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A new valuation school: Integrating diverse values of nature in resource and land use decisions

Sander Jacobs[a,*], Nicolas Dendoncker[b], Berta Martín-López[c], David Nicholas Barton[e], Erik Gomez-Baggethun[d,e], Fanny Boeraeve[f], Francesca L. McGrath[g], Kati Vierikko[h], Davide Geneletti[i], Katharina J. Sevecke[j], Nathalie Pipart[b], Eeva Primmer[k], Peter Mederly[l], Stefan Schmidt[m,n], Alexandra Aragão[o], Himlal Baral[p], Rosalind H. Bark[q], Tania Briceno[r], Delphine Brogna[b], Pedro Cabral[s], Rik De Vreese[t], Camino Liquete[u], Hannah Mueller[v], PehKelvin S.-H. [w,x], Anna Phelan[y], Alexander R. Rincón[z], Shannon H. Rogers[aa], Francis Turkelboom[a], Van ReethWouter [ab], van ZantenBoris T. [ac], Hilde Karine Wam[ad], Carla-Leanne Washbourn[ae]

[a] *Research Group Nature and Society, Research Institute for Nature and Forest (INBO), Kliniekstraat 25, 1070Brussels, Belgium*
[b] *University of Namur, Department of Geography, 61, Rue de Bruxelles, 5000Namur, Belgium*
[c] *Leuphana University, Faculty of Sustainability, Institute of Ethics and Transdisciplinary Sustainability Research, Scharnhorststr. 1, 21335Lüneburg, Germany*
[d] *Department of International Environment and Development Studies, Norwegian University of Life Sciences (NMBU), Norway*
[e] *Norwegian Institute for Nature Research (NINA), Gaustadalleen 21, 0349Oslo, Norway*
[f] *TERRA - BIOSE – Biodiversité et Paysages, Université de Liège, Gembloux Agro-Bio Tech, Passage des Déportés 2, 5030Gembloux, Belgium*
[g] *Department of Biological Sciences, National University of Singapore, 14 Science Drive 4, 117543, Singapore*
[h] *Department of Environmental Sciences, University of Helsinki, P.O. Box 65, 00014, Finland*
[i] *Department of Civil, Environmental and Mechanical Engineering, University of Trento, Via Mesiano 77, 38123Trento, Italy*
[j] *ESCP Europe Business School Berlin, Chair of Environment and Economics, Heubnerweg 8-10, 14059Berlin, Germany*
[k] *Environmental Governance Unit, Finnish Environment Institute, P.O. Box 140, 00251Helsinki, Finland*
[l] *Department of Ecology and Environmental Sciences, Faculty of Sciences, Constantine the Philosopher University in Nitra, Slovakia*
[m] *UFZ, Helmholtz Centre for Environmental Research, Department Computational Landscape Ecology, 04318Leipzig, Germany*
[n] *Martin-Luther-University Halle-Wittenberg, Institute of Geoscience & Geography, 06099Halle (Saale), Germany*
[o] *Faculty of Law of the University of Coimbra, Portugal*
[p] *Centre for International Forestry Research (CIFOR), Bogor, Indonesia and Department of Forest and Ecosystem Science, The University of Melbourne, Parkville, 3010Victoria, Australia*
[q] *University of Leeds, LeedsLS2 9JT, UK*
[r] *Earth Economics, 107 N. Tacoma Avenue, Tacoma, WA98403, USA*
[s] *NOVA IMS, Universidade Nova de Lisboa, 1070-312Lisboa, Portugal*
[t] *Vrije Universiteit Brussel, Public Health Department, Belgium*
[u] *European Commission Joint Research Centre (JRC), via Enrico Fermi 2749, 21027Ispra, Italy*
[v] *Faculty of Science and Engineering, University of Waikato, Private Bag 3105, Hamilton3240, New Zealand*
[w] *Centre for Biological Sciences, University of Southampton, University Road, SouthamptonSO17 1BJ, UK*
[x] *Conservation Science Group, Department of Zoology, University of Cambridge, Downing Street, CambridgeCB2 3EJ, UK*
[y] *University of Queensland, Business School, St Lucia, Queensland4072, Australia*
[z] *Alexander von Humboldt Institute for Research on Biological Resources, Colombia*
[aa] *Center for the Environment, Plymouth State University, Plymouth, NH, USA*
[ab] *Team Nature Report and Advice Co-ordination, Research Institute for Nature and Forest INBO, Kliniekstraat 25, 1070Brussels, Belgium*
[ac] *Environmental Geography Group, Department of Earth Sciences, Vrije Universiteit Amsterdam, De Boelelaan 1087, 1081 HVAmsterdam, The Netherlands*
[ad] *Norwegian Institute of Bioeconomy Research, P.O. Box 115, 1431Ås, Norway*
[ae] *Department of Science, Technology, Engineering and Public Policy, University College London, 36-38 Fitzroy Square, LondonW1T 6EY, UK*

