Classifying values for planning the conservation and use of natural resources

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Abstract: Understanding values and their interaction is fundamental to the wise conservation and use of natural resources. However, a confusing mixture of value classifications is applied in natural resource management. This is unhelpful where the aim is to implement values-based planning through group deliberative processes. At the same time, classifications described in the literature are rarely supported by explicit criteria and assumptions. Thus, their conceptual basis may be obscure, and they are therefore difficult to interpret and apply in practice. To address these issues, we develop two classifications of values grounded on clearly stated assumptions and criteria that facilitate interpretation, application, and adaptation. These classifications involve two distinct, but related, concepts of values: 'end state values' such as recreational satisfaction, spiritual-philosophical contentment, and adequate resources of food and water; and 'principles', which are the preferred ethical properties of human behaviour such as 'honesty', 'fairness', and 'prudence'. The proposed classifications are compared with a representative sample of alternative approaches including those based on 'needs', 'capabilities', and various socio-psychological constructs. The outputs are designed to support group deliberative processes including expert analysis. At the same time, this work contributes to resolving the confusion of approaches described in the literature.

Key words: Classification; planning; decisions; natural resources; end state values; principles
JEL classifications: Q57 Ecological Economics: Ecosystem Services • Biodiversity Conservation • Bioeconomics

1. Introduction

It is widely accepted that stakeholders[1] and the general community should be engaged in environmental planning[2] (Dietz and Stern 1998, Kenter et al. 2015, NRC 2008, Reed 2008). Therefore, given that an important aspect of consultative planning is to discover what people want, a variety of methods have been used to capture value ratings by stakeholders and the broader community (e.g., Brown and Reed 2012, Ives et al. 2017, Kant and Lee 2004, Roberts et al. 2015, Seymour et al. 2010). Methods used range from group elicitations to general surveys, with the choice of method dependent on situational factors and the aim of the engagement process (NRC 2008, Pellizoni 2003). Currently, there is increased attention on group deliberation as a method for eliciting values, partly because it expands the value types that can be assessed beyond those used in strictly economic approaches (Kenter et al. 2015, Lienhoop et al. 2015, TEEB 2010). Nevertheless, group deliberations have long played a vital role in environmental planning (Burgman 2005, Gregory et al. 2012), and the potential benefits from using group processes to elicit stakeholder values are an important motivation for our work.

In the conservation and use of natural resources, values elicited from stakeholders have been used to inform a variety of tasks ranging from goal formulation and analysis of wellbeing utilities (Gregory et al. 2012, Smith et al. 2016, Wallace et al. 2016b) through to conflict resolution in wildlife management (Redpath et al. 2013). However, the multiplicity of methods in current use presents a bewildering diversity of approaches to defining, documenting, and analysing values (Tadaki et al. 2017). After exploring various approaches in the literature, Wallace and Jago (2017)[3] concluded that two types of values are sufficient for deliberative group planning in natural resource management: end state values, such as 'recreational satisfaction' and 'adequate resources of food/water' (Section 3.3); and principles of ethical behaviour, such as 'fairness' and 'honesty' (Section 3.4). These values form, or contribute to, the constituents of human wellbeing, which is the ultimate goal of natural resource management (MEA 2003, 2005).

Building on recent work, this paper aims to develop two classifications of values that support natural resource planning. Underpinning concepts, criteria, and assumptions are outlined in detail to ensure that the classifications may be easily interpreted, applied, and adapted for wider use. A key assumption underpinning this work is that group deliberative processes are fundamental to prudent natural resource management, a point broadly supported in the references cited above. This is held to be the case whether groups are ultimate decision-makers or advisory, and whether their membership is narrowly defined or representative of all the stakeholders associated with a specific natural resource. Thus, the classifications

[1] Defined as those who can affect, or are affected by, a decision (Reed 2008).
[2] Throughout this paper we use 'planning' to encompass the total planning process, including decision-making.
[3] The component on 'values' in this work has been greatly expanded by Wallace et al. (currently under review).

outlined below are designed to support groups willing to share knowledge with the intent of making wise decisions concerning the conservation and use of natural resources.

