

Guidance document for the review of applications of valuation methods

IPBES Values Assessment

Chapter 3



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Introduction

Why? Purpose of the review

This review supports the overall aim of the IPBES Values Assessment Chapter 3 (“to analyse goals, principles, capacities and applications of valuation methods in order to provide guidance for selection of methods when choosing for valuation of biodiversity, ecosystem services (ES) or nature’s contributions to people (NCP) to inform decision-making”). As such, Chapter 3 specifically assesses how values are articulated through the application of valuation methods or approaches.

Chapter 3 aims to assess **how** the different methods and approaches have been used to make values explicit throughout the period of time where application of valuation methods or approaches have been documented across the globe (“**when**”, “**where**”) and across different stakeholder groups (“**who**(se) values”). This document is the manual to guide the systematic review of peer reviewed English literature sources, which is one of the many reviews in Chapter 3.

In this systematic review, existing evidence from the literature on valuation applications is synthesized to answer the Chapter 3 Assessment Questions, using a hierarchical set of topics, operationalised through “verifiers” to code from the papers.



What is the material to review?

Which papers?

The materials for this literature review are **published applications of valuation methods and approaches**. These will include both academic (peer-reviewed) and grey literature. But for now, we will stick to academic literature.

The papers are selected based on a keyword search and a scoping phase, to generate the list of documents (the 'corpus') for the review.

In short, the documents (academic papers) should deal with each of these:

- values of individuals, groups and societies (values in a broad sense)
- related to biodiversity, nature and ecosystems (nature in a broad sense)
- made explicit through methods and approaches (valuation in a broad sense)
- in the context of a real policy issue or decision problem (application to inform decisions in a broad sense)

The scoping process will weed out the papers which are out of this scope. But at the beginning of the survey, you will be asked to perform a double check, to avoid scoring of papers, which are not about nature, valuations nor applied to real life situations.

Which content?

Once a paper has been selected for the review, you have to familiarise yourself with the content.

We review the actual use of methods based on manuscripts providing empirical evidence.

We do not score assumptions, claims or theoretical discussions, but stick to the empirical evidence backed up by methods and results.

Knowing that scientists have (as normal people) opinions and (sometimes biased) attitudes towards what they do, it is important to stick to what is actually shown, and not base scores on the nice story that authors may have built around their study to get it published, or about claims to relevance.

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The main content and empirical evidence to be evaluated for the review should be covered in the methods and results sections of each paper. Additionally, the introduction might provide information on the context of application (number of applications, methods, case study place, time, social, policy,...). In the discussion/conclusion sections, useful information on the reliability, justice aspects..., etc. might be found, but

do not score based on potential of the methods or assumptions mentioned here. Finally, acknowledgements might contain information on purpose, funding or inclusion of stakeholders.

Unit of analysis

Our unit of analysis is a ‘valuation application’. Some papers will contain multiple case studies or independent methods, and thus **multiple ‘valuation applications’ can be scored for a single paper in these cases.** This means that there will be information gathered about the paper first, and then each application in it will be reviewed. This requires some repetition and comparison of scores when scoring several applications provided in one single paper.

Separate valuation applications in the same paper can be case studies from different locations, valuations at different moments at the same place, or valuations at the same time and place but with separate methods.

For an application to be considered as separate, the paper has to show clear descriptions of the separate methods applied, data generated and results presented.

One valuation can include different methods, moments of data collection or locations as one combined ‘valuation application’.

At the start of the review, you will be taken through some questions to determine if several (and how many) ‘applications’ should be scored in these cases ([see below](#)). This is a critical step and we will help out in case of any uncertainty.

“An application is a valuation activity in a place, moment and context, for which the paper provides sufficient information in methods and results sections to score it.”

How to review a paper - 5 steps

You have to read the instructions first!

You should first familiarise yourself with the topics and verifiers as described in the next section. This saves a lot of time later on. It explains the diverse aspects that the review needs to capture. The more familiar you are with these, the less frequent you will have to re-read the paper and instructions to extract the information for the review.

We suggest you spend about 30 minutes per paper. Initially, this may be difficult, but as you progress and get used to the framework and what to look out for, the mean time that you spend per paper will be less.

There is no standardised vocabulary across the multiple disciplines that do valuation. It is insufficient to search for key terms within the document: **you must read the sections in full.**

Make sure you set yourself up in a quiet place with good wi-fi and have the time and 'mindspace' to concentrate for the time needed. Each time getting 'in and out' of a paper will cost time and especially energy. You can consider muting your email, phone and social media notifications (and check these after reviewing a set of papers).

You will receive an electronic copy of this manual and the appendix tables. It is a good idea to have them close and at hand to check options for the relevant questions. Also -if possible or preferred- a printed version of the paper (or using a divided screen format/ or additional screen) and making marks in it is very helpful, especially if you want to re-check with similar papers later on. Keep your annotated papers and manuals for cross-checks between us!

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Step 1

Read the
paper

Step 2

Screen the
paper

Step 3

Score the
applications

Step 4

Check the
scores

Step 5

Take a break

5 Steps to review the papers

Step 1

Read the
paper

Read the paper. And while you read the paper, keep the topics and verifiers firmly in mind. Highlight key pieces of information that you know correspond to the verifiers. Remember that (unless this makes you feel queasy or anxious) you can skip the introduction and the literature review. You probably want to read the abstract, and may be interested in the conclusions. But keep the main focus on the methods, data and results.

You may think that the next step is more critical, but **focused and detailed reading is crucial** for reliable scoring. Do not worry if you do not fully understand the technicalities of the paper or the method application. You will be assigned papers using methods that you are not familiar with. But very few (if any) of the scores require a specialized expert judgement call.

Step 2

Screen the
paper

The first step in the review involves extracting information such as:

- the full reference of the paper (doi, 1st author, title, journal and year of publication, etc). This step may be partly automated.
- information on authorship and funding
- if needed, determine the number of applications and give them a clear name.

For this step, a separate google forms survey is designed ([see further](#)).

Be aware that any mistake in this step will result in deletion or misplacing of the entire scoring you will perform in step 3. Double-check everything.

In this step, it is also possible to check if the paper is within scope, and to remove it from the review if it isn't.

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Step 3

Score the
applications

Using the survey in Google Forms, score the application on ALL verifiers. For each application (even from the same paper) the survey has to be run again. The form takes you through the entire list of verifiers automatically.

Once you hit 'submit', your scores will be added as one line (one observation) in a central database. You can then submit the next observation by immediately hitting 'submit next' or by re-opening the original link.

Each submission will generate a unique **confirmation and editing email** to you with the summarized results, the ID of the paper and the name of your application. This email also contains a UNIQUE link (back to your answers for that specific application). This link goes back to YOUR filled-in survey and you can move back and forth in it to:

- validate / double check scores given earlier
- re-score certain questions (e.g. if, based on comparison, you want to adapt earlier scores)
- copy scores for common questions if you score several applications in the same paper.

For every NEW application, an EMPTY survey should be opened with the link above. If you see pre-filled scores, you are adapting existing application scores you filled in earlier. If you get stuck or confused, stop and notify the responsible Lead Author.

Keep to the text! You are not supposed to do the scoring from the top of your head: keep the paper close and open.

Understand what you are reading! Searching for exact words is NOT sufficient to score the paper. Experience in the pre-test/pilot has shown that the valuation literature does not use a harmonized terminology. So, yes, you will have to interpret some terminology, but avoid inferring what the authors tried to say or do, and stick to what is reported. Many of these questions will have an 'unclear/unknown' option in case you don't feel safe to interpret (or the paper actually is unclear). Such scores will be verified during quality checks, so be mindful not to use this option too lightly.

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Step 4

Check the
scores

A short self-evaluation question will pop up after every main survey topic. Be sure to fill this in honestly and add some explanation: these questions will serve to cross-check between papers, topics and determine reliability.

Some “crucial uncertainties” will result in ending the survey: crucial unclarities or information on scope might make it necessary to double-check this paper or application before continuing. This is not a bad thing, just move to the next paper and wait for the person responsible to check.

Step 5

Take a break

Take a short break before moving to the next application or paper. The papers will differ substantially: the next paper may take you to a different continent, or force you to delve into a totally new field of science. Fatigue can creep in rapidly. The more tired you get, the higher the risk for low-quality scores, especially for papers that you, for whatever reason, dislike. We need you to be awake, fresh and open-minded :-). So try to clear your brain each time after you have completed the review of a paper: take a breath, look away from the screen, do some push-ups, have some coffee or whatever floats your boat.

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The Review Surveys: detailed background

For the review, two designated surveys have been created which can be accessed through the link at the beginning of Steps 2 and 3. To familiarize yourself with the survey before, the full versions of these surveys are also available through a PDF which will be shared through Google Classroom. It is advisable to look at the survey questions & answer options alongside the background information in this manual.

