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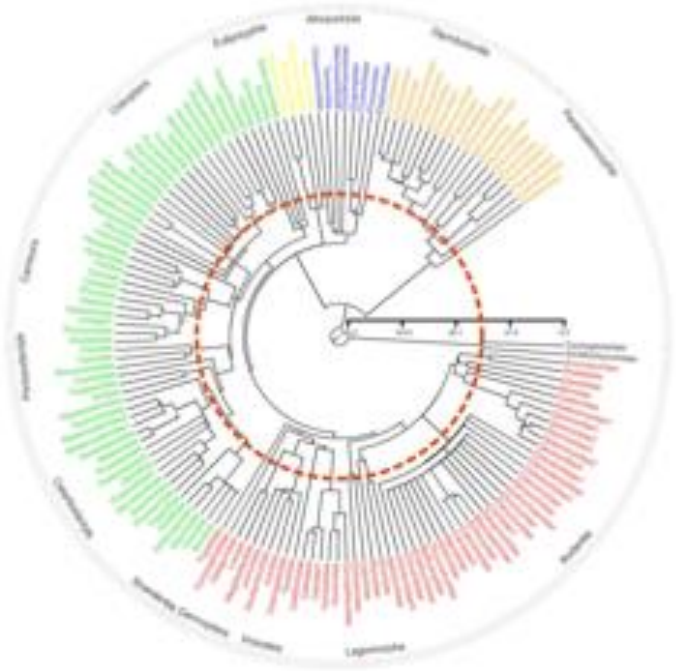
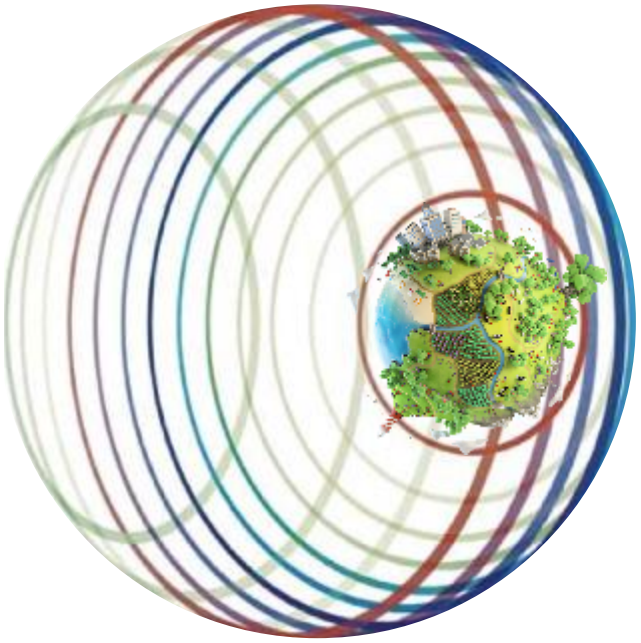




Biodiversity – Resilience

Dr Sarah Cornell

Acknowledging important inputs and enjoyable debates with the ARR community

Stockholm Resilience Centre
Research for Biosphere Stewardship and Innovation

Stockholm University

CAFF Arctic BIodiversity Congress
Trondheim, December 2014

A PARTNER WITH
The Beijer Institute of Ecological Economics
Kungl. Vetenskaps-Akademien
The Royal Swedish Academy of Sciences

FUNDED BY
MISTRA
The Swedish Foundation for Strategic Environmental Research

Also see impact detection, attribution and response in IPCC AR5 2013/2014 ,
and in-depth analyses by Arctic Council

Key messages from the 2013 Interim Report:

The Arctic is changing everywhere we look

These changes affect people's wellbeing (now and in the future).

Abrupt Arctic changes have been observed

Past choices shape today's response options

Governing in the Arctic = difficult choices

Resilience framing is useful for assessing change

Definition of biodiversity from CBD, of social-ecological resilience from ARR Interim Report

Biological diversity means the variability among living organisms from all sources

including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems.

