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Research area #2: Ecosystem condition
Discussion paper 2.2: Review of ecosystem condition accounting case studies: Lessons learned and options for developing condition accounts

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The SEEA EEA revision process

Ecosystem condition is defined in the SEEA EEA as the overall quality of an ecosystem asset in terms of its characteristics (United Nations, 2012).

How do we measure and report on the condition of ecosystems in an ecosystem accounting framework? Addressing this question means establishing a common definition of ecosystem condition, selecting suitable indicators of condition, evaluating the actual condition of an ecosystem against a reference level, and providing an overall, comparable condition score for reporting or accounting. It also requires a further understanding of the relationship between the ecosystem condition, biodiversity and the delivery of ecosystem services as well as knowledge about the pressures (or in a broader sense the drivers of change) that continue to impact ecosystems.

The SEEA EEA Technical Recommendations (United Nations, 2017) do not yet provide definitive advice on how to address these several challenges when reporting ecosystem condition in condition accounts. These challenges have been addressed in a Revision Issues Note for the Ecosystem Accounting Revision 2020 (United Nations, 2018) which recommends providing further guidance on ecosystem condition.

This paper is part of a series of discussion papers on ecosystem condition. **It aims to review published ecosystem condition accounts and provide a synthesis of how such accounts have been structured and reported.** Two other papers are part of this series: a paper on the purpose of ecosystem condition accounts (discussion paper 2.1) and a paper proposing a typology for ecosystem condition variables or indicators (discussion paper 2.3).

These discussion papers have been developed by a working group established as part of the revision process. The working group on ecosystem condition is one of five working groups for the four research areas (RAs) identified in the Revision Issues Note: RA1 focuses on spatial units, RA2 on ecosystem condition, RA3 on ecosystem services and RA4 on valuation.

1 Introduction and aims

The objective of this paper is to collect a set of ecosystem condition accounts that include information on the condition of various ecosystem types reported in a structured way following the recommendations of the SEEA EEA and at a scale which is relevant for policy and decision makers.

We address the following questions:

(1) What **indicators or variables** have been used to develop an ecosystem condition account, what are the criteria to select particular indicators, and have the indicators been classified according to any typology;

(2) Are indicators **aggregated** to single (or few) high-level indices or composite indicators to report an overall measure of ecosystem condition;

(3) Is the information in the accounting table on ecosystem condition compared to **reference levels** for condition indicators or against a **reference condition**, and if so what sort of information has been used to determine a reference;

(4) How is the account **reported or structured**: for example, is the account reported as area of ecosystem (ha or %) under a certain condition, have the condition indicators and/or aggregated index been reported as opening and closing stock values.

These questions are addressed in this paper by reviewing, summarizing and synthesizing the information that is presented in the case studies included in this review. For each question, we briefly summarize the specific recommendations of the SEEA EEA and then present a reality check based on the case studies.

Finally, the paper lists a number of possible options further to support the revision process.

2 Case study review

Case studies for this review were selected based on a list of 58 studies that report accounts of ecosystem assets (extent and condition and ecosystem services) at national and sub-national scale. The accounts were collected from a variety of internet sources, assisted by a SEEA program status list compiled by the United Nations Statistics Division (UNSD). All accounts reported on in this document were written in English and are publicly accessible by internet searches. This first search intended to provide a reasonably comprehensive list of compiled and published accounts, but was not exhaustive. From this list only studies that discuss the development of an ecosystem condition account or that report an ecosystem condition account were further considered in this review. The accounting context is important. Therefore this review does not consider articles, reports and studies that define ecosystem condition or related concepts such as ecosystem health or ecosystem integrity or that propose indicators how to measure condition if the accounting context is absent.

Subsequently, the remaining case studies were divided in two groups: type A case studies that include at least one explicit ecosystem condition account structured in the form of an accounting table, and type B case studies that include a discussion of ecosystem condition in the context of ecosystem asset accounts, including indicators of ecological condition, but do not include an ecosystem condition account as such (i.e. no table in which a condition account is presented).

Finally, the list of case studies was reviewed by the working group on ecosystem condition and a few more case studies that had been overlooked in the first round were added, notably type B case studies that scope condition accounts for specific ecosystem types.[1]

For now the list does not include case studies that are not published in English. They can possibly be added during the review of the first draft of this paper by a review group.

[1] We invite reviewers to alert us to welcome additional ecosystem condition accounts that we may have missed or that have been produced subsequent to this review.

Table 1. List of case studies included in this review

Number	**Country**	**Account (short title)**	**Reference**
Type A case studies ("Strict" condition accounts)			
1	Australia	Port Phillip Bay	Eigenraam et al. (2016)
2	Australia	Great Barrier Reef	http://www.abs.gov.au/ausstats/abs@.nsf/mf/4680.0.55.001
3	Australia	State of Victoria	Eigenraam et al. (2013)
4	Australia	Victoria Central Highlands	Keith et al. (2017a), (2017b)
5	Australia	Accounting for Nature Trials	Wentworth Group (2016)
6	Australia	Victoria's Parks	Varcoe et al. (2015)
7	Canada	Measuring ecosystem goods and services in Canada	Statistics Canada Environment Accounts and Statistics Division (2013)
8	Netherlands	Limburg province	de Jong et al. (2014)
9	South Africa	National river accounts	Nel et al. (2015)
10	UK	Woodlands	Eftec (2015).
11	UK	Freshwater ecosystems	Khan and Din (2015)
12	UK	Protected areas in England and Scotland	White et al. (2015)
13	UK	Forest Enterprise England (public forests and woodlands)	Forest Enterprise England (2017)
14	UK	Green space in urban areas	Office for National Statistics (2018)
Type B case studies: Accounts that discuss aspects of condition but don't include condition account tables			
15	Australia	Vegetation Assets, States and Transitions (VAST)	Thackway and Lesslie (2005)
16	Australia	Australian Capital Territory	Smith et al. (2017)
17	EU	Ecosystem condition accounts for EU and member states	UNEP-WCMC (2017)
18	South Africa	KZN province – land and ecosystem accounts	Driver et al. (2015)
19	Uganda	Experimental ecosystem accounts	UNEP-WCMC & IDEEA (2017)
20	UK	UK natural capital: developing UK mountain, moorland and heathland ecosystem accounts	Office for National Statistics (2017)
21	UK	UK natural capital: developing semi-natural grassland ecosystem accounts	Office for National Statistics (2018)
22	UK	Scoping UK coastal margin ecosystem accounts	Office for National Statistics (2016)
23	UK	Scoping peatlands	Dickie I, Evans C and Smyth MA (2015)

3 A synthesis of how the case studies dealt with the research issues on condition (indicators, aggregation, reference, reporting)

The set of 58 studies on ecosystem accounting collected contained 17 reports with explicit information about ecosystem condition. To this number six additional studies were added during a second screening of the literature. So this review is based on 23 studies (Table 1).