The review consists of two surveys. The first survey contains the questions for basic information on each paper (step 2 above). The second and main survey contains the questions on each application (step 3 above, split into 8 topic surveys for training purposes). Thus, a paper which describes one application requires both surveys to be filled once. But a paper with three applications (e.g. case studies A, B and C) requires the first survey (step 2) once, and the application survey (step 3) to be filled three times.

Topics are fundamental issues that form the basis for the evaluation and relate to the assessment questions

The Application Survey is organised in **8 topics**. Topics are sometimes split/translated into different criteria, or standards, which are sometimes further split into indicators, i.e. quantitative or qualitative variables of the method which can be measured or described. These are explained below, as their clarity (and your understanding of them) is essential to obtain valid scores.

Verifiers are data or information that enhances the specificity or the ease of assessment of an indicator

The topics (criteria/indicators) are translated into **verifiers**, which are the questions we need to score.

The topics are:

1. Methods and their use
2. Context of Application
3. Application descriptors
4. Reliability and Validity
5. Indigenous Peoples and Like-Minded Local Communities
6. Human well-being
7. Ecological sustainability
8. Justice and Recognition

This list demonstrates that you will have to do some ‘intellectual gymnastics’ when scoring.

Especially for the “Indigenous Peoples and Like-Minded Local Communities” topic, extra flexibility is required. Indigenous Peoples and Like-Minded Local Communities (IPLMLC) include local communities “...*embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity*” (CBD). Some of these communities are formally recognized (including some rights) as ‘Indigenous’ but others lack the political status and international recognition.

IPLMLC are essential stakeholders in IPBES, and also in this assessment. Several questions throughout the 8 topics, and topic 5 especially, consider their perspectives as brought in by representatives and knowledge holders of these communities in our chapter. As terms and concepts related to IPLMLC are not always familiar or common in scientific literature, we ask you to take extra care if and where they are covered.

Survey for STEP 2 Screening the Paper

Step
2

Screen the
paper

[Link to Survey](#)

After reading the paper ([STEP 1](#)), we will score the basic information on the paper before starting to score the application(s). Basic info on the paper needs to be registered, and the number of applications to be determined. **These applications will be scored EACH separately in STEP 3.**

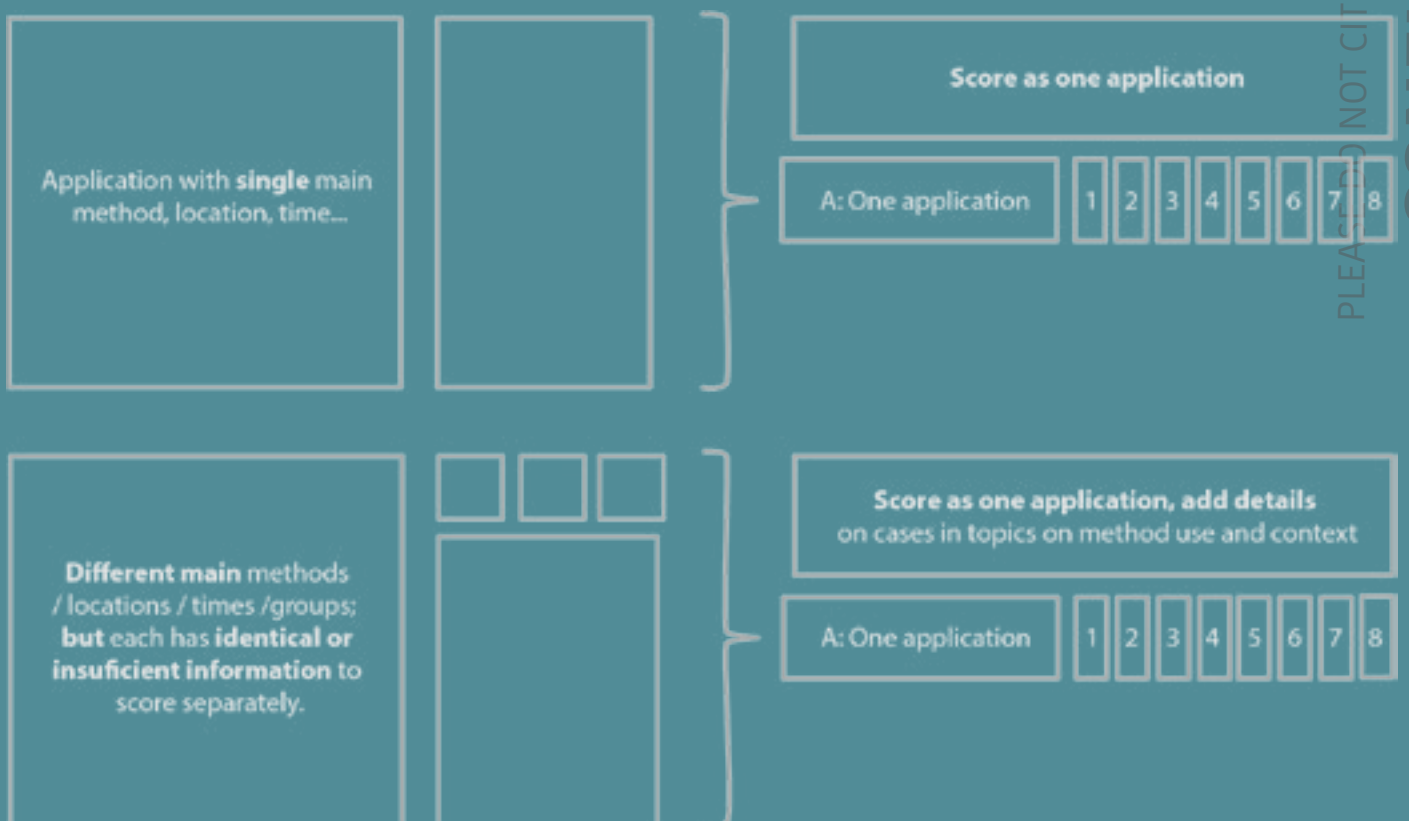
Summary table of the survey for STEP 2:

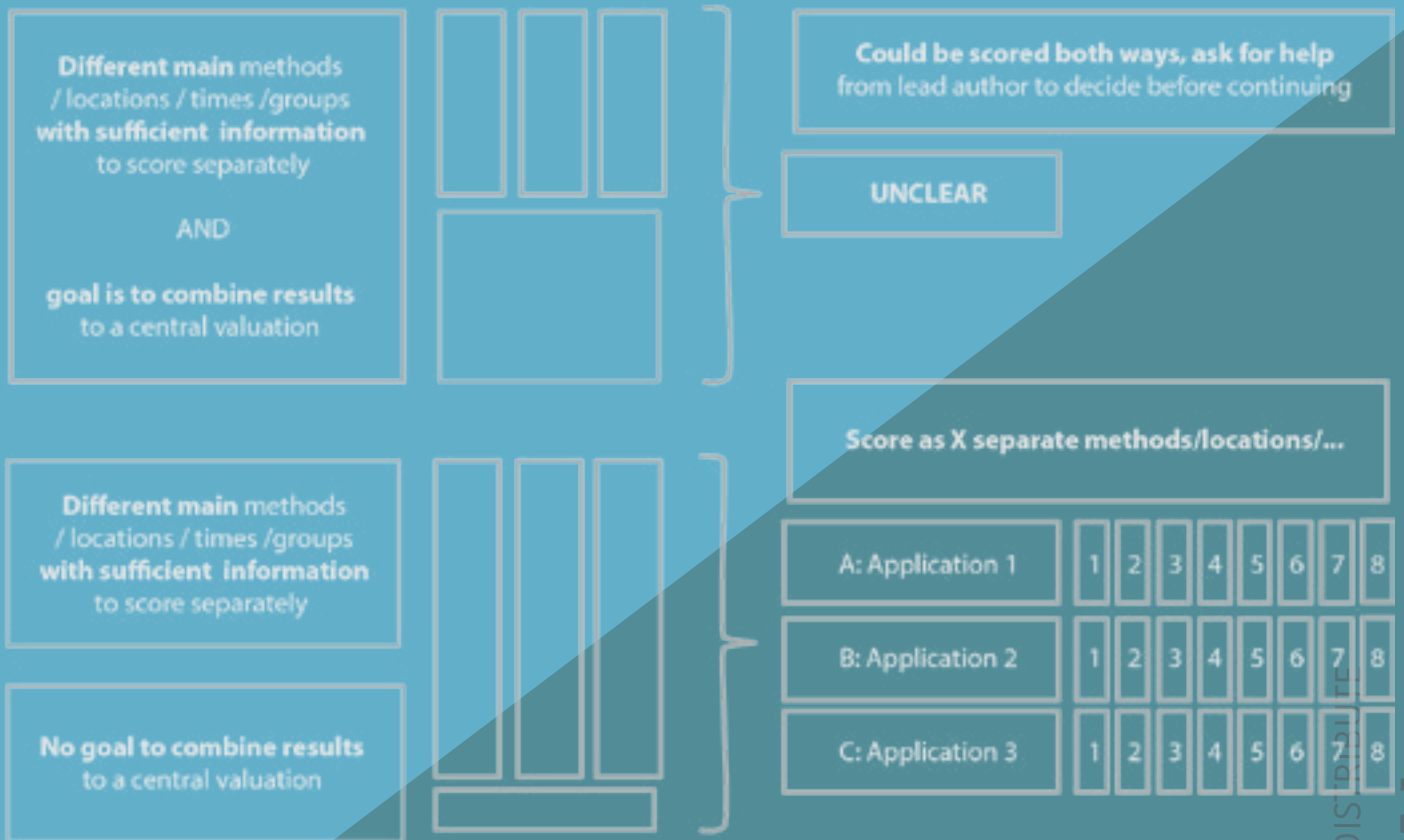
Your info	Required to trace back scores and results, and run quality checks
Basic paper info	Required to trace back scores, link surveys and perform analysis. Partly will be automated
Scope check	Checks whether the paper is a valuation related to nature and to a real life context. Allows to remove irrelevant papers from the full survey.
Authorship and funding verifiers	Verifiers on composition of authorship and origin of funding
No. of Applications	Determine how many applications from this paper can be scored separately as ‘observations’ in our review.

