


Incorporating climate change into ecosystem service assessments and decisions: A review

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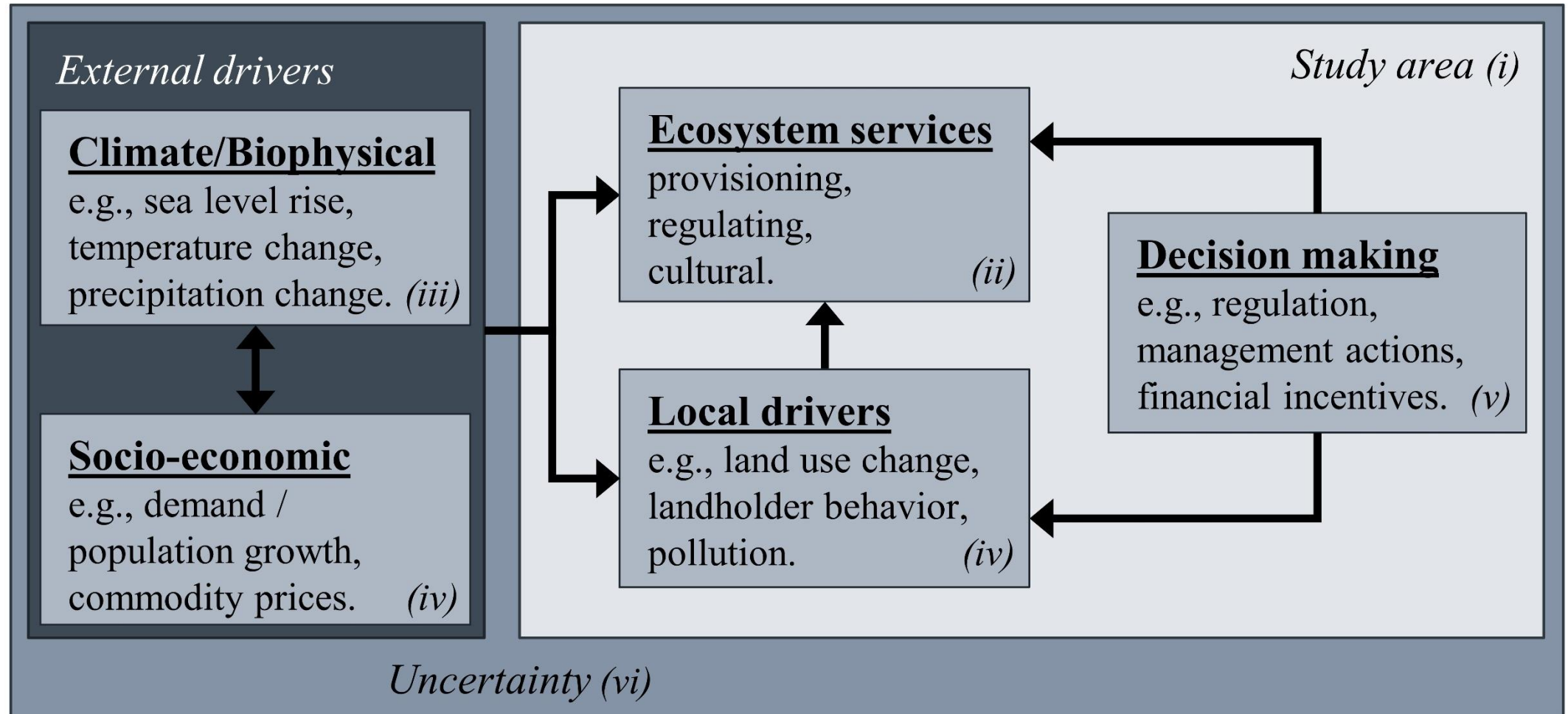
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Collaborators:

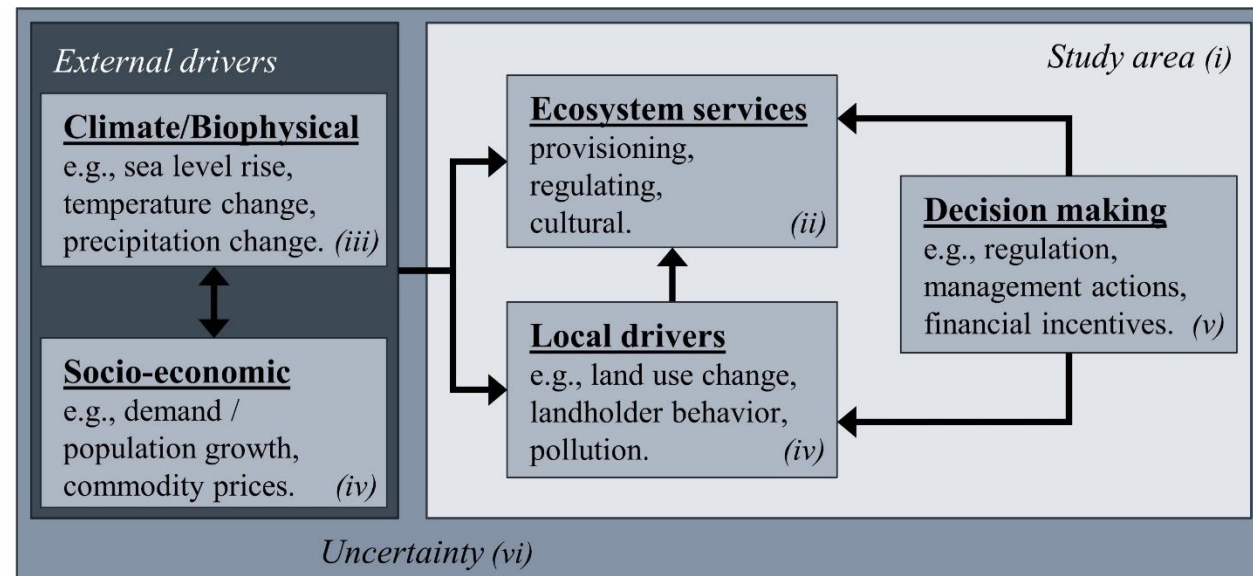
*Dr. Laura Dee, Dr. Perrine Hamel,
Fleur Maseyk, Prof. Kerrie Wilson,
Dr. Lisa Mandle, Kathleen Yetka.*