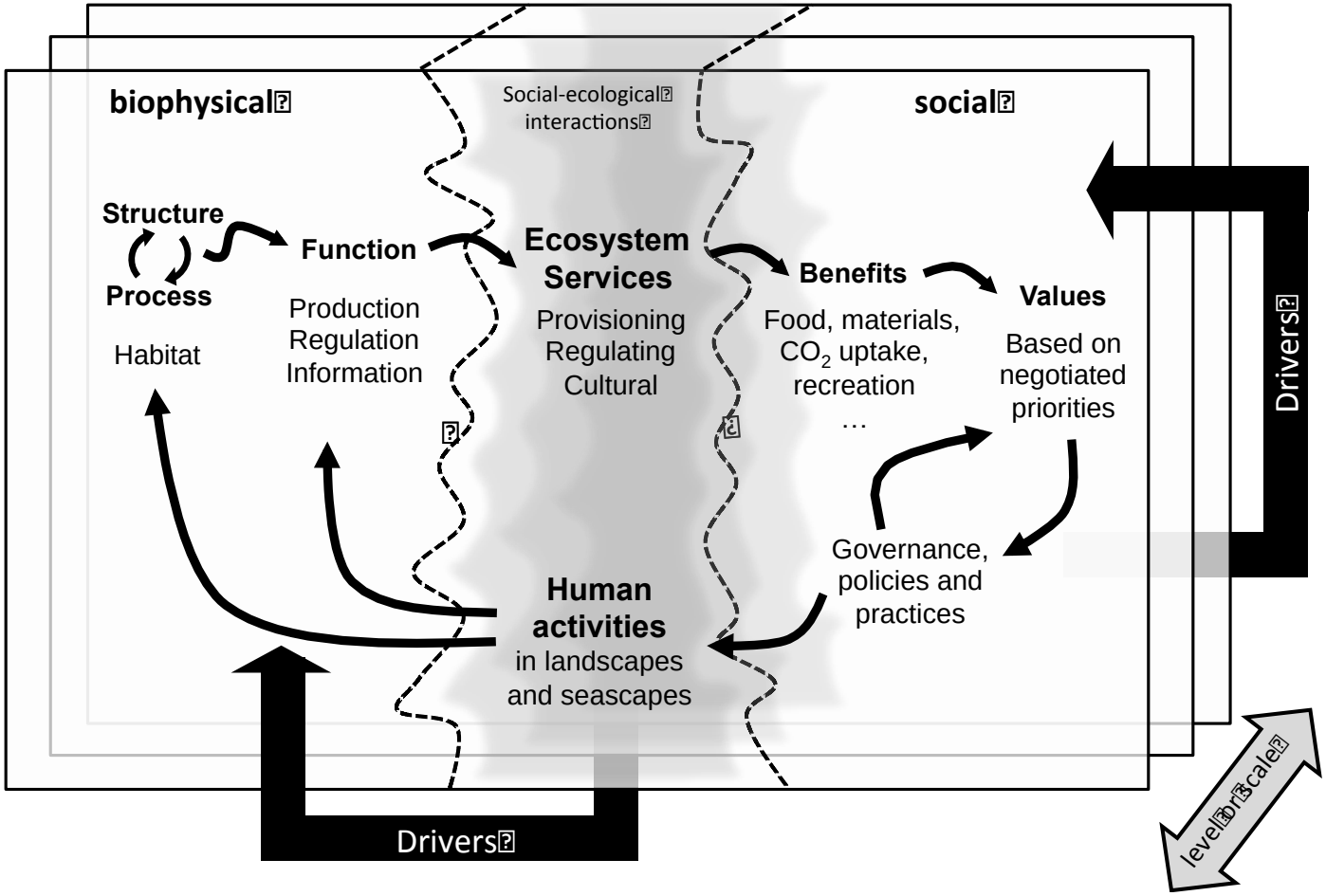
- **Not (just) counting or mapping**
- **Recognize and respect dynamics**
- **Acknowledge responsiveness to change – at levels 'above' *and* 'below'**

Resilience is the capacity of a system to cope with disturbance,

responding or reorganizing in ways that maintain its essential function, identity, and capacity for adaptation.