Here are some general observations. Virtually all studies come from Australia and the United Kingdom, and from countries where English is an official language (Uganda, Canada and South Africa) or for a region where English is an official working language (EU). The Netherlands undertook an effort to translate the findings to English. Clearly, this review would benefit from the inclusion of studies in other languages as well, if they are available.

All of the 23 studies reviewed are reports. None of them is a scientific article published in an academic journal. These studies are often undertaken or commissioned by governmental bodies and agencies (that are in charge for the management of publicly or privately owned land).

With one exception, all of the studies were published within the last six years (2013-2018), reflecting the fact that ecosystem condition accounting is a relatively new field of practice.

Of the 23 studies included in this review, 14 contain a structured condition table (type A). These 14 studies come from four countries: Australia, Canada, South Africa and the United Kingdom. The majority deal with the terrestrial and/or inland water realms, with the marine realm considered in only four of them. Five of them were conducted for the whole national territory, and nine for a sub-national area. (See Annex 1 for a summary of key characteristics of the 14 type A case studies.)

In ten cases, the condition table includes information about the extent of the ecosystem type for which condition data are presented. Furthermore, eight studies present aggregated condition indicators, seven studies organise condition information in a hierarchical classification and seven studies specifically compare the condition against a baseline situation or a reference condition (see Figure 1).

On online Supplement to this discussion paper is available with the following information for each case study: Ecosystem or asset types, Ecosystem extent reported, Ecosystem condition reported, Realm, Spatial unit for analysis, Spatial unit of reporting, Condition indicators, Aggregated index, Condition categories, Classification of indicators, Reference levels and How is condition reported. It also contains excerpts of reported ecosystem condition accounting tables. The online supplement can be consulted here:
https://seea.un.org/sites/seea.un.org/files/documents/EEA/seea_eea_revision_discussionpaper22_supplement.pdf

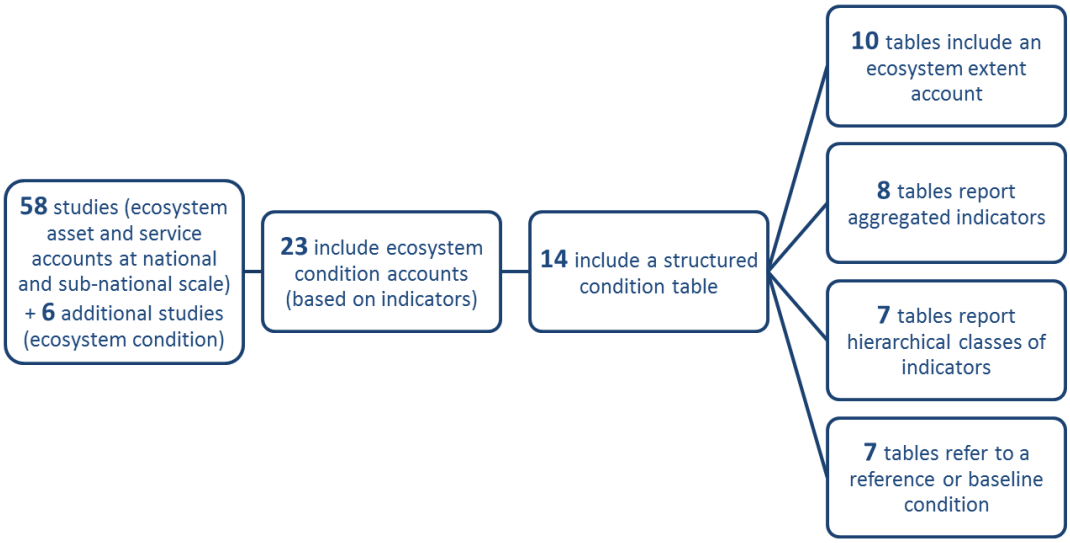

Figure 1. Break down of the studies of this review. (The characteristics shown for the 14 type A case studies are not mutually exclusive. See Annex 1 for further information about their characteristics).

3.1 Definitions of ecosystem condition

SEEA EEA and the Technical Recommendations define ecosystem condition and describe the condition account as follows:

"Ecosystem condition reflects the overall quality of an ecosystem asset in terms of its characteristics." (SEEA EEA 2.35)

The ecosystem condition account captures, in a set of key indicators, the state or functioning of the ecosystem and how it changes over time:

"The condition account provides insight in how ecosystems within the EEA [Ecosystem Accounting Area] change, and how those changes may influence the flows of ecosystem services supplied by those ecosystems. The ecosystem condition account is compiled in physical terms using a variety of indicators for selected characteristics." (TR 2.25)

3.2 Indicators for ecosystem condition

3.2.1 Current SEEA EEA recommendations

Key points from SEEA EEA and the Technical Recommendations (TR) include the following:

"Indicators in the ecosystem condition account reflect the general ecological state of an ecosystem, its capacity to supply ecosystem services and the relevant trends. These indicators may reflect such

aspects as the occurrence of species, soil characteristics, water quality, and ecological processes. … Generally, different ecosystem types require different indicators." (TR 4.5)

Ecosystem characteristics that do not generally change rapidly over time (e.g., slope or soil type) are not considered key indicators of the changing condition of an ecosystem (TR 4.6). Indicators relating to characteristics such as vegetation, water, soil, biomass, habitat and biodiversity for different ecosystem types, as well as indicators of relevant pressures and drivers of ecosystem change, are considered appropriate indicators (TR Chapter 4 box on key points).

The Technical Recommendations also define criteria for indicators. Indicators of ecosystem condition should (1) be relevant and easy-to-understand for policy and decision making, for instance because they reflect policy priorities; (2) reflect the overall ecological condition of the ecosystem or key processes within it and is able to signal changes in this condition; (3) relate to measures of potential ecosystem services supply; (4) require available data and scientific validity of measurement approaches; and (5) be cost effective (TR 4.31).

SEEA EEA does not provide any guidance on a typology or a hierarchy of indicators, and the Technical Recommendations do not explicitly discuss a typology or a hierarchy of indicators. However, paragraphs 4.39 and 4.40 of the Technical Recommendations include a discussion of a "continuum of information" from individual indicators of specific ecosystem characteristics to information on relative overall condition, which effectively proposes a hierarchical approach to the development of measures of ecosystem condition.