Before proceeding further, we first need to ask: Are classifications of values really needed? Perhaps documenting and analysing intuitive expressions of preferences and desires are sufficient for group deliberation? Four arguments support the development and use of classifications, particularly in the case of end state values (defined in Section 2), which are the focus of the discussion below.

Firstly, before decisions are made to trade-off or lose natural elements from systems, or expend resources on their conservation, it would be prudent to understand the relative merits of alternative systems that might be generated. Value classifications help decision-makers assess all alternatives and their implications by providing a comparatively comprehensive value set as a starting point. However, care is required to ensure classifications are structured without normative properties, and therefore do not directly influence the rating of values, which is a socio-political decision for the responsible group or individual. Nevertheless, capture by interest groups, biases, halo effects and framing may all influence group processes (Kahneman 2011, Nisbett and Wilson 1977, NRC 2008, Pieraccini 2015, Turnpenny et al. 2009), and this remains the case irrespective of whether classifications are used. Indeed, one would expect that exhaustive, well-designed classifications should encourage transparent planning by ensuring all values are explicit and trade-offs are overt. In addition, based on Kaptein's (2017) model of corporate ethical virtues, guided discussion and rating of principles, such as those outlined in Section 3.4, should positively contribute to group ethics and thus governance.

Secondly, classifications of the constituents of wellbeing are central to related theory and practice. Alexandrova's (2012, 2015) analyses of wellbeing research from a philosophical perspective highlight the role of theory in determining practice; and of practice and theory in challenging, or validating, each other. Whichever of the three generally-accepted philosophical approaches to wellbeing[4] is adopted, describing the content of wellbeing is integral to developing, testing, and applying theory; and even a simple list of constituents implies a classificatory structure. Also, classifications of wellbeing constituents are basic components of policies and strategies, as shown by their use in global reports on wellbeing (e.g., Narayan et al. 2000, OECD 2015, Pearce et al. 2006, Stiglitz et al. 2009, WHOQL 1995). Consequently, to develop and apply theories and models of wellbeing demands that we think through the constituents of wellbeing, which are then described in some form of classification.

Thirdly, decisions on environmental issues that cut across cultural or national boundaries require some form of shared framework for communicating, analysing, and planning the priorities and trade-offs affecting human wellbeing and its constituent values or needs (Gough 2017). Approaches that simply

[4] Hedonist, desire/preference satisfaction, and objective list theories (Alexandrova 2015, Crisp 2016).

'add up' or mix alternative views of the world are likely to increase the probability of category mistakes, which contribute to miscommunication and analytical errors (Wallace and Jago 2017). Adequate definition of terms and, in the case of wellbeing analysis, classifications of values that meet criteria such as those outlined in Sections 3.3 and 3.4, help to minimise such errors. These issues are particularly challenging in biodiversity conservation where assessing and managing trade-offs amongst values is increasingly important (McShane et al. 2011, Madden and McQuinn 2014, Redpath et al. 2013).

Finally, and related to the previous point, if one aims to promote informed thinking within groups, then value classifications can stimulate discussion and contribute to their shared understanding. Nevertheless, typologies may also constrain responses from stakeholders, or even obscure their actual values (Tadaki et al. 2017). Certainly, if one aims to document the intuitive thinking of individuals or groups, then qualitative methods unconstrained (as far as is practicable) by the framing of others are essential. However, group deliberative processes address quite different aims that generally include sharing perspectives and knowledge to achieve prudent plans acceptable to a range of stakeholders. This emphasises that the theory, methods, and tools applied will depend on the specific task at hand; and that within and across disciplines a plurality of approaches is likely to be required (Alexandrova 2015, Kitcher 2012).

With the above background, we proceed by firstly outlining the definitions of values and models (Section 2) applied in the development of the classifications, then describe the methods used to generate the classifications and the related results (Section 3), followed by discussion and conclusions (Section 4).