New challenges for understanding:

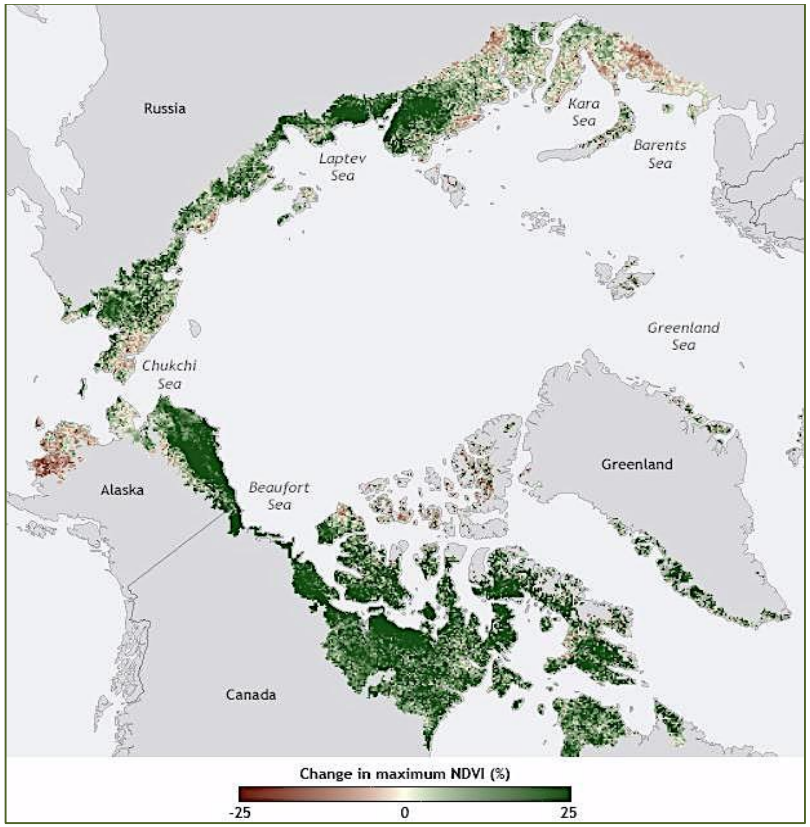
- **The complexity of linked physical, social and ecological systems**

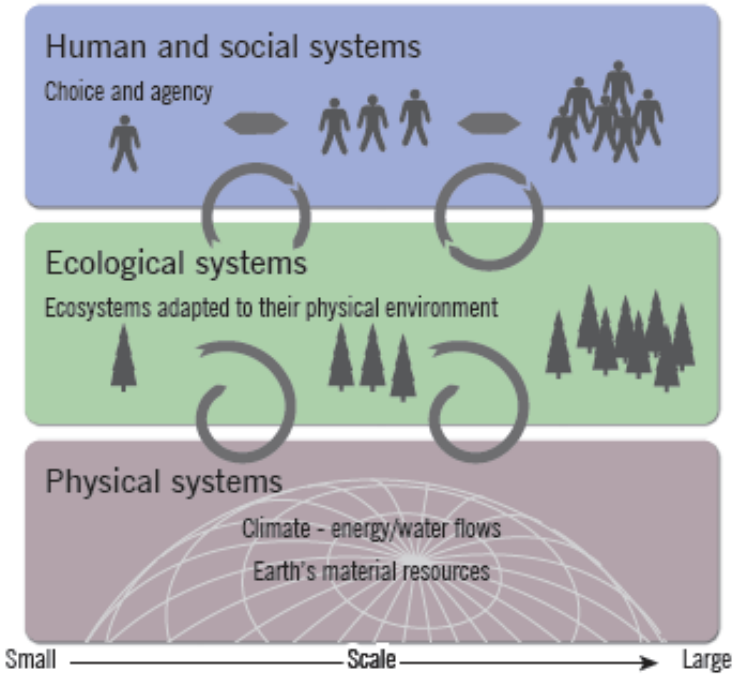


New challenges for understanding:

- The complexity of linked physical, social and ecological systems
- **The baseline of changing systems**

Change in tundra greenness – 'new normal'

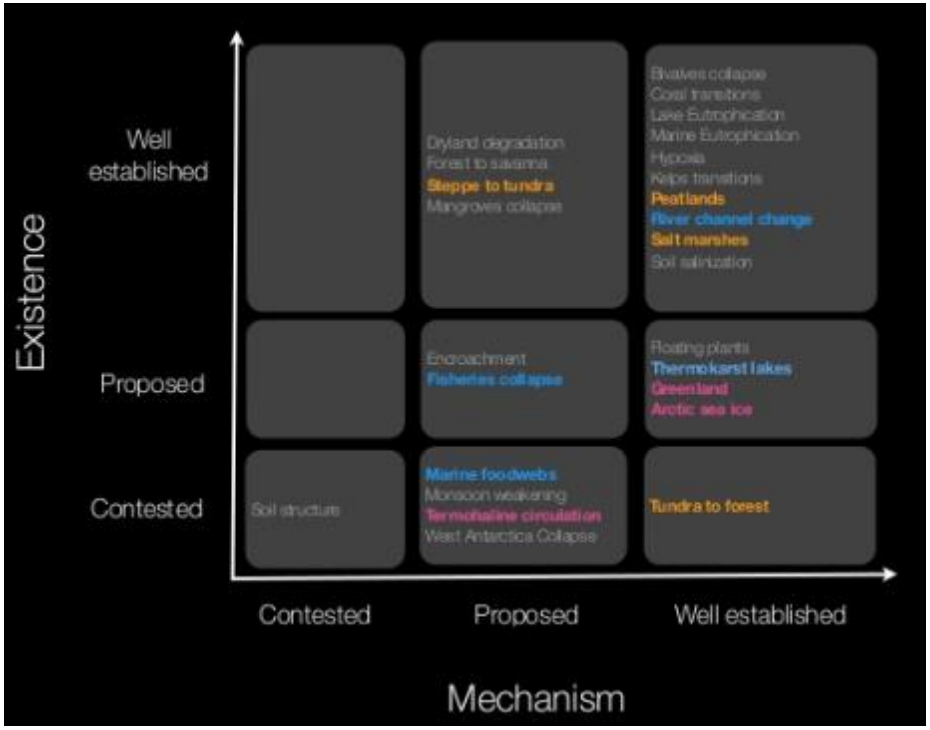




Images: Ahlenius/ARR, Arctic Report Card/NOAA

New challenges for understanding:

- The complexity of linked physical, social and ecological systems
- The baseline of changing systems
- **The relationship between qualitative and quantitative change**



International Regime Shift Database includes 11 Arctic-relevant regime shifts

JC Rocha and ARR Secretariat team

Approaches to defining a planetary boundary for biodiversity

Global Environmental Change (2014)

Mace, Reyers, Alkemade, Biggs, Chapin, Cornell, Diaz, Jennings, Leadley, Mumby, Purvis, Scholes, Seddon, Solan, Steffen and Woodward

Genetic library
uPSV (phylogenetic diversity)

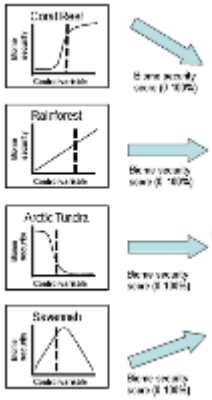
Functional diversity
Selected measures for selected functions

Biome integrity
Biome-specific drivers

Boundary position should be set to assure:
Long-term 'innovation' and resilience of ecosystem form and function

Ecosystem functions and processes (linked to human wellbeing)

Biome condition and extent – composite metric possible



Biome	Security score
Coral Reef	70%
Rainforest	75%
Arctic Tundra	60%
Savannah	90%

What large-scale systemic responses that could affect Earth's suitability for our societies are mediated by the biosphere?