Conceptual Framework

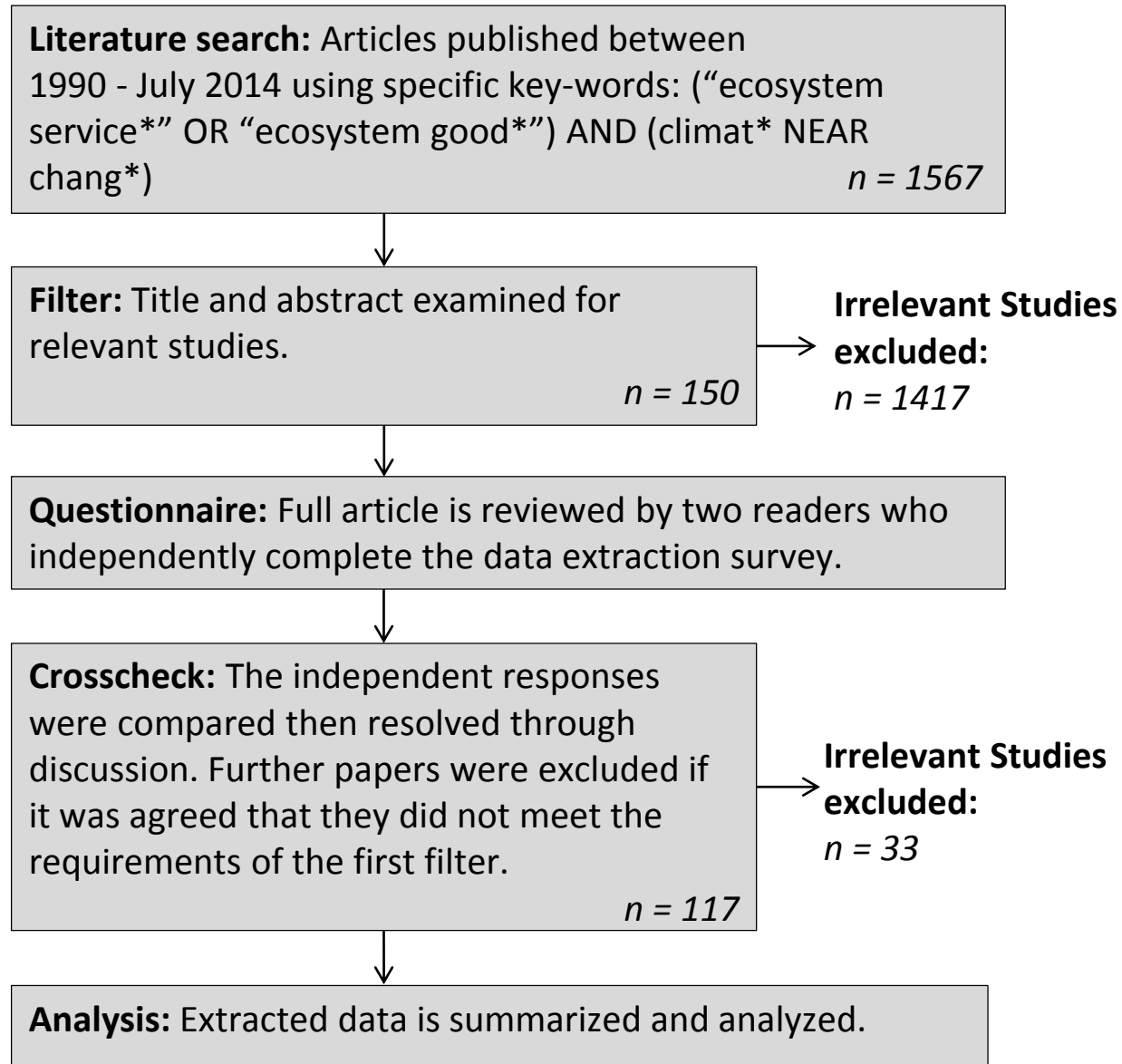


Aims

- Identify **gaps** relating to
 - Ecological/geographical context
 - The inclusions in the study:
 - ecosystem services,
 - attributes of climate change,
 - other drivers,
 - uncertainties,
 - decision making
- Determine the **impacts** of climate change and other key drivers
- Identify **methods** used across assessment components



Review Methods



Questions

(i) Study Area

Location, spatial scale, type of ecosystem

(ii) Ecosystem services (ES)

Which ES? Supply/demand?