2. Underlying definitions and models

The models describing: (a) the connections among system elements[5], processes, values, and wellbeing; and (b) the processes underlying the expression and rating of values; are outlined in Wallace and Jago (2017) and Wallace et al. (in review). These papers also develop and explain the two definitions of values applied here:

End state values are: *enduring beliefs concerning the preferred end-states of human existence, including those required for survival and reproductive success, which taken together determine human wellbeing*. Although these constitute human wellbeing, the rating of values is a socio-political decision dependent on the specific situation. Put another way, the components are universal, but their relative importance and the methods used to achieve them depend on the individual or group, their culture, and their situation.
Principles are: *enduring beliefs concerning the preferred ethical properties of human behaviour that instrumentally contribute to human wellbeing*. These values are instrumental and contribute to wellbeing

[5] "concrete entities in a system including: water, rocks, mountains, roads, buildings, and organisms" (Wallace and Jago 2017).

via end state values. Again, the components are universal, but their relative importance is a socio-political decision constrained by culture and situational context.

Based on the above background, we generated classifications of end state values and principles for natural resource management as outlined in Section 3.

3. Methods and Results

The current classifications of values (Tables 1 and 2) evolved through the integration of three processes: review and development of concepts as described above in Section 2; applied testing of classifications, which is documented in existing publications as summarised in Section 3.1; and comparison with alternative classifications, including documentation of assumptions and classification criteria, as described in Sections 3.2 to 3.4.

3.1 Applied testing of classifications – Summary of previous work

The original impetus for the current work was the perception that: "…it is important to describe the human values of biodiversity so that people understand its importance to them personally. Without such linkages, there would be little support for expending human resources…on conservation" (Wallace et al. 2003, p.6). This statement introduced a values-based approach to managing conservation lands embedded in an agricultural matrix. Implementing this and a later planning framework (Wallace 2012) led to values being elicited from multi-stakeholder, advisory groups as a basis for operational planning. Initial methods used simple classifications of values drawn from those outlined in Burgman and Lindenmayer (1998), combined with elicitation methods based on group discussion and voting, to produce ordinal ranking of priority values. Anonymous rating methods were soon introduced to minimise bias errors, particularly given the multi-stakeholder nature of the groups involved. Although basic, this early work underpinned the operational goals for several published management plans (DBCA 2017, DEC 2007, DPaW 2013).

Influenced by the research of others (e.g., Keeney 2006, Shields et al. 2002), it was also realised that classifications of values could be used as the evaluative criteria to assess land use change (Wallace 2006, Wallace et al. 2016a). This work, in an agricultural production context, highlighted a range of classification issues such as the importance of ensuring that system properties – for example, resilience and profitability – were not confused with values in assessment processes. Wallace et al. (2016a) was also the first time, in this specific developmental sequence, that a principle (justice) was trialled – and it became clear that while the concept is relevant, it is categorically different from end state values. During pilot testing of values-based planning with the Thames Enterprise Partnership (unpublished) in 2014-15, ratings of principles based on the six categories of Haidt (2012) were trialled with encouraging results, and this ultimately led to the definition of principles.

Experience from this work and literature review culminated in a much-improved approach to values elicitation and classification (Wallace et al. 2016b). This classification of end state values was further tested and developed (sections 3.2-3.4) to provide those currently used.

3.2 Development and testing of classifications against alternatives

In conjunction with the work outlined above, our current classifications were refined by comparing them with alternative classifications in the literature. Selected alternatives represent a cross-section of approaches and include those based on needs (Doyal and Gough 1991, Max Neef 1992), capabilities (Nussbaum 2006), socio-psychological methods (Narayan et al. 2000, Rokeach 1973), total economic value (TEEB 2010), and an approach representative of those common in operational natural resource management (Brown and Reed 2012). Details of this comparative work are reported in the Supplementary Material. In brief, alternative classifications were tabulated drawing on the original texts for categories and their definition. A commentary comparing each category of the alternative classifications with those in Tables 2 and 3 was then added, with a short conclusion drawing on criteria outlined below.

In addition, a further 11 classifications reported in Alkire (2002) were scanned to ensure no categories of values were missing from Tables 1 and 2, and numerous other classifications and reviews in the literature (e.g., Chan et al. 2012, 2016; Kenter et al. 2014, 2015) were also examined, but did not add further categories of values that met the assumptions and criteria below. Adjustments in the language and categories outlined in Wallace et al. (2016b) were made as necessary to accommodate missing categories and their content, while at the same time remaining consistent with the criteria outlined below.