Challenges for societal action?

- The complexity of linked physical, social and ecological systems
- The baseline of changing systems
- The relationship between qualitative and quantitative change…

So what do we do?

- **Precaution** – when risks are unclear, the burden of proof shifts to the exploiter

Resilience
Biodiversity conservation
Ecosystem-based management
Ecosystem approach
Stewardship
Sustainability

Policy contexts	Societal use
Rigid divisions	All the same thing, really
Precise technical meanings (jargon)	Interchangeable terms
Compliance – fixed metrics	Concern – untethered baselines

So what do we do?

- Precaution – when risks are unclear, the burden of proof shifts to the exploiter
- **Provisionality** – seek adaptive responses, with reversible consequences

Life is resilient, but biodiversity destruction may be terminal

Image: zengardener.com

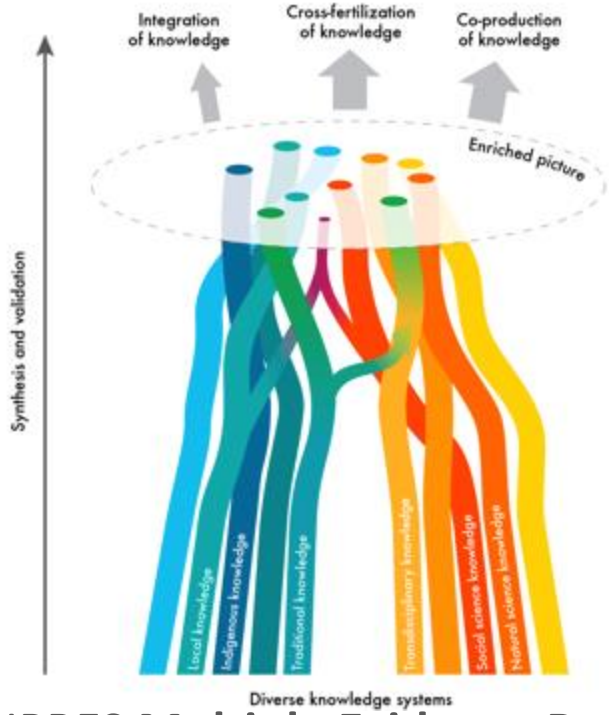
CBD Aichi targets – almost entirely process-oriented, not 'absolute' outcome (stop destroying life!)

1-4	Knowledge, values, incentives 'Plans implemented'
5-10	**Reduce rate of loss** (rolling: 2010, 2020, SDGs 2030…) Sustainable harvesting/management Minimize human pressure
11-13	Protected areas, species, genes
14-16	Safeguard essential services (carbon, genetic benefits), fairly and equitably
17-20	Plans with participation, respect for TLCK Knowledge sharing 'Substantially' more funds

So what do we do?

- Precaution – when risks are unclear, the burden of proof shifts to the exploiter
- Provisionality – seek adaptive responses, with reversible consequences
- **Participation** – new wider forms

Photo: Imprensa do Carajás



IPBES **Multiple Evidence Base** approach, with the CBD

Tengö et al. 2014, Connecting diverse knowledge systems Ambio 43: 579
Cornell et al. 2013, Opening up knowledge systems… GEC 28: 60

Social-ecological resilience must mean maintaining the fullest possible sense of the value of ~~biodiversity~~ life

