

Intelligence Briefing

Cite this article: Jacobs S *et al.* (2020). Use your power for good: plural valuation of nature – the Oaxaca statement. *Global Sustainability* 3, e8, 1–7. <https://doi.org/10.1017/sus.2020.2>

Received: 13 December 2018

Revised: 7 January 2020

Accepted: 8 January 2020

Keywords:





economics; ecosystem services; natural resources; policies; politics and governance; social value

Author for correspondence:

Dr Sander Jacobs,

E-Mail: sander.jacobs@inbo.be

Use your power for good: plural valuation of nature – the Oaxaca statement

Sander Jacobs¹ , Noelia Zafra-Calvo², David Gonzalez-Jimenez³, Louise Guibrinet⁴ , Karina Benessaiah⁵, Augustin Berghöfer⁶, Juliana Chaves-Chaparro⁷, Sandra Díaz⁸, Erik Gomez-Baggethun^{9,10}, Sharachandra Lele¹¹, Berta Martín-López¹², Vanessa Anne Masterson¹³ , Juliana Merçon¹⁴, Hannah Moersberger¹⁵, Barbara Muraca¹⁶, Albert Norström¹⁷, Patrick O'Farrell^{18,19} , Jenny C. Ordóñez²⁰, Anne-Hélène Prieur-Richard²¹, Alexander Rincón-Ruiz²², Nadia Sitas²³, Suneetha M. Subramanian²⁴, Wubalem Tadesse²⁵, Meine van Noordwijk²⁶, Unai Pascual²⁷ and Patricia Balvanera²⁸

¹Research Institute for Nature and Forest (INBO), Havenlaan 88 bus 73, 1000 Brussels, Belgium; ²Basque Centre for Climate Change (BC3), Edificio Sede N° 1, Planta 1ª, Parque Científico de UPV/EHU, Barrio Sarriena s/n, 48940 Leioa, Bizkaia, Spain; ³IPBES Technical Support Unit on Values based at the Instituto de Investigaciones en Ecosistemas y Sustentabilidad, Universidad Nacional Autónoma de México, Antigua Carretera a Pátzcuaro 8701, Col. Ex-Hacienda San José de la Huerta CP 58190, Morelia, Michoacán, México; ⁴Research Institute on Ecosystems and Sustainability, National Autonomous University of Mexico, Mexico City, Mexico; ⁵Natural Resource Sciences, McGill University, Macdonald-Stewart Building, McGill, 21111 Lakeshore Road, Sainte-Anne-de-Bellevue, QC H9X 3V9, Canada; ⁶Department of Environmental Politics, UFZ – Helmholtz Centre for Environmental Research, Leipzig, Germany; ⁷Science Policy and Capacity Building Division, UNESCO Headquarters, Paris, France; ⁸Instituto Multidisciplinario de Biología Vegetal (IMBIV-CONICET) and FCEfYN, Universidad Nacional de Córdoba, CC 495, 5000 Córdoba, Argentina; ⁹Department of International Environment and Development Studies, Faculty of Landscape and Society, Norwegian University of Life Sciences (NMBU), Norway, PO Box 5003, N-1432 Ås, Norway; ¹⁰Norwegian Institute for Nature Research (NINA), Gaustadalléen 21, 0349 Oslo, Norway; ¹¹Centre for Environment & Development, Ashoka Trust for Research in Ecology and the Environment (ATREE), Bangalore, India; ¹²Leuphana University of Lüneburg, Faculty of Sustainability, Institute for Ethics and Transdisciplinary Sustainability Research, Universitätsallee 1, 21355 Lüneburg, Germany; ¹³SwedBio at the Stockholm Resilience Centre, Stockholm University, Kräftriket 2B, 10691 Stockholm, Sweden; ¹⁴Institute of Educational Research, University of Veracruz, Mexico; ¹⁵Future Earth, Sorbonne Universités, Université Pierre et Marie Curie, Paris, France; ¹⁶Department of Philosophy & Department of Environmental Studies, University of Oregon, Eugene, OR 97403, USA; ¹⁷Stockholm Resilience Centre, SE-106 91 Stockholm, Sweden; ¹⁸Natural Resources and Environment CSIR, Biodiversity and ES Research Group, PO Box 320, Stellenbosch, 7599, South Africa; ¹⁹Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Rondebosch, South Africa; ²⁰World Agroforestry Centre, Latin America Region, Lima, Peru; ²¹National Research Agency, Department of Environment, Ecosystem, Biological Resources, 50 avenue Daumesnil 75012, Paris, France; ²²School of Economics, National University of Colombia, Bogotá, Colombia; ²³Centre for Complex Systems in Transition and Department of Conservation Ecology, Stellenbosch University, Private Bag X1, Matieland 7602, Stellenbosch, South Africa; ²⁴Central Ethiopia Environment and Forest Research Center, Ethiopian Environment and Forest Research Institute (EEFRI), Addis Ababa, Ethiopia; ²⁵United Nations University – International Institute for Global Health, Kuala Lumpur, Malaysia; ²⁶World Agroforestry Centre (ICRAF), Bogor, Indonesia; ²⁷Basque Centre for Climate Change (BC3), Edificio Sede N° 1, Planta 1ª, Parque Científico de UPV/EHU, Barrio Sarriena s/n, 48940 Leioa, Bizkaia, Spain and ²⁸Instituto de Investigaciones en Ecosistemas y Sustentabilidad, Universidad Nacional Autónoma de México, Morelia, Michoacán, Mexico