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ABSTRACT

We are increasingly confronted with severe social and economic impacts of environmental degradation all over the world. From a valuation perspective, environmental problems and conflicts originate from trade-offs between values. The urgency and importance to integrate nature's diverse values in decisions and actions stand out more than ever.

* Corresponding author.
E-mail address: sander.jacobs@inbo.be (S. Jacobs).

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Benefits of nature
Quality of life
Participation
Social and environmental justice
Decision support

Valuation, in its broad sense of 'assigning importance', is inherently part of most decisions on natural resource and land use. Scholars from different traditions -while moving from heuristic interdisciplinary debate to applied transdisciplinary science- now acknowledge the need for combining multiple disciplines and methods to represent the diverse set of values of nature. This growing group of scientists and practitioners share the ambition to explore how combinations of ecological, socio-cultural and economic valuation tools can support real-life resource and land use decision-making.

The current sustainability challenges and the ineffectiveness of single-value approaches to offer relief demonstrate that continuing along a single path is no option. We advocate for the adherence of a plural valuation culture and its establishment as a common practice, by contesting and complementing ineffective and discriminatory single-value approaches. In policy and decision contexts with a willingness to improve sustainability, integrated valuation approaches can be blended in existing processes, whereas in contexts of power asymmetries or environmental conflicts, integrated valuation can promote the inclusion of diverse values through action research and support the struggle for social and environmental justice.

The special issue and this editorial synthesis paper bring together lessons from pioneer case studies and research papers, synthesizing main challenges and setting out priorities for the years to come for the field of integrated valuation.

1. Introduction: why value nature?

We, as human species, are pushing the earth's system and biosphere beyond several planetary boundaries, undermining the long-term conditions for our own survival (Rockström et al., 2009; Steffen et al., 2015). As a direct result, we are increasingly confronted with severe social and economic impacts of environmental degradation that lead to ecological conflicts all over the world (Armiero and Sedrez, 2014; Martinez-Alier et al., 2016). From a valuation perspective, environmental problems and conflicts are the consequence of trade-offs between values held by different groups of stakeholders, which in many cases are not well represented in the decision making process (see Iniesta-Arandia et al., 2014; Phelan and Jacobs., 2016; Villegas Palacio et al., 2016).

The urgency and importance to integrate nature's diverse values in our land management decisions and actions stand out more than ever. Fuelled by public indignation and NGO pressure concerning climate change, mining disasters, and ever-faster destruction and degradation of nature, several governments and private companies have started to recognize sustainability challenges and are looking for solutions. Although there are economic interests to maintain status quo or even fasten unsustainable natural resource use, the popular outcry for socially fair and long term sustainable strategies is clear, from the very local (e.g. 'indignados' and 'occupy' movements) to the planetary level (e.g. SDG's, IPBES).

Valuation of our environment is nothing new. As a current scientific field, it has emerged from traditions in ecological as well as environmental economics (Gómez-Baggethun et al., 2010; Baveye et al., 2013), environmental justice (e.g. Martinez-Alier, 2002) and ecosystem service assessment practice. Valuation of nature and its services has become central to an increasing amount of academic literature (Fisher et al., 2009; Seppelt et al., 2011). This proliferation has been stimulated by policy initiatives such as the European Biodiversity Strategy to 2020, the Aichi targets, the Sustainable Development Goals and the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES). Under these umbrellas, national and local ecosystem service assessments and valuations are thriving (e.g. UK NEA, 2011; Santos-Martín et al., 2014; Jacobs et al., 2015, 2016).