Some papers present several ‘cases’. These can be methodological approaches, location case studies, moments in time,... If these ‘cases’ are really separate ‘applications’, we need to score each one of them separately in STEP 3. This information can be found in material and methods and results sections of the paper:

we want to score any ‘CASE’ (method/location/moment/...) with **SUFFICIENT UNIQUE INFORMATION as a separate APPLICATION.**

- **An application:** an explicit valuation, applied in a concrete context (a certain place, time, method, approach). Separate applications might be: using independent main methods, OR valuations at several locations OR at the same location at different times OR
- **A main method:** a valuation method which provides the ‘final’ valuation results, which is separately described, and for which separate results are presented centrally in this paper. (Supporting/ additional/ ‘mentioned in passing’ methods can be added in a later stage!)
- **Sufficient information:** When a ‘case’ (main method / location /...) contains descriptions which allow to provide scores for most the 8 topics: (method use, application context, application descriptors, reliability, IPLMLC, wellbeing, ecological sustainability, justice).
- **Unique information:** When a ‘case’ (main method / location /...) would generate unique scores on one of the topics, they are to be scored separately. If cases would score identically over all topics, they can be considered as one case (or be scored identically, but that’s just more work)





In case of uncertainty about the number of applications, contact the Lead Authors to ask for guidance before continuing the review process.

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Survey for STEP 3

Information for each application

Step
3
Score the
applications

This section provides an overview and explanations for step 3: the main survey. In step 2, we have determined how many applications we will score per paper. **Be sure to note down the same Letter and Name** (e.g. “A: Belgium”) **as you added in the STEP 2 paper screening survey.**

[Link to Survey](#)

Topic 1: Methods and their use

This section will take you through questions to inventory which valuation methods have been applied in this valuation.

This step is extremely important as we will distil results per method once we have the full database. There is an expanding list of valuation methods, found in appendix 2. We would like you to do two things here:

1. Count the NUMBER of MAIN valuation methods and ADDITIONAL valuation methods
2. Compile a LIST of each, referring to our methods list or adding new and/or related methods

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What is a valuation method?

Valuations apply methods. Finding evidence and deriving findings on methods is central to this review. In a sense, methods are also a ‘unit of analysis’. However, there is no universal terminology and typology available for valuation methods. Moreover, when looking at valuation applications, methods are often applied in combination or new methods are developed.

We have compiled a growing multidisciplinary list of methods from which you can choose ([appendix 2](#)). Additionally, you can add new methods which do not yet appear in our list. Alternatively, a method may already be in the list but under a different name. In this case, add the new name as a synonym to the method’s current name in the list. This method list will grow, and regular updates will be provided during the course of the review, based on your inputs.

During the training, it became clear that determining what a method is is not always straightforward. We therefore now distinguish between main and additional methods. While the main method(s) is what the application is about (and what you are scoring later on), we also want to list additional/supporting methods and activities to capture the details of the valuation.

- **A main method:** a valuation method which provides the ‘final’ valuation results in this application, which is separately described, and for which separate results are presented centrally in this paper. Main methods should be applied to obtain, compare or combine ‘final’ valuation results in the application.
- **An additional method** is applied to provide input to the process, design or data of other method(s). We are not looking for each method or activity which is mentioned in passing or which generated a single variable! A minimum name, description and results, and a certain ‘valuation activity’ is required to mark it.

In case an application mentions/applies several methods, we need information on the way they are combined. This has also been simplified based on the training experience, and the survey now asks for the reason why methods are combined (comparison of methods, integration of results, or to provide input to each other) and a short explanation how.

Note: if several methods are contrasted and applied independently, and described in full with sufficient and unique information, please reconsider if these aren’t separate applications, see step 2 survey. If so, go back via your editing link and correct the scores.



Topic 2: Context of application

This topic has the following criteria:

- **Spatial (administrative) scales**
- **Habitat types (terrestrial and aquatic)**
- **Biophysical data** collection level/ drawing conclusions level: This refers to the fact that sometimes, data is collected at a certain level and then applied to another. e.g. national value of a natural resource is estimated based on estimated willingness to pay of individuals, or household spending on recreation is calculated based on regional economic revenues of the sector. The levels applied here are:
 - field plot/individual organism (e.g. soil sample, vegetation quadrant, tree height)
 - local ecosystem/organism population (e.g. plant diversity of a municipal nature reserve, population size of a local beaver colony)
 - regional ecosystem/organism population (e.g. deciduous forest surface, regional occurrence map of rare flowering species)
 - global ecosystem/organism population (e.g. map of global condition of coral reefs, total number of whale species)

Note: there will be studies that haven't collected biophysical data, for example, studies investigating people's preferences only.

- **Socio-economic data** collection level / drawing conclusions level: This refers to the fact that sometimes, data is collected at a certain social level and then applied to another. e.g. national value of a natural resource is estimated based on estimated willingness to pay of individuals, or household spending on recreation is calculated based on regional economic revenues of the sector. The levels applied here are:
 - individuals
 - households
 - specific stakeholder groups/ communities
 - society (full human population of e.g. a country)

Note: as with biophysical data there will be studies that haven't collected values data from people, for example, mapping carbon sequestration capacities.

- **Temporal scales:** refers to the question whether the valuation was done once, continuous or repeated, if changes over time were assessed and over which periods (past/present/future + short/medium/long term studies)
 - **frequency of data collection:** “continuous / repeated” would often involve a comparison of data / findings from these different time periods.
 - **change over time:** in biophysical studies an example would be how carbon sequestration from this piece of land has changed in last 5 years (or will change in next 5 years); in studies involving people’s preferences an example would be how preferences for different forest types have changed over last 10 years (or will change in next 10 years).
 - **direction and duration of temporal change:** example of present - future change studies would be scenarios or expert prediction.
- **Multiple targets of valuation:** Many valuation applications aim to make multiple values explicit in a joint valuation process. We are interested in how this has been done and how it has been documented. When an application assesses multiple value targets (see appendix 3), we want to record if the application includes a methodology for bringing the values together, and if so, how this methodology can be characterised. The options include mathematical scaling and weighting of different value targets; bundling of values targets together and thereby avoiding explicit weighting of individual value targets; asking individual people to assign weights to different value targets (either explicitly assigning weights or implicitly by ranking options including multiple value targets), by group processes to reach consensus about acceptable weights given to individual value targets; and an option to keep values separate and not attempt to bring different value targets together. (or, if the application does assess multiple value targets, “not applicable”).
- **Conflicts:** valuations often take place in a context with different interests (or dependencies) on nature between the different stakeholders. In some cases, these people/groups are happy to collaborate towards a common optimal or consensus goal. Note that “conflict” is a buzz word, that you will often see in papers. Here we are looking for distinction between “different interests and potential for conflict have been mentioned” and “conflict in the context of physical, verbal or another type of harm has been assessed”.
- **How valuation is taken up in policy** (see appendix 1, table 1): Valuation practitioners use valuation methods that result in explicit valuation procedures/ outputs, which may be taken up in decision-making processes, negotiation and design of implementation actions. This is an issue elaborated in Chapter 4 of the assessment. Here, we aim to screen to what extent applications report on this uptake. “Uptake” of valuation outputs/procedures by decision-makers is different from use of valuation methods by researchers.
- **Valuation purpose** (see appendix 1, table 2): A valuation study must have at least one purpose. The purpose is defined as the ‘strategic’ aim of how to impact decision making. By informing stakeholders, as part of a decisive process, or as a technical support.



