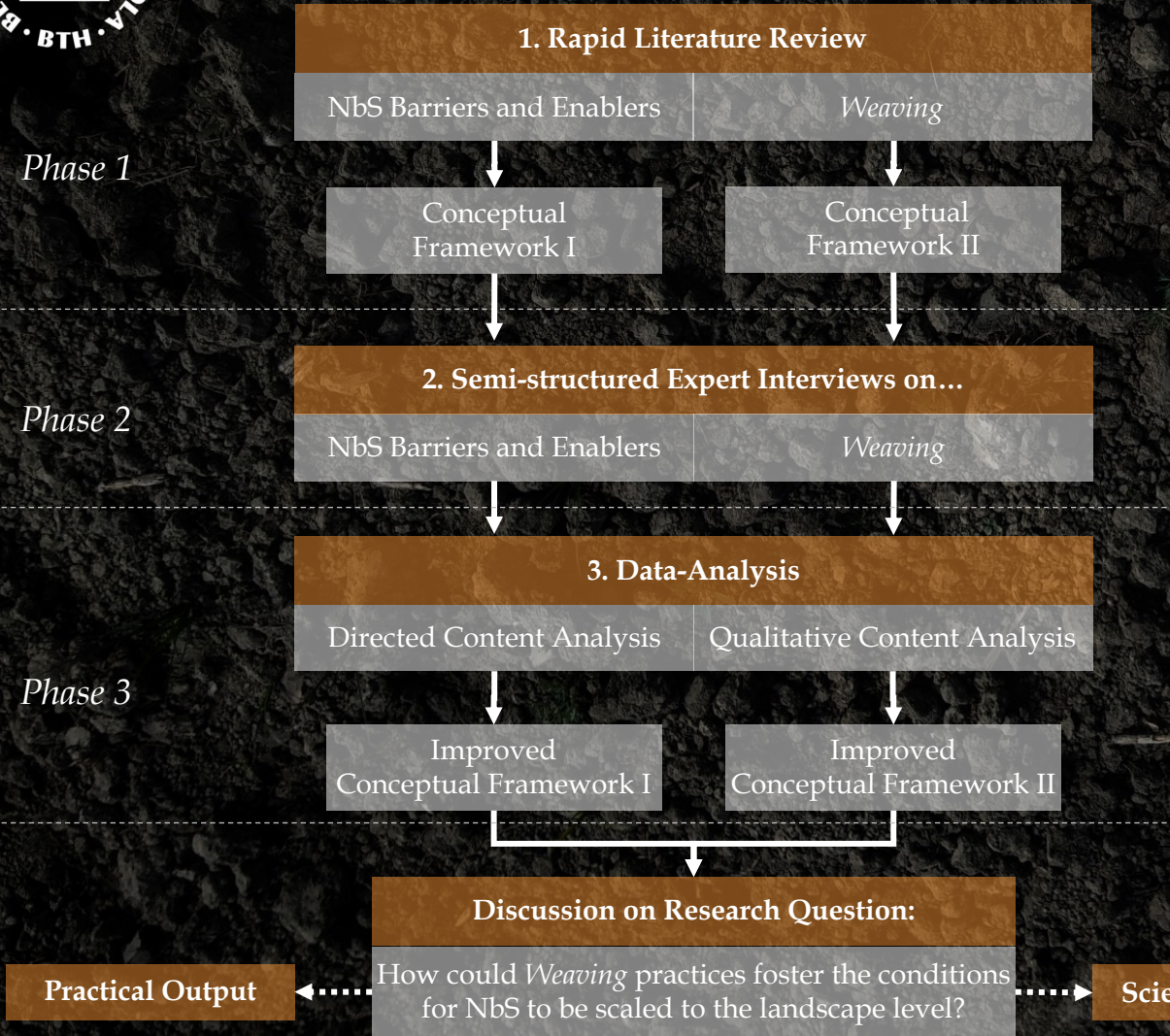
Toolkit

Scientific Discourse

Toolkit

HOW
Research
Focus





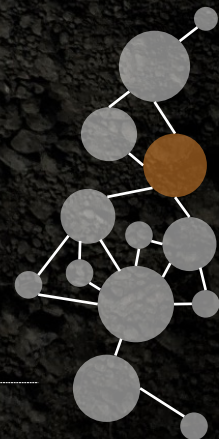
The research was conducted in an iterative manner that extracted and consolidated theory from literature to build conceptual frameworks, used these to inform the data collection through semi-structured interviews, and applied the insights again to the conceptual frameworks.

In Phase 1, 55 publications were studied on NbS and 18 of them considered for the analysis of barriers and enablers for scaling. 22 academic papers were found on *Weaving* and 12 analysed in more detail based on their relevance to sustainability.

In Phase 2, 18 semi-structured interviews were conducted on NbS and 13 on *Weaving* for primary, qualitative data collection.

The discussion contributes to a discourse around the two themes as well as their potential intersection.

HOW
Methods



If NbS are so promising...

Why are they not scaling?



Conceptual Framework I – Barriers and Enablers for scaling NbS to the landscape level

Despite the acknowledgement, promotion, and large-scale support for NbS as critical solutions to tackle the sustainability challenge holistically, they are not yet implemented on a large enough scale. There are several factors that hinder the uptake, scaling, and mainstreaming of NbS, which are referred to as ‘barriers’. Factors that support the implementation of NbS are called ‘enablers’.

The current literature presents several lists of barriers and enablers in urban settings. However, no comprehensive list of barriers or enablers was published specifically for the landscape scale or rural settings.

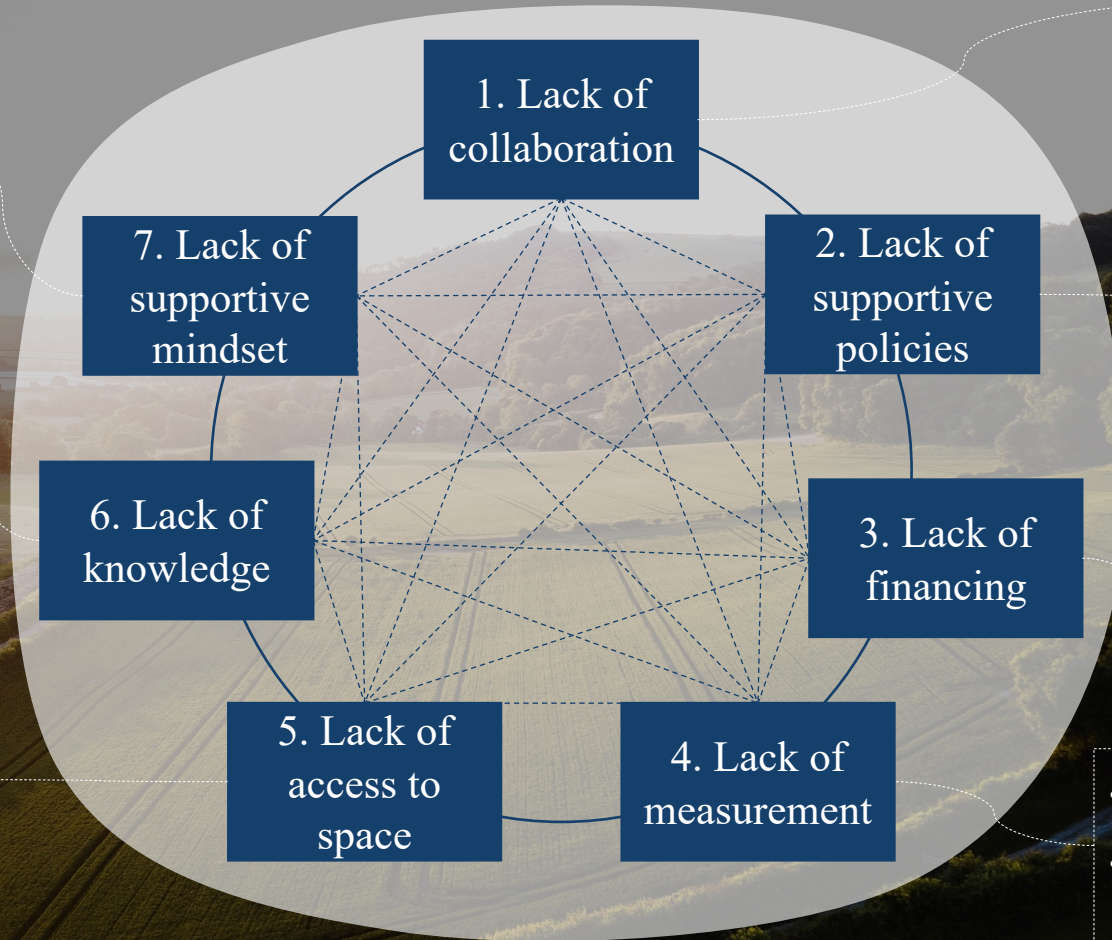
Hence, this research consolidated established lists from the urban context and validated them with experts for the landscape setting. The results of which can be found in the following pages.