(iii) Drivers: Climate

What aspects of climate change (e.g. temperature)?
Impact on ES? Methods used?

(iv) Drivers: Other

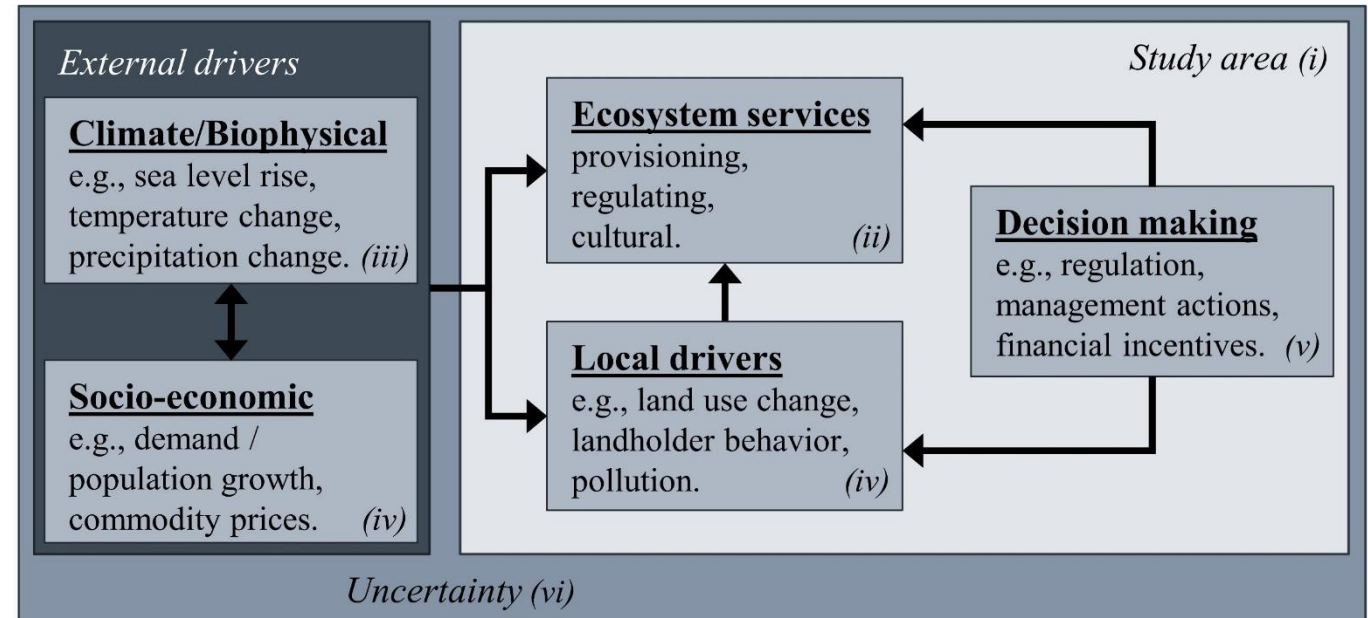
Which drivers? Impact on ES? Interaction?

(v) Decision Making

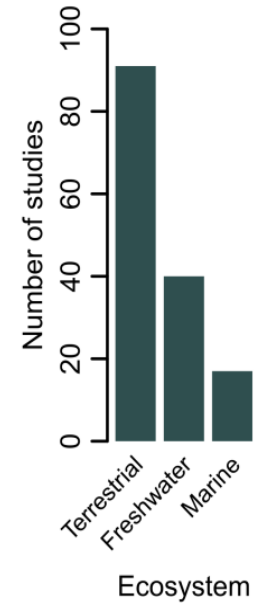
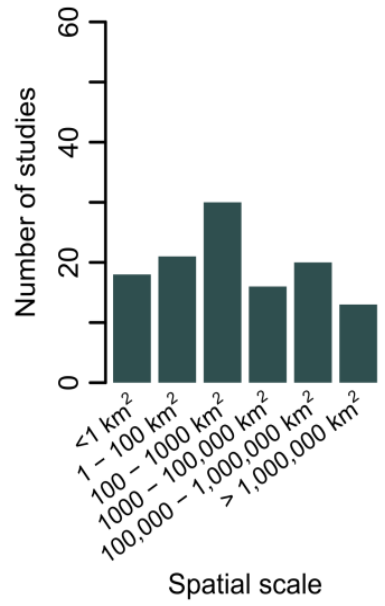
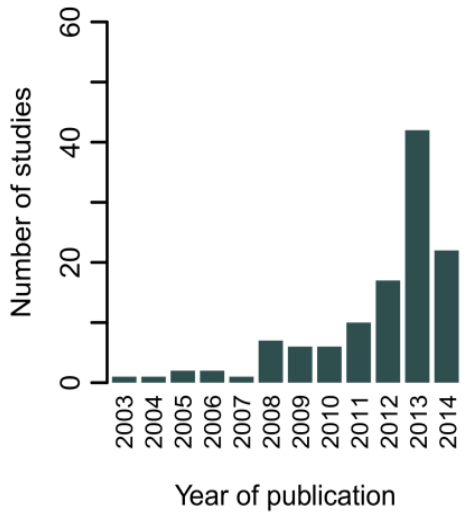
No. objectives? Which methods? Solutions?