Although some researchers have provided criteria with classifications (Max Neef 1989), and Alkire (2002) describes various classifications, we were unable to find any work combining detailed criteria, assumptions, and comparisons with other classifications.

3.3 Criteria and assumptions underlying classification of end state values

We propose that eight assumptions underpin the classification of end state values used in group planning for natural resource management:

1. End state values, taken together, sufficiently capture human wellbeing to support wise decisions concerning the conservation and use of natural resources both within and across temporal and spatial scales.
2. In natural resource management, the realisation of end state values may always be directly linked to a specific composition and structure of elements (Smith et al. 2016). For example, humans describe

some compositions and structures of elements as ‘food’, the enjoyment of which realises a value (adequate resources) that contributes to wellbeing.

3. As beliefs, values result from reflective thinking based on a wide range of inputs including group deliberations (Wallace et al. in review). However, when values are expressed, then desires, emotions, and intuitions inextricably influence ratings and preferences. Planners and decision-makers need to manage engagement processes accordingly.
4. As ‘enduring’ beliefs we expect that, in a similar situation, an individual or group will consistently express the same rating for a value, or specific set of values, over time. However, research has shown that even deep-seated personality traits may change (Roberts et al. 2017), so values are only enduring in comparison with more transient attitudes, such as fashions in music or clothing. In addition, socio-political, economic, and biophysical conditions may change dramatically over short periods. Therefore, it is important to review priorities among values, especially during periods of change.
5. Rating the importance of values is always subjective. Although science may inform decision processes, it cannot determine priorities amongst values, for ratings of values are socio-political.
6. End state values are the penultimate response to a set of ‘why’ questions where ‘wellbeing’ is the ultimate answer. For example: “I want money” – Why? – “Because I want to buy a fishing rod” – Why? – “Because I want to catch fish.” – Why? – “Because I want to eat” – Why? – “So that I am adequately nourished (i.e., have adequate resources, a value defined below) – Why? – “For my wellbeing”. This approach is consistent with Alkire (2002), who describes a similar approach of asking ‘why’ questions to arrive at ultimate ends, and with approaches to identifying fundamental (Gregory et al. 2012) and strategic objectives (Shields et al. 2002).
7. All proposed end state values are meaningful when placed within a statement paraphrasing the definition in Section 2, for example, “I have an enduring belief that [value X] is a preferred end state of human existence that, together with other values, determines human wellbeing”. As a form of short-hand, it is important to note that values are named for the desired end states themselves, rather than incorporating the full preamble concerning their status as a belief.
8. Values expressed as properties of human behaviour (i.e., principles) are instrumental to achieving end state values.

Given these eight assumptions, we applied six criteria to the development of a values classification, building on criteria described for various applications by Burgman (2005), Max-Neef (1989), Salafsky et al. (2008), and Wallace et al. (2016 a,b). These criteria are that the classification of values should be:

a. Readily understood by those applying the classification;
b. Exhaustive, in that there is a classification category for each item to be allocated to a value type;
c. Redundancy-minimizing among categories. That is, each item to be classified fits only within one value category. At the minimum, there must be situations where each value may be realised independently of all other values, otherwise an unacceptable level of redundancy is likely;

d. Consistent, in that components at the same level within the classification are of the same type. In natural resource management, the consistency of 'type' is achieved through assumptions (2), (6) and (7) above;
e. Scalable, that is, may be applied across the full range of relevant spatial and temporal scales; and
f. Structured so that the relationship between values and the ways in which they are satisfied may be analysed. This should be an outcome of the previous criteria; however, this specific criterion emphasises the point.

Table 1: Current classification of values as preferred end states. See Supplementary Material (Appendix 2) for a more detailed explanation.