Valuation of nature, in its broad sense of 'assigning importance' (Boeraeve et al., 2015, Dendoncker et al., 2013), forms part of many if not all decisions on natural resource and land use. Different value dimensions (ecological, cultural, economic, self-interest, electoral, or ethical) are implicitly or explicitly part of decision making and its justification (Kelemen et al., 2015). Here, the key challenge is to represent most of the values held by different stakeholders and, thus, to represent the diversity of values of nature, such as intrinsic, relational and instrumental values (Díaz et al., 2015). Uncovering and eliciting these diverse values necessarily requires integrating diverse valuation approaches (Martín-López et al., 2014; IPBES, 2015).

2. The dust is settling on the nature valuation debate

After over 50 years of fierce scientific debate between -and development of thought within- different schools of valuation (e.g. Martínez-Alier, 1998; Baveye et al., 2013; Beder, 2011), the dust seems to be settling. From an applied perspective, the need for combining multiple disciplines and methods to represent the diverse set of values of nature is increasingly recognized. In fact, a growing number of scientists and practitioners subscribe the ambition to further explore how *combining* ecological, socio-cultural and economic valuation tools can support resource and land use decision-making. The applied school of "integrated valuation" is building on earlier traditions in sustainability science. However, integrated valuation explicitly aims at including the multiple values and worldviews in a coherent and operational framework aiming at societal rather than (only) academic impact (Gomez-Baggethun et al., 2014, 2016; Kelemen et al., 2015, Barton et al., 2016, see Fig. 1.). (IPBES 2015) What started as a small informal working group within a monetary valuation dominated network,[1] has grown into research project working packages and deliverables[2], and percolated in the valuation guidelines of the largest assessment of biodiversity and ecosystem services to date (IPBES 2015). Researchers from different disciplines, fuelled by the urgency of addressing sustainability challenges, are working to operationalize integrated valuation approaches at different levels, i.e. from place-based research (e.g. Martín-López et al., 2014; Cabral et al., 2016; Phelan and Jacobs, 2016) to regional and global assessments (IPBES, 2015).

Mainstreaming a new culture of valuation can only be achieved by moving the scientific field beyond heuristic interdisciplinary debate, by learning from real world applications, sharing successes and failures, and explicitly choosing for transformative research for sustainability. To this end, the present special issue and this paper aim to bring together experiences on integrated valuation from multiple pioneer case studies and research papers. This synthesis paper is the editorial closing piece of the special issue 'Integrated Valuation of Ecosystem Services' which aims to synthesize the main

[1] http://es-partnership.org/community/workings-groups/thematic-working-groups/twg-6-valuation-of-es/

[2] http://www.openness-project.eu/about/work-packages

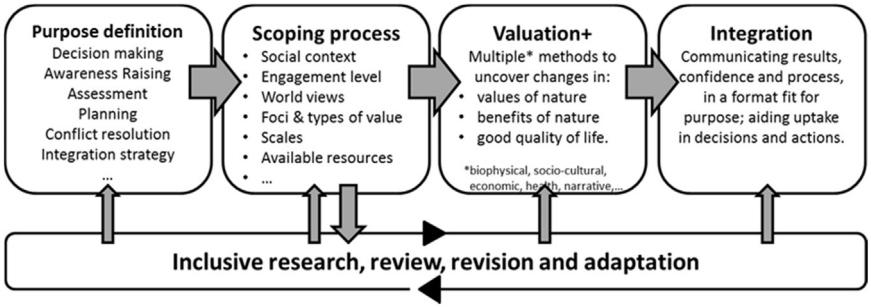

Fig. 1. Simplified schematisation of the current state-of-the-art approach for integrated valuation and its main components. (adapted from Kelemen et al., 2015; Gómez-Baggethun et al., 2016; Barton et al., 2016; Pascual et al., Subm.).

challenges of this emerging applied field and set out priorities for the years to come.

3. New challenges for valuation of nature

The difficulty of the valuation debate and the complexity of real life application defy hopes for a methodological silver bullet. Challenges for the new field sometimes seem insurmountable, especially because the inter-, transdisciplinary and real-life oriented mission of integrated valuation goes beyond the comfort zone of single disciplinary skills or strictly scientific endeavours, single knowledge system or single epistemic community (Gómez-Baggethun and Martín-López, 2015).