3.2.2 Analysis of the case studies

A wide variety of indicators is used across the case studies to assess ecosystem condition. Table 2 provides a synthesis of the indicators that have been used in the various type A and type B case studies. The table provides broad groups of indicators with some examples.

Different terrestrial ecosystems share a number of generic indicators which can be used to assess the condition of various ecosystem types. Examples are structure and composition of vegetation, conversion to intensive land uses, fragmentation, the chemical quality of the water and soil, biomass or carbon indicators, and species-based indicators. Also indicators related to accessibility and protection of ecosystems are included in the condition account, particularly in the UK accounts.

The indicators on access to ecosystems warrant some discussion. Accessibility is a standard indicator in the UK condition accounts. The rationale is that it can be used to assess the capacity of ecosystems to provide recreation services and hence links ecosystem condition to ecosystem services. Accessibility could thus be used as a metric in ecosystem service accounts rather than ecosystem condition accounts. However, measures of accessibility can also relate to management interventions or to increased pressure on ecosystems, and may thus be useful in ecosystem condition accounts. The specific indicator(s) to be used (e.g. length of trails, number of visitors, population density in the vicinity of the ecosystem) and their relationship to ecosystem condition (which could be positive or negative) is likely to be highly context specific.

A second comment refers to use of the term "species-based indicators" rather than "biodiversity indicators". The term "biodiversity indicators" is often used to mean species-based indicators, but in principle "biodiversity indicators" could relate to genes, species or ecosystems. A recommendation is thus to avoid using the term "biodiversity indicators" when referring specifically to species-based indicators.

Besides the generic indicators for terrestrial ecosystems, specific indicators are used to assess particular aspects of condition for forests, woodlands, grasslands, urban areas or heathlands. For forest the size and properties of the timber stock are important as well as the spatial configuration. Interestingly, accounts for semi-natural ecosystems which require a specific management to maintain them in a particular state include indicators in the condition account that can quantify management practises such as grazing or burning.

The condition of inland water ecosystems is frequently measured with indicators that relate to the physical structure (e.g. quantity and flow) and the chemical water quality of rivers, lakes and wetlands, as well as the condition of instream and riparian habitats. There is a long history of assessing water quality using composite chemical or ecological indicators (based on specific species) which is reflected in the accounts.

As for inland waters, the condition of marine ecosystems is measured by the same group of physico-chemical water quality indicators but also the loads of nutrients and sediments are used to assess marine ecosystem condition. There is less emphasis on ecological status of marine ecosystems (perhaps due to lack of data) and this seems to be replaced with the extent of particular habitats such as seagrass.

Table 2. Summary of the indicators used in the case studies, grouped into main classes of indicators with some examples. + means that for these ecosystem types specific indicators on top of the generic indicators are used in the accounts.

Realm	Ecosystem type	**Main groups of indicators and examples**
Terrestrial	Generic indicators – can be applied to all terrestrial ecosystem and vegetation types	• **Indicators on the structure and composition of the vegetation** such as tree canopy cover, understorey strata, leaf area • **Outright loss or conversion of natural vegetation cover** to intensive uses (linked to ecosystem extent, but is also used as an indicator of condition) • **Landscape indicators** including landscape type, natural land parcel size and spatial configuration • **Air, water and soil quality indicators** such as nitrogen content, heavy metal content, concentrations of different air, water and soil pollutants • **Species-based indicators** such as naturalness of biota, species richness, red-listed species, conservation status of species • **Biomass/carbon indicators** • **Other characteristics** amongst which annual rainfall, annual number of growing days • **Pressure indicators** such as lack of weeds, depth to groundwater table, degree of fragmentation • **Indicators on the access to ecosystems** such as distance to ecosystems, population density • **Indicators related to protection measures**, such as sites of special interest

	+ for forest and woodland	• **Specific forest indicators** such as extent of tree species type and volume, age, biomass of the timber stock • **Spatial configuration** of the forest
	+ for urban areas	• **Specific urban indicators** such as access and proximity of green space as well as indicators related to protection measures (special designation of sites of interest)
	+ for mountains, moorlands and heathlands	• **Specific indicators** include the particular **management** of these ecosystem types such as managed burning, length of trails, volume of sheep grazing
	+ for grassland	• **Specific indicators** include the particular **management** of these ecosystem types such as cutting and grazing intensity
Inland water	Rivers, open waters, lakes, reservoirs	• **Physical indicators about the hydrology** such as physical form, flow, reservoir stock • **Indicators on the instream and riparian habitats** • **Indicators of chemical and ecological water quality** including single indicators such as concentrations or composite indicators such as surface water status • **Species-based indicators** such as macro-invertebrate diversity • **Accessibility indicators**
	Wetlands	• **Physical indicators** on the size and shape of wetlands • **Carbon and nitrogen stock indicators** (including wetland soils) • **Species-based indicators** such as wetland birds • **Chemical water quality indicators** • **Accessibility indicators**
Marine	Marine inlets, transitional waters and coastal ecosystems Shelf and ocean ecosystems	• **Loadings** of nutrients, sediment or pollutants to sea • **Chemical water quality indicators** such as dissolved oxygen, Chlorophyll-a, turbidity, nutrient concentrations • **Bathing water quality indicators** • **Extent of specific habitats** such as seagrass habitats or coral reefs • **Species-based indicators** such as fish diversity and abundance or conservation status • **Access to coastal zones** and margins

Table 2 shows that there is some convergence towards using a similar set of indicators for the different realms (terrestrial, inland waters and marine) and for different ecosystem types. Here are some generalisations:

1. Biotic indicators are universally used, and species-based indicators (as a sub-class of biotic indicators) are widely used, to assess condition of ecosystem types. Accessibility is used in all the UK accounts, but not in the other countries.

2a. In addition to species-based indicators, terrestrial ecosystem condition measurements are based on indicators about pressures, structure (from vegetation level to landscape scale), loss or conversion of natural vegetation, the chemical quality of water and soil, the quantity of biomass and carbon.

2b. In addition to species-based indicators, inland water ecosystem condition measurements are based on physical (such as hydrological), habitat-related, chemical and ecological status indicators.

2c. In addition to species-based indicators, marine ecosystem condition measurements are based on physical and chemical status indicators as well as on an assessment of loads of nutrients, sediment or pollutants entering seas.

3. In addition to the indicators mentioned under 1 and 2, specific indicators are available per ecosystem type which can be related to the management of that ecosystem or to specific pressures, characteristics, or species.