(vi) Uncertainty

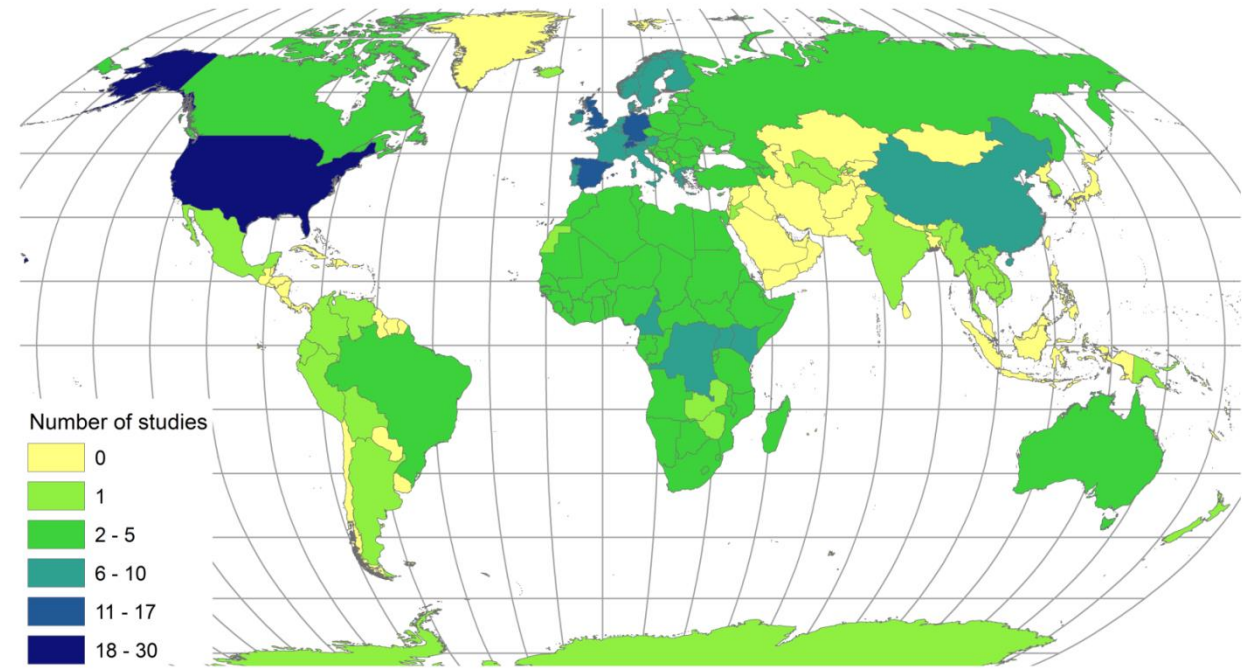
Source of uncertainty? Methods used? Are solutions robust to uncertainty?