Theme	Sarabi et al. 2019	Martin et al. 2021	Frantzeskaki 2019	McQuaid et al. 2021		
Collaboration & citizen engagement	<ul style="list-style-type: none"> Partnership among stakeholders 	<ul style="list-style-type: none"> Co-design (innovative stakeholder participatory processes that influenced the final NBS) 	<ul style="list-style-type: none"> Nature-based solutions experiments require and feed into trust between the city and its citizens both for the aim of the experiment and for the experimenting process itself Different for a for co-creating nature-based solutions are needed that include and learn from urban social innovation 	<ul style="list-style-type: none"> Co-production with local community/ entrepreneurs, partnerships/ collaborative governance; intermediaries 		
Theme	Sarabi et al. 2020	Dorst et al. 2022	Seddon et al. 2020	Schmalzbauer 2018	Price 2021	McQuaid et al. 2021
Collaboration & citizen engagement	<ul style="list-style-type: none"> Misalignments between short-term plans and long-term goals Lack of public awareness and support Site mentality 	<ul style="list-style-type: none"> Low private sector engagement Citizen engagement challenges Knowledge, data and awareness challenges Limited collaborative governance 				<ul style="list-style-type: none"> Lack of general public awareness of NBS concept
Policies						
Financing	<ul style="list-style-type: none"> Lack of political will and long-term commitment Lack of sense of urgency among policymakers Lack of supportive policy and legal frameworks 	<ul style="list-style-type: none"> Insufficient policy development, implementation and enforcement oriented at NBS 	<ul style="list-style-type: none"> Challenges to governing nature-based solutions 	<ul style="list-style-type: none"> Political support 	<ul style="list-style-type: none"> Inflexible and highly sectoralised policy, regulatory environments, existing direct and indirect subsidies and governance challenges, continue to favour grey, engineered solutions 	<ul style="list-style-type: none"> Lack of political will and urgency to invest in NBS, also barriers, short-term policies Fragmented/ inconsistent regulation
Measurement	<ul style="list-style-type: none"> Perceived high cost Lack of available financial resources Lack of financial incentives 	<ul style="list-style-type: none"> Insufficient public resources (incl. maintenance challenges) 	<ul style="list-style-type: none"> Lack of investment in nature-based solutions 	<ul style="list-style-type: none"> Financial support 	<ul style="list-style-type: none"> Lack of accessible funds and flawed approaches to economic appraisal lead to underinvestment in NBS Many benefits from NBS are difficult to monetise 	<ul style="list-style-type: none"> Lack of financing and reliance on public financing Lack of alignment with private sector investment interests
Knowledge sharing	<ul style="list-style-type: none"> Lack of design standards and guidelines for maintenance and monitoring Functionality and performance uncertainties 		<ul style="list-style-type: none"> Difficulties in measuring effectiveness 	<ul style="list-style-type: none"> Challenges for Evaluation 	<ul style="list-style-type: none"> Measuring the effectiveness of NBS is difficult 	<ul style="list-style-type: none"> Inconsistent approaches to measurement
Mindset	<ul style="list-style-type: none"> Lack of skilled knowledge brokers and training programs 			<ul style="list-style-type: none"> Knowledge gaps 	<ul style="list-style-type: none"> Lack of awareness/understanding of NBS approaches and nature's critical role in adaptation (entrenched attitudes and norms) Limited availability of knowledge and evidence to help make the business case for their use (especially against business-as-usual alternatives) 	<ul style="list-style-type: none"> Uncertainty over effectiveness of NBS Lack of evidence of effectiveness and resilience of NBS to climate change
Other						
Land	<ul style="list-style-type: none"> Property ownership complexities Space constraints 	<ul style="list-style-type: none"> Competition over urban space 				<ul style="list-style-type: none"> Competing land use priorities
Other	<ul style="list-style-type: none"> Risk aversion and resistance to change 	<ul style="list-style-type: none"> Literature based on NBS in urban development 	<ul style="list-style-type: none"> Governance of multifunctional green infrastructure Balancing trade-offs while delivering multiple goals Challenges for upscaling 	<ul style="list-style-type: none"> Technical challenges and gaps in capacity that impede wider implementation 	<ul style="list-style-type: none"> Public procurement challenges Lack of skilled suppliers in the private sector Complexity of governance 	

WHAT Results NbS



Conceptual Framework I – **Barriers** and Enablers for scaling NbS to the landscape level



- Detachment from nature
- Short-termism of human mind
- Fear of the unknowns
- Risk aversion and resistance to change

- Information is often scattered and hard to access
- Lack of consolidated evidence base to make the (business) case for nature instead of grey infrastructure
- Educational and training programs are mostly dedicated to traditional solutions

- Privatisation of land and water
- Lack of knowledge among land owners
- Ecosystem scales do not match with land ownership, administrative boundaries and political authority

- Institutional silos (and silo mentality)
- Lack of common language to promote NbS
- Lack of trans-boundary actors speaking the language of different groups
- Lack of public awareness and support
- Lack of shared vision on a local level

- Lack of political will and sense of urgency
- Politically-driven short-term action and decision-making cycles
- Path dependencies
- Lack of perceived responsibility for climate action

- Lack of alignment with private sector investment interests
- Perception of NbS as high risk (longer timeframes, more uncertainty)

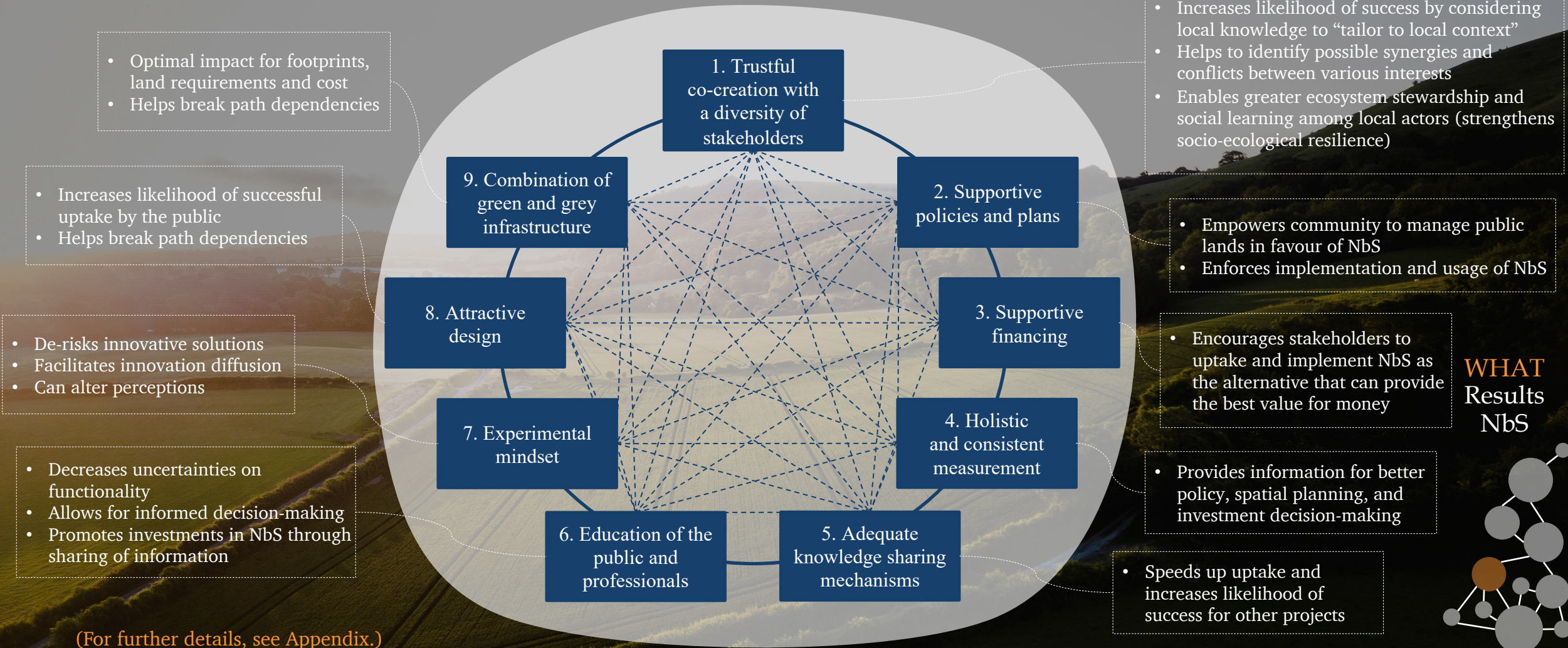
- Complexity of how NbS function is hard to understand and model
- Natural capital and climate accounting still early stage

WHAT
Results
NbS



(For further details, see Appendix.)

Conceptual Framework I – Barriers and Enablers for scaling NbS to the landscape level