Image: www.informationsecuritybuzz.com Global-network

Thank you

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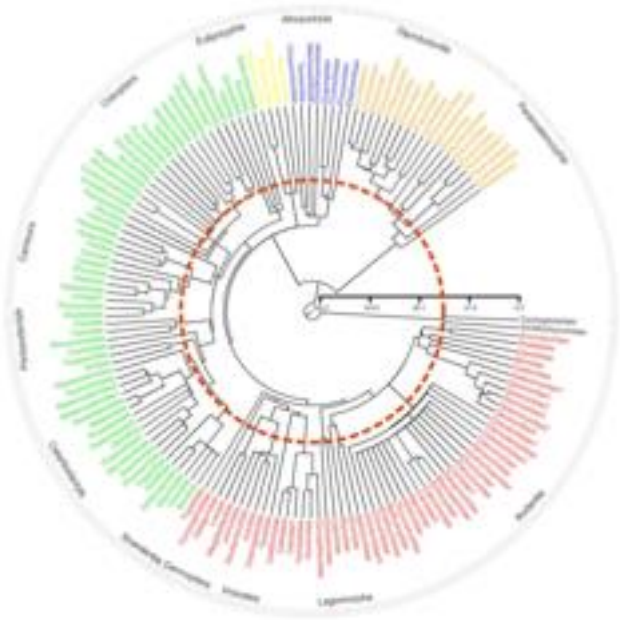

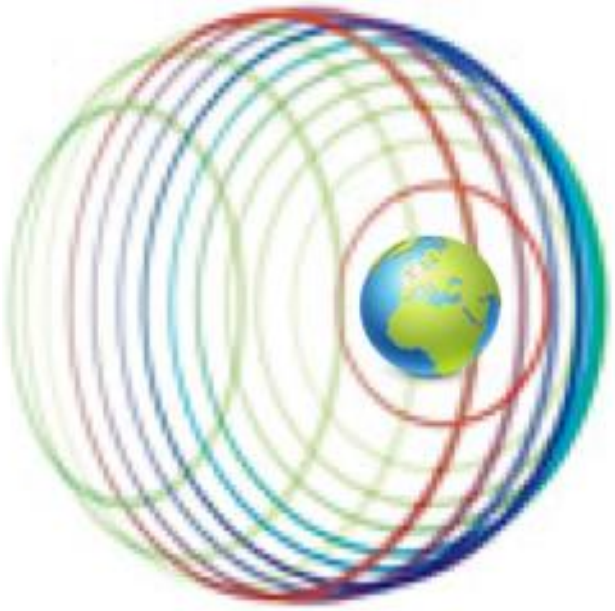

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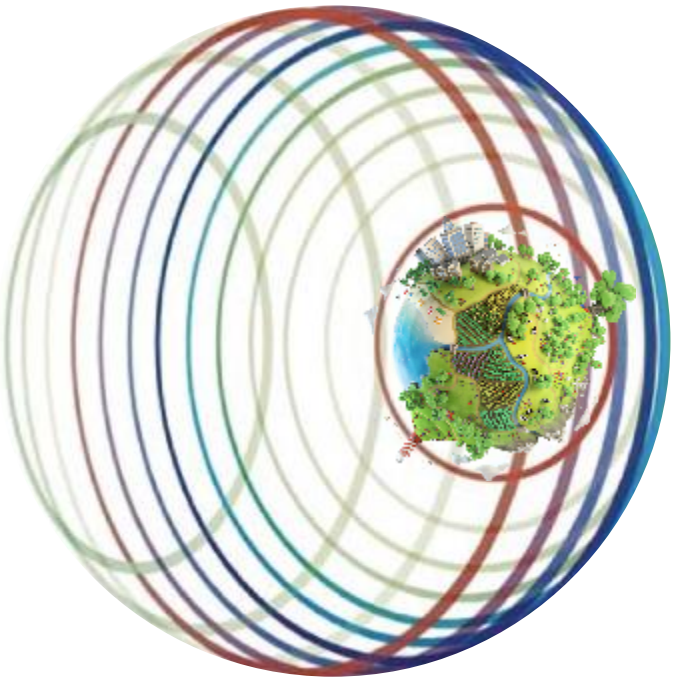