Topic 3: Application descriptors

This topic aims to describe the valuation method or approach used by scoring different aspects of how the valuation process is undertaken. The topic has the following criteria:

- **Elicitation process:** Information about values can be collected in different ways involving individuals or groups of people as participants or respondents; or not explicitly including people in the valuation. We are interested in obtaining information about the process of elicitation in the applications and the extent to which the elicitation involves discussion among individuals to reach a group response to the valuation question. For the applications relying on assessment of biophysical information we distinguish between data collected through observations in the field in real-time, data collected through measurement devices over a period of time and data collected using secondary sources of information. You should tick the categories that best represent how information about values were collected; more options may apply.

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- **Articulation of the valuation result:** This is about the unit/indicator the application uses to articulate the value(s) in the paper: in terms of money saved, money spent, time spent, number of people impacted, healthy life years, tonnes of carbon, rarity of species. The application might use several value indicators. Value indicators can be expressed using absolute measures, by ranking options relative to each other or by using qualitative categories such as high, medium or low. Some applications do not attempt to express the results of the study by a few indicators but present results in a narrative form, or express the values in artistic forms. More options may apply.
- **Aggregation to higher social scales: aggregation of different stakeholders' values** to a higher social scale, for example aggregation of individual to societal values, or values from different stakeholders to an overall societal value. Weights can be used in case the values of some people or areas are considered more important than others. Weights can be elicited from study participants or extracted from the literature. They can be discussed in a group to seek consensus on an acceptable weighting scheme. They can also be based on statistical information, e.g. based on the number of people in different groups. In economics, social welfare functions can include weights to address income-inequality. However, many studies apply an equal weight (without further discussion) to all members of the population.

Topic 4: Reliability and validity

Note: for scoring reliability and validity, it may be that you need to look in the discussion section of the paper where the limitations of the study are discussed. We want to know whether studies have actually tested/assessed the reliability and validity of the results. For any of the questions about this topic: **if the study only discusses potential limitations** to reliability or validity, but does not assess this, **then tick 'No'**. We have provided examples of tests in the descriptions below.

This topic has three criteria:

- **Reliability / dependability:** The quality of measurements, often evaluated by the consistency of measures and degree to which a method/instrument provides similar outcomes each time it is used under the same conditions with the same subjects.
 - **Replicability of results:** (also: repeatability) established through test-retest studies, inter-rater or inter-observer reliability. Sometimes replicability is established through comparing two studies with slightly different designs or frames (which should not matter for the final outcome), e.g. exposure of participants to slightly different levels/contents of information.

- **Consistency:** showing that the findings are maintaining, or conforming to, an accepted standard repeatedly over time, space, groups,.... Consistency can be established by looking at internal consistency (e.g. repeating the same question or including questions that measure the same concept, tested by e.g. Cronbach's alpha or other forms of inter-item correlation), or by describing how changing the study settings affects the way that the research is approached.
- **Precision:** precision is a measure of variation among observations. Examples of indicators: scatter in the results, heterogeneity, spread, variance, standard deviations/errors. (N.B. **accuracy** is a different concept than precision - see below). An approach sometimes used in valuation studies, especially those applying models, is the so-called "sensitivity analysis". It consists in assessing how results (of a model for example) would change if input parameters variate. The application of sensitivity analysis, when results do not variate too much as a result of small changes in input variables, is a form of assessing precision.
- **Validity** is about the relevance of the results for the strength of conclusions, inferences or propositions. This is established through the extent to which a concept is accurately measured in a study, because the instrument/method measures what it is supposed to measure and performs as it is designed to perform.
 - **Internal validity:** A study is internally valid when there are valid causal implications.
 - * **Credibility** (for qualitative studies): confidence in the 'truth' of the findings, i.e. are the findings believable and credible from the perspective of the study participants? Credibility can be established by triangulation, persistent observation, peer debriefing, negative case analysis, prolonged engagement, referential adequacy (like hold-out set, seeing if you can get the same results from one part of the data as from the other part), member checks (test whether results are discussed with the study participants).
 - * **Construct validity** (also **theoretical validity**): refers to the degree to which a method measures what it claims/intends to measure. That is a condition for making inferences from how the methods are used to the theoretical constructs or concepts on which those methods are based. Mostly used in social, economic and political sciences to see if a scale or test measures the theoretical construct adequately. For example, WTP measures are theoretically expected to vary with income, sensitive to scope. N.B. Construct validity is **not** about how a method/experiment is physically designed or constructed.
 - * **Content validity:** refer to the degree to which the method is designed to measure what it is supposed to measure. This is about the performance of the method. For example, how useful the various questions in a survey are to assess the values of interest (rather than distract from the main aim of the survey) and how complete the set of questions is: for instance by inducing truth-telling and ensuring participants understand the purpose and content of the method design (in WTP studies: avoids protest bids), so that they understand the questions that the researcher want to ask better and provide meaningful answers.
 - * **Criterion validity** (for quantitative studies): is the comparison of measurements or observations against a 'true' measure. Sometimes assessed

through convergent validity, i.e. by comparing to other methods, especially when there is no valid criterion measure. This is about how well a method/measure predicts an outcome for another measure, e.g. for predicting 'real' behaviour in another situation (past, present, or future); or how stated preferences from hypothetical markets compare to preferences in real markets (hypothetical bias). Another example of an application is comparing the results of an hydrological model to measurements done on the ground (for example of water flows volume), which can be assessed with statistical indicators such as correlation or mean-absolute-error. **Accuracy** is a validity indicator and is about measuring what the method is aiming to measure (the 'true' 'value'), and some studies do an accuracy assessment. n.b. the use of these terms (accuracy and precision) in the literature is inconsistent. (Precision is about how close observations are to one another, accuracy is about how close the observations are to what the methods aim to measure.)

Community validity: (especially relevant in IPLMLC contexts): from this perspective, the outcomes of a valuation approach would be regarded as acceptable evidence if the findings are adequately shared and approved by the collective of the community. The outcomes of a valuation application are regarded as reliable evidence if a) all the culturally appropriate conditions for undertaking the valuation are met, b) if the findings were shared with the collective and approved by the collective.

- **External validity:** refers to the ability to generalise the results of the study/method to other settings.
 - **Transferability:** showing that the findings have applicability in other contexts or settings, i.e. other times, settings situations, and people. Can be established by thick description (high level of detail, including a description of the context in which values are assessed, so that it can be better understood, e.g. by including subjective explanations and meanings provided by the participants), or by application of the method in a different context (for example a different ecosystem type or study area) to see if results remain constant.
 - **Generalisability:** the extent to which the results can be generalised from a sample to a population

Topic 5: Indigenous Peoples & Like-minded Local Communities

This set of verifiers was brought in by the representatives and scholars working as/with Indigenous Peoples & Like-Minded Local Communities (IPLMLC). It is important to carefully score these for papers explicitly relating to these groups (as well as for papers that do not, in order to make robust comparisons).

This topic has five criteria:

- **Respect (towards Nature):** This respect could be expressed or identified through ceremonies, rituals, offerings in sacred sites whose purpose is to renew a sense of thankfulness and reverence/deep respect to the land, or the sea (terrestrial or marine landscape) or to their components.
- **Responsibility/care for the land:** IPLMLCs and cultural identities are strongly connected to their lands (and seascapes). Their values often emerge in relation to their context and can become visible through issues related to the integrity of ancestral territory, leadership in caring for nature, actions and behaviours that minimize or prohibit exploitative use of materials within their lands or in other geographical terrains. A philosophy of zero waste of resources is enacted while thinking about the health and the future of the land (and sea), awareness about sustainability of the land (and sea) for the future generations; and preservation of cultural knowledge (ancestral heritage).
- **Kinship-centric principle (other humans):** Actions of mutual support between humans such as, sharing, gender equity, social equity, honesty, humility, modesty. Some of these elements can be revealed as relevant through valuation methods and approaches, as well as by practices associated with them.
- **Kinship-centric principle (non-humans):** IPLMLCs recognize kinship and cultural identity with animals, plants and spirits. They can maintain a strong, healthy social and functional relationship over time with animals, plants and the lands resulting in giving and taking in appropriate ways, at appropriate times. Animals and plants can be seen and treated as equals to humans, shaping a human/nature relationship. Often, the values embedded in these relationships drive human behaviour overall and are elicited through certain valuation methods. Appreciation (no disregard) for spiritual entities (e.g. sacred mountains, rivers, among others) residing on ancestral lands, can be an example of a kinship-centric approach (focused on non-humans).
- **Self-determination and ancestral law:** Effective self-governance of a community way of life (economically, politically, socially, culturally) are enacted through the application of ancestral laws and teachings therein. This relates to the level of participation and its meaningfulness and respectfulness, but is specific and culturally-sensitive towards IPLMLCs.