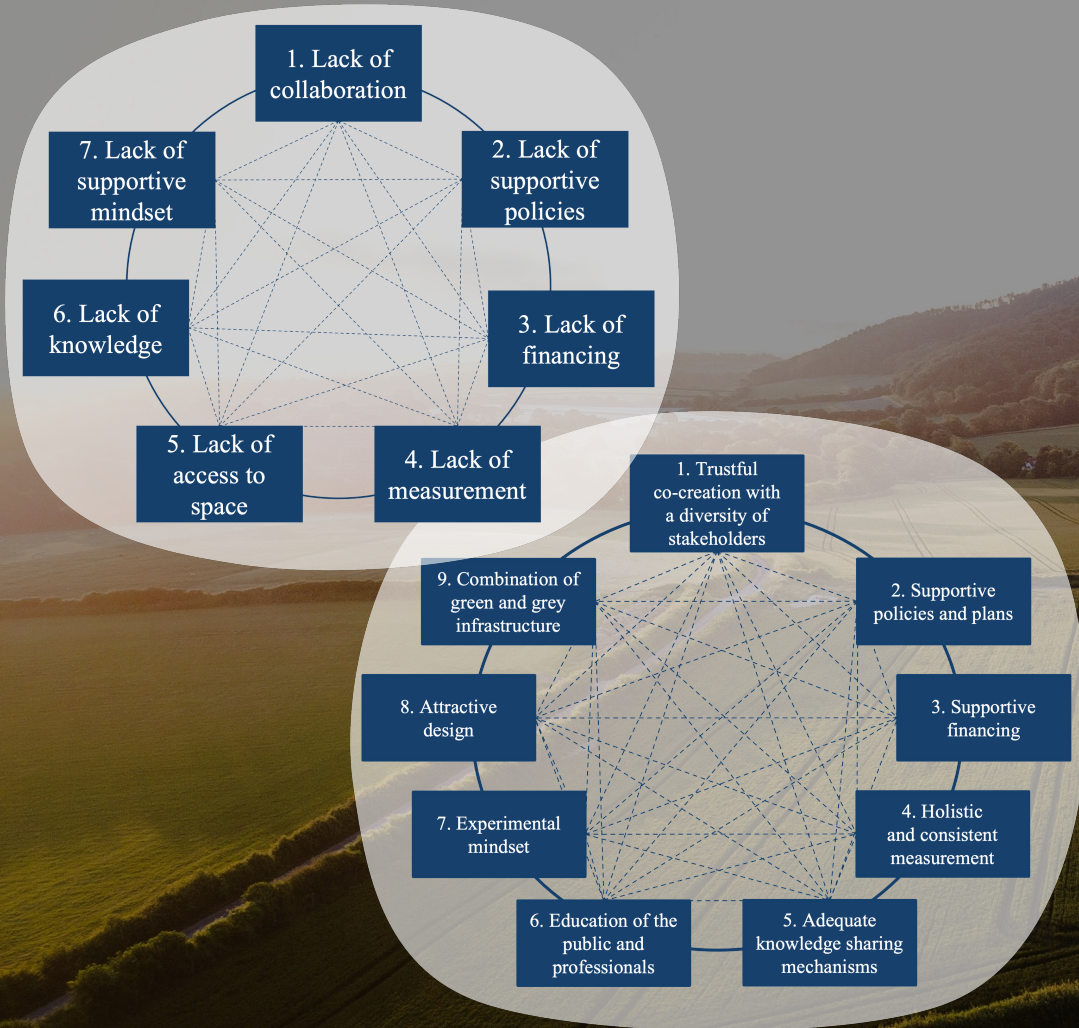


WHAT Results NbS



(For further details, see Appendix.)

Conceptual Framework I – **Barriers** and **Enablers** for scaling NbS to the landscape level



In summary, the collaboration stands out as a key component for NbS success and the current fragmentation and siloed approaches are a testament to the systemic failure of not fully recognising the interconnectedness of socio-ecological systems.

Barriers are highly interconnected, some are very context dependent, and many have ripple effects others. Further research is needed to qualify the interconnectedness in specific local contexts.

The listed barriers are merely the symptoms of structural conditions that are deeply rooted in how we design our social systems.

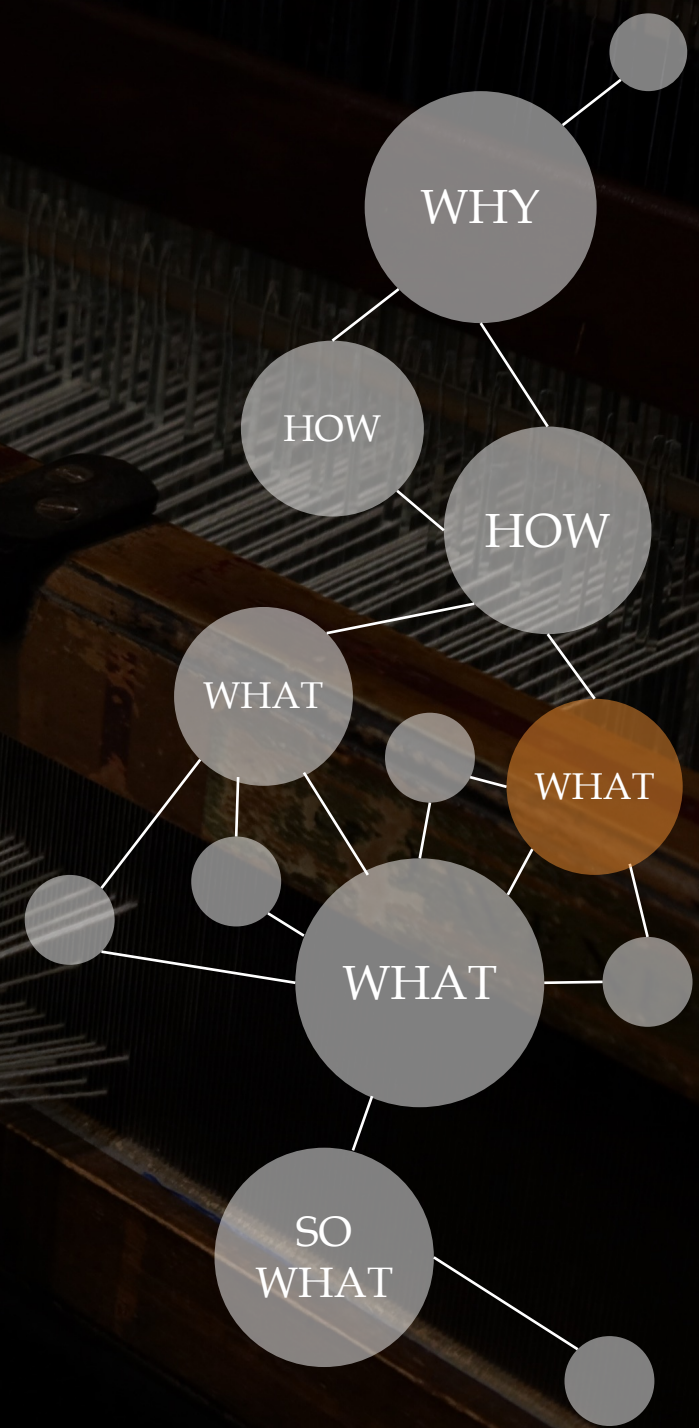
Trans-boundary actors “skilled in speaking the language of different groups, and connecting stakeholders” (Sarabi et al. 2020, 3) have been pointed out as a key leverage point to overcome several barriers, first and foremost, the lack of collaboration.

WHAT
Results
NbS





So... What is
'Weaving?'



Weaving as a relational leadership practice



Weaving is an emerging leadership practice that shows many similarities to other sustainability- focused leadership practices such as liminal leadership, systems and systemic leadership, integral or regenerative leadership to only name a few (Spencer-Keyes, Luksha, and Cubista 2020; Respondent #10; Respondent #16; Respondent #20). These practices are both evolutionary and developmental in their approach to shift the behavioural paradigms of industrial, competitive, command-and-control types of leadership, towards ones which act in more collaborative and co-creative manner, facilitating networks and communities to work and learn together (Spencer-Keyes, Luksha, and Cubista 2020; Respondent #10; Respondent #16; Respondent #20). Rather than approaching the challenges with a siloed and mechanistic mindset, leadership practices such as *Weaving* strategically connect diverse groups of actors in their pursuit to engage with the challenges at hand (Respondent #10). In doing so, they cross an ontological threshold in how they orientate themselves around complexity (Respondent #16).

WHAT
Results
Weaving



Weaving metaphors embody our relational nature and fundamental interdependence with the web of life



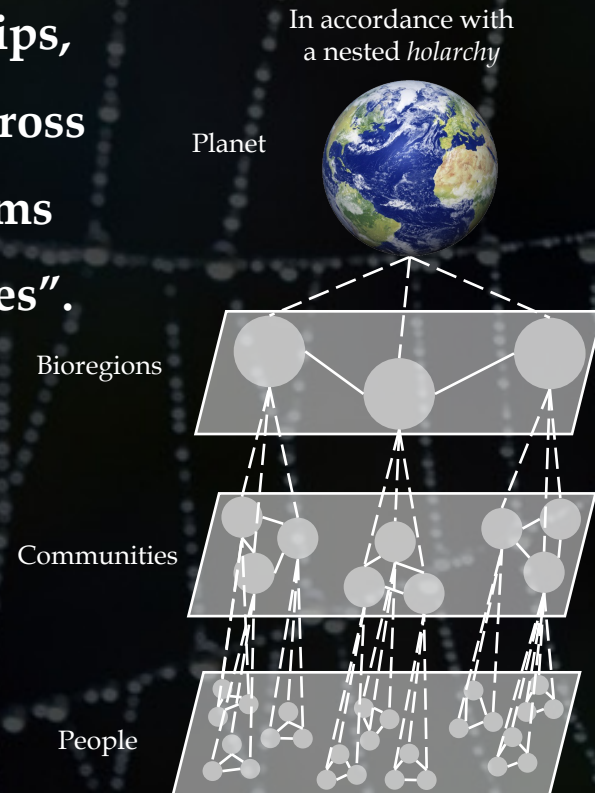
An emerging theme from the data was the use of *Weaving* as a metaphor and narrative to evoke “social imagination” (Respondent #17) and mobilise change (Respondent #1). Weaving practitioners often linked *Weaving* to recurring patterns of nature or life like spirals and fractals. Respondent #10 said that “scientific terms like *partnership brokering* and *systems innovation* do not seem to touch a wide range of people while *Weaving* brings more soul and aliveness that people seem to feel attracted to and seem to identify with”. The term has “a certain elegance and poetry to it” (Respondent #10) and it allows for a “sense of translation” beyond the academic field (Respondent #12) that everyone can bring their own meaning and motivation to. Interviewees highlighted how the Weaving terminology unites and inspires a community of practice and a sense of identity, functioning as “a strange attractor” (Respondent #10; Respondent #13; Respondent #20). Thus, the term *Weaving* can be seen as a powerful sense making tool (de Moor 2015) that evokes an embodied narrative of connectedness to others, to nature and the system as a whole.

