

Appendix 5. Codebook

Note: BR = Biosphere Reserve

Component 1: Setting

Table A5.1 Setting considerations for adaptive co-management initiatives in biosphere reserves (adapted for codebook)

Variable	Description
2 nd tier variable: BIOPHYSICAL	
3 rd tier variable	Description
REGION	Biome and ecoregion; classification systems, species at risk, buffer zone, transition zone, invasive species
AREA	Size of area of BR; physical layout of the area, including geographical coordinates, street and road names that define the entire or parts of the BR
2 nd tier variable: SOCIAL	
3 rd tier variable	Description
POPULATION	Population (size) and density
PROFILE	Socio-economic profile (e.g., demographics, employment)
2 nd tier variable: Social-ecological	
3 rd tier variable	Description
LAND USE	Current land uses (e.g., agriculture, golf courses, forest cover, urban areas)

EMBEDDEDNESS	Dependence/reliance on local ecosystems for income/identity (embeddedness) (social and/or economic element and ecological element)
2 nd tier variable: biosphere reserve	
Sub-category code	Description
GOALS	Visions and goals for BRs
STRUCTURE	Organizational structure
HISTORY	History (social history, development of the BR – prior to BR designation including social, geological, embeddedness), policies
ACTIVITIES	Activities that occur within the biosphere reserve

Component 2: Practices and activities

Table A5.2

Variable	Description	Key words, phrases
2 nd tier variable: PRACTICES		
3 rd tier variable	Description	Key words, phrases
SPACE	Spaces for interaction	Spaces where stakeholders meet (can be a physical space, or an event or meeting) (from Crona and Parker 2012) Include virtual spaces (Facebook pages, webinars, blogs, etc.)
BOUNDARY OBJECT	Boundary objects	Objects that allow “members of different communities to interact and coordinate their efforts despite their sometimes divergent perceptions of the object... (e.g., models, classification systems, interactive maps) (Crona and Parker 2012)

Code mentions of actual objects. For example, if a passage indicates that one of the activities that occurred during a meeting was a mapping exercise, the map would be considered a boundary object, and would be coded as such

2nd tier variable: ACTIVITIES

3rd tier variable

PLANNING

Description

Planning and decision making

Key words, phrases associated

Text that refers to the act/process of making decisions about activities that will be undertaken, creating documents that outline goals/actions

IMPLEMENTATION

Implementation and experimentation

Text that refers to the act/process of implementing plans and decisions, as well as actions undertaken for the purpose of experimentation (adaptive management)

MONITORING

Monitoring

Text that refers to the act of monitoring the effects/outcomes from plans and actions taken

ASSESSMENT

Assessment and evaluation

Text that refers to the act of assessing and/or evaluating effects/outcomes of plans and actions taken

Component 3: Results

Table A5.3 Adapted from Plummer and Armitage (2007)

Variable	Description	Definition and key words, phrases
3 rd tier variable: FIRST ORDER		
4 th tier variable	Description	Definition and key words, phrases
PLAN	Resource management plans	References to resource management plans that have been developed by the BRs

RESOLUTION OR AGREEMENT COLLECTIVE ACTION	Resolution of conflict/dispute and/or agreement regarding resource issue Undertaking collective actions to resolve problems	References to resolutions of conflicts or disputes; references to agreements regarding a resource issue References to collective actions that have been/are being undertaken in the BR for the purpose of resolving problems For example, new partnerships, coordination and / or joint action; implementation of agreements within the BR
STATEMENT OF ACTIONS SANCTIONS	Codified statement of actions Agreed upon sanctions	References to, or evidence of, a formal statement with a systematic arrangement of actions to be undertaken within the BR References to agreed upon rules to address negligent behaviour/action
INSTUTIONAL ARRANGEMENTS	New or modification of institutional arrangement(s)	References to formal or informal new policies, strategies, organization, etc., or modification to existing institutional arrangements
COOPERATIVE UNDERTAKINGS LEGITIMACY	New cooperative undertakings Enhanced legitimization for policies and actions	New physical projects undertaken via a cooperative effort within the BR References to just and fair actions and outcomes (E.g., satisfaction with a policy because all stakeholder viewpoints were expressed and considered)
ADAPTIVE CAPACITY	Greater adaptive capacity	References to increases in adaptive capacity specifically, or: increased ability to deal with change and uncertainty greater ability to nurture diversity (social and/or ecological) greater ability to combine different knowledge types for learning increased opportunities for self-organization
SOC/HUMAN CAPITAL PROBLEM SOLVING QUESTIONING	Social and human capital Creative ideas for solving problems Encourages contemplation and questioning of routines, values and governance	networks, groups, rules, norms, sanctions; relationships of trust, reciprocity, exchange References to creativity or new, different, innovative ideas for problem solving identified/developed within the BR Explicit references by respondents of opportunities to question/contemplate their own values/routines or the values/routines/governance of the BR resulting from the BR ACM process.

