

# Nature-based Solutions:

Interdependent social-ecological  
systems for resilience to global  
changes



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# Framing of Nature-based Solutions (NbS)



## People and nature as separate

- NbS benefits perceived as generated from nature on its own
  - “Nature-for-people” (Mace 2014)
- Problems:
  - Multiple – E.g. Limits understanding of how NbS work (Welden, Chausson et al. 2021)

# Framing of Nature-based Solutions (NbS)



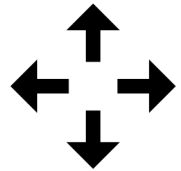
## People and nature as inseparable social-ecological system (SES)

- Humans and nature interdependent (Folke et al. 2010)
- Benefits generated from nature-people partnership (Seddon, Smith et al. 2021)
  - “Nature-and-people” (Mace 2014)
- Potentials:
  - Multiple - E.g. Better understanding of long-term NbS effectiveness

# NbS as social-ecological systems for resilience



NbS facing many threats from climate and other global changes (IPCC 2022)



Long-term effectiveness needs **social-ecological resilience** – capacity of the NbS's SES to navigate these threats and changes (Biggs et al. 2012)



Opportunity to learn from existing SES research

# Climate drivers & other inter-linked stressors

Social-ecological system

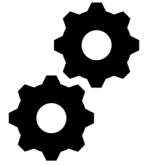
1A| SES resilience mechanisms affected by NbS



1B| Resilience mechanisms in NbS governance

2| Desired SES outcomes

# Resilience mechanisms



**Resilience mechanisms:** SES elements that influence level of the system's resilience

# Resilience mechanisms

**Resilience mechanisms:** SES elements that influence level of the system's resilience

Governance	Social	Ecological
Type of governance system: decentralized, co-management, external	<u>Diversity</u> Livelihood Actor Knowledge and experience	<u>Individual</u> Genetic diversity Phenotypic plasticity Sensitivity to environmental change
Local community participation in decision-making: active, passive, absent, mixed	<u>Social organization and capital</u> Knowledge exchange Bonding capital Bridging capital Attachment to place	<u>Community/Ecosystem</u> Species diversity Response diversity Functional diversity Heterogeneity (community level)
Knowledge types included in decision-making: external, local, multiple	<u>Potential for learning</u> Access to information Access to education	Keystone species or functional groups Dominant species Strength of species interactions
Inclusion of local values in decision-making	<u>Access to assets</u> Financial Technical	Habitat area Control of local threats Availability of resources Intact habitat structure
Application of adaptive (co-) management	<u>Agency</u> Empowerment Rights and ownership Social acceptance	<u>Landscape level</u> Network structure Heterogeneity (landscape level)
Understanding SES as a complex adaptive systems	<u>Equity</u> Distributional Recognitional	Ecological learning and memory

## Examples:



Local knowledge



Empowerment



Functional diversity

Turner et al. *in press* – based on key sources including Biggs et al. 2012; Oliver et al. 2015; Cinner et al. 2018

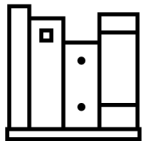
# Forest-based NbS effects on resilience



Apply SES resilience framework to global dataset of peer reviewed studies (From Chausson, Turner et al. 2020)



