

Appendix 4. Detailed results

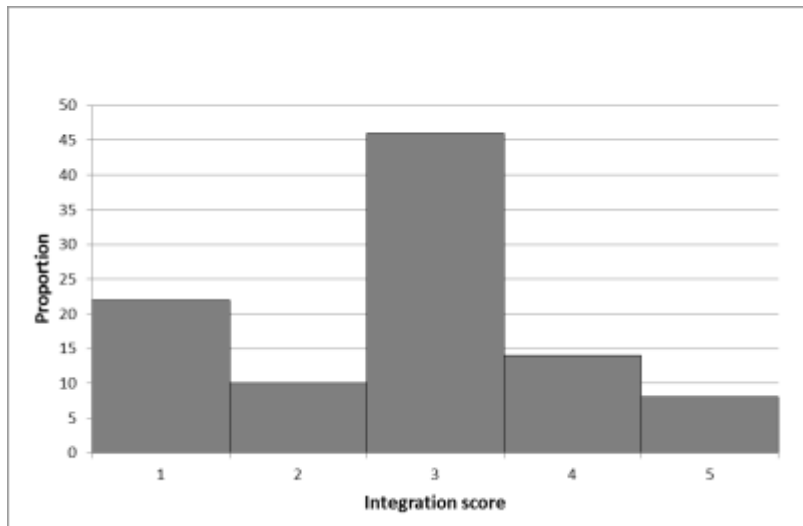


Fig. A4.1 Relative frequency distribution of integration score (n=101). Likert scale from 1 (minimal integration) to 5 (very well integrated).

Table A4.1 Representation of different types of social and environmental variables in empirical papers and betweenness centrality scores. High betweenness centrality scores are highlighted in grey, indicating the variables that are more commonly integrated with other variables.

Type of variable	No. of papers	% (n= 101)	Betweenness centrality
Land use or resource use	75	74.3	6.340
Biophysical aspects	72	71.3	6.340
Economic (e.g. population, poverty rate, available resources, investment, costs/payments, profits, gross domestic product, employment indicators, inflation rates)	62	61.4	3.174
Ecosystem services	52	51.5	0.959
Management (resources, professionals, plans and actions taken to manage a resource) and Management systems (policies, processes and procedures of an entity)	52	51.5	3.793
Biodiversity aspects	49	48.5	6.340
Demographic (e.g. gender, educational level, location, ethnicity, race, family size, education, income and occupation)	48	47.5	6.340
Governance (e.g. laws and policies, rules, institutions, procedures)	44	43.6	3.793
Ecological processes	42	41.6	0.614
Behavioural (e.g., actions/decisions of individual(s) that have an effect on the ecological systems)	33	32.7	3.174
Infrastructure (physical structures and facilities)	32	31.7	0.959
Social relations/interactions/processes (e.g. social capital, collaboration, social movements, social learning)	27	26.7	2.238
Psychosocial constructs (e.g. norms, values, attitudes, beliefs, preferences)	25	24.8	2.482
Historical accounts	22	21.8	0.959

Cultural aspects	16	15.8	0.434
Experiences	16	15.8	0.254
Politics or power	15	14.9	0.254
Other environmental	11	10.9	0.614
Other social	11	10.9	0.188
Wellbeing	8	7.9	0.180
Animal behaviour	8	7.9	1.951
Geomorphological processes	6	5.9	0
Evolutionary aspects	3	2.9	0
Genetics	1	0.01	0