Value	Description of value and examples relating to natural resources
Adequate resources	Having sufficient food, air, and water to support energetic needs, growth, and structural maintenance. This category also includes materials that supply energy for cooking food, but not energy required for warmth (see Benign physical environment below).
Aesthetically pleasing environment	Living in, and having access to, aesthetically pleasing environments – i.e., places where the structure and composition of elements give sensory pleasure. This category includes the scenic and other aesthetic values of landscapes, beauty of wildflowers and birds, etc. May include sounds and smells as well as sight.
Benign physical environment	An environment in which the physical properties lie within minimum and/or maximum boundaries (e.g., lead concentrations, temperature) that are conducive to wellbeing.
Knowledge-heritage fulfilment	Having sufficient access to the information contained in nature to support knowledge-heritage needs. Just as libraries contain a wealth of knowledge, natural elements hold a wide range of information that may be accessed for scientific research, educational uses, and heritage-related purposes.
Meaningful occupation	Broadly defined here as work occupation or equivalent that provides one or more people with satisfying tasks. While such tasks are often remunerated, e.g., park rangers and guides, it also includes volunteering, which provides meaningful occupation (unpaid) based on natural resources.
Protection from other organisms	The security that comes from living in an environment in which the presence of other organisms, including disease organisms and humans, does not harm wellbeing.
Recreational satisfaction	The fulfilment that people derive from leisure activities. The importance of natural resources as a basis for leisure activities is well-known and broadly recognised in typologies related to natural resources.
Spiritual-philosophical fulfilment	The fulfilment that arises from meeting, to a sufficient extent, one's spiritual-philosophical needs to achieve wellbeing. Includes concepts such as a biodiversity conservation ethic.
Social fulfilment	The fulfilment one achieves through strong family and community relationships: Family fulfilment: includes belonging to a family (e.g., a kin group of some description) that usually entails: ▪ Reproductive success and sexual satisfaction ▪ Loving, harmonious and supportive relationships ▪ Sense of familial belonging ▪ Some close friendships, not necessarily within the immediate kinship group. Community fulfilment: includes belonging to a group, or groups, and usually entails harmonious and supportive relationships at a group level. Leads to sense of social belonging and influences self-respect and dignity.

The current classification of end state values is outlined in Table 1 – a more detailed description of each value is provided in the Supplementary Material.

No classification of values will perfectly meet the above criteria with zero ambiguity in all situations. Where there is ambiguity, it is important to agree on methods that ensure consistency in scoring and analysis. Finally, the categories in Table 1 are broad, and may readily be sub-divided provided the criteria outlined above are re-applied at each subsequent hierarchical level.

The degree to which values in Table 1 are represented in the alternative classifications examined is summarised in the Appendix. Two conclusions may be drawn from this comparison:

i. Each of the categories of end state values in Table 1 are represented in two or more of the alternative approaches. Given the wide range of geographic and conceptual conditions represented in the alternative classifications, this supports both the relevance and universality of the categories in Table 1;
ii. The category in Table 1 that is least well represented in the alternative classifications is 'aesthetically pleasing environment'. Only two of the seven alternatives contained a similar category. However, research has shown that aesthetic pleasure may be separated from other values. For example, the aesthetic environment of a recreational activity, such as walking, may provide an additional benefit to that arising from the actual physical exercise and its social aspects, although the underlying mechanisms are incompletely understood (Marselle et al. 2016). Thus, aesthetic pleasure both meets the criteria outlined above and can be shown to be a separate value.

Importantly, based on the review in the Supplementary Material and Appendix 1, no additional categories were found that met the criteria outlined above. However, some of the alternative classifications mix end state values and principles. The latter were incorporated into Table 2 where they met the assumptions and criteria outlined in Section 3.4.

3.4 Criteria and assumptions underlying classification of principles

As defined, principles are ethical properties of behaviour, and thus relate to morality, understood as:

> "an informal public system applying to all rational persons, governing behaviour that affects others, having the lessening of evil or harm as its main goal, and including what are commonly known as the moral rules, moral ideals and moral virtues…That morality has no one in a position of authority is one of the most important respects in which it differs from law and religion" (Gert 2015 p 686).

We accept Gert's (2015) sense of morality, although acknowledging that there are many approaches to defining the relationship between ethics and morality. Also, we couch principles in positive terms (e.g., just behaviour), rather than in terms of rules or prohibitions. As with end state values, the rating of principles, including their acceptance or rejection, is entirely a subjective matter. Overall ratings accepted by groups are socio-political decisions of the group itself.