WHAT
Results
Weaving



A *Weaving* working definition

“Weaving is the practice of cultivating meaningful relationships, within, between and across socio-ecological systems for synergistic purposes”.



When asked to define *Weaving*, interviewees often described it as “fluid”, “amorphous”, or “organic” (Respondent #17; Respondent #20), emphasising that the terminology of *Weaving* is constantly evolving and that there is no single definition that works for everyone. Whilst they found it difficult to specifically define *Weaving*, there were some recurring themes and patterns that surfaced during the interviews. Firstly, *Weaving* is seen as a set of interrelated practices or as a “dynamic”, “iterative”, “cyclical” or “spirally”, rather than a linear process (Respondent #15; Respondent #16; Respondent #20). There is no step-by-step process that can be followed, as *Weaving* is highly context-dependent, and requires “continual pivoting and adaptation” depending on everchanging local needs (Respondent #20). Secondly, *Weaving* involves cultivating meaningful relationships for synergistic purposes. Thirdly, in accordance with a holarchy, *Weaving* happens within, between and across different scales of socio-ecological systems.

WHAT
Results
Weaving



Five core *interrelated Weaving practices* were found



Weaving practices were a prominent theme that emerged through the interview process, prompting the researchers to further develop Conceptual Framework II with an additional literature review and expert interviews. The *Weaving* practices refer to the activities or actions that weavers do, which together have the potential of bringing about systemic change towards sustainability. Thus, they are all interrelated and interdependent and cannot be seen in isolation.

(For further details, see Appendix.)

WHAT
Results
Weaving



How **naming** can illuminate seeds of a more **sustainable system**

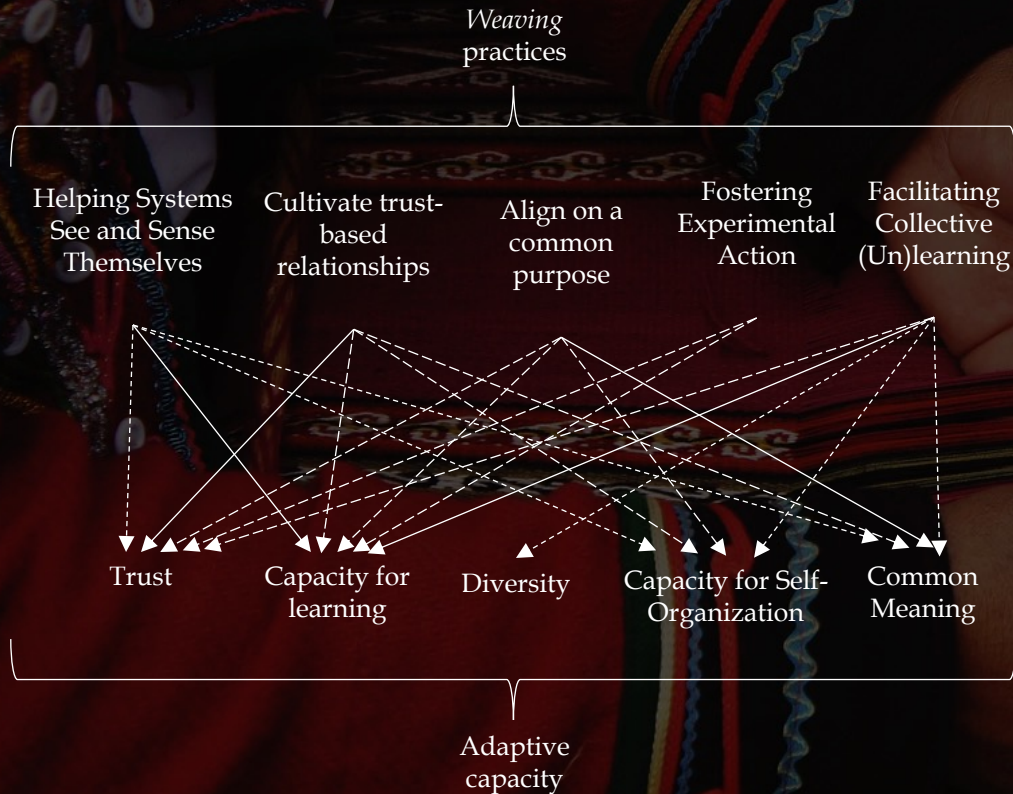


As *Weaving* was found to be an emerging concept, practitioners seemed to favour not to box the term by a specific definition and leave it open as a living term that evolves with time and the progression of the practice. However, not defining *Weaving* in clear terms might be an unrecognised obstacle that hinders practitioners from aligning on a shared vision that makes their efforts more coherent and effective. Thereby the working definition of *Weaving* can hopefully serve as a practical steppingstone to create more alignment around the concept and spur further evolution of the practice in different contexts. The process of defining *Weaving* and “naming” it as an important new approach to leading in complexity can help connect weavers into a nourishing community of practice that, together, can illuminate seeds of a more sustainable system while gracefully hospicing the old, unsustainable system.

WHAT
Discussion
Weaving



How *Weaving* can increase the adaptive capacity



Weaving has the potential to increase the adaptive capacity of social systems, as the practices align well with the essential aspects of social sustainability, which are trust, common meaning, diversity, capacity for learning, and capacity for self-organisation (Missimer, Robèrt, and Broman 2017). The *Weaving* practices directly address all essential societal needs apart from diversity. It might merely somewhat be represented in *facilitating collective (un)learning*, through weaving together diverse knowledge systems. One could, thus, suggest that diversity should be placed at the forefront of *Weaving* practices, as diverse and inclusive collaborations are key for fostering sustainability transformations (e.g. Abson et al. 2017 and Baumgärtner et al. 2008). Respondent #10 noted that “if we do not continuously bring new perspectives and voices into our networks, we risk creating echo chambers and bubbles”. Nevertheless, whilst diversity can be embedded more into the practices, the *Weaving* practices as a whole have the potential to increase the adaptive capacity and resilience of social systems through their interconnected and interwoven approach to the complex challenges.

WHAT
Discussion
Weaving





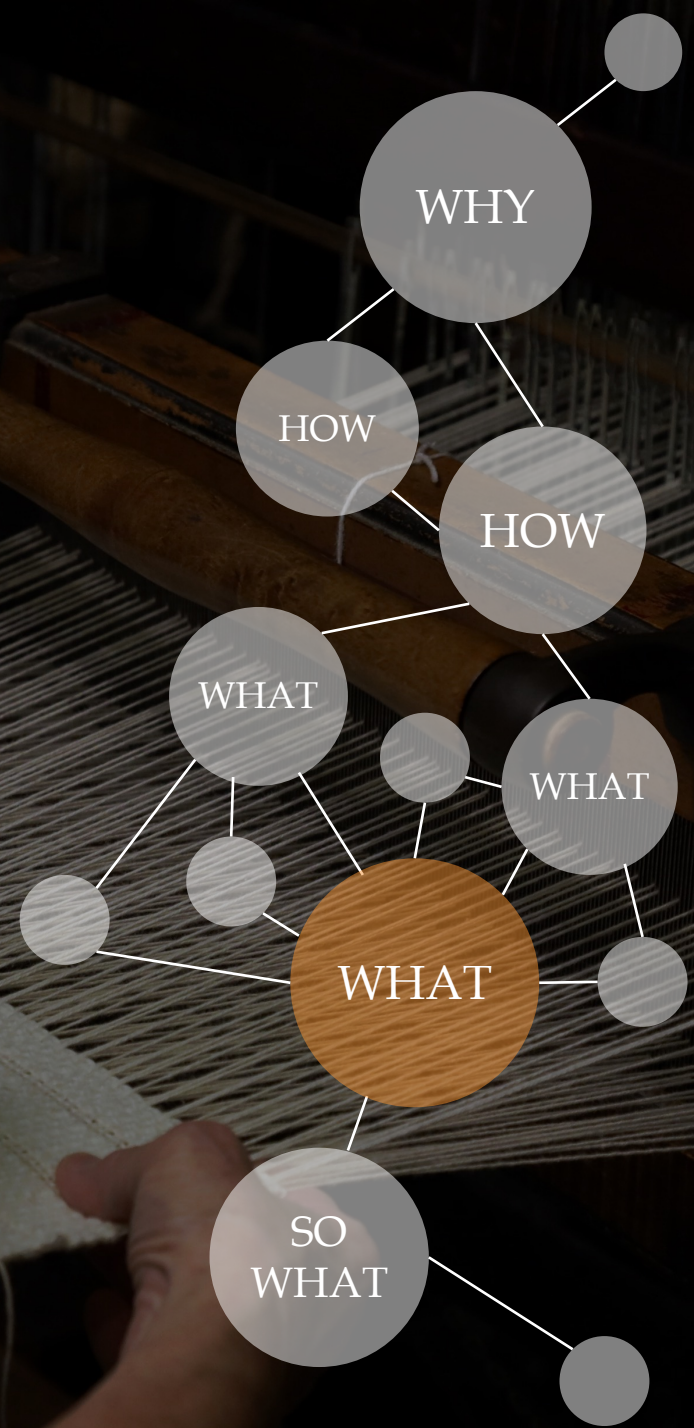
Southern Washlands

Now...

Could 'Weaving'
help NbS scale?