Rationale or criteria to include or exclude indicators

Not all the studies included in this review justify the choice of particular indicators to measure condition. So how do we know if a set of indicators adequately describes the condition of an ecosystem? Consider leaf area index or soil carbon content. Do increasing values of these indicators always correspond to better condition? What if ecosystem condition exhibits a bell-shaped response to increasing values of certain indicators? These questions are relevant but not always considered in the reviewed studies. In some cases justification of the criteria to select condition indicators is not found in the case studies which report the actual accounts but in preceding articles or reports which are then cited by the case studies. A good example is the scoping studies by the UK which scope a condition account and include a rationale as to why certain indicators have been selected.

Case study 5, the report by Wentworth group (2016) includes a useful section on the selection criteria for indicators.

Case study 8, the accounts for a Dutch province, couples the selection of indicators to the purpose of the accounts (capacity to provide ecosystem services).

Typology or classification of indicators

None of the studies developed a formal typology or classification of ecosystem condition indicators. Indicators are rather assorted or grouped ad hoc into classes that describe the relation among indicators. For instance the Canadian account discriminates between site conditions and the landscape context and groups indicators accordingly. The Dutch case study groups indicators according to physical state, environmental state (chemical quality) and ecosystem state. Several UK accounts have higher level categories for indicators but there is no consistent use of a typology or a classification across the different accounts.

The UK scoping paper on mountains moorland and heathland comes closest to proposing a classification that could be generally applied across different ecosystem types. The paper refers to the principles of natural capital accounting (Office for National Statistics, 2017) which recognises seven dimensions of quality for which condition can be indicated. The dimensions are as follows:

- relevant volume estimates (for example, timber biomass, water quantity or flow, length of linear features)
- biodiversity indicators (for example, abundance indicators, mean species richness)[2]

[2] It is confusing to the authors of this paper that the fourth dimension is called “ecological condition indicators” when many of the other dimensions relate directly to ecological characteristics. The second dimension, “biodiversity indicators”, is referred to as “species-based indicators” in this paper.

- soil indicators (for example, carbon content, water content)
- ecological condition indicators (for example, water quality, plant health, invasive species)[2]
- spatial configuration (for example, fragmentation, connectivity)
- access (for example, proximity to areas of population)
- management practices (for example, organic farming, degree of protection)

Several case studies do not group indicators per se but they report an implicitly adopted hierarchy through the use of composite indicators, which in themselves, are constituted of separate metrics. Case study 3 (Victoria) reports the condition of wetlands based on an index. This index is based on six sub-indices, which are derived from 13 metrics. The sub-indices represent six dimensions of ecosystem condition indicators: wetland catchment, physical form, hydrology, water properties, soil and biota. The condition of rivers is reported based on a similarly derived index. Case study 5 (Accounting for Nature Trials in Australia) aggregates different indicators into three composite indicators which reflect habitat and to a lesser extent ecological processes, biological health, and the physical/chemical quality of wetlands and streams. Case study 9 (South Africa) reports values for an aggregated ecological condition index based on four sub-indices that characterise river condition: flow, water quality, riparian habitats and instream habitats. (We pick up on this discussion in the next section on aggregation).

We note also that a possible typology emerged from Table 2 by simply listing the major groups of all indicators which are reported by the case studies of this review. These classes or groups are indicated in bold.

Discussion paper 2.3 presents a more detailed discussion on criteria and typologies for ecosystem condition indicators. It also proposes a typology for ecosystem condition indicators for ecosystem accounting. Table 3 presents a cross walk between the proposal for a typology (Discussion Paper 2.3) and the main groups of indicators based on the case studies and reported in Table 2.

Discussion paper 2.3 proposes a typology with six main types or classes. Almost all indicators that are reported in the case studies can be assigned to one of these classes. Indicators (or variables) for ecosystem characteristics that are not selected as ecosystem condition indicator, such as precipitation (see also discussion paper 2.1, and selection criteria for ecosystem condition indicators see discussion paper 2.3), are excluded.

Table 3. Cross walk between the proposal for a typology for ecosystem condition indicators for ecosystem accounting (discussion paper 2.3) and the main groups of indicators and examples in Table 2.

Type of indicator	Main groups of indicators and examples from the case studies
Species-based indicators	• General species-based indicators such as naturalness of biota, species richness, red-listed species, conservation status of species • Ecosystem-specific species-based indicators such as macro-invertebrate diversity, wetland birds, fish diversity
Vegetation and biomass	• Indicators on the structure and composition of the vegetation such as tree canopy cover, understorey strata, leaf area

	• Biomass/carbon indicators
Ecosystem physical and chemical state	• Physical indicators about the hydrology such as physical form, flow, reservoir stock • Physical indicators on the size and shape of wetlands • Indicators of chemical and ecological water quality including single indicators such as concentrations of dissolved oxygen, Chlorophyll-a, turbidity, nutrient concentrations or composite indicators such as surface water status • Air, water and soil quality indicators such as nitrogen content, heavy metal content, concentrations of different air and soil pollutants • Bathing water quality indicators
Ecosystem disturbance & management	• Pressure indicators such as lack of weeds, depth to groundwater table, degree of fragmentation • Outright loss or conversion of natural vegetation cover to intensive uses (linked to ecosystem extent, but is also used as an indicator of condition) • Indicators related to protection measures, such as sites of special interest • Specific indicators include the particular management of ecosystem types such as managed burning, length of trails (accessibility), volume of sheep grazing, cutting and grazing intensity • Loadings of nutrients, sediment or pollutants to sea
Habitats, ecosystem subtypes	• Specific forest indicators such as extent of tree species type and volume, age, biomass of the timber stock • Specific urban indicators related to protection measures (special designation of sites of interest) • Extent of specific habitats such as seagrass habitats or coral reefs • Indicators on the instream and riparian habitats
Landscape complexity	• Landscape indicators including landscape type, natural land parcel size and spatial configuration • Spatial configuration of the forest
Indicators excluded from this typology	• Ecosystem characteristics amongst which annual rainfall, annual number of growing days • Indicators on the access to ecosystems, distance to ecosystems, or population density

3.2.3 Options for SEEA EEA revision

1. The statement that different ecosystem types need different indicators is only partially valid. While there is no single "one-size-fits all" set of condition indicators that will work for all realms and all ecosystem types, there may be some common indicators. Whereas the final set of indicators to measure ecosystem condition is likely to be specific per ecosystem type or class of ecosystem types, and may depend on the local or regional context, at least at a higher hierarchical level, some generalisations are possible.

Generalisations could be useful to inform a typology which allows comparison of the condition of ecosystems across ecosystem types and across different spatial contexts.