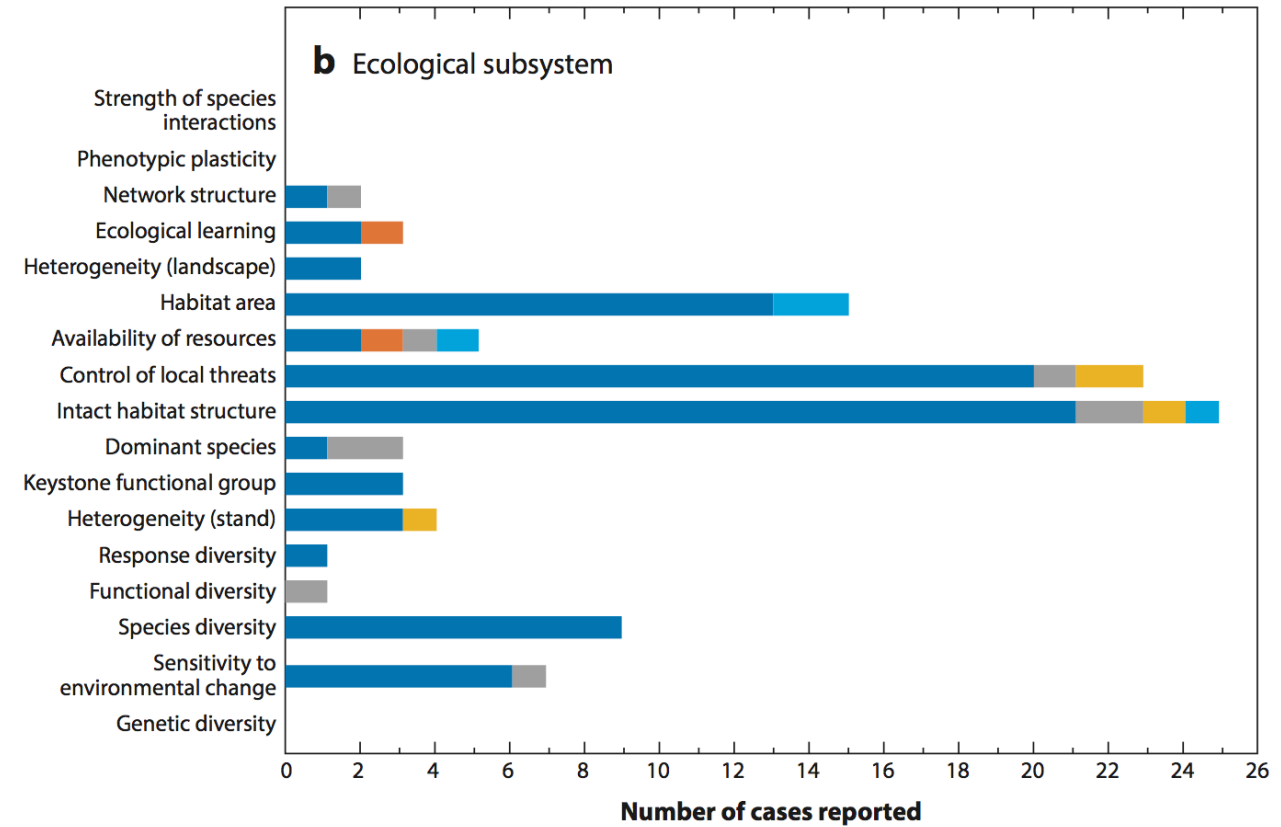
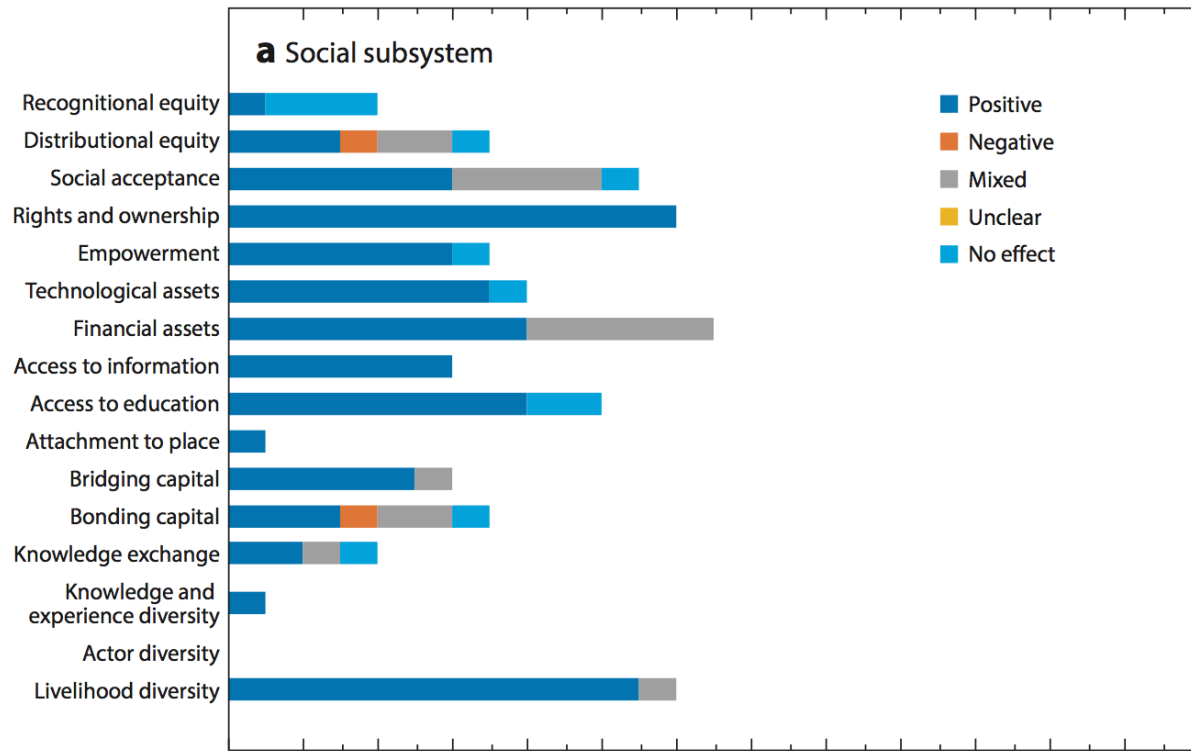
Focus on NbS in forests for climate change adaptation