Moreover, the valuation debate affects all of us, entailing the need to consider multiple social actors who articulate different values and use different value languages, as well as different levels of societal organization, from individuals, to communities, to larger societies (Gómez-Baggethun et al., 2014; Gómez-Baggethun and Martín-López, 2015).

Valuation is not -as often depicted- a last and optional step in assessment of ecosystems and ecosystem services (La Notte et al., 2015; Martín-López et al., 2014; Potschin and Haines-Young, 2011, 2016). Indeed, valuation decisions span over the multiple steps that entail the assessment of ecosystem services. The choice of the types of values to elicit or the value language to use, the selection of social actors to engage in the process, the decision of which methodological tools and measurement units to use, or even the choice of which ecosystem services or benefits to include, are steps of the assessment that determine the construction of values and, therefore, the outcome of assessment (Vatn, 2009). In fact, to broaden the action of valuation beyond the mere act of estimating values has severe implications for the conceptualization of valuation, the valuation practice itself, and the role taken by scholars who perform the valuation. Although the importance of questioning our role as researchers in the research process has been increasingly acknowledged in sustainability science (Popa et al., 2015; Buizer et al., 2016), political ecology (Blaikie, 2012; Jarosz, 2004), feminist geography, ecofeminist research (e.g. Kobayashi, 1994, 2003; Faria and Mollett, 2014) and gender research in global environmental change (Iniesta-Arandia et al., in press); reflexivity is still one of the missing cornerstones in ecosystem services valuation. Reflexivity allows researchers to locate oneself in the research process in order to track down how knowledge is constructed, situated and shared, how power relations determine the research process and especially its outcomes. Integrated valuation encourages self-critical reflection, which is strongly required to raise our own (researcher) awareness about our background assumptions and normative orientations that shape our decisions regarding selection of value-types, social actors to engage, ecosystem services to value, or methodological tools to apply. These choices also determine our power to influence how knowledge is produced, legitimated and consumed (Limb and Dwyer, 2001).

Scientists engaged in ecosystem services valuation can no longer claim that their daily decisions do not influence the valuation output and that the multiples choices for conducting valuation do not deserve thoroughly reflection.

The following challenges for the integrated valuation research field, synthesised from the authors experiences and the papers in this special issue, demonstrate this broader relevance for ecosystem services valuation, applied (social-)ecological research, and by extent all research claiming to provide decision support on land and resource use:

1. The scientific fields which study the different values keep operating in disciplinary silos. Methods, languages, quality criteria and even publication formats differ substantially between scientific fields, such as ecology, economy, geography, political ecology, or environmental anthropology. Dialogue -if existent- is often lost in translation and engagement is hampered by scientific patriotism, lack of interdisciplinary experience or funding.
2. Combining methodologies is difficult as every valuation method has its own complexity, shortcomings, and on-going debates. Also, some valuation approaches rely on different pre-analytical frameworks (axioms) that can be difficult to conciliate.
3. There is a lack of reflexivity practice in the research of ecosystem services valuation. Assessing real societal/policy impact of valuation studies, and of the methodological decisions on the resulted 'research outcomes, is hard and rarely done.
4. The policy and governance fields to target are diverse and fragmented. Improvement towards sustainability is hampered by different or opposed stakes between different topical policies, but also by the lack of communication between different governance levels and by their diverse functioning.
5. It is hard to communicate value complexity and uncertainty in a comprehensive and compact way that can be easily digested for use by practitioners and decision-makers.
6. Application of one single method affects the outcomes of valuation, while important values outside the method reach are left unaccounted for. Selecting an appropriate set of methods is difficult.
7. It is hard to account for equity issues, especially in the context of power imbalances. Some social actors get more power in the decision-making because their interests are represented by the valuation output (which is linked to the method used), while others remain unheard. The choice of whose values need to be included for a purposeful yet realistic valuation is a daunting one.
8. Integrated valuation appears to be more costly in time, resources and data needed, and seems therefore less efficient.

Rather than avoiding or ignoring these problems when engaging in applied research, we aim at stressing them as conditional requirements to address and resolve. Many of these problems risk to have a paralyzing effect when regarded from within the single discipline, but current practice attests that transdisciplinary approaches hold the key to their solution.