Assumptions underpinning the classification and practical application of principles overlap with those relating to end state values. This is unsurprising given the common context. Below, we have referenced the relevant assumptions from Section 3.3, paraphrased them where necessary, and added where required. The assumptions for principles are therefore that:

i. Items (3) to (5) inclusive as described under Section 3.3 are directly applicable to principles.
ii. In natural resource management, principles describe a preferred ethical mode of behaviour that has the intent of delivering an end state value (i.e., principles are always instrumental in relation to an end state value(s) described in Section 3.3).
iii. Group deliberations may involve consultation with stakeholders outside the planning group. Therefore, there are potentially two sets of principles at play: a set that are accepted by the planning/decision group as governing their internal processes; and a second set that govern their interactions with others outside the group. Although the same classification of principles (i.e., those in Table 2) will inform both sets, the relative ratings of principles between the two sets may differ. Also, given that we are concerned here only with group deliberations in planning, some potential principles, for example, 'being loving' and 'being gentle' that may constitute important aspects of individual virtuous behaviour, are not considered to be important properties of group behaviour (see criterion (g) below; and Appendix 3, Supplementary Material).
iv. Principles are the penultimate response to a set of 'why' questions where achieving an end state value in an ethically acceptable manner is the ultimate answer.
v. All principles must be meaningful when placed within a statement paraphrasing the above definition, such as, "I have an enduring belief that [value X] is a preferred ethical mode of behaviour that should be adopted in the pursuit of end state values".
vi. As a type (criterion (d) above), all principles relate to ethical properties of behaviour and thus morality.

Table 2: These principles are a suggested starting point for those wishing to explore desirable ethical properties of behaviour. The current categories are based largely on a combination of Comte-Sponville (2003) and Haidt (2012).

Principle i.e., our group behaves with:	**Proposed short definition**	**Comments**
1. Care	Concern for the welfare of others (based on Haidt).	Characterised by empathy with the situation of others and concern for their welfare. Actions are typically compassionate, caring, kind, and merciful.
2. Fairness	Treating people with justice, includes the concept of proportionality (rewards to each based on their contribution) (based on Haidt).	Typified by actions that are characterised by fairness, justice**,** trustworthiness, fidelity, reciprocity, equality.
3. Honesty (good faith)	Is "…love or respect for truth…someone of good faith says what he believes…and believes what he says." (Comte-Sponville 2003, p 195).	According to Comte-Sponville (2003, p196): "…good faith goes beyond sincerity…sincerity means not lying to others; good faith means lying neither to others nor to oneself."
4. Liberty	Allowing people to make decisions for themselves, equality of rights (based on Haidt).	Many writers would construe this as 'freedom' (e.g., Nussbaum 2006). There is also considerable overlap between fairness and this category (e.g., Comte-Sponville 2003). Involves political equality, social justice, allowing people to make decisions for themselves.
5. Loyalty	Strong support for, or allegiance to, a group (adapted from Oxford Living Dictionaries).	Includes loyalty, patriotism, self-sacrifice, group pride, and fidelity.
6. Politeness	Acting in accord with the accepted courtesies and ceremonies of the relevant socio-cultural context (based on Comte-Sponville).	Involves being civil and respectful given the socio-cultural context.
7. Prudence	Acting well (e.g., following other principles) to achieve good ends that are responsibly sought with consideration of their consequences (based on Comte-Sponville).	"Good motives aren't enough…hence an ethic of responsibility requires that we answer not just for our intentions or principles but also for the consequences of our acts, to the extent that they can be foreseen. It is an ethic of prudence…" (Comte-Sponville 2003, P31).
8. Respect for earned authority	Applying authority with due responsibility as a leader of people, and respect for authority that is so used (based on Haidt).	Authority is not the same thing as 'power' and is held by those humans responsible for maintaining order and justice. Actions are characterised by obedience, respect, deference, legitimacy, politeness.
9. Sanctity	Managing bodies and relationships in accord with society's mores and with a sense of the sacred (where appropriate) (based on Haidt)	Actions typified by temperance, chastity, piety, cleanliness, purity
10. Tolerance	To "accept what could be condemned or allow what could be prevented or combated. It means renouncing some of one's power…Thus, we tolerate the… positions of an adversary, but such forbearance is virtuous only if it involves self-control…" (Comte-Sponville 2003, p 159).	One would expect that this will be a principle that should be continuously maintained in group planning and decisions.
11. Care for non-human organisms	Concern for the welfare of other organisms.	To treat other organisms with respect and to avoid harming them. Although developing the details of all principles is a socio-cultural enterprise, it is especially so regarding the treatment of other organisms. Even deciding as to which organisms this principle should apply is a challenging task. Will include avoiding cruelty and the taking of life (to the extent practicable).