2. SEEA EEA and/or TR could contain more guidance as to why to include or also to exclude certain indicators is needed.

So far, classification of indicators that measure ecosystem condition seems to be based on a pragmatic approach which is essentially driven by indicator availability rather than on an a priori defined typology for indicators. Yet, defining the type of indicators that should be included in a condition account should be done before selecting indicators to ensure that all relevant aspects of ecosystem condition are covered or at least that gaps are identified explicitly.

2.1. The SEEA EEA could indeed develop a classification or typology of indicators for ecosystem condition: what are the classes (or dimensions or themes) that need to be included in an ecosystem condition account to ensure a representation of different indicators which describe condition?

Providing a typology for ecosystem condition indicators encourages the development of a more inclusive account including both biotic and abiotic characteristics of ecosystems. A typology can give guidance on data gaps and monitoring.

2.2. More generic recommendations could be included in the TR on indicator selection that is relevant for any indicator

2.3. Specific recommendations could be included in the TR on the specific indicators for condition

These issues are discussed extensively in discussion paper 2.3.

3.3 Aggregation of indicators

3.3.1 Current SEEA EEA recommendations

SEEA EEA refers to aggregation mainly in relation to ecosystem services and their valuation, and also to aggregation of spatial units for reporting purposes. There is a brief discussion of aggregation in ecosystem asset accounting in Section 4.3.3, with four paragraphs that deal jointly with aggregation of condition indicators and reference condition (4.86-4.89). However, the initial thinking reflected in SEEA EEA has been largely overtaken by more detailed discussion of aggregation of ecological condition indicators in the Technical Recommendations, including in section 4.4.2 on aggregate measures of condition.

The Technical Recommendations recognise that aggregation of indicators to provide an overall measure of ecosystem condition is likely to be useful, but do not provide definitive recommendations on how this should be achieved.

“Where indicators of individual characteristics are available, the next question for ecosystem accounting concerns if and how aggregation of indicators to obtain overall measures of ecosystem condition for a single ET and for multiple ecosystem assets within an EAA is required. … [T]he development of overall measures of the condition of ecosystem assets remains a challenge in measurement terms.” (TR 4.36)

"A range of different approaches are available for aggregation, ranging from using an equal weight for all indicators, to weighing based on expert judgement, or weighing based on specific criteria, for instance in relation to indicators aggregated by ecosystem compartment (soils, vegetation, etc.), by species group (e.g. weighting of insects, mammals, plants, etc.) and/or taking into consideration key ecosystem services." (TR 4.73)

3.3.2 Analysis of the case studies

All type A case studies essentially aggregate at least some information as they report the condition of ecosystems at sub-national or national level. Often indicators are spatially explicit, for instance bird counts or water quality data, and are thus spatially aggregated by summing (in case of counts) or by averaging (in case of water quality) values across space.

Eight of the 14 type A case studies and several type B case studies also perform thematic aggregation. They combine different indicators into a single basket or composite indicator, for instance by normalizing the indicators and summing them. Aggregation occurs in one step or in two steps. A common practice is to aggregate individual indicators or metrics into a single index of ecosystem condition (one step thematic aggregation) or sub-sets of indicators are aggregated into a several sub-indexes which, in turn, are aggregated into a single condition index (two step thematic aggregation).

Aggregation can be to a single index or score (e.g. 0 – 1 or 0 – 100), or to an ecological condition category (such as good, fair, poor), or both.

Indicators are usually aggregated (and reported) within an ecosystem type rather than across different ecosystem types.

3.3.3 Options for SEEA EEA revision

Aggregating indicators to a scaled ecological condition index or a set of ecological condition classes can allow for comparison across different ecosystem types and different realms, and ideally between countries. It also provides a way of summarising and presenting complex information on ecosystem condition for a non-technical audience. For this reason we encourage aggregation in principle.

However, aggregation should be approached with care, and it would be useful for SEEA EEA to develop or refer to good practices for aggregation of condition variables, metrics and indicators. The need for ecological intelligence in the aggregation process should be emphasised, as is it quite possible to develop an index or composite indicator that is not ecologically meaningful (i.e. that does not reflect anything sensible about the overall condition or changes in condition of an ecosystem type or asset). It is essential to involve ecologists with expertise in the realm, ecological region and ecosystem types concerned in the development of aggregate measures of condition.

If condition categories are used, it is important to include a caveat that care should be taken in applying thresholds to divide the indicator or index into ordinal intervals. If "arbitrary local" cut-off points are used, then the spatial (inter-regional) comparability of the accounts is lost.

3.4 Reference levels and reference condition

3.4.1 Current SEEA EEA recommendations

SEEA EEA recognises the need for a reference condition for ecosystem asset accounting (SEEA EEA 4.10), and this is taken up in more detail in Section 4.4.3 o the Technical Recommendations. Key points include the following:

A common starting point for determining a reference condition is to use the idea of near-natural or pristine condition and then to define the distance from natural. In many cases the application of this reference condition is done by selecting a point in time at a pre-industrial stage (SEEA EEA 4.16, TR 4.49). A clear distinction should be made between reference and target condition (SEEA EEA 4.20, TR 4.53).

From a purely accounting perspective, it may be sufficient to use the condition value at the beginning of the accounting period as a reference and measure the actual condition relative to that point in time. However, this approach has limitations for assessing the relative condition of multiple ecosystem assets, as ecosystems that may have been heavily degraded in the past will be compared from the same starting point as those that have not been degraded at all (SEEA EEA 4.15, TR 4.54).

Determining reference conditions for multiple ecosystem types and more than one country is not straightforward and further testing of relevant approaches for ecosystem accounting is required. (TR Chapter 4 box on key points.) Pending further testing of different approaches to defining reference conditions, it is recommended that in the development of ecosystem condition accounts for a given country, a point in time be selected, as far in the past as possible given the availability of data, to allow the development of the relevant metrics of current condition and the application of the reference condition approach (TR 4.59). To allow for comparison across countries, it will be necessary to move towards common structures for the organisation and presentation of data on ecosystem condition (TR 4.60).

3.4.2 Analysis of the case studies

Only half of the type A studies clarified the reference levels of the indicators, referring to a reference condition or a baseline situation. Australian studies typically use the pre-European reference of the 18th century. The South African cases use the natural state (prior to major human modification) as reference condition. The official UK accounts commissioned by the Office for National Statistics do not use a reference condition as a matter of principle, measuring change only as the difference between opening and closing stocks. However, other UK accounts report indicators for which reference levels or targets have been established, in particular under EU law such as the Water Framework Directive (WFD) or the Habitats Directive (HD). For instance EU member states monitor the ecological status of surface water bodies under the WFD and the conservation status of threatened habitats and species under the HD. Both ecological status and conservation status have target levels (good ecological status and favourable conservation status, respectively) and are each determined using a number of indicators or assessments. These target or reference levels could possibly be used to help define a reference condition.