Half Moon Pond

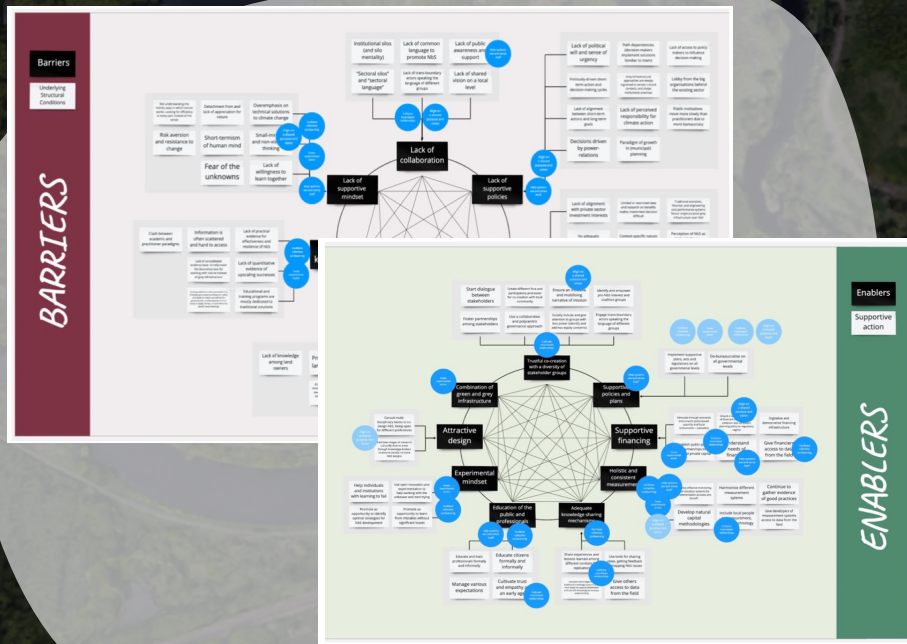
River Calder



Could 'Weaving' help NbS scale?

While the practice of *Weaving* is an emerging facet of leading in complexity and illustrates *how* the sustainability challenge could be tackled, nature-based solutions can be considered one part of *what* needs to be done to combat the current crises. There are several indications of potential direct and indirect leverage points where Weaving can address barriers and enablers to scaling NbS to the landscape level. Among the most obvious examples is the potential for overcoming the *lack of collaboration*, which weavers, as trans-boundary actors, can address with the practices of *cultivating trust-based relationships* and *helping systems see and sense themselves*. Both help to break silos within and bridge gaps between different organisations. Through strengthening collaboration and helping to align on a shared vision and purpose, *Weaving* also has the potential to indirectly address barriers like *lack of supportive policies*, *lack of financing* or *lack of access to space*, for example.

Despite these and other first indications, it became clear that a linear one-to-one mapping of *Weaving* practices on all barriers and enablers would not do justice to the complex and interconnected nature of both sides. Instead of problem-solving in a mechanistic way, the *Weaving* practices are based on sensing into the systems and responding not to symptoms, but rather the underlying structural conditions that hold the system in place. Thus, more research is needed to further qualify the potential of *Weaving* and *Weaving* practices to address specific barriers and enablers or the entire complexity of scaling NbS to the landscape level.



(For further details, see Appendix.)



What we invite you
to leave with ...





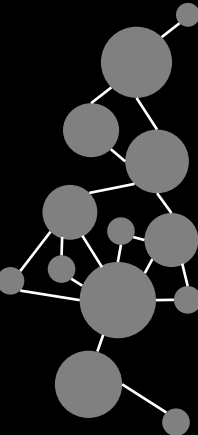
Interconnected challenges
require interwoven approaches.

And as Martin Luther King said:
We are all part of this system
that is in need of more resilience.

So let us start *Weaving*.



Appendices





Conceptual Framework I – **Barriers** and Enablers

1. Lack of collaboration

Several studies have shown the vital role of multi-stakeholder collaborations for successful and holistic landscape restoration projects (e.g. IPBES 2019). Hence, a lack of collaboration between stakeholders has been identified as a key barrier and consists of various facets. Often highlighted is the fact that within institutions, departments work in very traditional, siloed structures and different silos use different languages (Müller et al. 2022; Sarabi et al. 2020; Kabisch et al. 2016; Thorn et al. 2021). This often contradicts the multi-functionality of NbS and their inherent need for cross-departmental and cross-sectoral collaboration in planning, implementation, and maintenance (Schmalzbauer 2018). Müller et al. (2022, 59) attribute this siloed institutional approach partially to a “systemic failure of not fully recognizing the interconnectedness of the environmental, social and economic crises” (also see UNDP 2017, 9).

Beyond a silo-mentality within institutions, Müller et al. (2022) found conflicting operating time frames of NbS work and critical stakeholders to be a major reason for a lack of collaboration. Where NbS practitioners operate in periods of decades, decision-makers in politics, corporates, and financing institutions often operate in much shorter cycles of years or months, creating a discrepancy in expectations and incompatibility for collaboration. And even among those who implement NbS, collaborations are rare as practitioners are “absorbed by their own hard work to change systems and create multiple benefits at the same time, dealing with a myriad of stakeholders”, leaving little time for inter-initiative exchange which could unlock new financing and other opportunities (Müller et al. 2022, 61).

But also with regards to the general public and other stakeholders, a lack of engagement and commitment is pointed out as a key barrier (Müller et al. 2022; Dorst et al. 2022; Sarabi et al. 2020). Reasons for this appear to include (but are not limited to) a general lack of public awareness about NbS (Sarabi et al. 2020; McQuaid et al. 2021), a lack of common language and communication strategies to promote NbS (Müller et al. 2022; Thorn et al. 2021), an underappreciation of natural assets for social and economic resilience in general (Price 2021), and a fear of change (Schmalzbauer 2018). Sarabi et al. (2020, 3) specifically point to the lack of “trans-boundary actors skilled in speaking the language of different groups, and connecting stakeholders” and Müller et al. (2022, 59) found that rising polarisation between stakeholders “prevents people from finding true dialogue and co-creating solutions together”. As a consequence of critical stakeholders not collaborating sufficiently, there is a lack of shared vision for the future which, in turn, becomes a barrier again for streamlining efforts towards NbS success. NbS social entrepreneur Respondent #26, interviewed for the Bioregional Weaving Lab’s Insights Report, specifically points to the “need to shift from a national approach to a regional based vision, to restore trust between people” (quoted in Müller et al. 2022, 59).



Conceptual Framework I – **Barriers** and Enablers

2. Lack of supportive policies

A second, often-mentioned barrier is the lack of supportive policies (e.g. Sarabi et al. 2019; Dorst et al. 2022; Müller et al. 2022). Besides the overall lack of policies that promote NbS uptake, Dorst et al. (2022) and McQuaid et al. (2021) also highlight that extensive regional differences and inconsistencies in policies make it hard to implement NbS on a larger scale (nationally or even internationally). Müller et al. (2022, 60) argue that existing legal frameworks are often “out of touch with reality” and, therefore, stifle NbS uptake rather than support it. Seddon et al. (2020, 9) also mention examples like “rural development payment schemes, post-disaster recovery policies, [and] policies promoting intensive agriculture” that can clash with NbS interests.

The literature finds several underlying structural conditions for this lack of supportive policies that range from a lack of political will/urgency and short-termism to power- relations and path dependencies that drive decisions for grey (i.e. man-made/ constructed) infrastructure solutions over NbS (Sarabi et al. 2020; Kabisch et al. 2016; Schmalzbauer 2018; Price 2021; Seddon et al. 2020). Seddon et al. (2020) found that cognitive factors like a lack of awareness of ecosystem services provided by NbS and a lack of perceived responsibility for climate action in public institutions foster a reluctance to change policies in favour of NbS. McQuaid et al. (2021) also point to the fact that there is limited access to policymakers for those who promote NbS to influence decision-making, while social entrepreneurs interviewed for the Bioregional Insights Report 2022 note that competing solutions often have stronger lobbying power (Respondent #26). NbS expert Respondent #7 supports this and argues that such power imbalances between the incumbent and new solutions are the key challenge that underlies almost all other barriers.



Conceptual Framework I – **Barriers** and Enablers

3. Lack of financing

Generally, a lack of financing has been reported as a key barrier to NbS implementation and scaling (e.g. Sarabi et al. 2020; McQuaid et al. 2021; Thorn et al. 2021). Experts specify that it is in fact not an absence of available funding that is the problem, but the right allocation of existing money (Respondent #1; Respondent #2; Respondent #4; Respondent #6). Because financing can happen both through public funding and through private investments, there are two sides of problems that contribute to this barrier of fund allocation. On the public funding side, both traditional cost-performance measurement systems and a high-risk perception of NbS due to longer time frames and more uncertainties were found to favour single-purpose grey infrastructure over NbS in public funding decision-making (Price 2021). Interviews with entrepreneurs and experts also confirmed that budgets are often held by departments or ministries (like Ministry of Agriculture) which often do not have a direct interest in NbS while those that do (like Ministry of the Environment), do not have power over the money (Respondent #6; Respondent #24). Furthermore, maintenance costs for NbS are considered particularly vulnerable to budget cuts and, thus, increase the risk of NbS benefits not realising fast enough before funding for maintenance is stopped (Schmalzbauer 2018).

On the private investment side, the most significant problem appears to be a misalignment between investors interests and NbS characteristics (McQuaid et al. 2021; Respondent #1; Respondent #2; Respondent #4). While investors are often looking for clearly measurable, predictable, and rather short-term results, NbS are still novel interventions needing a lot of testing, monitoring, and evaluation which increases costs and decreases predictability in returns (Schmalzbauer 2018). And even if successfully implemented, the economic, societal, and environmental impact of NbS is naturally delayed and takes long time frames to realise, creating inherent uncertainties (Respondent #2). Furthermore, data on NbS-related benefits is often limited or restricted, which makes investment decisions difficult (Price 2021). Müller et al. (2022) also point out that there is a lack of adequate financing infrastructure for large scale investments and Price (2021) notes that existing barriers in the enabling environment of NbS make them even less attractive to investors. The same applies to the fact that benefits associated with NbS can often “not be capitalised by any one party or organisation”, creating externalities that impact on risk sharing and the attractiveness of investments (Seddon et al. 2020, 8; Price 2021, 17). Finally, Müller et al. (2022) stress that the carbon market is not yet working for social innovators with NbS as compensators usually favour projects that optimise for carbon sequestration, instead of strengthening holistic ecosystem resilience (also emphasised by Respondent #8).