Non-technical abstract

Decisions on the use of nature reflect the values and rights of individuals, communities and society at large. The values of nature are expressed through cultural norms, rules and legislation, and they can be elicited using a wide range of tools, including those of economics. None of the approaches to elicit peoples' values are neutral. Unequal power relations influence valuation and decision-making and are at the core of most environmental conflicts. As actors in sustainability thinking, environmental scientists and practitioners are becoming more aware of their own posture, normative stance, responsibility and relative power in society. Based on a transdisciplinary workshop, our perspective paper provides a normative basis for this new community of scientists and practitioners engaged in the plural valuation of nature.

Technical abstract

During a workshop held in Oaxaca, Mexico, a shared vision, mission and strategies to foster a more plural valuation of nature were developed. The participants represent a wide range of backgrounds and are active in science, policy and practitioner networks and activities.

© The Author(s) 2020. This is an Open Access article, distributed under the terms of the Creative Commons Attribution licence (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted re-use, distribution, and reproduction in any medium, provided the original work is properly cited.

Their common ground is the recognition of the need to change the prevailing culture of how nature is valued and subsequently managed as an essential step towards a more just and sustainable world. After an open plenary session in which the goal of the workshop was determined and the diverse perspectives and backgrounds of the participants were heard, breakout groups developed the components of a shared vision, mission and strategies for plural valuation of nature. Consequently, these components were discussed back in plenary and consolidated into a consensus text, which was further debated and its main building blocks agreed upon. The compilation of our shared views converged into a normative call and perspective to share with our peers. The information generated throughout the workshop was collaboratively synthesized, amended, reviewed and validated by all workshop participants/co-authors. Our message aims to contribute to advancing plural valuation approaches as a science-policy field, as well as to raise personal awareness among researchers and practitioners on implicit inequality and power issues.

Social media summary

Neutrality or power? Capturing plural values of nature needs a well-defined vision, a bold mission and clear strategies.

*If you advance not knowledge, they will perpetuate ignorance;
If you exert it not for good, they will for evil.*

– Frances Wright, Scottish writer

1. Introduction

This paper summarizes the outcomes of a workshop on multiple values of nature held in November 2017 in the city of Oaxaca, Mexico.¹ The workshop convened 28 participants from diverse regional, disciplinary and professional backgrounds, active in transformative research and practice. After sharing local, sub-global and global experiences on the plural valuation of nature, we identified a common vision, a mission to pursue with the growing plural valuation community and part of a strategy going forward.