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Topic 6: Human well-being

For this topic, we assess whether the applications provide information about the following three criteria:

- Human well-being is ensured
- The importance (or preferences) that people attribute to different aspects of nature and biodiversity is made visible
- Natural resources and ecosystem services are used efficiently

The verifiers are overlapping to some extent and one application may assess all three aspects. We also collect information on whether the application has assessed the variation in human well-being indicators according to socio-demographic characteristics such as age, gender, income and education.

- **Well-being:** This concept is used here as an equivalent to a ‘good quality of life’ at individual, household or community level. However, there are several fields with several interpretations and specific jargon.
 - Well-being can consist of diverse ‘items’ that are considered important for a good quality of life, e.g. health (mental and physical), food, education, living standards (such as housing conditions, ownership of assets, access to drinking water and electricity, etc.). Sometimes these are combined into ‘objective lists’ and/or composite indicators of well-being.
 - Subjective well-being (SWB) is defined as “fulfilling one’s virtuous potentials and living as one was inherently intended to live” (life satisfaction, happiness, optimism about one’s future,...). These concepts of well-being are often measured through construct scales, operationalised by statements with likert scales. SWB is not a category in which to put other considerations with respect to wellbeing, that do not fit the objective list. They are not subjective in the sense of a respondent’s perception of income or other subjective estimates of ‘objective well-being’ indicators. If a study does not refer to SWB or very similar wording in the text, don’t choose this category.
 - Utilitarianism regards well-being as ‘desire fulfilment’, ‘desire satisfaction’ or ‘preferentism’. Economic valuation methods are based on this theory.
 - Other well-being concepts such as the ones found among Indigenous peoples are characterised by having a holistic and interrelated set of principles guiding their relationship with Nature and other beings (human and non-human). For instance, reciprocity, generosity, altruism, kinship, self-determination, and self-governance are key guiding principles of Indigenous peoples. These aspects were evaluated under Topic 5 and you should not repeat information about these concepts here.

Examples of applications that assess well-being:

- An application that assesses how differences in human well-being are related to differences in Ecosystem Services / Nature's Contributions to People (ES/NCP) in space and/or time.
- An application that assesses which ES/NCP are important to people for their well-being/good quality of life, for example by asking this explicitly from study participants/respondents, or observing and inferring this relationship.
- An application that assesses whether there are changes in (aspects of) wellbeing as a result of a change in environmental management, or whether the ability to access/enjoy NCP/ES also provides people with these items considered important for a good quality of life.

Be careful: well-being is a word that is lightly used and easily mentioned, but that doesn't mean it is actually addressed:

- Ecosystem Services / Nature's Contributions to People (ES/NCP) are defined as 'benefits to people'. However, not every ES/NCP study assesses well-being by definition!
- Some studies/methods will mention well-being, for example in the introduction, but not assess how well-being is related to NCP or ES.
- An application that assesses the production of ES only in biophysical units does not assess well-being. This means that if an application assesses the accumulation of biomass and associated CO2 equivalents, converting the assessment into monetary terms using a carbon price from a permit market, does not make the application an assessment of well-being.
- An application which asks to identify NCP/ES without being specific about why these are important, what kind of benefits they provide and, crucially, how they relate to individual human well-being do not assess well-being.

• **Making human preferences and views about the importance of nature and biodiversity visible (explicit):** Many valuation applications aim to make the values of people visible to inform decision-making processes. Under this criteria we seek information about how the application assesses preferences of individuals about different aspects of nature and biodiversity. We include the range of ways that different disciplines go about analysing how important nature and biodiversity are in a given situation.

Examples of applications that should be registered under this criteria include:

- An application registering how often people use natural areas for recreational activities and use this to infer the importance of different areas.
- How much people are willing to pay for having access to nature of improved quality.
- How much people are willing to compromise to change their activity or behaviour to protect nature and/or biodiversity.

Be careful: Sometimes studies ask participants or respondents to list the ES/NCP that they know about or recognised as being relevant in a given place. However, lists of ES/NCP should not be scored as an assessment of preferences or importance of those ES/NCPs.

• **Efficiency:** Where policy aims to manage ecosystems efficiently, this is to make the best use of limited resources (i.e. minimise inputs, including energy and time, to maximise outputs such as increasing human well-being, produce at lowest average costs per unit) or to allocate ecosystem services / benefits such that changing the allocation would generate the largest overall net benefits from use of ecosystems. Efficiency is about making sure that natural resources, ES or NCP are managed, allocated and used in such a way that these resources do not go to waste, and in such a way that is best for society (often: intra-generational distributional issues aside) in the short and long term.

- Efficiency is about making sure that natural resources, ES or NCP are managed, allocated and used in such a way that these resources do not go to waste, and in such a way that is best for society (often not considering distributional issues, see Topic 8) in the short and long term.
- Assessments of demand (how much people would like to have NCP (given various NCP prices)) and supply (the amount of NCP available at various prices) is done to assess efficiency.
- Efficiency is assessed with economic, and often (but not necessarily) monetary, indicators.
- Cost-effectiveness studies seek to identify how to reach a given goal (eg. achieve a given target for biodiversity conservation, protect communities from natural hazards or maintain the capacity of ecosystems to produce ES/NCP) with the lowest amount of resources. The resources can be measured as land, management effort, time, money etc.
- Optimisation studies are often driven by efficiency or cost-effectiveness motives.

Examples that assesses efficiency include:

- Cost-effective selection of conservation areas for protection to maximise the number of species included within the protected area given a fixed budget.
- Assessment of the overall benefits from changes to the management of an area relative to the changes in the costs
- Comparisons of damage estimates from wildlife using different mitigation measures and identification of the most effective measure.

Topic 7: Ecological sustainability

This topic has three criteria:

- **Ecosystem condition:** if an application assesses (aspects of) the ecosystem of the natural world **regardless of their use, services for or contributions** to humans. Although this includes conservation related biodiversity values from biocentric or ecocentric perspectives, which relate to humans, but are still about **how the ecosystem itself is doing**. Related concepts include:

- Ecosystem health, healthy functioning of ecological processes
- Resilience of ecosystems, response to perturbation, recuperation
- Naturalness of ecosystem
- Biodiversity (not related to human use)
- Threatened species, extinction risk
- Degradation, impacts of drivers on the ecosystem
- Other, ...

• **Ecosystem capacity:** refers to the **potential or actual delivery of services, contributions, benefits to people**. It also includes biodiversity studies which refer to human utility, e.g. biodiversity assessment of rainforest patches for pharmaceutical exploration, or biodiversity of grassland species related to nutritious value for cattle. It does **not** include studies of just the benefits to people without assessing the ecosystem. Related concepts include:

- Ecosystem service potential, stocks, ...
- Ecosystem service supply, flow, delivery, use,...
- Nature's contributions to people
- Viable populations of 'useful' species (Habitat suitability)
- Biodiversity (related to a human use, functional biodiversity)
- Quantity or quality of natural resources (related to a human use)
- Other, ...

• **Sustainable use / management of ecosystems:** **sustainable use:** Meeting human needs without compromising the health of ecosystems" (Callicott & Mumford 1997); **Sustainable ecosystem management:** restore and maintain the ecological structure and function of ecosystems and to preserve and enhance the health and diversity of species and ecological communities (Gobster 1994). **While both concepts are not the same, both require combining aspects of ecosystem condition with aspects of ecosystem capacity, including an aspect of impact of management or use on this condition.** Related concepts include:

- Ecological thresholds, boundaries, tipping points
- Maximum sustainable yield or harvest
- Carrying capacity for human use
- Restoration, conservation effectiveness

Topic 8: Justice

This topic has four criteria, each with a number of verifiers:

- Distributive justice: how outcomes (gains, losses) are distributed
- Procedural justice: whether procedural justice is built into the method design
- Recognition (of multiple values, knowledges, value frames, value justifications)
- Community of Justice

- **Distributive Justice:**

- “Distributive justice focuses on the **allocation among stakeholders of costs and benefits resulting from, for example, environmental policy or resource management decisions** (Mahanty et al., 2006).” (from McDermott et al. 2013). This concerns the fair distribution of costs and benefits.
- Some studies use the term **equity** rather than justice (for example, economics studies)
- Distributive justice **is about outcomes**. To assess distributive justice, methods can assess and compare the gains and losses falling to different stakeholder groups (either in the current status or as a result of a new policy). Outcomes are about what people get, not about what they want or like.
- **Studies that only assess how values** (e.g. stated preferences, opinions, attitudes,...) **vary across different people** (e.g. in the statistical analysis) **are not dealing with distributive justice**. Such heterogeneity addressed in another question.