3.4.3 Options for SEEA EEA revision

Given the discussion on aggregation in section 4.2 above, it may be useful to distinguish between reference levels for individual indicators, and an overall reference condition. We propose the following:

- "*Reference level*" applies to an individual indicator (or variable).
    - Reference levels may have different scales and different measurement units for different indicators.
    - Reference levels for the same indicator may well differ for different ecosystem types:
        - E.g. in order to be ecologically meaningful, the reference level for a carbon indicator such as NDVI would be different for a forest, a savanna and a grassland;
    - Reference levels are also needed for the thematic aggregation:
        - The normalization that is (in most cases) needed for adding up "apples and pears" relies on implicit reference levels for each of the indicators involved. Using "arbitrary" local values (e.g. local opening values, or regional maxima) as reference levels can compromise the comparability of the normalized (and/or the aggregated) indicators in a subtle and hidden (and thus very dangerous) way.
- "*Reference condition*" applies to aggregate measures of condition.
    - Reference condition can be set in relation to a consistent set of categories or a single index for all ecosystem types
        - E.g. the reference condition for forest, savanna and grassland ecosystem types could be "natural" or "100"

Reference levels are values against which it is useful to compare the current value of an indicator. A reference condition is a complete description of the condition of an ecosystem based on indicators or an index against which the current condition is assessed. A reference condition can be defined by measuring (or collecting information about) a selection of ecosystem condition indicators using one of the following options:

- The natural or pre-industrial state,
- The undisturbed state (which could be measured by monitoring ecosystems where there is an absence of pressures or where a degree of modification can be established),
- A temporal baseline state (which could be selected based on the earliest date for which consistent or reasonably comprehensive data are available),
- A state which is defined based on expert judgement or based on a statistical analysis of the indicator values and reference levels that are used to describe the current state.

A note on using a temporal baseline state: It is important that the baseline date selected should be stable across different accounting periods. We suggest ruling out the use of the condition value at the beginning of each accounting period as a reference with measurement of the actual condition

relative to that point in time. While this might be acceptable practice from a purely accounting perspective, it amounts to a shifting baseline and does not make sense for ecosystem accounting.

A note on statistical approaches to define a reference condition. Statistical approaches have been used to describe a reference condition when other approaches are not applicable. This occurs in countries or areas where certain ecosystem types have been so heavily modified that the natural or undisturbed state is not found any more or where historical data or sources to define a reference condition are absent. Statistical approaches use data of the current state of ecosystems and describe a reference condition based on higher end values of the current condition. These approaches necessarily have to make assumptions about the current condition relative to a reference condition.

It may also be useful to address the distinction between a reference condition and a target or desired condition in more detail. A key point is that using a reference condition of "natural" for an ecosystem type need not imply that the target or desired condition for that ecosystem type is natural. There is ample scope for setting a target condition of semi-natural or intensively modified for an ecosystem type or a particular ecosystem asset for which the reference condition is nevertheless natural.

3.5 Reporting the account

3.5.1 Current SEEA EEA recommendations

SEEA EEA presents two suggestions for ecosystem condition accounting tables that are intended to serve as a starting point for experimentation in the area of compilation rather than as definitive methodological guidance (SEEA EEA 4.52, 4.67, 4.71).

Generally, ecosystem condition should be reported per ecosystem type (TR 4.19). The Technical Recommendations suggest reporting condition as opening and closing stocks for given years and provide the table below as an example (TR 4.20).

Table 4.1: Initial example of an ecosystem condition account

		Proxy ecosystem type (based on land cover)														
		Artificial surfaces	Herbaceous crops	Woody crops	Multiple or layered crops	Grassland	Tree-covered areas	Mangroves	Shrub-covered areas	Regularly flooded areas	Sparse natural vegetated areas	Terrestrial barren land	Permanent snow and glaciers	Inland water bodies	Coastal water and inter-tidal areas	Sea and marine areas	
Example indicators of condition		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Vegetation (e.g. native cover)	Opening condition																
	Closing condition																
Water quality (e.g. turbidity, pH)	Opening condition																
	Closing condition																
Soil (e.g. erosion, pH, nutrients)	Opening condition																
	Closing condition																
Carbon (e.g. net primary productivity)	Opening condition																
	Closing condition																
Biodiversity (e.g. species richness)	Opening condition																
	Closing condition																
Habitats (e.g. fragmentation)	Opening condition																
	Closing condition																
Overall index of condition	Opening condition																
	Closing condition																

3.5.2 Analysis of the case studies

The way the condition account is reported is very closely related to whether or not the account contains or is based on an aggregated index. There are basically two different ways used in the case studies to report the condition account.

- Ecosystem condition indicator values are reported as closing stock values per year (sometimes against a baseline year or a reference condition).
- Ecosystem condition indicators are divided into broad condition categories or classes, such as excellent, good, medium, fair and poor and instead of reporting the underlying indicator values the total ecosystem extent considered in the account is broken down over these different categories either in absolute numbers, expressed in ha or km^2 or km length, or as a percentage of the total surface area.

Both reporting formats are often extended with ecosystem extent and with aggregated indicator values, sub-index values or ecosystem condition index values in which case they follow the same format (opening/closing stock values or share of the ecosystem assigned to a broad class).

Those ecosystem condition tables that included a measure of extent reported ecosystem extent in ha or km^2 or km length. This confirms that ecosystems are seen by the case studies as assets that can be measured by both extent and condition.

Good practice of reporting was observed in the South African river accounts (see Figure A for the concept of reporting and aggregation) in a sense that they provide complete set of accounts which allow tracking the different thematic aggregation steps. Sometimes, studies report only values and change of the aggregated indicators which results in a loss of information.

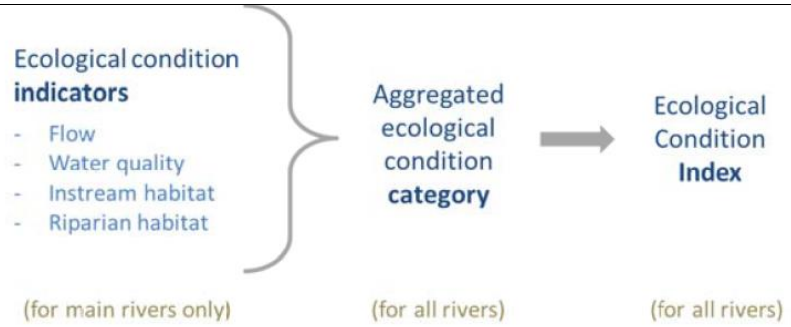

Figure A: Schematic showing the three sets of ecosystem condition accounts for rivers
Condition accounts based on the ecological condition indicators were developed for main rivers only due to lack for tributaries in 1999 data.