Nature is valued in very different ways by individuals and groups with very unequal levels of power, and a more plural approach to valuing nature is increasingly seen as critical to addressing deep inequities, injustices and conflicts. Scientists and practitioners working on the valuation of nature have a position of power to contribute to addressing this challenge. Yet the power of the research community to foster change remains unrealized as the dominant scientific postures and academic structures, as well as institutional incentives at a practical level, can often restrict open debate and constrain transformative change. Recent research on the ineffectiveness and potential harmfulness of single-approach valuation (e.g., Bigger *et al.*, 2017; McDermott *et al.*, 2013; Pascual *et al.*, 2014; Poole, 2018; Rozzi, 2012; Turnhout *et al.*, 2013) has increased awareness of the importance of plural valuation. We argue that a global paradigm shift towards a more plural valuation is urgently needed, and in support of the emerging plural valuation initiatives we propose a shared vision, mission and strategy for the growing group of researchers and practitioners who (re)position themselves at the frontline of post-normal and action-orientated research, as well as decision-making around nature.

2. Valuing nature for sustainability?

Protecting life through the sustainable use of nature is at the heart of the United Nations Sustainable Development Goals (UN SDGs). The SDGs aim to reconcile ambitions for human resource

use with ethical considerations and ecological limits. Globally, nature and its associated contributions to peoples' quality of life are in severe decline (Chaplin-Kramer *et al.*, 2019; IPBES, 2018a, 2018b, 2018c, 2018d, 2019; WWF, 2018). Valuation of nature – in its broad sense of assessing its importance and significance for people's quality of life – is essential to making societal decisions on nature's management and the use and distribution of its contributions. Values related to nature are articulated by diverse institutions and are as such associated with culture and traditions, which together impact nature through several mechanisms (Aragão *et al.*, 2016; Hejnowicz *et al.*, 2017; IPBES, 2015; Kelemen *et al.*, 2015; Pascual *et al.*, 2017; Šunde *et al.*, 2018). In other words, none of these valuations are neutral, and more to the point, neither is the information underpinning them. Valuation is – often implicitly – based on specific lenses through which human–nature relations are perceived. Diverse views and aspirations, cultural norms, differences in power, gender, class, religion and age all influence the ways in which values are attributed to economy-related profit values, biodiversity and socio-cultural heritage (Arias-Arévalo *et al.*, 2017; Klain *et al.*, 2017). Consequently, differences in how we relate to nature are at the core of socio-environmental conflicts and represent a hidden bottleneck for realizing the sustainable and equitable flow of the contributions of nature to people within and across generations.

Recognizing the full scope of values of nature requires respect for the principles and practical implementation of diverse complementary valuations approaches. Since the Rio Summit in 1992, valuation has become a high policy priority, at least discursively, although mostly unidimensional perspectives have been applied (i.e., with either an economic or an ecological value lens) (Fagerholm *et al.*, 2016; Liqueste *et al.*, 2013; Martín-López *et al.*, 2019; Nieto-Romero *et al.*, 2014). More recently, the long-recognized need for including plural values has gained traction in the scientific literature and within science-policy platforms, such as the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). IPBES applies a fully fledged plural valuation framework, which aims at bridging worldviews and values held by diverse societal actors, from financial enterprises to indigenous and local communities (IPBES, 2015; Pascual *et al.*, 2017).

This paper puts forward a vision, mission and strategy for scientists, practitioners and policy-makers engaged with sustainability challenges by fostering the practice of plural valuation. Co-developed by a geographically, disciplinarily and professionally diverse group and building on numerous other individuals, groups, ideas, papers and practices, we aim at stimulating a

much-needed shift in valuation and its consequent policies and practices.

3. What is plural valuation of nature?

Plural valuation has been defined as a science-policy process that assesses the multiple values attributed to nature by social actors (i.e., actors with a stake) and how this knowledge can guide decision-making (Rincon-Ruiz *et al.*, 2019). The growing literature on plural, inclusive or integrated valuation provides a broad range of guidelines for the practical implementation of nature valuation studies (see Figure 1). In plural valuation, valuation is not understood as a single, independent and discrete step of a research or assessment process embedded in a policy cycle, but rather as a deeper and more continuous process: values are intentionally or unintentionally excluded and included from the first steps of description, problem definition and project scoping, all the way up to the communication of results (Figure 1). Plural valuation aims to address these implicit valuation aspects by articulating values through a context-specific process that takes into account different worldviews, dynamic social-ecological interactions, power relations and plural value elicitation itself (Arias-Arevalo *et al.*, 2018). Valuation is the collective responsibility of all societal actors involved, including scientists, decision-makers and funders.