Conceptual Framework I – **Barriers** and Enablers

4. Lack of measurement

A lack of harmonised metrics for monetary and nonmonetary valuation as well as inconsistent measurement of co-benefits and design standards is another barrier that is described extensively in the literature and confirmed by experts (e.g. Müller et al. 2022; Sarabi et al. 2020; McQuaid et al. 2021; Thorn et al. 2021; Schmalzbauer 2018; Raymond et al. 2017 cited in Price 2021). Müller et al. (2022) point to the fact that natural capital and climate accounting practices are still at an early stage in their development and Seddon et al. (2020) emphasise that assessments often still fail to fully consider trade-offs between ecological and socio-economic benefits. They even argue that “simple standardized metrics of NbS effectiveness that work across different scales, or that comprehensively capture the social-ecological dimensions of effectiveness, are unlikely to be found” and, thus, context-specific metrics will be the only way to generate reliable data (Seddon et al. 2020, 7). Both Seddon et al. (2020) and Respondent #5 suggest that the lack of adequate measurement is due to the complexity in which NbS work and the interdependence of factors that constantly fluctuate over time. This was further confirmed by Respondent #2 who stated that “[NbS] and their implementation are inherently complex, considering the range of ecosystem services, their multi-functionality, and the trade-offs between functions, and across temporal and spatial scales. This complexity makes their interests, impact, and value particularly difficult to exhaustively consider and assess.”

5. Lack of access to space

While a lack of space has been mentioned several times in the literature focussed on NbS in urban settings (e.g. Sarabi et al. 2020; Dorst et al. 2022; Thorn et al. 2021), experts have clarified during the interviews that on a landscape scale, the problem rather manifests in ownership complexities and privatisation of land and water bodies (Respondent #4; Respondent #6; Thorn et al. 2021). It is, thus, more a problem of competing interests and demands for the land than a physical lack of space. Respondent #8 has also mentioned that landowners often lack the knowledge to fully understand the benefits of NbS and, thus, do not support their implementation. Moreover, it has been highlighted that ecosystem scales often exceed land ownership, administrative boundaries, and political authority and, therefore, increase complexity around land usage (Kapos et al. 2019 cited in Price 2021).



Conceptual Framework I – **Barriers** and Enablers

6. Lack of knowledge

The lack of knowledge is described two-fold. Firstly, it is stated that uncertainties remain about the functionality and performance of NbS (Sarabi et al. 2020; McQuaid et al. 2021; Schmalzbauer 2018). It is suggested that while there is a lot of theoretical appraisal of the potential of NbS, practical evidence for their effectiveness, resilience, and upscaling successes is still scarce (Sarabi et al. 2020; McQuaid et al. 2021; Schmalzbauer 2018). Furthermore, information about NbS and their performance is mostly scattered and “existing evidence is often presented in such a way that is challenging for policy and decision-makers as well as the general public to understand, and frequently not in a ‘ready-to-apply’ format, or tailored to the specific local challenge” (Schmalzbauer 2018, 10). This makes it difficult for political decision-makers to adequately evaluate and compare NbS to other alternatives (Price 2021). Price (2021) also points out that the evidence base is still too poorly consolidated to make the (business) case for NbS. Secondly, the knowledge is not sufficiently disseminated through educational and training programmes which leads to professionals being educated for traditional solutions but not NbS (Sarabi et al. 2020). While validating all the above as a general problem for NbS uptake, Respondent #5 also hypothesized during the interview that academics mainly publishing on the problems of NbS and practitioners mainly talking about the successes of NbS hints at a mismatch or gap in communication that could add another factor hindering NbS success.

7. Lack of supportive mindset

The lack of supportive mindset was repeatedly mentioned by experts and practitioners during the interviews. The literature supports this through a discourse pertaining to a deeply rooted fear of the unknowns, risk aversion, and resistance to change that hinder NbS as a new type of intervention to be scaled (Sarabi et al. 2020; Kabisch et al. 2016; Solheim et al. 2021). Interviewees pointed out how stakeholders on all levels lacked an adequate understanding of the holistic ways in which nature works and named a general detachment from nature as a core underlying condition that leads to overall underappreciation of ecosystem services and overemphasis on technological solutions to socio-ecological problems (Respondent #4; Respondent #8). Commonly mentioned was also the inherent short-termism of the human mind and, thus, a lack of capacity to think in a visionary way (Respondent #1; Respondent #4; Respondent #8). Lastly, an observed lack of willingness to learn together was brought up as a key mindset that hinders NbS implementation and scaling (Respondent #4; Respondent #8).



Conceptual Framework I – Barriers and Enablers

1. Trustful co-creation with a diversity of stakeholder groups (1/2)

Synergistic partnerships among and co-creation with various stakeholder groups in planning, implementation, and maintenance is by far the most-mentioned enabler in the literature (McQuaid et al. 2021; Martin et al. 2021; Schmalzbauer 2018; Sarabi et al. 2019; Frantzeskaki 2019; Cohen-Shacham et al. 2016, Somarakis et al. 2019 and WWAP/UN-Water 2018 cited in Price 2021). The rationale for this enabling factor is multi-faceted. Sarabi et al. (2019), for example, argue that due to the multidisciplinary nature of NbS vertical and horizontal cooperation is needed to generate the multitude of benefits and outcomes that NbS have the potential to create. The authors further highlight that collaboration is critical for developing a shared vision as well as common understanding of NbS and nature in general. When a vision for the landscape is co-created with a diversity of stakeholder groups, they feel more stewardship and acceptance, trust, and connection with the project (Sarabi et al. 2019; Schmalzbauer 2018; Somarakis et al. 2019 cited in Price 2021). With an increase in public awareness around environmental and societal issues, the willingness to co-create and to legitimize efforts has risen (McQuaid et al. 2021).

Critical in this part, however, is that inclusion and equity concerns need to be considered carefully, and open dialogue needs to be established between parties to avoid domination of the process by one or few powerful parties (Sarabi et al. 2019; Schmalzbauer 2018; Somarakis et al. 2019 and WWAP/UN-Water 2018 cited in Price 2021). Innovative and participatory stakeholder co-creation processes and different fora with “inclusive narratives of mission” are suggested for this to involve affected people as early as possible in the process (Martin et al. 2021; Frantzeskaki 2019, 108). An early involvement also helps to consider, negotiate, and calibrate the diversity of goals and priorities that exist among relevant stakeholders as well as identifying potential synergies and conflicts (Schmalzbauer 2018; Somarakis et al. 2019 cited in Price 2021). Frantzeskaki (2019, 108) argues that “early scepticisms, criticism, even negativity can be turned into constructive points for improving the design and the process of planning and co-creation of a nature-based solution”. Similarly, Sarabi et al. (2019, 10) found that bringing in local and indigenous knowledge increases the likelihood of success for interventions as they become more “[tailored] to the local context”. Multi-stakeholder approaches are also said to help break path dependencies that would otherwise continue to favour known solutions and social learning can happen among local actors which, from a systems perspective, strengthens the socio-ecological resilience of a given community (Sarabi et al. 2019). Public-private partnerships have been found to support implementation and scaling by combining top-down regulation with flexibility and through complementing technical and financial resources (Schmalzbauer 2018; Sarabi et al. 2019).



Conceptual Framework I – Barriers and Enablers

1. Trustful co-creation with a diversity of stakeholder groups (2/2)

But not only the trustful co-creation among different stakeholder groups is important. Martin et al. (2021) and Schmalzbauer (2018) also argue that a polycentric governance structure within organisations is critical to overcome silo-structures through cross- departmental collaborations and novel arrangements in public administration for example. Close collaborations with pro-NbS interest groups and champions can increase pressure or mobilise engagement among peers both on institutional and local community levels (Martin et al. 2021; Cohen-Shacham et al. 2016 cited in Price 2021). Sarabi et al. (2019) and Schmalzbauer (2018) explicitly highlight the critical role of transboundary actors that are not affiliated with any involved party but facilitate and coordinate between stakeholder groups. This was further emphasised by Respondent #5 who emphasised transboundary actors as the biggest leverage point for scaling enabling conditions.

2. Supportive policies and plans

Policies and political plans have an enormous steering function and can significantly influence the uptake of NbS (Sarabi et al. 2019; McQuaid et al. 2021; Somarakis et al. 2019 cited in Price 2021). Plans, acts, and legislations can empower communities to manage land in favour of NbS and can even enforce the usage of NbS (Sarabi et al. 2019). By setting and communicating international, national, regional, or local targets and plans, administrations send signals about the overall direction for development and incentivise actors to work towards those commonly agreed upon targets. Hence, a proactive and explicit policy steering towards NbS on all political levels can be a strong leverage point for NbS uptake (McQuaid et al. 2021). During the interviews for the Bioregional Weaving Lab Insights Report 2022, NbS entrepreneurs have also mentioned that debureaucratization on all governmental levels is urgently needed for NbS policies to be implemented efficiently and effectively (e.g. Respondent #25).