For distributional justice, we evaluate the following verifiers:

- **Intragenerational justice:** whether the distribution of ES/NCP wealth and resources (gains and losses) within one generation is assessed. The application:
 - * presents benefit or cost outcomes for different groups of people (e.g. by stakeholder type, livelihood type, socio-demographic characteristics, location, country, etc),
 - * estimates an indicator/index of inequality (e.g., Gini, HHI),
 - * assesses perceptions of intragenerational justice, or of the distribution of gains and losses;
 - * assesses weights / importance of prioritising needs of disadvantaged groups (e.g. in welfare function, or puts a weight on an indicator in an MCA or in discussions).
- **Intergenerational justice:** whether the distribution of ES/NCP wealth and resources (gains and losses) across generations is assessed. The application deals with:
 - * how values compare over time (e.g. using discounting, overtaking, Chichilnisky criteria, etc);
 - * presents values, benefits or costs disaggregated by generations; or
 - * deals with future or past generations’ needs, values, or ability to live a good life by explicitly discussing these.

- **Procedural justice:**

- “Procedural justice refers to fairness in the political processes that allocate resources and resolve disputes. It involves recognition, inclusion, representation and participation in decision-making” (McDermott et al. 2013). How can it be ensured that all the voices are heard and properly considered?
- In the context of the Values Assessment, the question arises in particular as to how it can be methodically ensured that all different values are adequately captured and represented.
- Unlike distributional justice, procedural justice is about the process of the valuation study and often enabled by the study/method design, e.g. sampling, logistics, time, etc.

For procedural Justice, we evaluate whether procedural justice is built into the application design by paying attention to representation, inclusiveness, participation, power, and transparency.

- **Representation:** here, representation is about who is involved in the valuation study/exercise as participants OR (in case of non-participatory approaches) whether the sample is representative of the stakeholders involved. N.b. Representation (as used here) is not about how stakeholders are represented, but whether an application process involves multiple/relevant groups, in particular ‘vulnerable’ groups. Two questions are included about representation:
 - * Degree of representation: whether different stakeholder groups were identified and targeted in the valuation in the sample or among the participants
 - * Problems with representation are sometimes described in the discussion section (under study limitations)
 - * Characteristics by which stakeholder groups are identified and distinguished (who is included in the valuation process?)
 - * The recruitment/sampling strategy should mention this; n.b. this is not about all sample characteristics.
- **Inclusiveness:** how does the application enable participants to get involved (to ensure “participatory parity”), to check whether a study does not invite participants to participate without enabling their involvement. Participants, who are likely to vary in their capacity to participate (time, skills, ...) may encounter different barriers to participate and get involved as equals and some studies explicitly accommodate such needs.
- **Power dynamics:** power can impair participatory parity, i.e. the ability of all stakeholders/participants to engage and interact in participative contexts. This question asks about whether the power dynamics were assessed in the application, e.g. by showing speaking time, interruptions, use of physical space, or testing difference in outputs in different power context.
- **Level of participation:** this relates to meaningful participation, in the sense that participants can influence the process and outcomes of the valuation.
- **Transparency:** asks whether application provides information about the valuation process and outcomes to the general public as well as the study participants.

Note: the former options in the survey assume that an academic paper is sufficient (even if not open access), whereas latter options require adaptation of outputs to the needs of stakeholders and the general public.

- **Recognition:** In social-environmental justice, recognition is about the respect for [community] ways of life, local knowledge, and cultural difference (Schlosberg, 2007), and in particular for this assessment, different ways of knowing and valuing nature.

Recognition is important to check whether valuations reproduce the societal structures that produce injustices in the form of lack of respect, discrimination, and domination across social fault-lines such as gender, sexuality, and ethnicity (Martin et al. 2015). Here, we want to assess whether the applications consider different peoples and their values, worldviews, knowledge, things they value and why they value those.

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A number of verifiers asks whether the application recognises:

- **Types of knowledge included in the MAIN method(s)**, where ‘knowledge’ must be explicitly mentioned;
 - * this should not be inferred from who participates in the study
- **Diverse worldviews/life frames**, based on which broad (ethical) values are mentioned:
 - * There are four groups of values: A-D. Tick the box(es) of those groups of values of which at least one of the value concepts/terms is explicitly mentioned and assessed in the application.
 - * The terms should be explicitly used in the methods, data or results sections.
 - * If the paper uses synonyms or value concepts/terms highly related to the terms under A-D, please provide the term/concept used in the paper, and the group to which this values pertains most in your opinion.
 - * Only add these related/synonymous terms if they are explicitly used in the methods, data or results sections.
- **Diverse Value Types:** Reasons why individuals value (gain utility from) aspects of nature
 - * Use values:
 - * Direct use value: The value from using goods and services from biodiversity and ecosystems directly, eg. fuelwood, fish, berries, recreational space.
 - * Indirect use value: The value from using biodiversity and ecosystems indirectly through the ecological functions provided, eg. protection of the climate system through carbon sequestration, protection of reproduction of fisheries through coastal habitat protection, protection from flooding through regulation of hydrological flows.
 - * Option value: The option to obtain direct and indirect use values in future even if the goods and services are not used today.
 - * Non-use values:
 - * Bequest value: The value of future individuals having use and non-use values ie. utility derived from intergenerational equity.
 - * Altruistic value: The value of other individuals in the current generation having use and non-use values ie. utility derived from intragenerational equity.
 - * Existence value: The value from knowing that biodiversity and/or ecosystems exist irrespective of own or others current or future use.

Note: The applications do not have to use this terminology explicitly for you to score this. This question is not only applicable to applications that express values in monetary terms, but also to other units of value. You can score applications on this verifier, unless the paper explicitly rejects these value types or if they do not assess values for people.

- **Diverse Justification of values:** this question expands on why values are important (beyond individual values). These can be:
 - * Intrinsic: this concept refers to inherent value, that is the value something has independent of any human experience or evaluation. Such

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a value is viewed as an inherent property of the entity and not ascribed or generated by external valuing agents.

- * Instrumental: The value attributed to something as a means to achieving a particular end.

- * Relational: The values that contribute to desirable relationships, such as those among people or societies, and between people and nature. While instrumental values relate to the benefits humans derive from nature and are unidirectional (from nature to humans), relational values refer to the relationships that people can establish with natural beings, such as in kinship or stewardship.

Finally, there is an overall question about who/which entities (and their values) should be considered for moral consideration, including in the quest for a more sustainable and just future.

- **Community of Justice:** a specific verifier about who/what is (implicitly) considered for moral consideration, for example, in their existence, values, knowledge, rights and duties. This is not only about which part of the human population (certain regions or the entire human population), but can also include future or past generations, animals, and more-than-human or non-human beings, mother earth,...

- You should try to infer this from your answers in the sections on distributive justice, procedural justice and recognition (applications usually won't use the term 'community of justice' or even 'justice', but you should still be able to score this). This is about more than only who participated/responded in the application - some entities cannot participate (e.g. future or past generations). This question is about how the application conveys who/what is considered to be entitled to moral consideration, what/whom should we consider when we think about what is morally right?



Appendix 1: Valuation

Table 1. Definitions from Chapter 4, which will analyse the ‘depth of use’

	Use type	Description	Detailed criterion description	Study examples	Example link
Valuation of ESV/ NCPV degree of valuation uptake	No reference to use	Method development and testing only	Methodology development, possibly applied to a given set of data or a real-life social situation, but with a method development purpose. No mention of uptake of valuation results in a social situation. Valuation studies which focus on statistical issues or econometrics tests of valuation study design, without any discussion of uptake for informative, decisive or technical uses.	Borzykowski et al. 2019 Scope Effects in Contingent Valuation: Does the Assumed Statistical Distribution of WTP Matter?	https://drive.google.com/open?id=1W4Z-sA1uQn7EWEvUk8OEwS-Q92bsYYthJ
	Cursory reference to use	A potential, expected, or wished for use of valuation outputs from a case study	A valuation case study. However, valuation uptake is only mentioned as a possibility, a potential role in policy-making or decision-making. Typically, use of valuation mentioned in introduction/conclusion, but not analysed (in methodology, results or discussion of results).	Burkhard et al. 2012 Mapping ecosystem service supply, demand and budgets	https://drive.google.com/open?id=1xLY9CyN-qmWCzASMaRj05V-M5UYomx2foJ