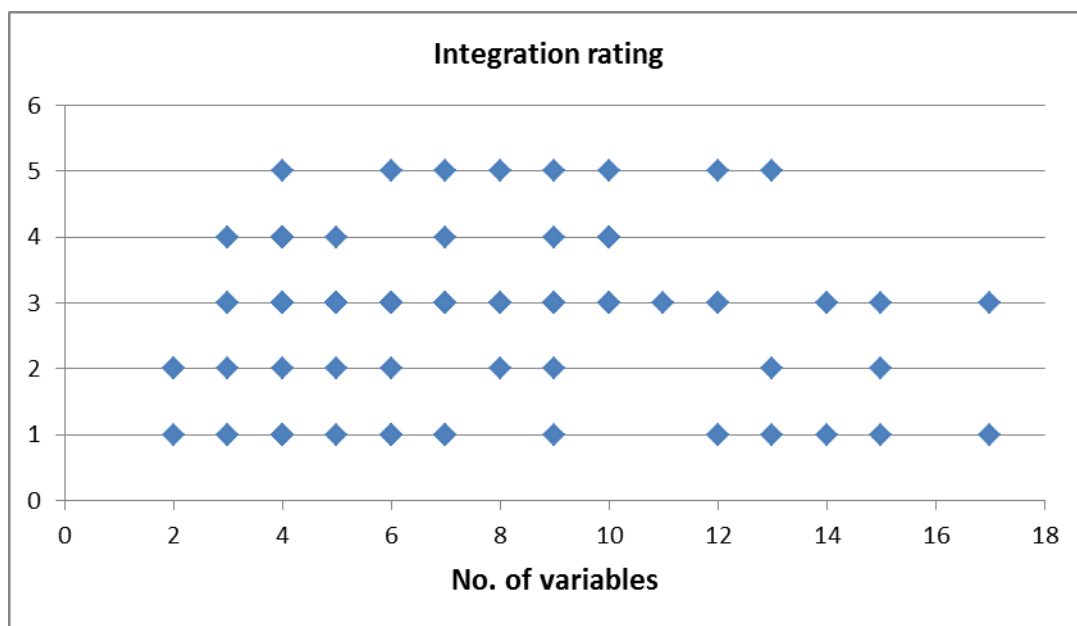


Fig. A4.2 Scatter plot indicating a lack of association between number of variables used in empirical studies and level of social-ecological integration. Some of the data points are overlaid on top of others because more than one study could have used the same amount of variables and rated equally for integration.

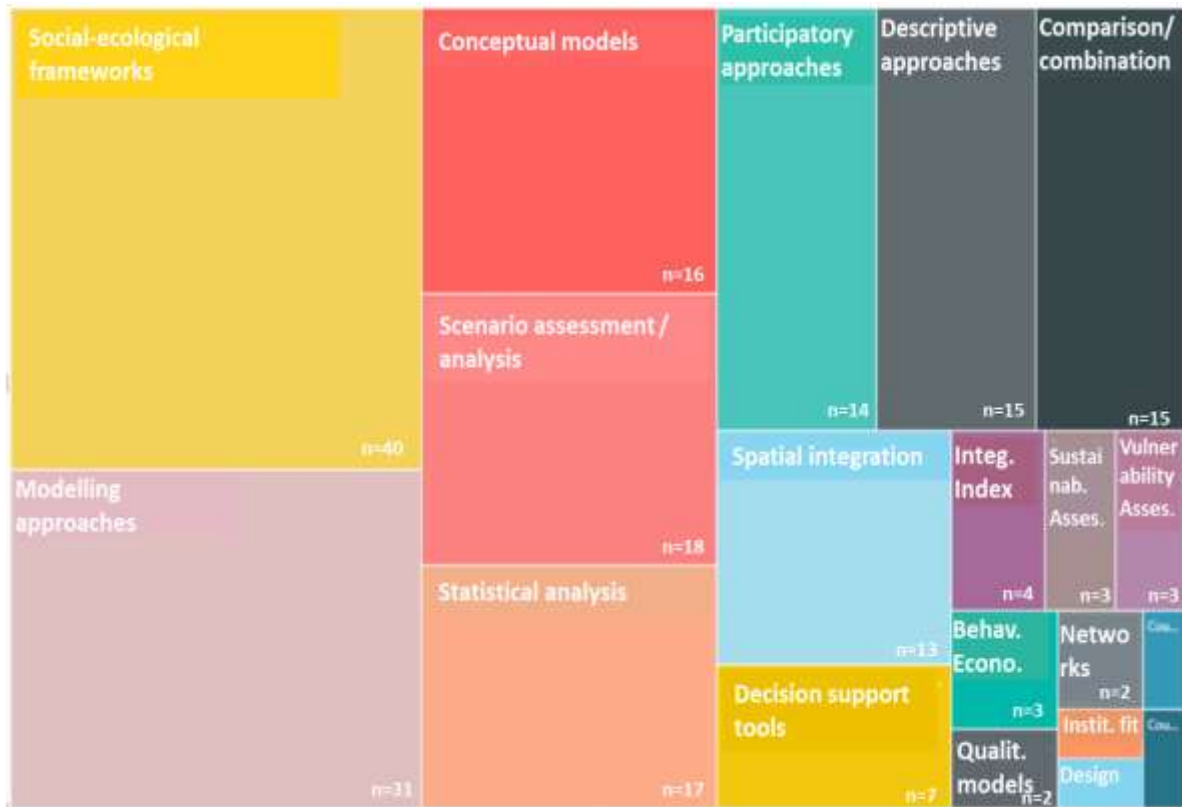


Fig. A4.3 Methods used in social-ecological research (n=110). Area of each quadrant denotes proportion. Each paper was assigned to one method or more. Institutional fit and telecoupling were found only once our sample. Social-ecological frameworks used include the Social-ecological Systems framework (n=9), the Resilience framework (n=11), the Ecosystem Services framework (n=9), the Driver-Pressure-State-Impact-Response framework (n=5), the Management Strategy Evaluation framework (n=2), the Sustainable Livelihoods framework (n=1; ref), and the Pressure-State-Response framework (n=1). Modelling approaches used include agent-based modelling (n=8), simulation modelling (n=8), dynamic modelling (n=7), system modelling (n=6), bio-economic modelling (n=5; ref), integrated modelling (n=4), bayesian belief networks (n=2), and game theoretic modelling (n=1).