4. From global to local methodological advances

Signs of a changing valuation culture are apparent at different levels. At the global policy level, IPBES is conducting the first global, government-legitimated assessment on values of nature. IPBES implements a conceptual framework which includes a global diversity of worldviews and takes into account both the knowledge from occidental science and the indigenous and local knowledge (Diaz et al., 2015). Further, its valuation framework explicitly recognizes different ways of perceiving the importance of nature and distinguishes the value of nature itself ('intrinsic' values), the importance of nature to foster desirable relationships between people and nature (relational values) and the importance of nature's benefits to humans (instrumental values) (Díaz et al., 2015; Chan et al., 2016; IPBES, 2015). For its regional and thematic assessments, IPBES puts forward integrated valuation as the center-piece of its valuation guidelines. The weight of these guidelines is not to be underestimated, as the document represents a global political agreement between a large number of states and representatives of indigenous peoples on how to cope with Nature's values.

Simultaneously, and perhaps even more encouraging is the increasing number of local cases all over the world that apply self-conceived integrated valuation frameworks to a diversity of contexts, driven by the pragmatic need to effectively impact decision-making, and the autodidactic observation that simplified valuations lack credibility and acceptability. Table 1 depicts the sample of research projects that contributed directly to this paper. This sample is far from exhaustive and the ideas are inspired by many more publications and cases, while also the number of known cases applying an integrated valuation approach seems to be growing fast.

5. Lessons drawn from pioneer integrated valuation work

The set of studies depicted in Table 1 demonstrates the relevance of integrated valuation for a broad diversity of contexts, such as landscape planning, urban planning, river basin management, environmental conflict resolution, support for social struggles in environmental conflicts or strategic impact assessments. Several promising pathways to tackle integrated valuation challenges are suggested, such as

Table 1
A sample of integrated valuation studies in diverse application contexts. The projects marked with a * were presented and discussed at the Openness-ESP Working Group 6 session on integrated valuation at the ESP global conference 2015 in South Africa (Jacobs et al., 2015). Projects marked '2016' are presented in this thematic issue on Integrated Valuation.

Country	Integrated valuation context	Authors
General	Exploring environmental justice as a normative framework for integrated valuation.	Aragão et al. (2016)
General	Identifying strands in economic theory which allow inclusion of multiple values beyond individual preferences.	Hansjürgens et al. (2016)
General	Comparing Multi-Criteria Decision and Cost-Benefit frameworks ffor integrated valuation of ecosystem services.	Saarikoski et al. (2016)
General	How do plural values are already influence policy actions, and what are the motivations behind this.	Sevecke and Geisendorf, 2015 *
General	Comparing valuation approaches for local scale applications and improving relevance for decision-making.	Pandeya et al. (2016)
General	Development of a framework for integrated valuation of planted forests.	Baral et al. (2016)
General	Development of health-based valuation metrics to assess the well-being dimension of Ecosystem Services.	McGrath and Carrasco, 2015 *
Belgium/General	Using images of nature as a boundary object in integrated ecosystem services assessments.	De Vreese et al. (2016)
Norway/General	Combining non-monetary and monetary values of multiple uses of boreal forests in decisional metrics to mitigate conflicts.	Wam et al. (2016)
Netherlands /General	How do monetary units/prices affect preferences and elicited values in choice experiments, and how does this influence results.	van Zanten et al. (2016)
Colombia	Lessons from three case studies of ecological, socio-cultural and economic valuation.	Villegas Palacio et al. (2016)
USA	Comparing more and less integrative tools to inform decision making on conservation and nitrogen point source reductions.	Berg et al. (2016)
France	Involving stakeholders into assessing urban land use change, considering changes in multiple values for future planning policies.	Cabral et al. (2016)
USA	Using a multi-objective optimization model to help forest managers assess trade-offs.	Schroder et al. (2016)
Brazil	Evaluation of social, economic and ecological impacts of infrastructure plans.	Dias-Carrillho and de Almeida, 2015 *
Brazil	Combination of economic and socio-cultural values to assess and contest impacts of hydro-electric project in Brazil.	Jericó-Daminello et al., 2015 *
Colombia	Combination of ecological, socio-cultural and economic values and an analysis of trade-offs to reveal environmental conflicts.	Rincón Ruiz et al. (2015)*
Australia	Impacts of fracking projects on local communities' well-being by mobilizing cultural, economic and ecological value-domains.	Phelan and Jacobs (2016)
Nepal	Integration of biodiversity values and nature's benefits in a conservation strategy and benefit sharing processes.	Peh et al. (2016)
Belgium	Articulation of social and biophysical values within a participatory valuation for land consolidation plans.	Pipart et al. (2015) *
France	Application of a participatory framework to analyse farming systems' socioeconomic and environmental performances.	Bellet (2015) *
Finland	Combination of socio-technical and biophysical values to compare potential alternative sites for infill urban development in Finland.	Kopperoinen et al. (2015) *
Slovakia	Combination of biophysical and social assessment and cost-benefit analyses for landscape planning and impact assessment.	Mederly et al. (2015) *
New Zealand	Assessing impact of water quality degradation using multiple values.	Mueller et al. (2016)
Australia	Using a post-hoc tool to provide credibility, legitimacy, and saliency to decision support for water quality restoration.	Bark et al. (2016)
Italy	Comparing nature-based and traditional infrastructures for water purification with plural values in multi-criteria analysis.	Liquete et al. (2016)