Engaging with an *inclusive team* of a wide range of stakeholders from practitioners to scientists in an open-minded, adaptive and self-reflective posture is essential for plural valuation (step 0; Figure 1). Regardless of the type of challenge or the scale, defining a clear *purpose* with societal actors through negotiation is the foundation for plural valuation (step 1; Figure 1). If this purpose takes into account the stakes, interests, power, influence and dependency of different actors, it communicates a shared understanding of the valuation *scope* (step 2; Figure 1). The scope makes explicit both the position and mandate of people involved in the process and the available human and financial resources for the valuation. This scope also determines the multiple disciplines, approaches, methods and metrics needed to *capture* the diversity of values (step 3; Figure 1). The result, as well as the uncertainties, caveats and risks of valuation, are then *integrated* in an adequate format for the purpose of valuation (step 4). Values are recognized, elicited, measured or co-created throughout all of these steps.

Despite the large knowledge limitations and uneven coverage of different value dimensions and worldviews, the field of valuation of nature has started to close some gaps. New developments include the integration of indigenous and local knowledge systems and practices (Tengö *et al.*, 2014), the development of integrative frameworks (e.g., Hill *et al.*, 2016; Jacobs *et al.*, 2016) and the comparative study of methods' capacities to capture plural values (Arias-Arevalo *et al.*, 2018; Jacobs *et al.*, 2018; Martín-López *et al.*, 2014). Yet, sound methodological approaches are not sufficient on their own. The transformative aspect of performing plural valuation tends to clash with the traditional posture of science as a neutral and objective institution (Crouzat *et al.*, 2018; Pielke Jr, 2007; Temper *et al.*, 2019). Scientists often struggle with the fact that their individual and shared values, worldviews and institutional positions strongly affect the outcomes of their valuation work. Valuation must, therefore, be supported by an explicitly articulated normative vision to effectively align various practices towards the common goal of sustainability and resolving valuation disputes.

In order to start addressing the issues above, our workshop had the explicit aim to set out a vision, mission and strategy to stimulate and provide guidance to plural valuation approaches. Our aim is to provide a starting point for discussion and reflection for the many researchers and practitioners who are struggling to connect their disciplinary expertise with personal engagement for transformative change on the ground. The authors of these article are very clear about what they want, and they see themselves – and their audience – as a growing critical mass of post-disciplinary scholars and practitioners with a common vision, unbound by discipline.

4. The vision: strong sustainability

On the basis of the advances of the last decade of valuation, the visions and goals formulated by various initiatives and their application in diverse contexts, we formulated the following vision for plural valuation:

We imagine a world in which the diversity of values – especially neglected values – and knowledge related to nature and its contributions to quality of life are included in policy, decision-making, governance and practice to achieve a more just and sustainable world. We envision a world in which the participation and representation of all people is realized and nature's contributions to people are distributed equitably within and across generations.

It is argued that the recognition of the multiple values of nature leads to more equitable and more widely accepted decisions (Diaz *et al.*, 2018; Jacobs *et al.*, 2013, 2016; Pascual *et al.*, 2017). Plural valuation can also be more (cost-)effective for three reasons (Jacobs *et al.*, 2018). First, although seemingly complex, recognition and integration of multiple values into decision-making can be achieved by combining established processes and tools. Second, increasing effectiveness by combining methods does not necessarily require a higher cost (Jacobs *et al.*, 2018). Third, in comparison, unidimensional or single-method valuation estimates are often less reliable, making their application riskier (Martín-López *et al.*, 2014).

Decisions are more effectively informed by a richer understanding of the diverse values of nature as this can help identify options that optimize societal benefits while contributing to sustainability. For instance, large-scale hydroelectric projects might provide large societal benefits from a national economic point of view, but simultaneously negatively impact on the livelihoods and social values of local inhabitants. Therefore, recognizing and including local social and ecological impacts for a wide range of stakeholders might avoid severe injustices and social conflicts (Albizua *et al.*, 2019; Jerico-Daminello *et al.*, 2015) (see example in Figure 2).