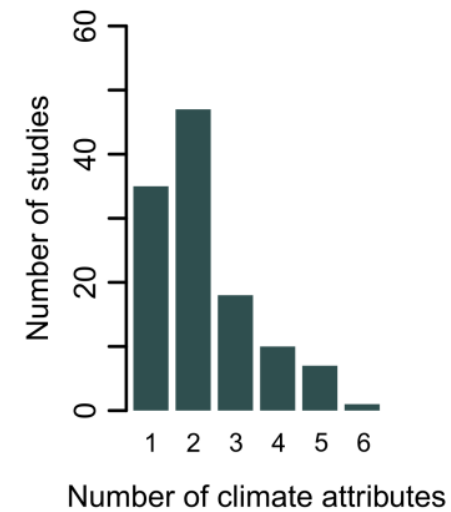
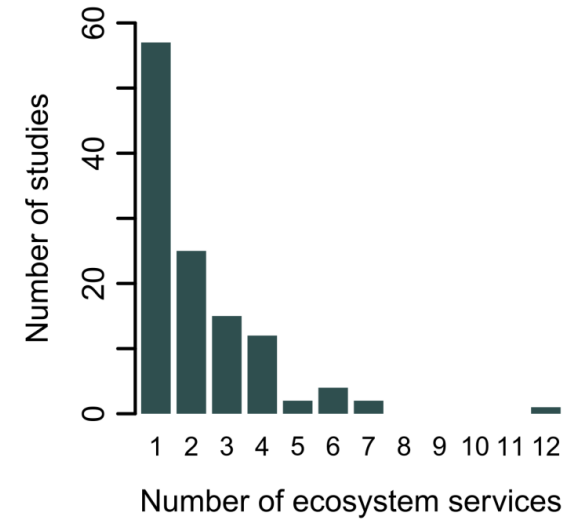
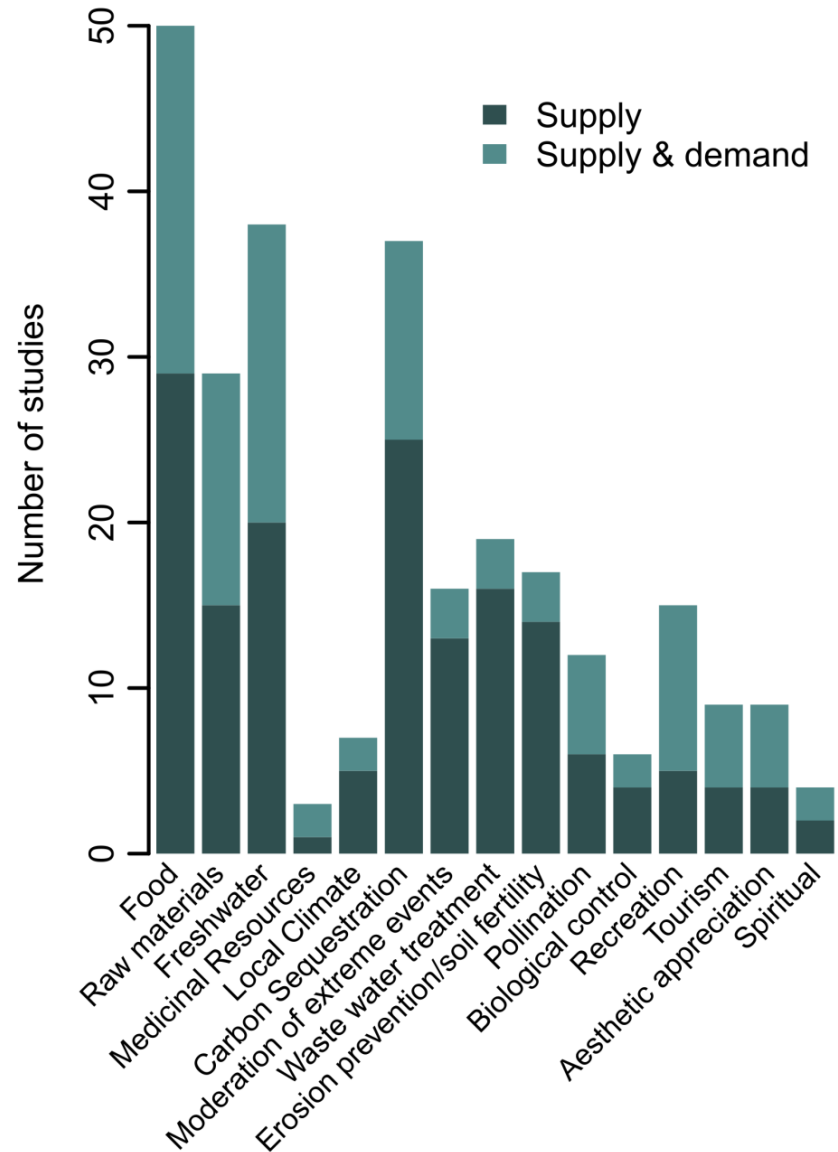
Results: Context of assessments



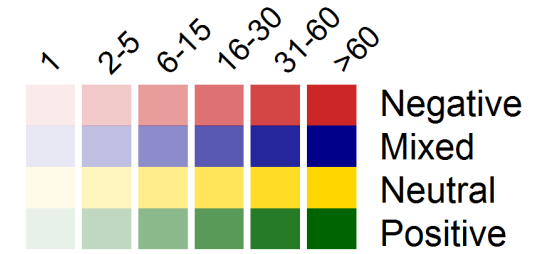
Location of assessments:



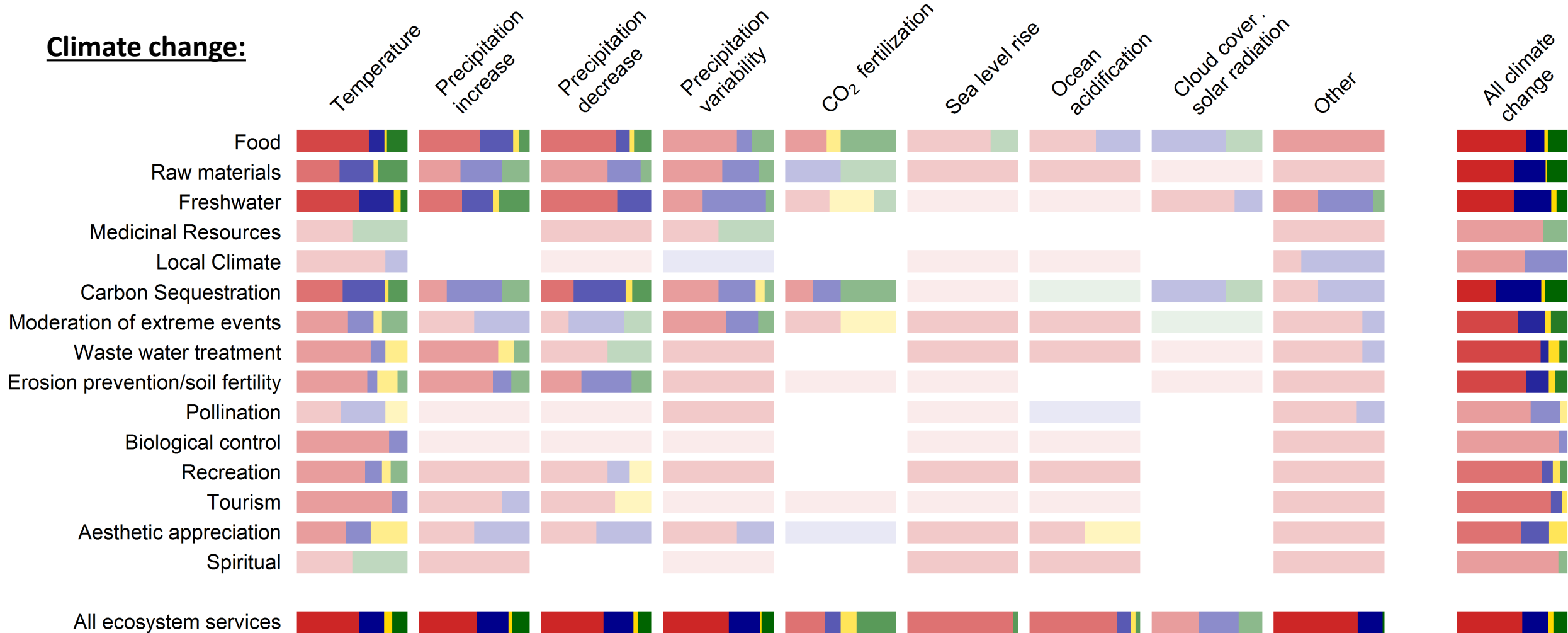
Results: Ecosystem services



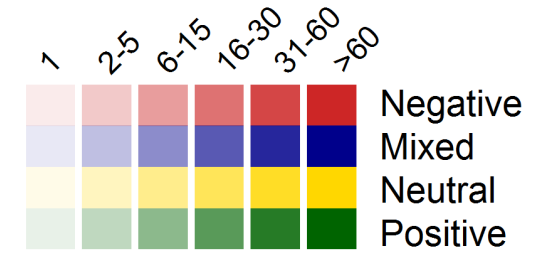
Results: Impacts on ES



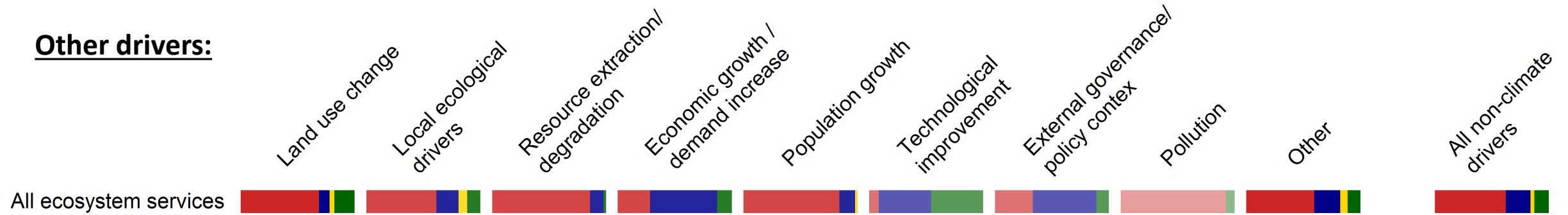
Climate change:



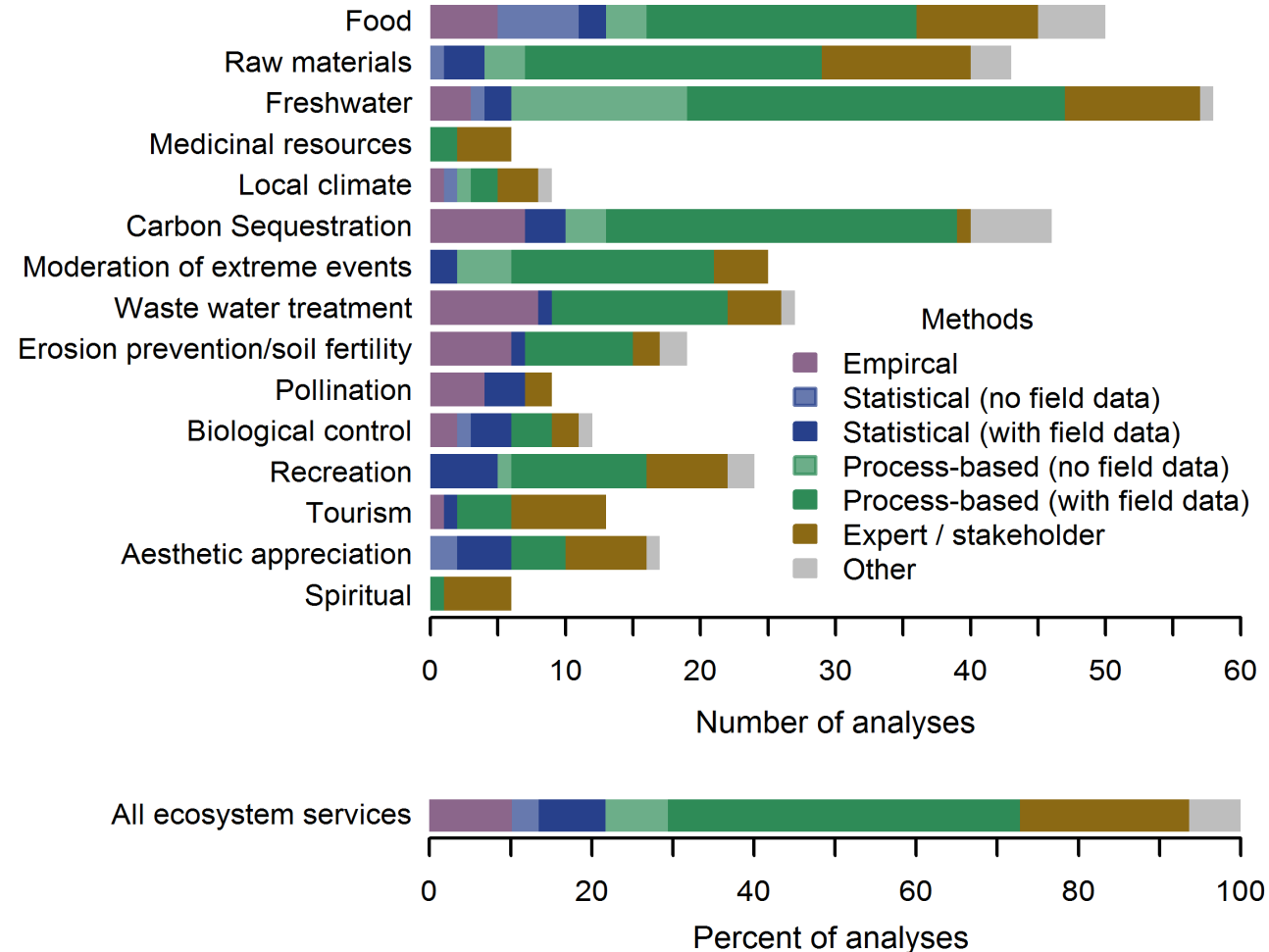
Results: Impacts on ES



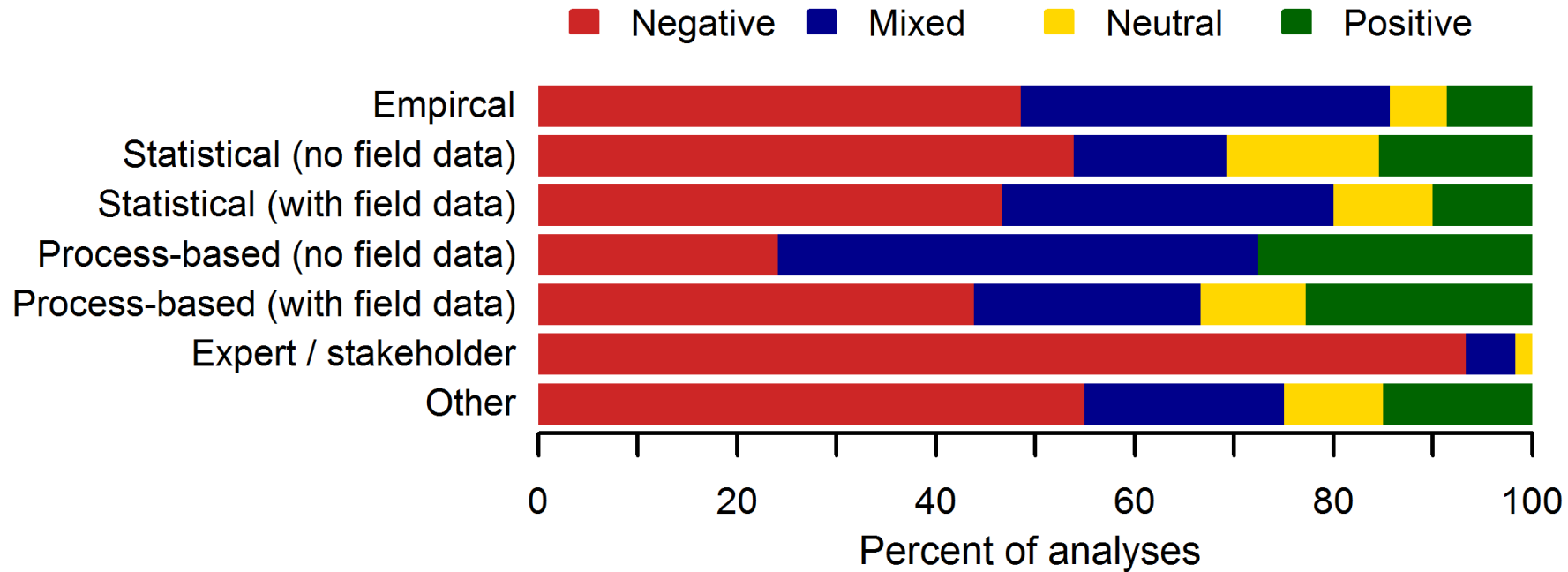
Other drivers:



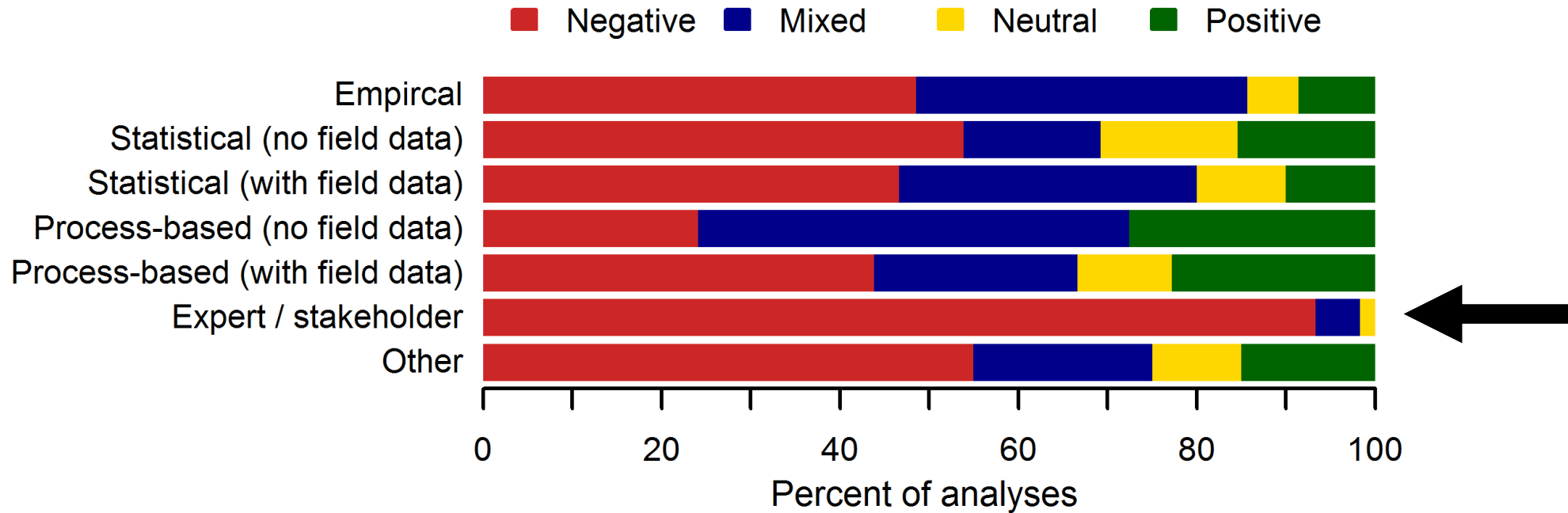
Results: Methods used



Results: Methods used - impact



Results: Methods used - impact

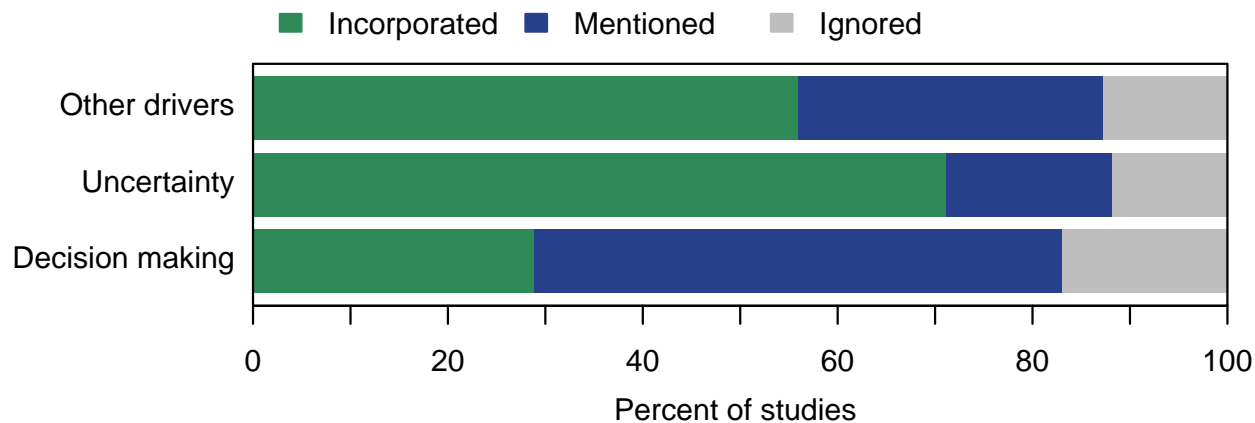


Results: Uncertainty

		Method used				
		Scenario analysis	Sensitivity analysis	Multiple models	Probabilistic	Other
Source of uncertainty	Magnitude of climate change	49	8	25	1	0
	Magnitude of other drivers	23	3	1	1	1
	How climate change impacts ES	2	5	2	1	0
	How other drivers impact ES	1	0	0	1	0
	How an intervention impacts ES	1	3	0	0	1
	How ES are supplied	1	10	1	1	5
	How ES are delivered	0	2	2	2	0

Results: Decision Making

- Not often included:



- Rarely robust:
 - Only 5 studies had solutions/management strategies that were robust.
 - 3 of these focused on a single ecosystem service (1 objective).
 - Usually only 1 or 2 sources of uncertainty.

Conclusions

- Variability of impacts across drivers, services and methods (!)
- Multiple drivers and uncertainties should be incorporated.
- Need to develop/apply robust decision making methods.



RESEARCH REVIEW

Incorporating climate change into ecosystem service assessments and decisions: a review

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Abstract

Climate change is having a significant impact on ecosystem services and is likely to become increasingly important as this phenomenon intensifies. Future impacts can be difficult to assess as they often involve long timescales, dynamic systems with high uncertainties, and are typically confounded by other drivers of change. Despite a growing literature on climate change impacts on ecosystem services, no quantitative syntheses exist. Hence, we lack an overarching