inclusion of established strands in institutional economics (Hansjuergens et al., 2016) and environmental justice (Aragão et al., 2016; Villegas Palacio et al., 2016) in the disciplinary mix. Also, tools for integrated valuation, communication and evaluation of policy impacts are proposed (e.g. De Vreese et al., 2016).

An essential lesson drawn from this practice-oriented perspective is that *integrated* valuation seems to be the natural thing to do, whereas single-valuation approaches are often disputed, discarded or simply ignored in real life practice. This is a direct consequence from the equity challenge explained earlier: single-valuation approaches often mask voices of particular actors because their valuation language is not captured by the specific tool used. For example, conventional stated preference methods risk to be blind for the importance of nature given by indigenous communities as these might not be able to trade nature by money. Nonetheless, these same communities can express their values of nature by other means, such as the willingness to spend time in conservation or restoration projects (e.g. Higuera et al., 2013; García-Llorente et al., 2016), their sense of place or sacredness associated with particular places (Klain et al., 2014; Bieling et al., 2014), or the diverse activities developed in community in a natural setting (Bieling et al., 2014; Chan et al., 2016).

Consequently, methodological progress has to target comparison and selection of valuation methods and guidelines for local cases. Within the OpenNESS project, a broad suite of valuation methods (biophysical, monetary and sociocultural) were applied in local case studies all over Europe. Based on feedback from these applications, guidelines are being continuously refined and adapted (Kelemen et al., 2015). The potential which resided in connecting the levels of governance, the theorizing science, and the proofing in practical projects is being unlocked to leap forward in the field of valuation. However, there is much left to be done beyond academic progress. Establishing a culture, a common good practice of valuation is essential for an effective and widespread application. Building on ideas from the special session and special issue, and taking stock from the discussions and recent experiences in several networks (e.g. Ecosystem Service Partnership ESP), initiatives (e.g. IPBES) and projects (e.g. OpenNESS), we have derived three priority avenues for the years to come. These priorities were extracted as a long-list from all contributions, which was then synthesised, validated and amended by the involved co-authors.

5.1. Priority 1. (How to) Achieve inclusion of stakeholders and decision makers in research design and knowledge production, to include hidden values, deal with power asymmetries and improve societal relevance of the valuation results

Integrated valuation demands co-operation between scientists, decision-makers, practitioners and policy-makers, hereby fulfilling a firm condition for real world application (Fisher et al., 2009; Liu et al., 2010; Bellet, 2015). To take into account multiple worldviews and interests, local stakeholders could be engaged by using tools as 'open spaces for dialogue' or 'common languages' (e.g. maps (Cabral et al., 2016); photos (Berbés-Blázquez, 2012; García-Llorente et al., 2012; Milcu et al., 2014); or other artistic expressions (Heras and Tàbara, 2016; Heras et al., 2016). However, because integrated valuation truly relies on transdisciplinary approaches, it necessarily depends on building trustful relationships between stakeholders and researchers. In doing so, knowledge brokers -i.e. intermediary or liaison persons between scientists and stakeholders (Turnhout et al., 2013)- will be needed to appropriately include the diverse values (e.g. Mueller et al., 2016). Stakeholder engagement goes beyond application in data-scarce areas or the requirement to validate weights attributed in multi-criteria decision tools (e.g. Wam et al. 2016, Kopperoinen et al., 2015). Participation also increases efficiency and local relevance of actionable knowledge, will increase policy support (Pandeya et al. 2016, Jerico-Daminello et al., 2015; Rincon Ruiz et al., 2015), and can reduce the incidence of trade-offs and perceived disservices (Baral et al., 2016). Conclusively, more research is needed on tools and methodological approaches for inclusion and engagement of multiple social actors and their multiple values, and lessons should be learned about the effects of these different approaches on the research output and outcomes.