DECISION MAKING	Improved decision making	<p>And/or, references to opportunities taken to do this within the governance of the BR in associated documents (strategic plans, etc.)</p> <p>Explicit references to improvements to the decision-making process within the BR (E.g. of a generic statement a respondent might make that would be coded here: 'We found that the decision to undertake action x was easier to make as a result of recent changes to the governance structure of the BR')</p> <p>Note: This is different than any mention of decision-making identified above in Component 2 where all acts of planning and decision making are coded)</p>
UNDERSTANDING OF INTERACTIONS	Changes in understanding of human-environment interactions	References to changes in the way individuals or groups understand human-environment interactions (e.g., as a result of increased knowledge, experience, diversity of viewpoints available to them)
FLEXIBILITY	Enhanced flexibility	References specifically describing increased flexibility in responses to issues/problems, or actions taken within the BR
OTHER	Other first order outcomes that do not fit in the existing sub-categories	
3 rd tier variable: SECOND ORDER		
4 th tier variable	Description	Definition and key words, phrases (from Innes and Booher [1999])
COOPERATIVE UNDERTAKINGS	New co-operative undertakings beyond the specific issue	For example, new partnerships, coordination and / or joint action; implementation of agreements that extend beyond the BR
LEARNING AND ENGAGEMENT	Extends engagement and learning across scales	For example, learning that extends into the broader community, this can be planned engagement/learning, or can be emergent
PERCEPTIONS AND BEHAVIOURS	Changes in perceptions (attitudes) and actions (behaviours)	Evidence of new / different attitudes and behaviours by individuals beyond the BR. This may be evident from interview responses (hypothetical example: 'I found that, as a result of our efforts in the BR, people in my community began to see the BR differently, as more of a special place')

RESPONSE EFFICIENCY AND EFFECTIVENESS	Enhances the efficiency and effectiveness of responding to other issues within the problem domain	This also may or may not be evident in some of the documents you collect. References to the way (process by which) other issues are dealt with; more effective and/or efficient approaches or experiences in responding to issues other than those for which the ACM is intended For example, a hypothetical comment by a respondent may be: ‘We found that dealing with community issues outside the BR but where the issues may affect us is easier since we have a management structure and specific individuals who deal with this’ The actual responses to other issues – what was actually done? For example, using the above hypothetical response, creating a role for a person to be a community liaison would be coded in this sub-category. It is the actual response to the issues outside of the BR, and their response in this case resulted in response efficiency and effectiveness (but that would not always be the case)
ADDRESSING OTHER ISSUES	Outgrowth(s) from the initial arrangement to address additional issues within the problem domain	
OTHER	Other second order outcomes that do not fit within existing sub-categories	

Component 4: Effects

Table A5.4 Adapted from Plummer and Armitage (2007) and others where noted.

Variable	Description	Key words and phrases
3 rd tier variable: ECOLOGICAL		
4 th tier variable COMPONENT	Description Components that make up the ecological/ biophysical system. From Cumming et al (2005): “System components can be thought of as the	Key words and phrases Species Stocks (population [number] of a species) Landscape change Vegetation patterns Hydrology (References to water movement, quality, etc. within the system both above and below ground)

pieces of the system, the 'nodes' of graph theory. In a simple system diagram, they would be represented as the contents of a box. Components include such things as ... particular ecosystem types or habitat types (for example, forest, grassland, coral reefs); resources, goods and materials (for example, wood, fruit, water, bushmeat; many of these will be marketable); and abiotic variables (for example, water, heat, elevation, and geomorphology)."

