

Methods and Concepts for Mapping and Analysing Ecosystem Services in Landscapes: a Systematic Review

Oskar Englund, PhD

Dept. of Energy and Environment
Div. of Physical Resource Theory
Chalmers University of Technology
oskar.englund@chalmers.se

Introduction

- We want to understand how biomass production systems can be designed to support other ecosystem services (ES) in the landscape
 - Requires methods for assessing how biomass production affects other ES
 - Requires methods for mapping ES at the landscape scale

In this study, we

1. Review methods for mapping ES in landscapes
 - Systematic review (1112 screened, 171 reviewed)
2. Attempt to clarify the terminology and typology in ES research, primarily the concept of *landscape* and *landscape scale*
 - Meta-review
 - Outcome from systematic review

Assessment framework

All papers demonstrate mapping of ES at a landscape scale

- General information
- References to *landscapes*
- Resolution and mapping approach
- ES mapped
- Methods for mapping
- Validation

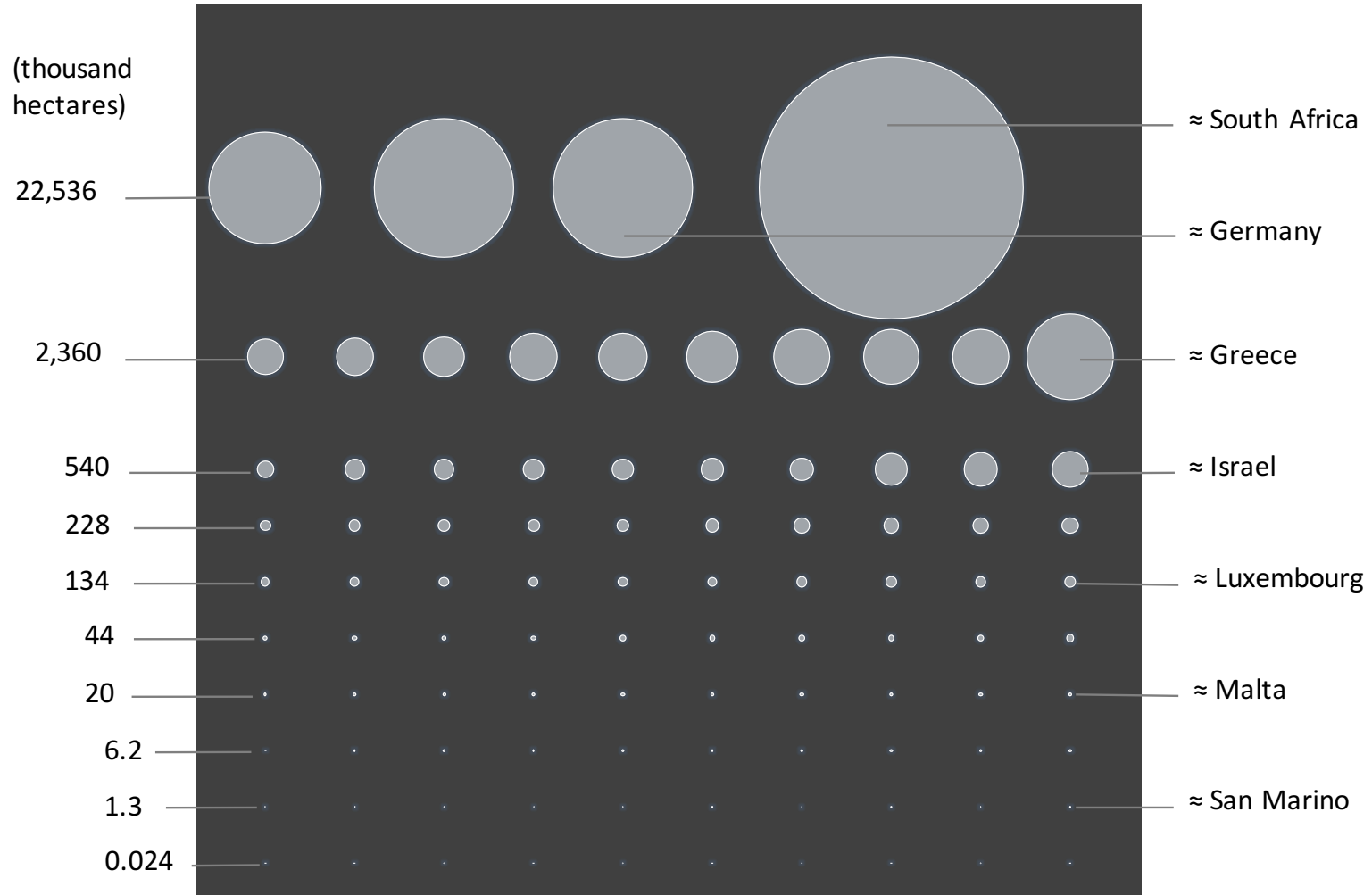
Mapping methods

- Direct mapping
- Empirical models
- Simulation and process models
- Logical models
- Extrapolation
- Data integration
- Combination
- Unknown

Landscape scale

- An intermediate integration level between the field and the physiographic region
- Extent: 100 - 10 000 ha
 - Lacoste et al. (2014)

Size of the “landscapes”



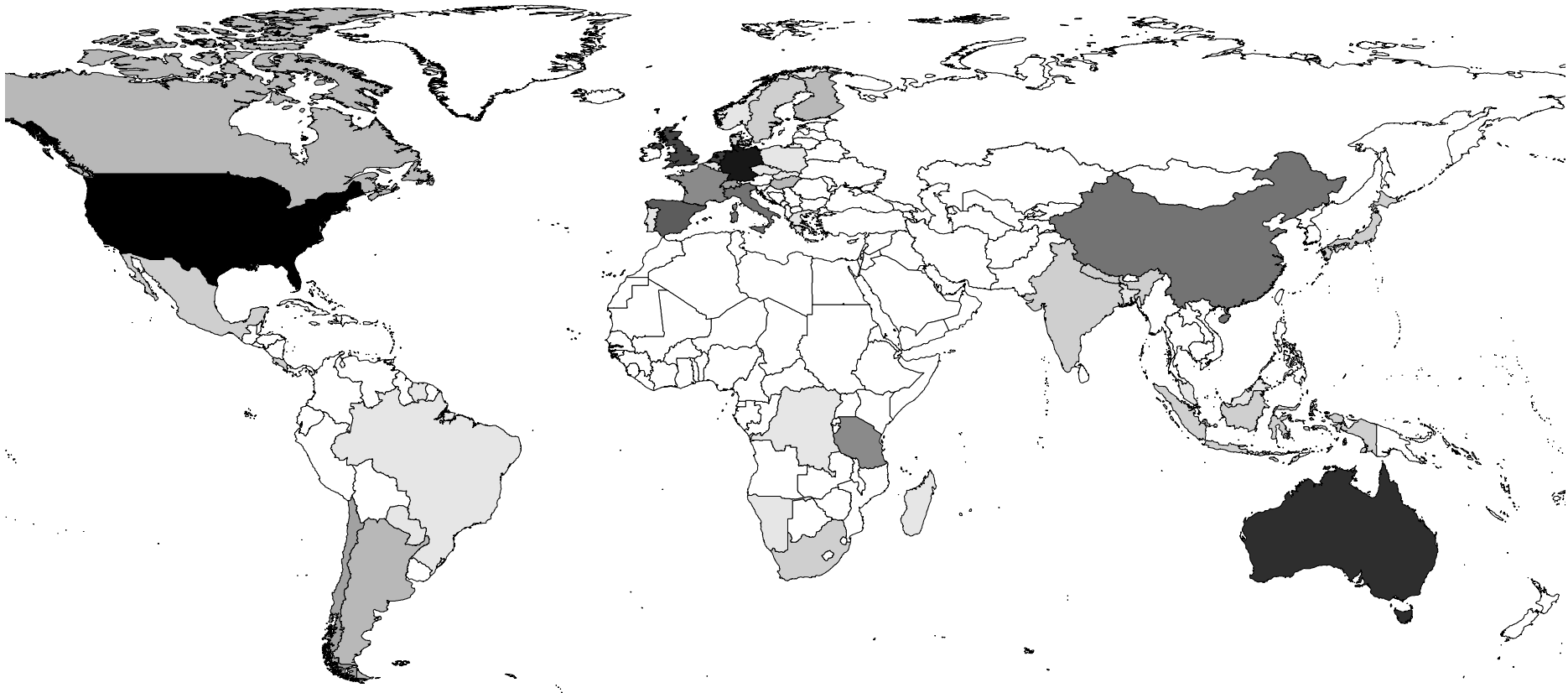
Landscape scale

- An intermediate integration level between the field and the physiographic region
- Extent: 100 - 10 000 ha
 - Lacoste et al. (2014)
- 23 of 94 areas referred to as landscape fall within the above range