5.2. Priority 2. (How to) Combine a set of appropriate methods, disciplines and new approaches to obtain more comprehensive, acceptable and credible valuation results

This requires researchers working in interdisciplinary teams (Bark et al. 2016), and especially better inclusion of social valuation methods (Peh et al., 2016; Dias Carrilho and de Almeida, 2015). Integrated valuation has to provide guidance on when to apply which method (van Zanten et al., 2016; Hansjürgens et al., 2016) and integrate ecological, social and economic criteria in decisions and policies (Liquete et al., 2016; Mederly et al., 2015), in order to obtain broader acceptance of results (Wam et al., 2016; McGrath and Carrasco, 2015; Pipart et al., 2015). Research is needed on limitations and potential of different methods, their resource and data requirements and their modes of application, up till how this influences the results and integration of outputs.

5.3. Priority 3. (How to) aim for and evaluate societal impact of integrated valuation studies, to advance effective contribution of science to societal challenges

Integrated valuation avoids overemphasizing epistemological debates on how a context should be framed or "reality" analysed, by focusing on practical outcomes using multiple methods. By providing multiple values it helps to increase transparency of trade-offs based on values (Schroder et al., 2016), while diminishing the possibility of critique and personal interest behaviour. Consequently, any decision based on integrated valuation is likely to be more fair, sustainable, credible, legitimate and effective then a decision informed by single-value methods. The integration level of each study depends on the policy question or study context (Berg et al., 2016). We need to understand the socio-political setting of the decision-making mechanism (Pandeya et al., 2016) to determine the appropriate level of integration (Sevecke and Geisendorf, 2015). Considerations to evaluate this appropriateness could be legal frameworks (Bark et al., 2016; Aragão et al., 2016), the contribution to redressing inequities in benefits and rights (Peh et al., 2016) or multiple aspects of justice (Aragão et al., 2016). On the other hand, more instrumental criteria of credibility and legitimacy, which are absent from e.g. single-metric cost-benefit analyses (e.g. Bark et al., 2016) can also be essential to evaluate studies and determine effectiveness (Saarikoski et al., 2016). To achieve this, research is needed on the diverse purposes of valuation, ethical grounds and motivations of researchers, social and ecological justice issues, and on how the position of the research(er) influences the purposeful societal impact of the study.

6. Conclusion – a new valuation school

From global policy to local practice, from studies in natural science, social science and environmental justice research, we observe the rise of a more integrated valuation culture. Taking stock of theories on value pluralism, this new school of valuation explicitly applies a diversity of valuation methods to real-life human-nature issues, and aims to account for normative (what should be) and cognitive (what is) complexities and uncertainties of values. It offers a way to articulate between the different value domains (e.g. non-anthropocentric, relational, instrumental) and is inclusive per definition by involving the broad set of stakeholders concerned with and affected by the outcomes.

Integrated valuation explicitly addresses and highlights the gaps in knowledge, methods and concepts, especially when these affect the outcomes of applied valuation studies.

The current sustainability challenges and the ineffectiveness of single-value approaches to offer relief demonstrate that continuing along a single path is no option. We advocate for the adherence of a plural valuation culture, by establishing a common practice, by contesting, rejecting and complementing ineffective, discriminatory and counterproductive single-value approaches. We argue for thorough reflexivity in valuation, as the conceptualization of the research, its fieldwork, its analysis and communication is a political process. Consciousness on moral assumptions and regular self-reflection should frame the practice of integrated valuation. To achieve this new culture, multilevel communication and education of individuals in the relevant public and private institutions is needed, as is continued comparative research between and within real life case studies in diverse contexts. In policy contexts with a willingness to improve decision making, integrated valuation approaches can be blended in existing stakeholder processes, whereas in contexts of power asymmetries and environmental conflicts, integrated valuation can offer sound methodologies to include diverse values in action research, to support the struggle for social and environmental justice.

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