Addressing the diversity of values can also support the integration and achievement of policy priorities (e.g., the UN SDGs and the Aichi Biodiversity Targets) and can inform policy tools such as natural capital accounting (e.g., System of Environmental-Economic Accounting (SEEA)) and intergovernmental environmental assessments (e.g., IPBES, Intergovernmental Panel on Climate Change (IPCC)). However, a prerequisite for integration is the existence of a context in which the values and goals of different actors can be freely voiced, articulated, understood, negotiated and incorporated into policies. Scientists can make a significant contribution to the creation of this safe space.

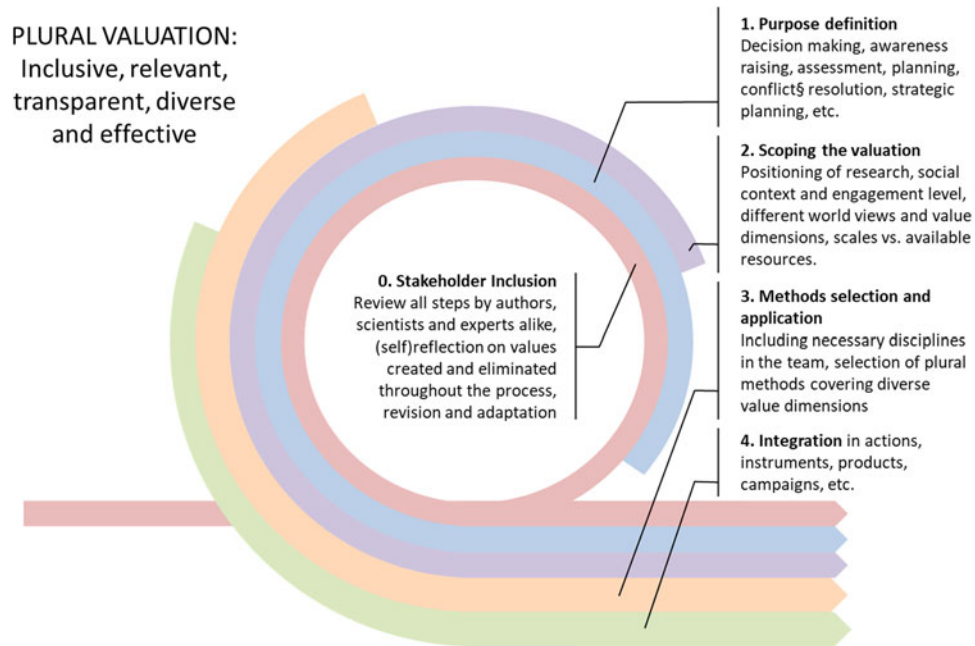


Fig. 1. Inclusiveness and different steps in the process of the plural valuation of nature. For more details, see, among others, Dendoncker *et al.* (2013), Díaz *et al.* (2015), Boeraeve *et al.* (2015), Kelemen *et al.* (2015), Gómez-Baggethun *et al.* (2016), Barton *et al.* (2016), Jacobs *et al.* (2016, 2018), Pascual *et al.* (2017) and Arias-Arévalo *et al.* (2018).



Fig. 2. The need for a more plural valuation. George Palmer with baby Ruby, son Peter, 7, and stepdaughter Karolina, 16, at their home in Tara, west of Toowoomba, Australia. George is worried that his family's health has been compromised by the massive expansion of the coal seam gas industry in the region (picture: Lyndon Mechelsien, <https://www.theaustralian.com>; aerial view: Simon Fraser University, Flickr). Fracking megaprojects exemplify the destructive pursuit of short-term economic profit for the few, at the cost of the local economy, quality of life and the diversity of values of nature for the many. The decision power of affected local communities is extremely low, resulting in protest, conflict and despair. Plural valuation could help visualize and address these conflicts and advance pluralistic decision-making (Phelan *et al.*, 2016).

5. The mission: to transform

Realizing this vision requires transforming the way in which values of nature are currently recognized, represented, expressed and captured in dominant research and practice by:

- Fostering recognition of neglected voices and marginalized knowledge systems;
- Empowering and nurturing marginalized worldviews;
- Contesting and restoring power imbalances and injustices that result from current valuation processes;
- Revealing how values are embedded in individual and collective action, social norms and rules, as well as research methodologies and decision-making processes.

Committing to this mission requires substantially different practices and will impact what we choose as our funding sources, formulate project goals or research calls, solicit consultancy, communicate findings, produce research proposals and research outputs and, finally, contribute to our vision.