In developing the classification of principles, we have been consistent with the above assumptions and followed criteria (a) to (f) as outlined in Section 3.4. In addition, based on assumption (iii) above we add a seventh criterion, that is, that the classification should be:

g. Consistently appropriate for group planning and decision-making in natural resource management. In other words, principles consist of those that one could reasonably apply to all, or nearly all, behaviours in group planning for natural resource management.

The use of 'could' in criterion (g) is important. We make no judgement concerning the relative importance of principles, or whether any one or more of the principles 'should' be applied. A second test we used in applying this criterion was to ask whether, given the current list in Appendix 4 (Supplementary Material), the addition of any further principle might make a significant contribution to group processes. Using these tests we considered, for example, that 'generosity' and 'love' were not generally relevant to group deliberative processes. Thus, criterion (g) focuses attention on the key principles relevant to group behaviour in a natural resource planning context.

The above assumptions and criteria were then tested against classifications described in Comte-Sponville (2003), Haidt (2012), Lockwood (2010), Lockwood et al. (2010) and Rokeach (1973). These comparisons are explained in the Supplementary Material (see Supplement Appendix 3). Testing was iterative and led ultimately to the development of a classification of principles (Table 2). This classification is largely a combination of items from Comte-Sponville (2003) and Haidt (2012) that meet the above assumptions and criteria.

4. Conclusions

Drawing on the classificatory approaches in the literature and experience in their application, we have generated typologies for end state values and principles. Taken together, these should be sufficient to support group deliberative processes involving the elicitation and analysis of values in natural resource management. Importantly, the concepts, assumptions, and criteria underpinning these classifications are described in detail to encourage their critique and adaptation for application. Given the history of change, one would expect that the classification of values and their supporting concepts will continue to evolve. However, such changes should be based on explicit criteria and assumptions, preferably supported by applied testing.

A notion underlying the development of classifications in general is that there is some fundamental set of values (or needs) that will apply across many situations, and potentially across cultures (Gough 2017, Rokeach 1973). As noted in the Introduction, whenever natural resource planning involves more than one culture, assessments of relative wellbeing under alternative future scenarios require some form of common value set as a basis for comparisons and, ultimately, decisions. Even if separate cultural analyses

are undertaken, at some point they need to be combined for decision-making, at which point an overarching covering consideration or evaluative statement is required. Given that different cultures may even define fundamental properties of environmental elements quite differently, for example, the same object may be viewed as animate or inanimate (Satterfield et al. 2013), developing such common sets is challenging, and an important area of research.

Nonetheless, it is emphasised that the end state values listed in Table 1 do not entail any assumptions concerning the rating of values, or how they might be achieved, or their specific sub-constituents. For example, one of the end state values listed above is 'adequate resources of food/water', but this makes no assumptions concerning which items are considered as food, how food might be obtained (including the principles that should be followed), or the relative priority of food resources amongst all values. Also, the conservation or use of an environmental element, such as a fruit or animal, may satisfy many different individual or group values including adequate food resources, spiritual-philosophical contentment, and access to knowledge-heritage. Thus, end state values and principles described above accommodate a very wide range of individual, group, and cultural differences. Plus, in applied situations values may be added or deleted as required, provided this is consistent with the criteria and assumptions underlying the set.

Finally, as has been pointed out in different contexts by Alexandrova (2012, 2015) and Kitcher (2012), it is likely that a plurality of classification approaches will be required depending on the context and decision question. However, the need for plurality should not be taken as licence to produce classifications for which the conceptual basis, assumptions, and criteria are covert. An unnecessary diversity of ill-considered approaches to value classification inhibits effective communication and analysis. Those interested in the prudent conservation and use of our diminishing natural resources cannot afford such extravagance.

Supplementary Material

The Supplementary Material may be obtained from the corresponding author, Ken Wallace (ken.wallace@uwa.edu.au).

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