Table A4.2. Average number of tools used by studies with different levels of integration. Likert scale from 1 (minimal integration) to 5 (a great amount of integration).

Integration rating	Average number of tools used
1 (n=22)	2
2 (n=10)	2.3
3 (n=47)	2.7
4 (n=12)	2.4
5 (n=10)	3.5
Total (n=100)	2.5

Table A4.3. Integration rating by tool used

Tools used in social-ecological studies	Average integration rating
Scenario assessment/analysis (n=18)	3.0
Statistical analysis of social and ecological data (n=17)	2.4
Spatial integration of social and ecological data (n=13)	3.5
Participatory approaches (n=14)	2.9
Integrated index (n=4)	3.0
Social-ecological systems framework (n=9)	3.1
Resilience framework/Adaptive capacity/Panarchy/Adaptive cycle (n=11)	2.1
Ecosystem services framework (n=9)	3.1
Driver-Pressure-State-Impact-Response (DPSIR) (n=5)	3.8
Descriptive approaches (case study analysis, historical analysis) n=18	2.8
Decision support tool/approach (n=7)	2.7
Conceptual models (e.g. mental models, casual-loop diagrams, cognitive maps, fuzzy maps/models) n=16	2.7
Collection/comparison/combination of social and ecological data (n=15)	2.4
System modelling (n=6)	3.3
Simulation modelling (n=8)	3.0
Integrated modelling (n=4)	4.8
Dynamic modelling (n=7)	2.7

Bio-economic modelling (n=5)	3.2
Agent-based modelling (n=9)	3.0
All tools	2.8

Table A4.4 Average integration rating for studies that used/not used theory to drive the social-ecological approach employed. Integration ratings were calculated for resilience theory (2.4, n=17), Common-pool resource theory (2.8, n=10), and systems theory (3.5, n=10). All other theories had small sample size.

Theory driving the approach?	Integration rating
No (n=53)	3.0
Yes (n=48)	2.5
Total	2.8

Table A4.5 Representation disciplines in empirical papers and *betweenness centrality* scores. Analysis was done using the studies identified during the abstract review (n=700) and was based on the classification system used by the Web of Science database, which assigns classification based on journal.

Discipline	No. of papers	% (n=700)	<i>Betweenness centrality</i> (mean=21.4 S.D.=65.2)
Ecology	379	54.1%	137
Environmental Sciences	345	49.3%	342
Environmental Studies	339	48.4%	177
Biodiversity Conservation	75	10.7%	34
Geography	56	8.0%	7
Engineering	43	6.1%	4.3
Physical Geography	40	5.7%	3
Economics	38	5.4%	11
Urban Studies	28	4.0%	33
Computer Science	23	3.3%	0
Geosciences	22	3.1%	13
Sociology	20	2.9%	1
International Relations	13	1.9%	0
Agriculture	11	1.6%	5
Planning & Development	10	1.4%	2
Anthropology	9	1.3%	0
Zoology	8	1.1%	0

Meteorology & Atmospheric Sciences	7	1.0%	0
Water Resources	6	0.9%	1
Marine & Freshwater Biology	3	0.4%	0
Mathematics	3	0.4%	0
Remote Sensing	3	0.4%	0
Biology	2	0.3%	0
Evolutionary Biology	2	0.3%	0
Forestry	2	0.3%	1.9
Genetics & Heredity	2	0.3%	0
Imaging Science & Photographic Technology	2	0.3%	0
Limnology	2	0.3%	1
Soil Science	2	0.3%	0
Energy & Fuels	1	0.1%	0
Ethics	1	0.1%	0
Fisheries	1	0.1%	0
History & Philosophy Of Science	1	0.1%	0
Plant Sciences	1	0.1%	0
Public Administration	1	0.1%	0
Statistics & Probability	1	0.1%	0

Table A4.6. Integration scores for studies that did/did not involve stakeholders at some point in the study (e.g. in the study design, for collecting data, for the delivery of outputs)

	Integration rating (n=47)
No one involved	2.9
Stakeholders were involved	2.6
Grand Total	2.8