3.5.3 Options for SEEA revision

We make the following tentative recommendations relating to reporting the condition account:

- In many cases it is possible and useful to include a measure of extent in the condition account table.
- Condition account tables should preferably show opening and closing values, as well as how these relate to the reference level or condition.
- Condition account tables can be constructed for individual condition indicators, for a condition index or for condition categories – all three of these can be useful. An advantage of using condition categories is that they work well for display purposes, for example in maps and graphs with different colours for different categories, but care should be taken in relation to the comparability of such graphics from different accounts.
- Condition accounts can be disaggregated to individual ecosystem types or classes of ecosystem types, in which case extent and condition are essentially reported in a combined account.

Discussion paper 2.1 provides examples of possible structures for ecosystem condition accounts.

4 Lessons/recommendations for SEEA EEA revision

This section draws together recommendations relating to the four questions addressed in this discussion paper.

1. Indicators for ecosystem condition accounts

While there is no "one-size-fits-all" set of condition indicators that will work for all realms and all ecosystem types, there may be some common indicators. There is scope for some of the underlying indicators to be common across different ecosystem types, and some to be specific to a particular realm or class of ecosystem types.

It would be useful for the SEEA EEA to develop a typology of indicators, including biotic and abiotic indicators, to guide the selection of a set of indicators that provide a comprehensive representation of condition.

It is always important to provide a clear and explicit rationale for the indicators selected for an account, and to identify any gaps explicitly.

2. Aggregation of indicators

In addition to a set of condition indicators, some form of aggregation is recommended, whether to an index or a set of condition categories or both. It is useful to distinguish between *condition indicators*, an aggregated *condition index*, and *condition categories* (which can be applied to condition indicators or a condition index). A careful approach to aggregation should be taken to ensure that the resulting index and/or categories are ecologically meaningful

A condition index and/or condition categories can be common across all ecosystem types / classes of ecosystem types / realms, allowing for comparison and easy communication (for instance to policymakers).

3. Reference level or reference condition

It is useful to distinguish between reference levels for individual indicators, and a reference condition that applies to aggregated measures of condition.

There are different options for determining reference levels and reference condition. The approach used and the rationale should always be explicit in the account.

4. Reporting the account

Condition accounts can be presented in a range of formats, and with varying degrees aggregation or detail. More comprehensive reporting is recommended where possible (i.e. it is useful to show several tables, for example for individual indicators and aggregated indices).

Condition account tables should preferably show opening and closing values, as well as how these relate to the reference level or condition. In many cases it useful to include measures of extent in the condition table.

5 References

de Jong, R., Edens, B., van Leeuwen, N., Schenau, S, Remme, R., Hein, L. (2014) Ecosystem Accounting Limburg Province, the Netherlands Part I: Physical supply and condition accounts

Dickie I, Evans C and Smyth MA (2015) Scoping the Natural Capital Accounts for Peatland, work package 3 of Report NR0165 for Defra

Driver, A., Nel, J.L., Smith, J., Daniels, F., Poole, C.J., Jewitt, D., Escott, B.J. (2015) Land and ecosystem accounting in KwaZulu-Natal, South Africa. Discussion document for Advancing SEEA Experimental Ecosystem Accounting Project. South African National Biodiversity Institute, Pretoria

Eftec (2015). Developing UK Natural Capital Accounts: Woodland Ecosystem Accounts. Report prepared for the Department for Environment, Food and Rural Affairs (Defra), March 2015.

Eigenraam, M., McCormick, F., Contreras, Z. (2016). Marine and Coastal Ecosystem Accounting: Port Phillip Bay. Report to the Commissioner for Environmental Sustainability. ISBN 978-1-76047-395-2

Forest Enterprise England (2017) Natural capital accounts. Forestry Commission England

Information Paper: An Experimental Ecosystem Account for the Great Barrier Reef Region (2015). http://www.abs.gov.au/ausstats/abs@.nsf/mf/4680.0.55.001

Eigenraam, M., Chua, J., Hasker, J. (2013). Environmental-Economic Accounting: Victorian Experimental Ecosystem Accounts, Version 1.0. Department of Sustainability and Environment, State of Victoria.

Keith, H., Vardon, M., Stein, J., Stein, J., Lindenmayer, D. (2017a) Experimental Ecosystem Accounts for the Central Highlands of Victoria

Keith, H., Vardon, M., Stein, J.A., Stein, J.L., Lindenmayer, D. (2017b). Ecosystem accounts define explicit and spatial trade-offs for managing natural resources. Nature Ecology & Evolution 1, 1683-1692.

Khan, J., Din, F. (2015) UK Natural Capital – Freshwater Ecosystem Assets and Services Accounts. Office for National Statistics

Nel, J.L., Driver, A. (2015) National River Ecosystem Accounts for South Africa. Discussion document for Advancing SEEA Experimental Ecosystem Accounting Project. South African National Biodiversity Institute, Pretoria

Office for National Statistics (2016) Scoping UK coastal margin ecosystem accounts

Office for National Statistics (2017) UK natural capital: developing UK mountain, moorland and heathland ecosystem accounts.

Office for National Statistics (2018) UK natural capital: developing semi-natural grassland ecosystem accounts

Office for National Statistics (2018) UK natural capital: ecosystem accounts for urban areas Initial natural capital accounts containing information about green space in urban areas. Statistical Bulletin

Smith, B., Summers, D., Vardon, M. (2017) Environmental-Economic Accounting for ACT State of the Environment Reporting – Proof of Concept. Office of the Commissioner for Sustainability and the Environment.

Statistics Canada Environment Accounts and Statistics Division (2013) Human Activity and the Environment. Measuring ecosystem goods and services in Canada.

Thackway, R., Lesslie, R. (2005) Vegetation Assets, States and Transitions (VAST): Accounting for vegetation condition in the Australian landscape. BRS Technical Report, Bureau of Rural Sciences, Canberra

UNEP-WCMC & IDEEA (2017) Experimental Ecosystem Accounts for Uganda. Cambridge, UK.