Conceptual Framework I – Barriers and Enablers

3. Supportive financing

The financing of NbS is closely linked to other factors such as the availability of data and policies. Again, several interviewees suggested that an absence of available funding is not the problem, but the right allocation of existing money (Respondent #1; Respondent #2; Respondent #4; Respondent #6). The two main streams of financing for NbS are public funding including economic policy instruments and private sector investments. On the public side, price-based economic instruments like fees for ecosystem services can raise funds to be invested in NbS and incentivise further investments in NbS rather than in traditional solutions (Droste et al. 2017; Martin et al. 2021). Fiscal instruments like the inclusion of ecological criteria in subsidy distribution or grants can further direct capital towards solutions that generate holistic benefits, like NbS (McQuaid et al. 2021; Droste et al. 2017). Schmalzbauer (2018) specifically emphasises the need for public-private partnerships as a means to channel private capital into NbS while providing securities through coherent and consistent policy and regulatory regime. During the expert interviews, Respondent #4 highlighted the importance of NbS projects acknowledging private sector financier's needs and interests and Respondent #1 pleaded for more digitalised and democratised financing infrastructures that distribute capital to a multitude of different solutions.

4. Holistic and consistent measurement

To improve NbS implementation and make better decisions, data is needed about NbS effectiveness and value generation (Sarabi et al. 2019; McQuaid et al. 2021; Global Commission on Adaptation 2019 cited in Price 2021). Due to the inherent multi-dimensional nature of their benefits, measuring NbS is complex (Respondent #5). It requires nested multiscale assessment systems that consider and stack the holistic value that NbS create (Sarabi et al. 2019; Respondent #8). Natural capital approaches appear to be promising tools to help value nature's benefits (Price 2021). For measurement systems to be improved and harmonised, Respondent #1 points out the importance of granting developers access to data from the field and Respondent #9 emphasises the need for external support with this as those implementing NbS are often too occupied with other work so that measurement and data collection naturally fall short. With that goes a need for measurement systems to be practical and easy to use. Beyond technical measurement systems, Respondent #8 also points out the need for including local people in the measurement and building on their knowledge.



Conceptual Framework I – Barriers and Enablers

5. Adequate knowledge sharing mechanisms

As NbS are still a novel approach and high degrees of collaboration are needed for successful implementation and scaling, efficient knowledge sharing mechanisms are key. Technologies can be used to share ideas, experiences, and lessons learned across different regions and between different parties as well as getting feedback from critical stakeholders and mapping NbS issues (Sarabi et al. 2019; McQuaid et al. 2021). Frantzeskaki (2019, 108) even argues that NbS themselves should be designed in a way that “lessons for their effectiveness can be easily harvested” and replication in other locations becomes easier. Respondent #1 suggests giving others open access to data from the field once an NbS is implemented to enable collective learning. Sarabi et al. (2019) highlight that increased flows of information may also encourage more investments in NbS. The Global Commission on Adaptation (2019 cited in Price 2021) emphasises the importance of increasing both the flows of scientific and indigenous knowledge, the latter commonly having adaptive capacity and a systems perspective deeply embedded. Overall, this approach helps to speed up the uptake of NbS and increases the likelihood of success for other projects (Respondent #1).

6. Education of the public and professionals

The education of the public can decrease uncertainties and doubts regarding the functionality of NbS and catalyse public support for their implementation and scaling (Sarabi et al. 2019). The authors plead for both formal (in the classroom) and informal education (e.g. through media) in this regard. Interviewees agree with Schmalzbauer (2018) that early age education plays a critical role in the overall uptake of NbS. Specifically, Respondent #4 emphasised the need for working with the young generation to shift mindsets from “man vs. nature” to “we are nature” and Respondent #1 mentioned the importance of cultivating trust and empathy from a young age to ease multi-stakeholder collaborations later on. Sarabi et al. (2019) argue that not only the public should be educated about the NbS, also professionals need to be trained to handle both decision-making and practical work with NbS appropriately (Sarabi et al. 2019). More and more experts will be needed to plan, implement, and maintain the NbS over time (Respondent #2). Finally, Nesshöver et al. (2017 cited in Price 2021) state the need for carefully managed expectations through educating both the public and professionals about benefits, functionality, costs, and overall complexity of NbS.



Conceptual Framework I – Barriers and Enablers

7. Experimental mindset

Experimentation is not only important for iteratively finding the best strategies for NbS development and to learn from mistakes without significant losses (Sarabi et al. 2019). An experimental approach also helps to make NbS more tangible for stakeholders, decrease uncertainty, and de-risks the innovative solutions (Frantzeskaki 2019). Experiments, therefore, have the potential to invite for discussions, can alter perceptions, and build trust and appreciation among important parties (Sarabi et al. 2019; Frantzeskaki 2019). Respondent #8 argues that it can give people a way to break loose from a negative mental spiral in face of the sustainability challenge. Combined with the right knowledge sharing mechanisms, an experimental mindset can facilitate innovation diffusion through, for example, open innovation approaches (Sarabi et al. 2019). Furthermore, an experimental mindset helps individuals and organisations with learning to fail and working with the unknown (Respondent #4). Respondent #9 highlights the importance of applying this experimental mindset not only to NbS as the product but also to resources, rules, roles, and ways of working. For an experimental mindset to be applied, Respondent #7 points out the need for a safe space in which ideas are nurtured with sufficient budget and governance protection while still being fragile.

8. Attractive design

Paying attention to the aesthetical aspects of NbS is often mentioned as a critical factor for their successful uptake by the public (Sarabi et al. 2019; Frantzeskaki 2019). Although functionality being relatively more important than aesthetics on the landscape level, interviewees confirmed that, for example in the case of grey interventions like wind turbines or coastal protection measures, aesthetics mattered as well (Respondent #1; Respondent #4; Respondent #5). Many people visit rural areas for recreational purposes and do care about the aesthetics of whatever solution is being implemented (Respondent #1). Hence, planners carefully need to consider different perspectives while planning NbS implementation.

8. Combination of green and grey infrastructure

While mainly mentioned in the literature for NbS in urban settings (Sarabi et al. 2019; Martin et al. 2021), a combination of green and grey infrastructure also seems important on a landscape level, as supported by several expert interviewees (e.g. Respondent #4 and Respondent #6). Despite being less dominant in rural settings, combining existing grey infrastructure with natural solutions can help break path dependencies towards grey infrastructure options and ease the way for NbS to become more widespread. Particularly in the fields of water management and energy, the combination was highlighted as a promising enabler.



Five core *interrelated Weaving practices* were found

1. Helping systems see and sense themselves

Weavers initiate and support systems to see and sense themselves. This implies that they help people see themselves as part of a larger system in order to better understand the dynamics of these complex socio-ecological systems (Respondent #10; Respondent #15; Respondent #16; Waddock and Waddell 2021). Through this systems perspective, weavers allow actors to better understand their own role in catalysing systems change and the identification of potential leverage points that can lead to large-scale and fundamental changes (Lee and Waddock 2021; Respondent #10; Respondent #15; Respondent #16; Respondent #20; Respondent #21). Seeing and sensing systems can be done informally, for example, through facilitating dialogues with key stakeholders (Waddock and Waddell 2021). A more structured and rigorous approach is also possible through participatory mapping processes with tools such as systems mapping, data analysis and visualizing, network mapping, and social network analysis (de Moor 2018; Waddock and Waddell 2021; Krebs and Holley 2006; Respondent #18).

2. Cultivating trust-based relationships

Weavers shed light on the potential for synergy and actively cultivate trust-based relationships. When weavers help people become more aware of the systems around them, they enable them to better see the potential of mutual benefit within those systems (Vance-Borland and Holley 2011). A weaver strategically 'illuminates' this potential for synergy to the wider system, so that a mutualistic relationship between key actors can organically arise or be strengthened (Respondent #10; Respondent #19; Vance-Borland and Holley 2011; Krebs and Holley 2006; Waddock and Waddell 2021; Holley 2012). Additionally, weavers actively create the conditions for fostering deep and meaningful relationships. For example, they facilitate generative dialogues and deep listening practices as well as sensing into what wants to emerge (Respondent #12; Respondent #15; Respondent #16; Respondent #19; Respondent #20; Spencer-Keyes, Luksha, and Cubista 2020). Weavers specifically focus on cultivating relationships based on trust, as trust is the foundation for creating thriving networks and sustaining socio-ecological systems (Respondent #10; Respondent #12; Respondent #20; Ehrlichman, Sawyer, and Spence 2018; Röbbke 2020; Missimer, Robèrt, and Broman 2017). Cultivating trust-based relationships is something deeply human and cannot be mechanised (Respondent #13; Respondent #15). Like Wheatley (1999, 145) said: "If we are interested in effecting change, it is crucial to remember that we are working within webs of relations, not with machines".



Five core *interrelated Weaving practices* were found

3. **Aligning on a shared purpose and vision**

Weavers help people align and connect to a shared purpose and vision. This alignment provides the foundation for a common practice and a shared understanding (Goldstein et al. 2017; Respondent #21). Weavers help bring initiatives into alignment, for example, by co-creating or collaboratively uncovering a shared intention, aspiration, identity, purpose, vision, narrative or set of values (Meadows 1999; Goldstein et al. 2017; Waddock and Waddell 2021; Rübke 2020; Respondent #19; Respondent #20; Respondent #21). Moreover, weavers help communicate the shared visions through crafting, articulating, and framing these visions in powerful narratives, stories, images, and other symbols (Klerkx, Aarts, and Leeuwis 2010; Waddock and Waddell 2021). Frequently mentioned purposes revolved around universal wellbeing, the regeneration of life, a story of love, the evolution of complex systems, or co-creating thriving communities and ecosystems (Respondent #10; Respondent #20; Respondent #21).