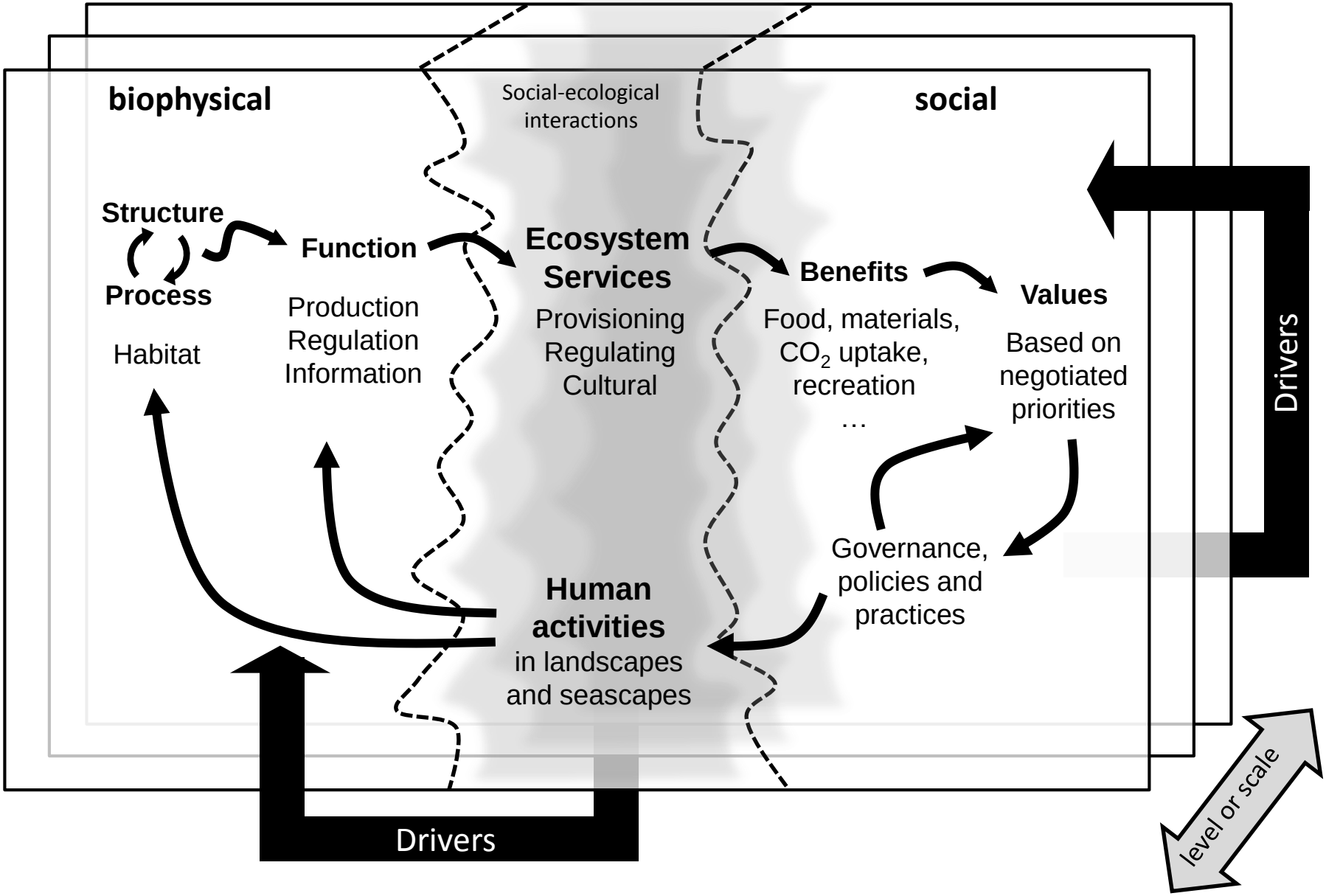
biophysical
Social-ecological interactions
social
Structure
Process
Habitat
Function
Production
Regulation
Information
Ecosystem Services
Provisioning
Regulating
Cultural
Benefits
Food, materials, CO_2 uptake, recreation
…
Values
Based on negotiated priorities
Drivers
Governance, policies and practices
Human activities
in landscapes and seascapes
Drivers
level or scale