Differing views on the spatial extent of a “landscape”

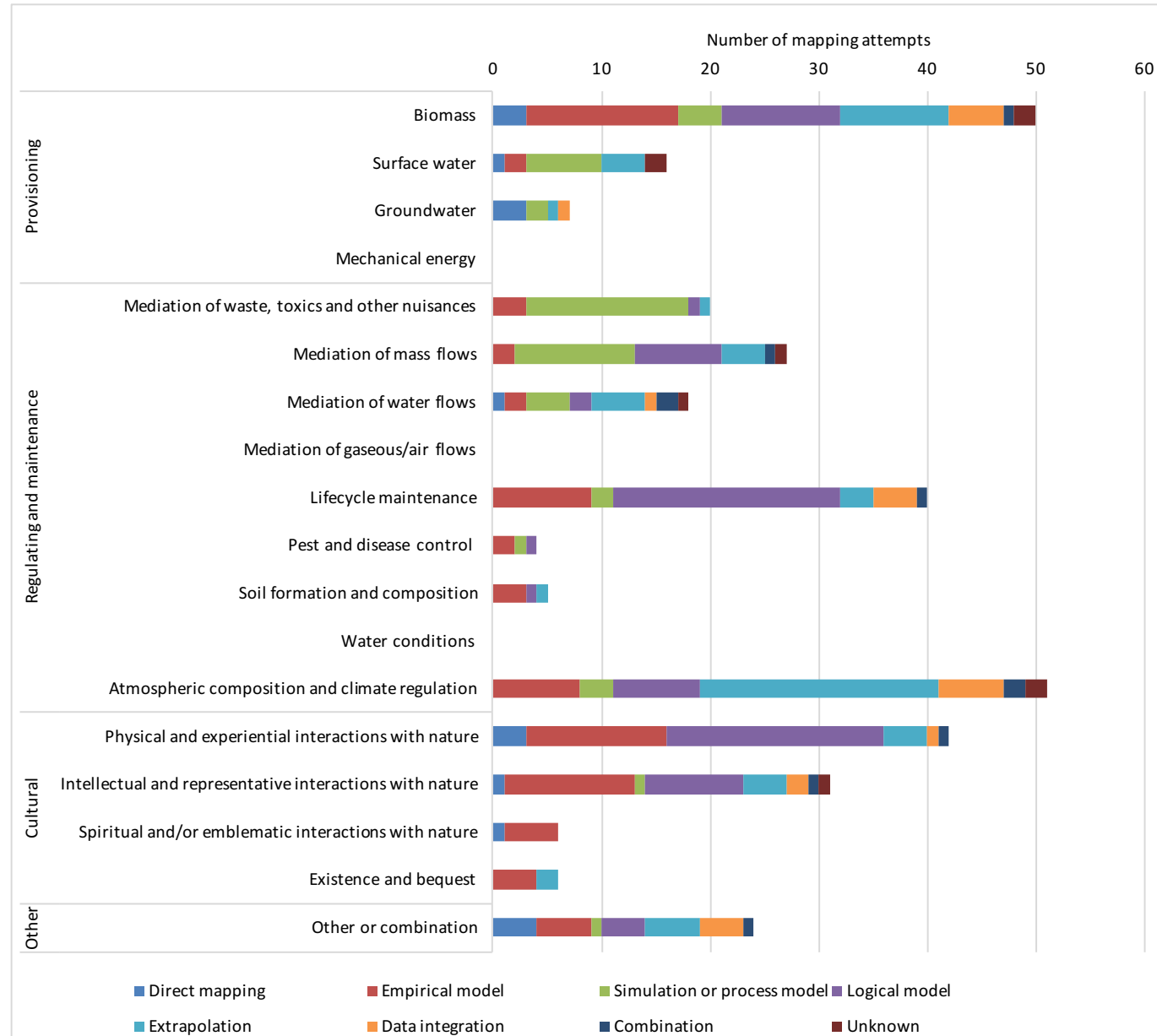
Reviewed papers

- Rather concentrated geographically

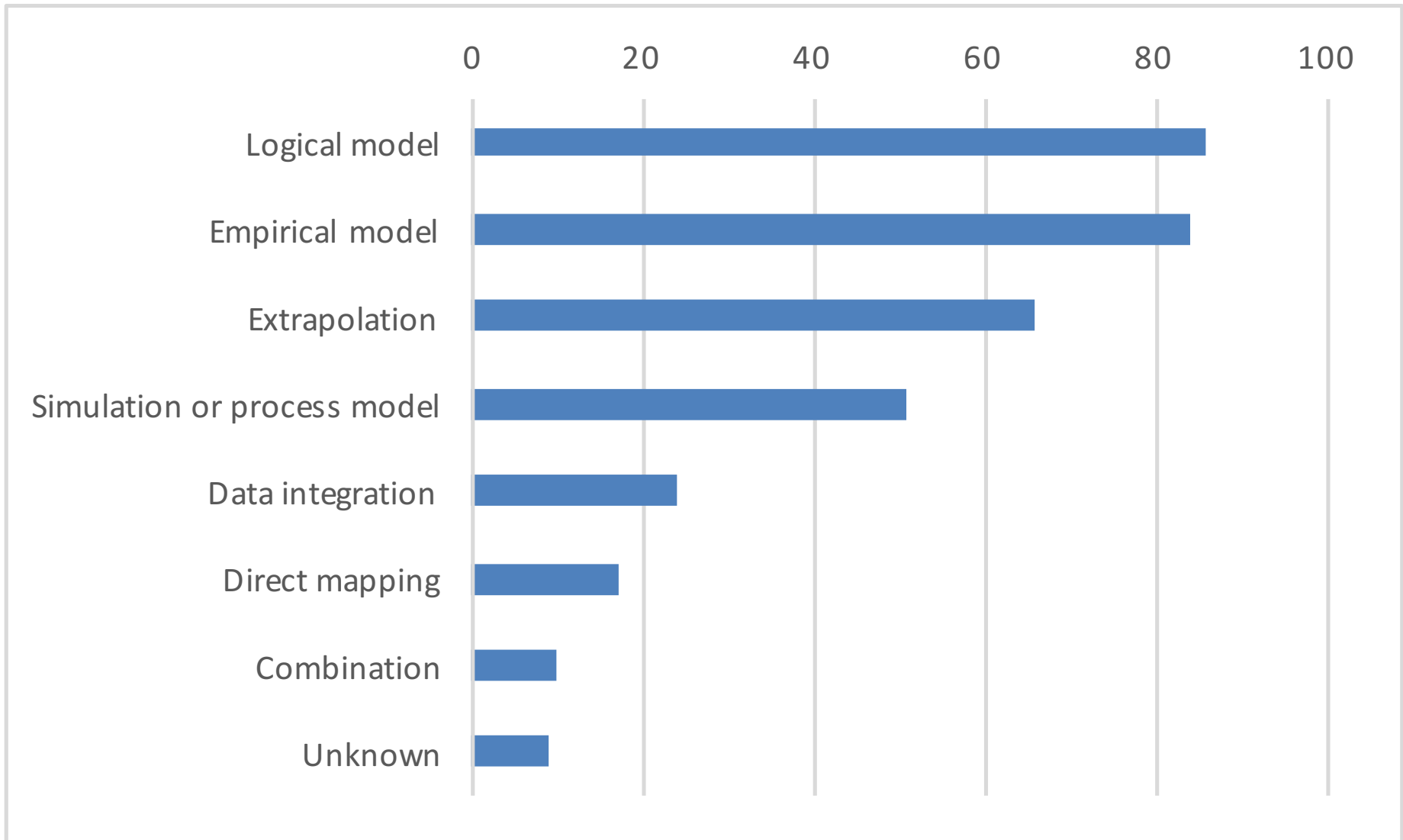


Mapping attempts

$\Sigma = 347$

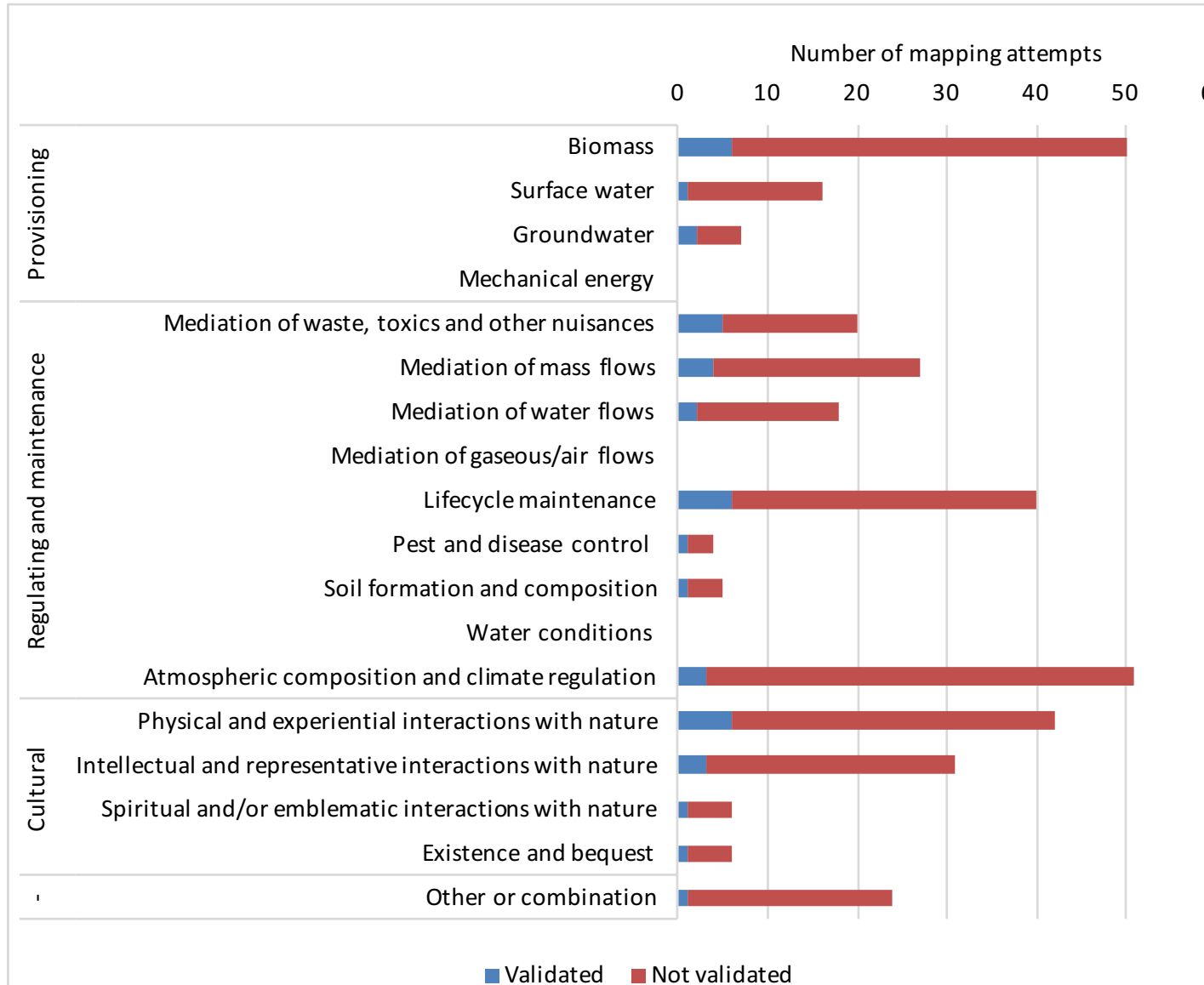


Method types used

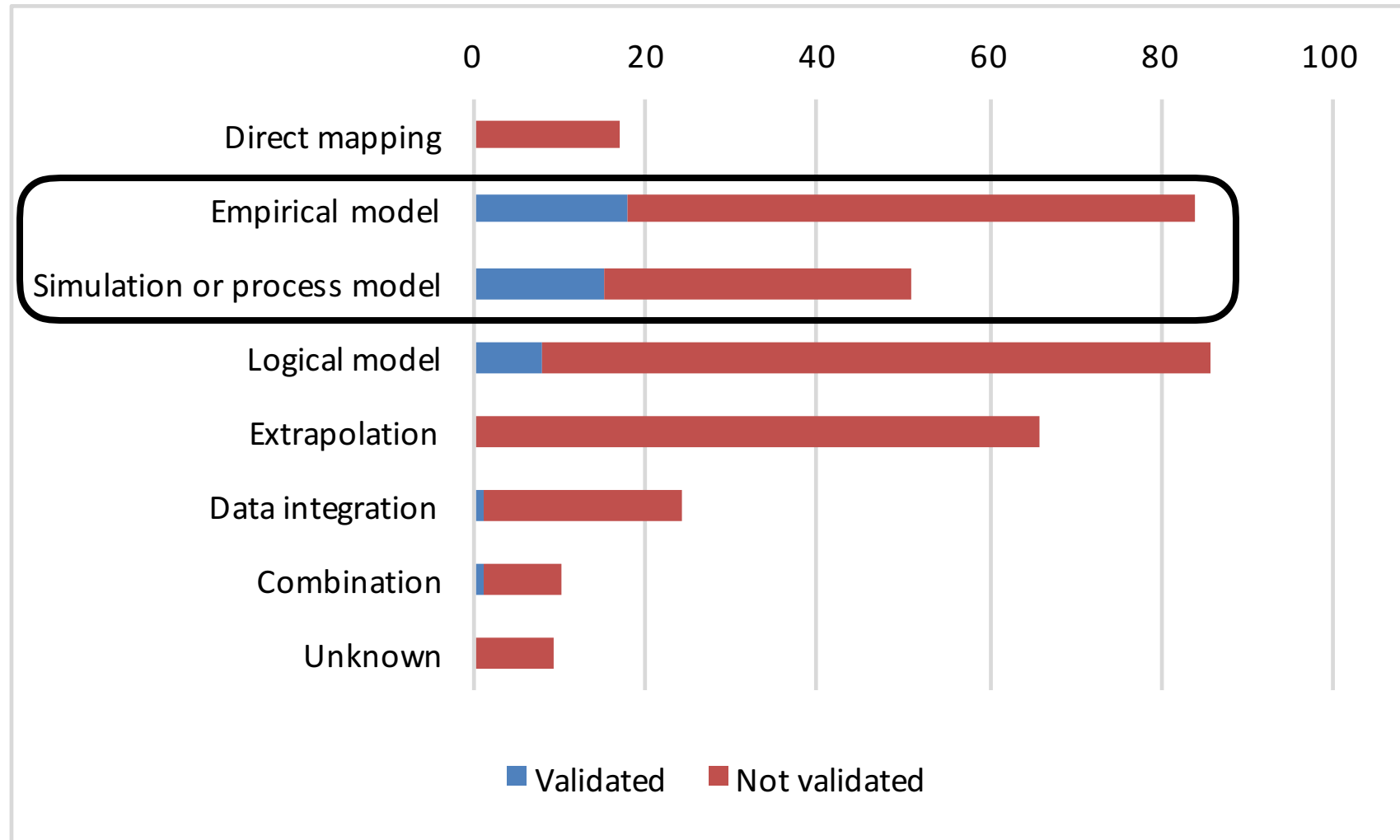


Validation efforts (1/2)

(13% validated)



Validation efforts (2/2)



Conclusions (1/2)

- A high level of detail and accuracy is necessary for ES mapping at the landscape scale
- Assessments can thus be challenging
 - Data collection
 - Computation capacity
- Mapping attempts:
 - Regulating and maintenance services (165)
 - Cultural services (85)
 - Provisioning services (73)
- Cultural services more frequently mapped at the landscape scale

Conclusions (2/2)

- Type of method in several cases difficult to determine
 - Insufficient method descriptions, failed to facilitate reproducibility
 - Problematic in an emerging research area
- Only 13% included efforts to validate results against empirical data
 - Important given the need for high resolution and accuracy
- Difficult to generalise which methods that are most appropriate: several methods should be considered
 - Research question
 - Competence
 - Data availability
 - Time frame
- This review can serve as a resource for information on methods

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