6. The strategy: to octupy

Plural (integrated, inclusive) valuation has been steadily gaining critical mass over the last decade, allowing researchers to develop skills and expertise, providing a scientific underpinning as well as testing applications in real-life practice and policy contexts. In order to work further on the above mission, it is key to contribute to the transformation of the institutions that – to a large extent – determine the ways in which nature is valued.

We created the word ‘octupy’ (Figure 3) to refer to the strategy we can employ, each in our own capacity, to realize transformation towards the integration of plural valuation in research and practice. However, it is essential to do this in an open, transparent and collaborative manner, without stepping in the way of each other or duplicating efforts. Etymologically, the term ‘octupy’ hybridizes the verb ‘occupy’, in reference to the strategy of collaborative and constructive occupation, and ‘octopus’, a metaphor for diverse yet connected initiatives: a remarkable feature of the *Octopus* genus is that the partly decentralized nervous system of the octopus operates its arms in a semi-autonomously yet coordinated manner for the common goal of the organism’s development and ultimate survival.

Promising steps towards more plural valuation practice are being taken. To *octupy* an institution (or institute) and shift its valuation focus to plural perspectives, one can apply some of these steps:

- Creating spaces for critical reflection on the normative assumptions behind valuation in order to *gain awareness of our own positionality* when practicing valuation (Horcea-Milcu *et al.*, 2019).
- Creating physical spaces and moments for nurturing plural values and forming alliances *within existing disciplinary silos*, to adjust current valuation practice.
- Developing new methods, best practices and networks for plural valuation *across disciplines, age groups, and professional expertise*.
- Strengthening *science-policy-practice dialogues beyond disciplines*, to improve horizontal learning and knowledge co-production. This means learning from each other, broadening the network of support and continuous investment in capacity building.

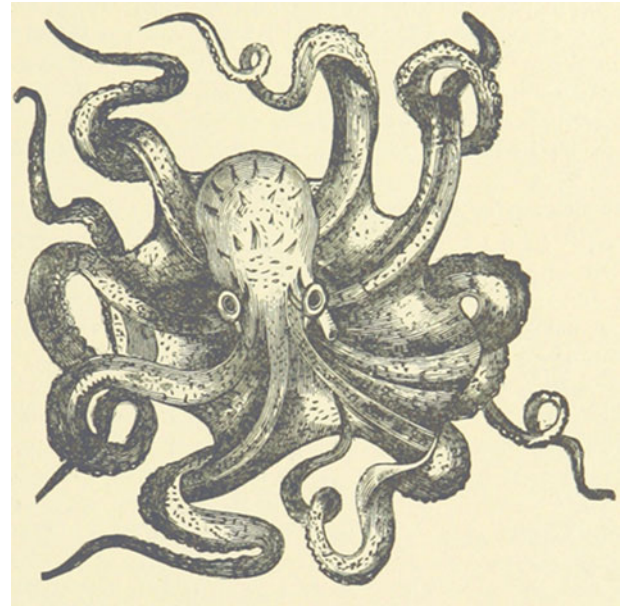


Fig. 3. octupy: oc-tu-py /'äktəpi/ *verb*. To access and transform various institutions in an active yet constructive manner, with the dual goal of participating in and connecting with a shared goal. Picture from British Library Open Flickr account. British Library HMNTS 10492.ee.20. BUTTERWORTH, Hezekiah, 1891.

- Integrating *local communities and capacities*; connecting abstract concepts with local practices and integrating neglected voices while protecting intellectual property rights.
- Communicating in formal and informal contexts the development in thinking regarding plural valuation in order to engage a *broader community*.

As strategies have to be regularly adapted, octupation is only one step in realizing the full transformation towards plural valuation as a standard practice. Additionally, there is a need for mainstreaming and communicating successes, the development of authoritative global quality standards for plural valuation, compiling repositories of methods and guidance, developing value articulating institutions to empower neglected values, etc.