4. **Fostering experimental action**

Weavers foster experimental action for collective impact. Weavers create “safe” and “brave spaces” for others that encourage rapid experimentation and invite questioning, exploring, and analysing assumptions (Respondent #14; Respondent #15; Waddock and Waddell 2021; Goldstein et al. 2018). Weavers specifically foster experimental actions that could bring about large-scale and fundamental change, as opposed to incremental or fragmented approaches (Lee and Waddock 2021; Respondent #20). This requires nurturing “courage”, “action-confidence”, and a “sense of agency” (Respondent #14; Respondent #15; Respondent #17; Rübke 2020). An example of fostering experimentation is using ‘rapid prototyping’ with a design-thinking logic to facilitate quick action-learning cycles (Waddock and Waddell 2021). Weavers also experiment with different approaches or methods for relationship building or collaboration methods, realising every process is highly context dependent and requires continuous adaptation and iteration (Goldstein et al. 2017; Respondent #20). Besides fostering experimental action, weavers foster collaborative actions, for example through interconnecting already existing projects to create mutually reinforcing outcomes (Respondent #10; Respondent #20). Even though weavers generally catalyse innovation, they also have an openness to using what already exists (Respondent #20).



Five core *interrelated Weaving practices* were found

5. Facilitating collective (un)learning

Weavers facilitate collective learning and unlearning. They continually share and make sense of what has been learned from the experiments to the wider system, to support collective learning and conscious evolution (Waddock and Waddell 2021; Rübke 2020; Respondent #20). Weavers are aware of the information, knowledge, and ideas that are already present in the system, and subsequently open, aggregate, and direct these flows of information to the right places at the right time (Waddock and Waddell 2021; Goldstein, Smith, and Ryan 2021; Goldstein et al. 2018; Respondent #16; Respondent #18; Respondent #20). Weavers can have a curatorial role, enabling people to navigate complexity and information overload more effectively (Kampelmann, Kaethler, and Hill 2018). Sharing knowledge, information or ideas can be done in numerous ways, for example through storytelling, arts, events or digital community platforms (Respondent #10; Respondent #11; Respondent #14; Respondent #17). Besides opening and directing the flow of information, weavers help co-produce new knowledge (Chambers et al. 2021). Weavers, for example, help diverse knowledge systems collaboratively mobilise, translate, negotiate, synthesise, and apply multiple types of knowledge to create a shared and coherent understanding (Tengö et al. 2017; Respondent #10; Respondent #20). This does not only involve learning, but also unlearning, as weaving knowledge often requires “a softening of the ego” or a “beginners mind” of the people involved, enabling them to let go of preconceived ideas or models and being more open to the collective possibility (Respondent #10; Respondent #14; Respondent #15; Respondent #16; Respondent #20).



Could 'Weaving' help NbS scale? (1/3)

Among the most obvious is the potential for overcoming the lack of collaboration which Weaving can address with the practice of cultivating trust-based relationships to break silos within and bridging gaps between different organisations that are critical for NbS implementation on the landscape scale. Weavers can function as intermediary or trans-boundary actors that are not affiliated with any involved party but have the potential to cohere and convene different groups by speaking their different languages. Especially considering the fast pace in which the concepts and language around NbS evolve, weavers can play a critical role in linking the parts that might otherwise develop into entirely different directions and create a common language. An increase in collaboration among NbS-critical stakeholders can also be supported by the practice of helping systems see and sense themselves. For example, this practice helps stakeholders to understand the interconnectedness of the environmental, social, and economic crises, as well as their own agency in the crises. A lack of such awareness and understanding has been reported as a key underlying structure that fosters a lack of collaboration (see UNDP 2017, 9). The practice of aligning on a shared vision and purpose could help bridge the gap between different operating timeframes that practitioners and policymakers or financiers, for example, were found to have. Similarly, it has the potential to help the public (i.e. the local community in the case of BWL) to create a shared vision for the landscape that is to be transformed and, hence, strengthen feelings of stewardship, connection, trust, and acceptance which are critical to mediating conflicting interests and creating a common goal. Finally, the practice of facilitating collective (un)learning has the potential to ensure that local and indigenous knowledge systems are as much considered as other types of knowledge, which helps to tailor the NbS implementation to the given local context and, thus, increases likelihood of success. Besides establishing a shared language, facilitating the dissemination of knowledge, can also contribute to raising overall awareness about NbS which, in turn, fosters citizen engagement and secures a social license to operate.

Overall, the facilitation of connection and knowledge exchange between and across holonic structures can help stakeholders engage in collaboration where time and capacity constraints make it difficult to engage when no external facilitation is provided. In the example of BWL, this can take the shape of connecting individual NbS social entrepreneurs among themselves to exchange best-practices on the implementation (horizontal connection) or connecting social entrepreneurs to policymakers, for example, to lobby for better regulatory conditions across governance scales (vertical connection).



Could 'Weaving' help NbS scale? (2/3)

By potentially addressing the collaboration aspect of NbS implementation on the landscape level directly, Weaving also has the potential to indirectly address 'what barriers' like lack of supportive policies, lack of financing or lack of access to space. These are all areas in which systems change and mindset shifts are needed to support the scaling of NbS. Weaving might have the potential to facilitate these systems changes and mindset shifts by directly helping to overcome a lack of collaboration as one example. Through the practice of helping systems see and sense themselves, for example, Weaving could help overcome the lack of perceived responsibility to collaborate with NbS practitioners that was found to be present in critical ministries or departments and continues to hinder effective NbS implementation on the landscape scale. Trust-based relationships between NbS practitioners and policymakers that weavers could cultivate might help create collaboration and, through that, overcome the issue of traditional solutions having powerful lobby groups that influence policy decision-making in their favour, often opposing the needs of NbS. To create supportive financing, the practice of aligning on a shared vision and purpose between the collaborating parties might address a misalignment of investment interests and facilitating collective (un)learning could increase the open flow of information needed to make good investment decisions in NbS. As established in the Results section 4.1.2, a lack of access to space is rather a problem of ownership and authority complexities than an actual lack of land. Since Weaving happens holonically and connections are built across levels (irrespective of man-made borders), it has the potential to address the challenges that come with working across municipalities, counties, and even nation- states for large-scale NbS implementation. These are some examples of barriers which Weaving might address indirectly, given the complexity of both barriers and enablers as well as Weaving as a concept, more indirect touchpoints might be possible and require further research.

While the enabler 'trustful co-creation with a diversity of stakeholder groups' corresponds to what was said above, other 'how conditions' that could be addressed by Weaving are the enabler 'experimental mindset' and the barrier 'lack of supportive mindset'. By fostering experimental action, weavers can help communities try, test, and learn about the best strategies for locally implementing NbS in safe incubation space without risking significant losses in case of failure. Supporting people to approach NbS implementation with experimental action also allows for dealing with the uncertainty around them and can change perceptions of new interventions like NbS as outlined in section 4.1.3 on experimental mindset. When applying the experimental mindset not just to NbS as a product but also to resources, rules, and roles (as Respondent #9 mentioned), this Weaving practice could help change the fundamental structures of the system (e.g. policy-making and financing). Specifically in the example of BWL, the practice of helping systems see and sense themselves could contribute to a fundamental shift from the paradigm of human-nature detachment, which has been reported as a key barrier for pro-NbS policy change for example, to what the BWL collective calls a paradigm of "We Are Nature".



Could 'Weaving' help NbS scale? (3/3)

Broadly speaking, the practice of cultivating trust-based relationships stood out in the mapping (see Appendix M) as one of the most dominant practices for helping NbS scale. This suggests that the strength of the relationships within a system, indicated by level of trust and trustworthiness, for example (Missimer, Robèrt, and Broman 2017), may be one of the most important success-factors for endeavours of implementing novel and complex solutions like NbS. Additionally, Weaving practices mapped onto the barriers showed a continuous theme of three specific practices being featured on several of the barriers. The Weaving practices of aligning on shared purpose and vision, helping systems see and sense themselves and facilitating collective (un)learning could all be mapped to the barriers of lack of supportive policies, lack of supportive mindset, lack of collaboration and lack of knowledge. Suggesting that in order to shift the system from its current paradigm and ways of working, a systems perspective with an aligned vision and collective knowledge dissemination could weave together the currently fragmented approach to scaling NbS.

During the mapping process itself, however, it soon became clear that a linear one-to-one mapping of Weaving practices on all barriers and enablers with the guiding question "Can this barrier/enabler be addressed by any of the five Weaving practices?" would not do justice to the complex and interconnected nature of both sides. Initially, the mapping exercise aimed to develop a linear and practical application of how Weaving practices could foster the conditions for scaling NbS. In doing so, the researchers intended to develop a framework that would help organisations like BWL who are using Weaving, to identify and overcome the gaps in their current work of scaling NbS to landscape level. However, beyond the above-mentioned first indications of potential touchpoints, the researchers acknowledge that complex and interconnected problems require complex and interconnected solutions, and a linear one-to-one mapping would not solve a gap in the process of scaling NbS to a landscape level. Barriers will not be overcome if they are not addressed as a whole, starting from their underlying structural conditions. Weaving is a dynamic process and highly context dependent. Instead of moving in a mechanistic, band-aid solution mindset, which can be found in many siloed approaches to problem solving, the Weaving practices are based on sensing into the systems and responding not to a symptom, but rather the underlying structural conditions that hold the system in place. Thus, the emergence of Weaving as a new leadership practice, for example in the work of large-scale landscape restoration, is promising to help overcome identified barriers and create enabling conditions for NbS to be scaled. Future studies might find better suited methodologies to investigate and further qualify the potential of Weaving and Weaving practices to address specific barriers and enablers or the entire complexity of scaling NbS to the landscape level.