41 NbS cases across 37 studies



# Forest-based NbS effects on resilience

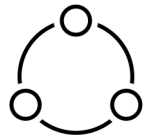


# Forest-based NbS effects on resilience

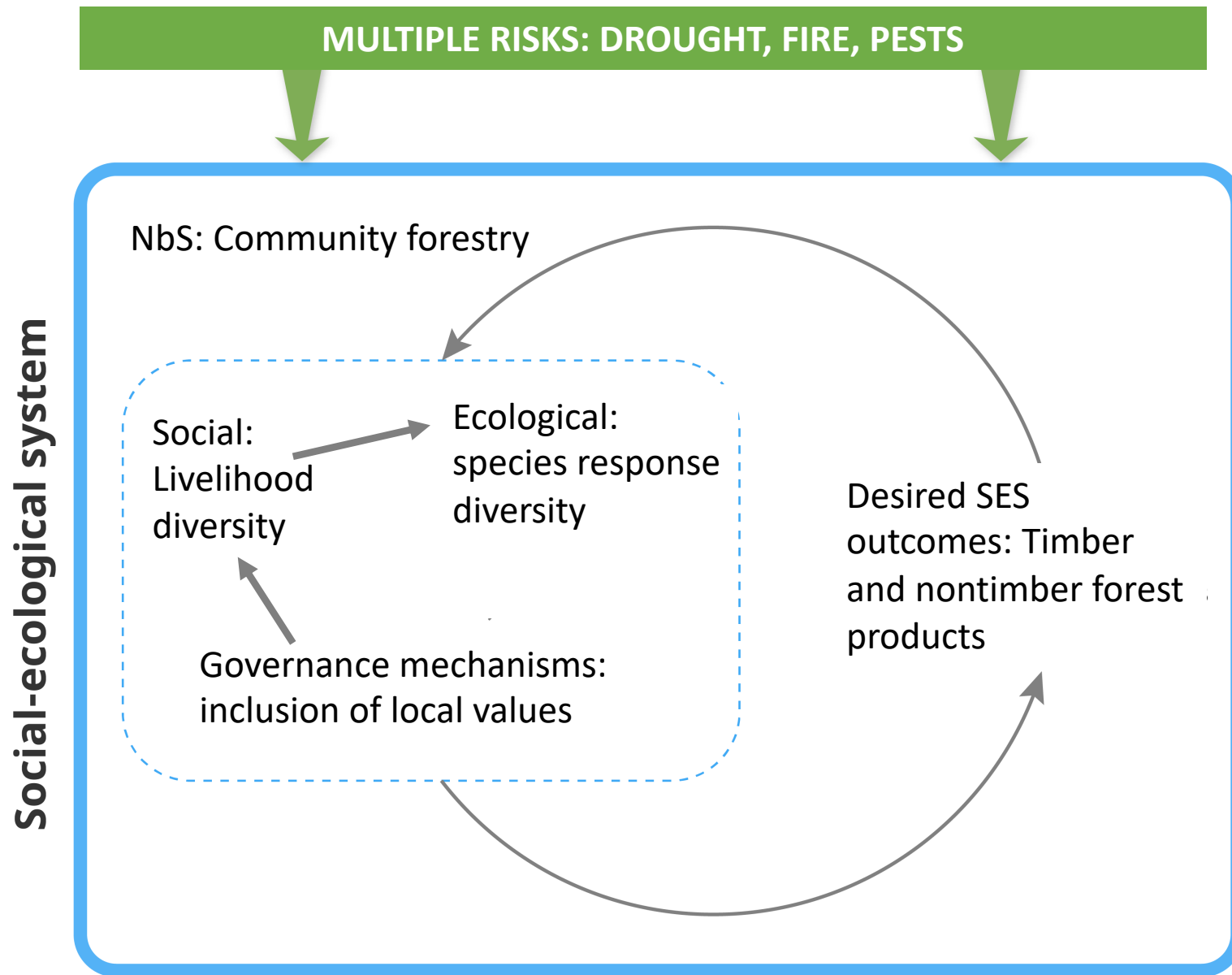
## Key take-aways:

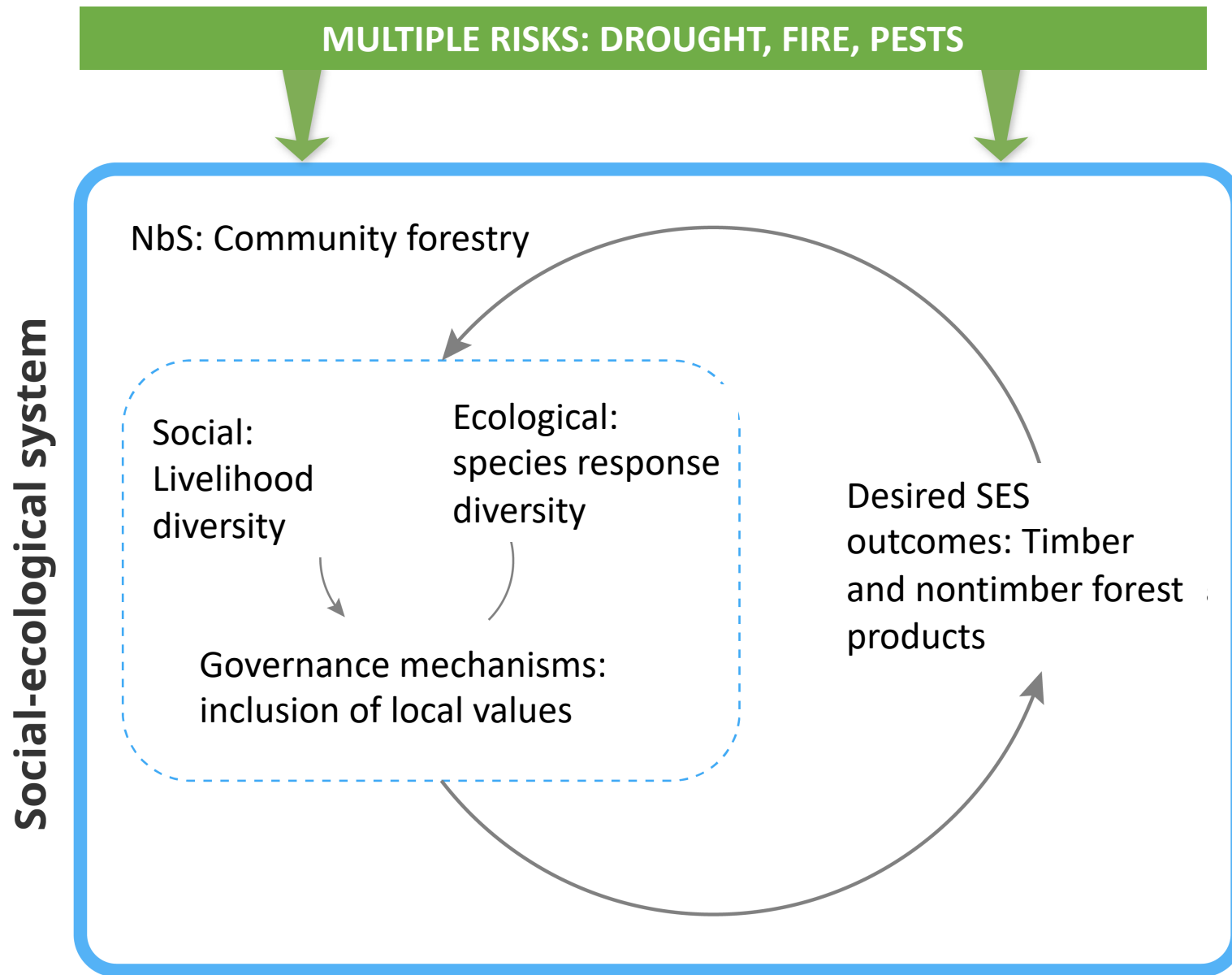


NbS affect resilience mechanisms across the social-ecological system



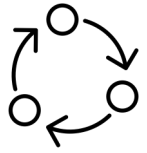
NbS influence mechanisms by supporting their interactions