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Valuation of ESV/ NCPV degree of valuation uptake	Use case (testing)	Researcher initiated valuation study	ES /NCP valuations studies where the paper addresses the use of these by a group of stakeholders, in an experiment or a study organisation where researchers have themselves gathered or contacted stakeholders to discuss and convey the valuation results. It includes valuations where authors have influenced (or tried to) real-life decision-making processes, but through a dedicated participation process they themselves have organised. Study with no evidence of third party commissioning (third party = not the authors nor participants in the study).	<p>Kenter et al. 2016 Integrating deliberative monetary valuation, systems modelling and participatory mapping to assess shared values of ecosystem services</p> <p>Ranger et al. 2016 Forming shared values in conservation management: An interpretive deliberative-democratic approach to including community voices</p> <p>Fish et al. 2016 Making space for cultural ecosystem services: Insights from a study of the UK nature improvement initiative</p>	<p>https://drive.google.com/open?id=10c30-rRhvbpo_dnuMvL5Di-QfQ-gpxj5rY</p> <p>https://drive.google.com/open?id=1pPXE-8gc3EvMQNiWHnx-lYkUm4Y5Fcrv</p> <p>https://drive.google.com/open?id=1a3U6ezcu-DaE0pcNUPYWG2pz-jR5q52UYD</p>
	Use case (actual)	Stakeholder commissioned valuation study	Documentation of the process by which valuation results are implemented by social actors. Evidence of implementation of valuation results for informative, decisive, technical purposes after the results have been produced by researchers. Commissioned by stakeholders e.g. to deliver responses to decision-making questions. Documents how valuation results have been influential or taken into account by third party stakeholders. Third party stakeholders are social actors who are not acting as participants in the study, nor the study authors. Can include ex post studies of outcomes /impact evaluation of decisions or technical design of policies informed by the valuation. Evidence of third party uptake of valuation is clear when valuation results are documented by third parties, e.g. as observed changes in regulations, budgets, programmes and projects decisions, definition and choice of variants, decision to go / no go for a project, choice of location, etc.	<p>Marre and Billé 2019A demand-driven approach to ecosystem services economic valuation: Lessons from Pacific island countries and territories</p> <p>Naidoo et al. 2009. Economic benefits of standing forests in highland areas of Borneo: quantification and policy impacts.</p>	<p>https://drive.google.com/open?id=10CJd-Y2zValh4rFY4LLnVVG-54Fa9t2JLlV</p> <p>https://drive.google.com/open?id=1qmY-GF-R7wMQnScEEu-ZkPZuvcOWrxncw8</p>

Table 2. from Chapter 4, which will analyse the ‘valuation purpose’ in the policy cycle.

General	Specific	Short description	Description	Study examples	Example link
Informative	Formative Affirmative	Value formation or affirmation (not used decisively or for technical purposes)	A paper that mentions ESV/NCPV valuation process as a resource for training and education, or a process used to help stakeholders form, express, or affirm importances of nature. The valuation setting is designed for the purposes of forming, and answering research questions about values. Value formation / affirmation through participation in these studies is not used for any of the decisive or technical purposes below.	Kenter et al. 2016 Integrating deliberative monetary valuation, systems modelling and participatory mapping to assess shared values of ecosystem services	https://drive.google.com/open?id=10c3OrRhvp0_dnuMvL5DiQfQ-gpx-j5rY
	Awareness raising	Advocacy and raising awareness of total value, trade-offs, conflicts, scenarios.	An article that suggests or advocates that ESV/NCPV results are influential, or should be influential in creating the awareness, with respect to the importance of environmental issues, ecosystems preservation, etc. i.e. where ESV reveals, demonstrates, suggests the importance of ecosystems for society, including where it brings conflict with other values. With no targeting of a specific policy or decision to be made.	Naidoo et al. ,2009. Economic benefits of standing forests in highland areas of Borneo:quantification and policy impacts.	https://drive.google.com/open?id=1qmY-GF-R7wMQnScEEu-ZkPZuvcOWrxncw8
	Justification (ex post of a decision)	Evaluation of existing projects and policies (ex post)	An article where ESV/NCPV is used to justify (or to challenge) already made decisions, existing policies or instruments. The key criterion here is “ex-post”: evidence after the decision has been made, the policy adopted and implemented.	Munda and Rus-si(2008) Social multicriteria evaluation of conflict over rural electrification and solar energy in Spain	https://drive.google.com/open?id=1P-GZIWkAOUCHzNd-y48h0rQbUmDVv-j5rYM
	Accounting & Indicators	Assessment of historic trends	An article where ESV is used for ecosystem accounts or single indicators to assess long-term historic trends, of physical or monetary ecosystem services. Can include first time demonstration of indicator with the intention of accounting over multiple periods. Studies that just value the current state with no mention of follow-up/trends/accounting perspective, are awareness raising.	Fish et al. 2016 Making space for cultural ecosystem services: Insights from a study of the UK nature improvement initiative Villamagna et al. 2014 A multi-indicator framework for mapping cultural ecosystem services: The case of freshwater recreational fishing	https://drive.google.com/open?id=1a3U6ezcu-DaE0pcNUPYWG2pz-jR5q52UYD https://drive.google.com/open?id=15g5-koe_oM-thD66PqbiGFpt-Z6x635z8z
Decisive	Recommendations & guidance	Guidances, strategies, plans	ESV/NCPV has been used to justify which values are considered in recommendations, strategies, guidance documents for decision-making (e.g. EIA guidelines, national strategies...)	<examples>	<examples>



CONTINUES

General	Specific	Short description	Description	Study examples	Example link
Decisive	Participation	Negotiation, arguments for discussion, shared norms & conflict resolution	ESV/NCPV has been used as process or an instrument to organise or support the expression of preferences, opinions, positions, of stakeholders or people in a context where a decision had to be made, and before it had to be made (ex ante a decision).	Garmendia et al 2010 Social multi-criteria evaluation as a decision support tool for integrated coastal zone management	https://drive.google.com/open?id=17LwWGAk9vXeIdkKG1m9aK4S-CwPwgL0uS
		Formulation of decision problem and structuring	ESV/NCPV has been used as a process or an instrument to structure the expression of preferences, opinions or positions of stakeholders, by formulating the options under scrutiny.	Fish et al. 2016 Making space for cultural ecosystem services: Insights from a study of the UK nature improvement initiative	https://drive.google.com/open?id=1a3U6ezcuDaE0pcNUPYWG2pz-jR5q52UYD
	Prioritization Trade-offs	screening alternatives	ESV/NCPV has been used to define and specify the alternatives to be considered in a decision to be made. Valuation has been used in benefit-cost analysis or multi-criteria analysis to identify a set of alternatives that pass some minimum criteria (e.g. net present value > 0)	Barton et al. 2010 Economic benefits of large-scale remediation of contaminated marine sediments—a literature review and an application to the Grenland fjords in Norway	https://drive.google.com/open?id=1ZU-XK7kK9wgplVVR-J2HLHy2gq41br3nZ5
		ranking alternatives	ESV/NCPV has been used to rank alternatives considered in a decision to be made, a policy to be designed. E.g. by ranking alternatives by net present value in a CBA, or by total utility our outranking in a multi-criteria analysis.	Marre and Billé 2019A demand-driven approach to ecosystem services economic valuation: Lessons from Pacific island countries and territories Schleiniger 1999 Comprehensive cost-effectiveness analysis of measures to reduce nitrogen emissions in Switzerland	https://drive.google.com/open?id=10C-JdY2zValh4rFY4LLn-VVG54Fa9t2JLv https://drive.google.com/open?id=10K9Z2HS32A-F6B-j-z7p4twPO3n-Mw8VUE
	Environmental management criterion	Policy target-setting	ESV/NCPV has been used to specify, and especially quantify, the target of a given policy or instrument to be decided upon or implemented (e.g. thresholds, biological indicators, quality levels, compliance rates, reserve area target, restoration, conservation targets etc.).	Schroter et al 2014 Ecosystem Services and Opportunity Costs Shift Spatial Priorities for Conserving Forest Biodiversity	https://drive.google.com/open?id=19Fm-VqPKcE31IOhn1Q-1Blo9DkfycaUCqG