UNEP-WCMC (2017) Developing Ecosystem Condition Accounts for the EU and Member States

United Nations (2017). Technical Recommendations in Support of the System of Environmental-Economic Accounting 2012 – Experimental Ecosystem Accounting. United Nations, New York. https://seea.un.org/sites/seea.un.org/files/technical_recommendations_in_support_of_the_seea_eea_final_white_cover.pdf

United Nations (2018) SEEA Experimental Ecosystem Accounting Revision 2020. Revision Issues Note. https://seea.un.org/sites/seea.un.org/files/documents/EEA/eea_2020_revision_issue_final_jul2018.pdf

United Nations, European Union, Food and Agriculture Organization of the United Nations, Organisation for Economic Co-operation and Development, World Bank (2012). System of Environmental-Economic Accounting 2012 — Experimental Ecosystem Accounting. United Nations, New York. https://seea.un.org/sites/seea.un.org/files/seea_eea_final_en_1.pdf

Varcoe, T., Betts O'Shea, H., Contreras, Z. (2015) Valuing Victoria's Parks Accounting for ecosystems and valuing their benefits: Report of first phase findings.

Wentworth Group (2016) Accounting for Nature- A scientific method for constructing environmental asset condition accounts. ISBN: 978-0-9944577-3-8

White, C., Dunscombe, R., Dvarskas, A., Eves, C., Finisdore, J., Kieboom, E., Maclean, I., Obst, C., Rowcroft, P. & Silcock, P. (2015), 'Developing ecosystem accounts for protected areas in England and Scotland: Main Report', Department for Food, Environment & Rural Affairs/The Scottish Government

Annex 1. Summary of key characteristics of the Type A case studies

Table A1. Key characteristics of the 14 type A case studies

Case study	Undertaken by	Realm	Scope	Indicators	Aggregated index or category?	Reference condition?	More than one time point?	Extent included in condition table?
A1. Port Phillip Bay (2016)	Government (State of Victoria)	Terrestrial, marine	Sub-national	Development of indicators still being explored	Yes Five categories: excellent, good, medium, fair, poor Score 1-10	Yes Natural	No, and only hypothetical values given	Yes (ha)
A2. Great Barrier Reef (2015)	NSO (Australian Bureau of Statistics)	Terrestrial, inland water, marine	Sub-national	Terrestrial: NPP River loads: Solids, nitrogen, phosphorus Marine: coral, water quality, seagrass, fish numbers	No	No Each indicator indexed with base year of 2007/8	Yes 6 annual periods (2007/8 – 2012/13)	No
A3. State of Victoria (2013) (comprehensive)	Government (State of Victoria)	Terrestrial, inland water	Sub-national	Terrestrial: Habitat Hectares Approach (based on Wetlands: Index of Wetland Condition (based on sub-indices, in turn based on multiple metrics) Rivers: Index of Stream Condition	Yes Index 0-1	Yes Natural 1750 = 1.00	Yes Wetlands: 1750, 1994, 2012 (Terrestrial and rivers: only one time point relative to 1750 reference - Terrestrial 2005, rivers 2004)	Yes (ha, km for rivers)
A4. Victoria Central Highlands (2017)	University (Australian National University)	Terrestrial	Sub-national	Area of forest in each age class	No	[unclear?]	Yes 5-yearly intervals from 1990 to 2015	Yes (ha)
A5. Accounting for Nature Trials (2016) (comprehensive)	NGO (Wentworth Group)	Terrestrial, inland water, marine	Sub-national	Yes – set of indicators for each realm	Yes Econd – composite indicator 0-100 for each realm	Yes Natural	Yes Annual 2003 – 2011 (although data not available every year for all asset classes)	No, but could be incorporated into table

Case study	Undertaken by	Realm	Scope	Indicators	Aggregated index or category?	Reference condition?	More than one time point?	Extent included in condition table?
A6. Victoria's Parks (2015)	Government (State of Victoria)	Terrestrial, inland water, marine	Sub-national	Native Vegetation Score Index of Wetland Condition Index of Stream Condition Marine habitat condition	Yes Index for terrestrial (0-100), wetlands (0-10), rivers (0-50) Category for marine	Yes Natural (1750)	No (2010 for terrestrial, 2011 for wetlands and rivers, 2014 for marine)	Yes (ha)
A7. Canada MEGS (2013)	NSO (Statistics Canada)	Terrestrial (for condition)	National	Five measures of ecosystem quality: landscape type (settled, agricultural, natural or naturalising), natural land parcel size, distance to natural land parcel, barrier density, population density	No	? Talks about natural as reference, but 2001 seems to be most recent figure	Yes 2001, 2011	Yes (km^2)
A8. Limburg (2014)	NSO + university (Stats Netherlands, Wageningen)	Terrestrial, inland water	Sub-national	Physical indicators, environmental state indicators and ecosystem state indicators – some examples for each	No	No	Conceptual table shows single time point, but could show more than one	Yes (ha)
A9. South Africa rivers (2015) (comprehensive)	Government (SANBI, CSIR, DWS, Stats SA)	Inland water	National	4 indicators: flow, water quality, riparian habitat, instream habitat	Yes Index (0-100) and category (degree of modification: none/small, moderate, large, critical)	Yes Natural	Yes 1999, 2011	Yes (km length)
A10. UK Woodlands (2015)	Government (commissioned by DEFRA)	Terrestrial	National	Broadleaf vs coniferous species, age, biomass stock, carbon stock, woodland in flood risk areas, woodland SSSI	No	No	No 2012	Yes (ha)

Case study	Undertaken by	Realm	Scope	Indicators	Aggregated index or category?	Reference condition?	More than one time point?	Extent included in condition table?
A11. UK Freshwater ecosystems (2015)	NSO (Office for National Statistics)	Inland water	National	Wetlands: accessibility, ecological condition (wetland birds,, mean species richness), soil (nitrogen stock, carbon concentration) Open water: accessibility, ecological condition ("surface water status" chemical, biological and habitat condition), water (volume)	No	No	Yes 2008, 2012	Yes (ha)
A12. PAs in England and Scotland (2015)	Commissioned by government (DEFRA)	Terrestrial, inland water, marine	Sub-national	Biomass/carbon (standing timber volume, topsoil carbon stock, vegetation carbon stock), biodiversity (woodland bird index), soil/water quality, accessibility, conservation status (SSSI)	No	No	No 2013	No – separate extent table just above condition table (ha)
A13. Forest Enterprise England (2017)	Government (Forestry Commission England)	Terrestrial	Sub-national	…	Uses condition categories: Favourable, recovering, declining, unfavourable, no known	Baseline year 2013-14	Reporting year compared to baseline year	No – separate extent table
A14. UK Urban areas (2018)	Government (ONS & DEFRA)	Terrestrial	National	SSSI status, Green Flag status these are both composite indicators	Categories for SSSIs: favourable, unfavourable, destroyed/partially destroyed	No	No 2018	Yes (ha)