# Forest-based NbS effects on resilience

## Key take-aways:



Desired outcomes feedback onto underpinning mechanisms

# Climate drivers & other inter-linked stressors

Social-ecological system

1A| SES resilience mechanisms affected by NbS

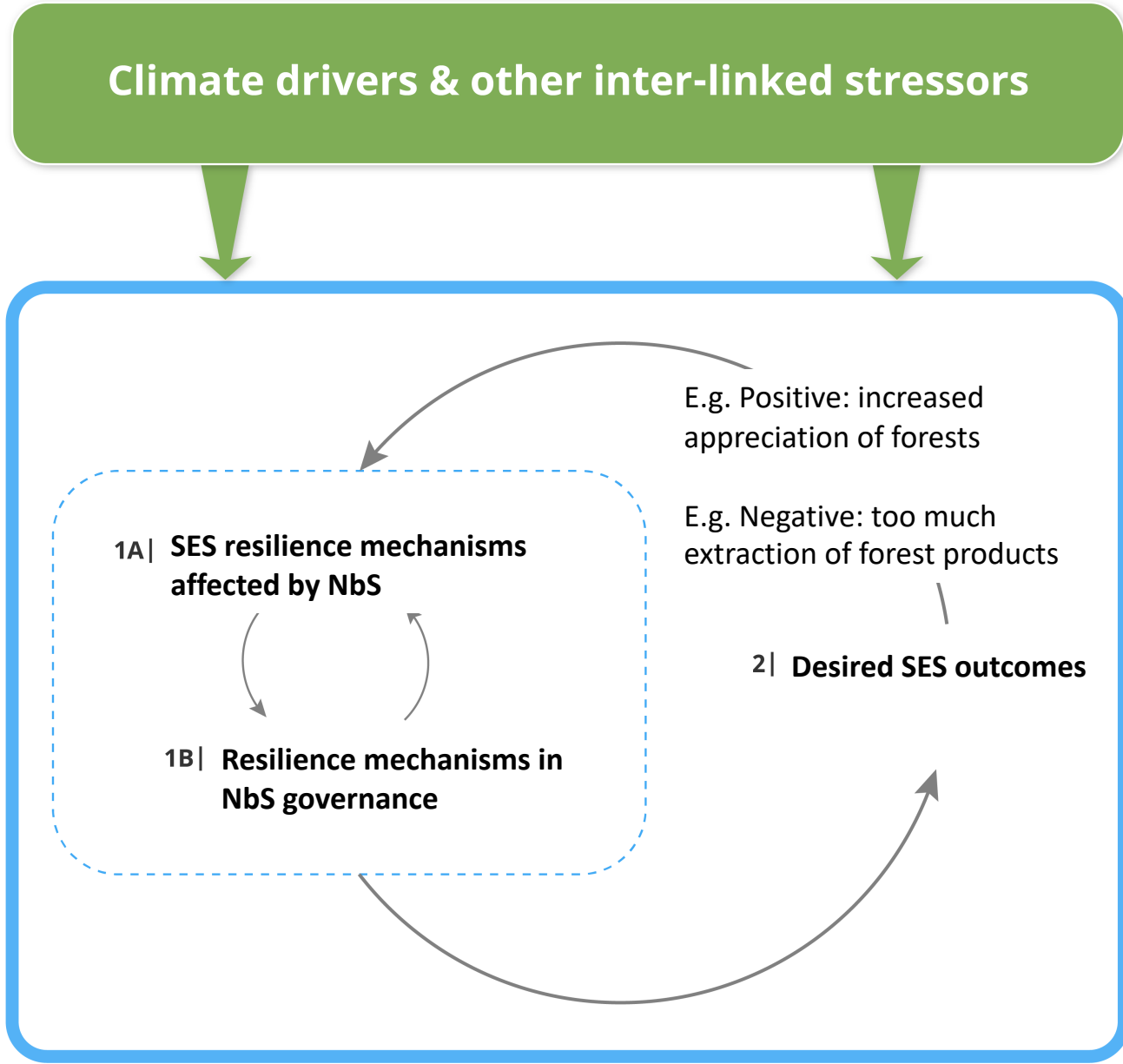


1B| Resilience mechanisms in NbS governance

E.g. Positive: increased appreciation of forests

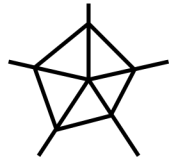
E.g. Negative: too much extraction of forest products

2| Desired SES outcomes



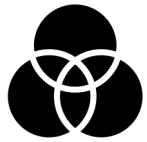
# Forest-based NbS effects on resilience

## Key Takeaway:



Holistic social-ecological systems framework needed for NbS resilience

- Needed in research and practice



Similar lessons from other NbS contexts

- e.g. Bruley et al. 2021; Hajjar et al. 2021; Tidball et al. 2018



Way forward: Learn from and support Indigenous Peoples and local communities forming nature partnerships

# Thank you!

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