CONTINUES

General	Specific	Short description	Description	Study examples	Example link
Decisive		Criteria for spatial targeting (zoning, planning)	ESV/NCPV has been used to produce a zoning and a spatial planning of environmental policies, instruments (prioritization of conservation objectives...). Mapping of ecosystem services as valuation	Schroter et al 2014 Ecosystem Services and Opportunity Costs Shift Spatial Priorities for Conserving Forest Biodiversity Veidemane et al. 2017 Application of the marine ecosystem services approach in the development of the maritime spatial plan of Latvia	https://drive.google.com/open?id=19Fm-VqPKcE31IOhn1Q-1Blo9DkfycaUCqG https://drive.google.com/open?id=1ak7mvYsvYfTs-hVuOPk7gHvb3kF-2D9RZY
		Allocation of rights to land and natural resource use	ESV/NCPV to determine welfare from changes in operating, use, extraction, emissions rights regimes. Rights could include ownership / licencing / permitting / certification / quotas/ responsibilities / use norms and rules.	Temper and Martinez-Alier (2009)The god of the mountain and Godavarman: Net Present Value, indigenous territorial rights and sacredness in a bauxite mining conflict in India	https://drive.google.com/open?id=1EDJ-mWcCRirEnDkqqd-7WEU2ZefZ7ycbNq
	Price-setting	Environmental standard setting (implicit pricing)	ESV/NCP has been used to value a physical minimum standard or conservation target: e.g. harvesting quota allocation, pollution emissions permits, reserve site selection	Schroter et al 2014 Ecosystem Services and Opportunity Costs Shift Spatial Priorities for Conserving Forest Biodiversity	https://drive.google.com/open?id=19Fm-VqPKcE31IOhn1Q-1Blo9DkfycaUCqG
Technical		Pricing, setting incentive levels (explicit pricing)	ESV/NCP has been used to specify an economic parameter of an economic instrument: tax and fees rates, level of payment for ecosystem services. Explicit use for pricing: does not include payment instrument for eliciting willingness-to-pay (in CVM, CE studies) used to estimate welfare estimates.	Szabó 2011 Reducing protest responses by deliberative monetary valuation: Improving the validity of biodiversity valuation	https://drive.google.com/open?id=1ch-vD5CFTV_VC-8hGs-zoeY-mkdV8PLvDD
	Damage compensation	Establishing levels of damage compensation	ESV/NCP has been used to quantify the damages and the compensation required, in a legal process	Martin-Ortega et al. 2010 Application of a value-based equivalency method to assess environmental damage compensation under the European Environmental Liability Directive	https://drive.google.com/open?id=1U9--85VYfLK8LU-T9eu-q-uS2kKQN4cj

Appendix 2: Chapter 3 List of methods

Table 1. IPBES Values assessment Chapter 3 - list of methods for systematic review
Version 1.0 (12/03/20)

#ID	Method name
1	Expert elicitation (Structured; e.g. Delphi, nominal group technique, IDEA protocol)
2	Afrocentric methodologies
3	ARIES (ARTificial Intelligence for Ecosystem Services)
4	Assessment of green assets investment banks
5	Bayesian Belief networks
6	Benefit transfer
7	Big data methods (e.g. GPS location of people...)
8	Biocultural Methods
9	Biodiversity and sustainability reports of private sector
10	Biophysical Assessment Methods (others)
11	Business accounting
12	Cards game method
13	CAVAT method
14	Choice experiments
15	Coast Salish Indigenous Health Indicators
16	Concept mapping and mental mapping
17	Consensus analysis
18	Consultative methods
19	Contingent valuation
20	Corporate Ecosystem Services Review
21	Cost-based methods (others)
22	Cost-benefit analysis
23	Cost-effectiveness analysis
24	Cultural Health Index (CHI),
25	Damage costs and replacement costs

#ID	Method name
26	Deliberative knowledge types integration
27	Deliberative valuation method
28	Documentary analysis
29	Dreams/visions
30	Dryland water resource assessment
31	Ecohealth Approach to Public Health Assessment
32	Ecological importance
33	Effect on production method
34	Epidemiological methods
35	Ethical analysis
36	Ethnobiological approach
37	Ethnobotanical approach
38	Ethnoentomological approach
39	Ethnographic approach
40	Ethnopedological approach
41	Ethnozoological approach
42	Expected damage function
43	Focus Groups
44	Folktales
45	Frames elicitation
46	Global Environmental Flow Calculator
47	Group model building
48	Health Impact Assessment (HIA)
49	Hedonic valuation method
50	Historical methods
51	Holistic valuation of systems of life of Mother Earth
52	Impact assessment
53	Inclusive General Assembly (consensus building)
54	Indicators for Living Well (and well being)
55	Insurance value
56	Integrated Modelling
57	InVEST models
58	IPLC Workshop/dialogue
59	Kaupapa Maori Methodology
60	Khipu model approach
61	Life Satisfaction approach (LSA)
62	Māori Wetland Indicators
63	MapNat App
64	Mapping (others)
65	Market prices

#ID	Method name
66	MARXAN
67	Modeling ecosystem services
68	Multi Evidence Base Approach (MEB)
69	Multicriteria decision analysis
70	Narrative method
71	National accounting
72	Natural Capital Protocol
73	Neuroeconomics based environmental valuation
74	Oral history
75	Participant observation
76	Participatory economic valuation methods
77	Participatory mapping methods a.k.a. PGIS and PPGIS
78	Participatory modelling
79	Participatory research methods (others)
80	Participatory Rural Appraisal
81	Participatory video & theater
82	Photo-elicitation survey
83	Photo-series analysis aka geotagged photo-analysis
84	Polyscape
85	Preference assessment survey
86	Production function method
87	Protected Area Benefit Assessment Tool (PA-BAT)
88	Proverbs & metaphors
89	Psychological measurement methods
90	Q-methodology
91	Questionnaires
92	Relational interview
93	Revealed preference (hedonic pricing/wages)
94	Revealed preference (travel cost methods)
95	RIOS - Resource Investment Optimization System
96	Ritual Tree ordination
97	Role Playing Games
98	SAPA - Social Assessment for Protected Areas
99	Scenario planning method
100	Semi-structured interviews
101	Shadow pricing method
102	Sharing circles/talking circles
103	Social and cultural maps
104	Social-ecological memory
105	SolVES - Soivial Values for ES

#ID	Method name
106	Songs/dance/poems
107	Spreadsheet-type methods (aka matrix method)
108	State and transition models
109	Stated preferences methods (others)
110	Storytelling/oral tradition (elder's interpretation)
111	Strategic Environmental Assessment
112	Surveys
113	Sustainability report
114	Symbol-Based reflection
115	TESSA - Toolkit for site-based ES assessment
116	Time use method
117	Turtle island (North American) Medicine Wheel
118	Ubuntu worldview
119	Upscaling values
120	Webmapping
121	Worldview assessment

Appendix 3: Value Foci and Valuation Targets

Table 1. Value Focus - From IPBES ECA assessment Chapter 1

	Value Focus*	IPBES-Valuation Targets	Further examples and clarifications
N1	Individual organisms	Individual organisms	Living beings (biocentrism), sentient beings (animal welfare/rights)...
N2	Biophysical assemblages	Biophysical assemblages	Populations, communities, ecosystems, biomes, the biosphere, Gaia, Pachamama, Mother Earth...
N3	Biophysical processes	Biophysical processes	Evolution, ecosystem functions and processes, ecological resilience ...
N4	Biodiversity**	Biodiversity	Genetic, functional, taxonomic and phylogenetic diversity, uniqueness, vulnerability...
C1	Options for NCP	18 Maintenance of options	
C2	Regulating NCP	1 Habitat creation and maintenance	
		2 Pollination and dispersal of seeds and other propagules	
		3 Regulation of air quality	
		4 Regulation of climate	
		5 Regulation of ocean acidification	
		6 Regulation of freshwater quantity, flow and timing	
		7 Regulation of freshwater and coastal water quality	
		8 Formation, protection and decontamination of soils and sediments	
		9 Regulation of hazards and extreme events	
		10 Regulation of organisms detrimental to humans	



CONTINUES

	Value Focus*	IPBES-Valuation Targets	Further examples and clarifications
C3	Material NCP	11 Energy	
		12 Food and feed	
		13 Materials	
		14 Medicinal, biochemical and genetic resources	
C4	Non-material NCP	15 Learning and inspiration	
		16 Physical and psychological experiences	
		17 Supporting identities	
Q1	cultural	Living well in harmony with nature	Stewardship, relationships and interactions between people and nature inherently entwined as systems of life, as also indicated by time spent for managing ecosystems, conservation activities, contemplation of nature...
		Identity and Autonomy	Sense of place, sense of community, historical values, agency, self-determination...
		Spirituality and Religions	Sacred sites, totemic beings, spiritual well-being...
		Art and Cultural heritage	Inspiration, artistic creation...
Q2	societal	Sustainability and Resilience	Social-ecological resilience, social, economic and ecological sustainability...
		Diversity and Options	Biocultural diversity, diversity of current and future options ...
		Governance and Justice	Environmental justice, intra-generational equity, inter-generational equity...
Q3	individual	Health and Wellbeing	Physical, mental, holistic health, biophilia...
		Education and Knowledge	Inspiration, education, experience, learning space...
		Good social relations	Community cohesion, social resilience, conviviality...
		Security and Livelihoods	Physical security, political stability, food and water security, energy security, livelihood security...