RELATIONSHIPS

Relationships and interactions among components of the ecological system.

From Cumming et al. (2005): "Relationships describe the ways in which system components interact or fit together. In a system diagram, they would be the causal or logical arrows that link boxes ('edges' in graph theory). Relationships of interest in most study systems include such things as nutrient cycles, food webs and trophic interactions (relating different organisms to one another and to the abiotic environment, ...), economic and ecological competition".

DIVERSITY

Biological diversity of the system and response diversity (different responses to environmental change among species within the system).

Ecological components

Climate components (air quality, temperature, sunlight, etc.)

Entities (Broader term than species that includes abiotic elements of the ecosystem)

Habitat

Natural resources

Goods and materials (marketable and non-marketable)

Individuals (an individual within a population [e.g., a single fish])

Population (all the individuals of a particular species within a defined area)

Ecological processes (Interactions among elements/components within the ecosystem that occur continuously over time such as photosynthesis, nutrient cycling, decomposition)

Species interactions (interactions among two or more species, including predator-prey interactions)

Productivity and biomass (the production/accumulation of biotic material [e.g., grasses, trees, crops])

Food web disruptions

Ecosystem functions (The collective ways in which the natural elements of the ecosystem interact – i.e., what the elements of the ecosystem actually do when they interact)

Process or interaction variables that link components

Dependency (A requirement of specific conditions for the survival/existence/fitness of an element of the ecosystem on another.

For example, when one species is dependent on another for survival)

Competition (Interaction between at least two organisms or species where the fitness of one is reduced by another)

Species richness and diversity (Number of different species or degree of variation within a collection of individuals)

Response diversity ("Range of reactions to environmental change among species contributing to the same ecosystem function"

Elmqvist et al. (2003))

MEMORY

From Cumming et al. (2005): “The sources of innovation are those subsets of the system that generate change or novelty. They may include or be closely related to such things as diversity ..., migration”
Memory and continuity

Provides the potential to maintain the system over time and continue to self-organize. From Cumming et al. (2005): “Continuity describes the ability of the system to maintain itself as a cohesive entity through space and time. Systems that are incapable of spatiotemporal continuity will frequently change their identity, providing a moving target for resilience studies. In social-ecological systems the key issue is often whether identity can be maintained through times of flux. Continuity is facilitated by system memory, which may take the form of ... seed banks, ... biological legacies that remain after disturbances”

- Biodiversity (degree of variation of life forms within a given boundary [e.g., a watershed])
- Adjustment (Process of adapting to changing conditions)
- Novelty (unfamiliar/new physical, chemical or biological changes to the ecosystem or components of it)
- Ecosystem protection (e.g., creation/existence of parks and protected areas, zoning for protection)
- Landscape patchiness (homogenous areas that differ from the surrounding landscape), landscape mosaics (describes the pattern of patches of a landscape)
- Corridors (contiguous and homogeneous areas that allow for movement of wildlife), networks for wildlife (interconnected corridors)
- Maintain identity in space and time (from an ecosystem perspective this would be akin to maintaining a relatively similar system configuration [e.g., same species, same functions] over time and within space)
- Banks (e.g. seed banks)
- Legacies remaining after disturbances (from an ecological perspective these are the reservoirs from which a recovery from disturbance is possible such as important species for seed dispersal, organic material for nutrients for growth, etc.)
- Recruitment (the supply of new, young individuals to a population of a particular species [e.g., the growth and development of juvenile fish to increase the population of salmon in a river system])
- Laws (e.g., zoning or parks creation as mentioned above) – something that explicitly conserves and/or preserves (i.e. says *this* is what the law is, and *this* is what it does).

3rd tier variable: LIVELIHOOD ASSETS

4th tier variable

Description

Key words and phrases

HUMAN

Human capital

skills, knowledge, health, etc.

SOCIAL	Social capital	networks, groups, rules, norms, sanctions; relationships of trust, reciprocity, exchange
NATURAL	Natural capital	stocks (fish) and key ecological services (nutrient cycling)
PHYSICAL	Physical capital	infrastructure and producer goods
FINANCIAL	Financial capital	financial resources - cash, bank deposits, livestock, jewels and regular inflows of money

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