7. Power: it is up to us

Researchers and practitioners engaged in tackling sustainability challenges are becoming aware of both their power and their normative positions and the responsibility that comes with the exertion of such power. Valuation is more than just a technical job: it requires complex decisions about which problems to pursue, which funding to accept or distribute, who to include in research and decision-making, how to recognize their participation, which methods to choose and how to communicate the findings while upholding scientific rigor, inclusivity, transparency, intellectual property rights and critical thinking. As the ethics of these decisions also determines one’s impact on the world, researchers and practitioners face difficult dilemmas that require trade-offs, compromises and hard choices. We hope that a clear vision, mission and the presence of a growing critical mass of plural valuation researchers and practitioners can offer support in making these choices.

In the end, the responsibility of valuation researchers and practitioners – including all of those who work in ‘assessment’ in the

broadest sense – is to reflect upon the power they have. We are in a powerful position ourselves to engage in collective decision-making processes. It is up to us to decide what to do with that power.

Acknowledgements. The authors thank all of their peers in the diverse formal and informal networks who helped – and still help – to develop these ideas and advance the large and growing community. Especially noteworthy are the inspiring exchanges with colleagues in the extended networks of the OpenNESS project, the IPBES Assessments, the Ecosystem Service Partnership (ESP), SwedBio, Future Earth and the Program on Ecosystem Change and Society (PECS). The personal, real-life exchanges between scientists, policy-makers and practitioners in concrete local contexts have been instrumental in developing and pursuing plural valuation.

Author contributions. SJ and NZC compiled and edited the final paper and facilitated the collaborative writing process. PB, DG, LG and UP convened, organized and led the Oaxaca workshop that generated the information on which the paper is based. KB, AB, JC, SD, EG, SL, BML, VM, JM, HM, BM, AN, PO, JO, AP, AR, NS, MV and AHPR contributed to the generation of knowledge, information and perspectives during the plenaries and breakout sessions of the workshop, produced base material and reports of these sessions and discussions and co-authored by writing, revising, amending and validating all sections of the paper.

Financial support. The authors wish to thank the Sida-funded SwedBio programme at the Stockholm Resilience Centre, the Programme for Ecosystem Change and Society of Future Earth, the Gordon and Betty Moore University through sub-grant GBMF5433 to the Basque Centre for Climate Change (bc3) for supporting the undertaking of the workshop that led to this paper and the EQUIVAL project and the work of UP, PB and NZC, the Future Earth Montreal Global Hub, the Institute of Ecosystem and Sustainability Research at the Autonomous National University of Mexico and the Division of Science Policy and Capacity-Building (SC/PCB) of the United Nations Educational, Scientific and Cultural Organization (UNESCO), CISEN V, the ValuES project from GIZ supported by the BMUB and ecoSERVICES from Future Earth for providing support and financial resources. SJ wishes to thank the Flemish Department of Environment and Energy for funding a research stay under the Flanders–Basque Country Declaration of Intent.

Conflict of interest. None.

Ethical standards. The manuscript is our own original work, and does not duplicate any other previously published work; the manuscript has been submitted only to the journal – it is not under consideration, accepted for publication or in press elsewhere. All listed authors know of and agree to the manuscript being submitted to the journal; and the manuscript contains nothing that is abusive, defamatory, fraudulent, illegal, libellous or obscene.

Note

¹ The workshop was supported by the project ‘Nurturing a Shift towards Equitable Valuation of Nature in the Anthropocene’ (EQUIVAL) of the Future Earth-Pegasus programme, Future Earth Montreal Global Hub, the Capacity Building Programme Mentoring Program on Plural Valuation supported by Future Earth’s Natural Assets Knowledge–Action Network, the Institute of Ecosystem and Sustainability Research at the Autonomous National University of Mexico, the Basque Centre for Climate Change, the Programme on Ecosystem Change and Society (PECS) and ecoSERVICES of Future Earth, SwedBio GIZ-BMUB, the ESP Working Group on Integrated Valuation and UNESCO.

References

Albizua, A., Pascual, U. & Corbera, E. (2019). Large scale irrigation impacts socio-cultural values of agroecosystems: An example from Navarre. *Ecological Economics*, 159, 354–361.

- Aragão, A., Jacobs, S. & Cliquet, A. (2016). What’s law got to do with it? Why environmental justice is essential to ecosystem service valuation. *Ecosystem Services*, 22B, 221–227.
- Arias-Arévalo, P., Gómez-Baggethun, E., Martín-López, B. & Pérez-Rincón, M. (2018). Widening the evaluative space for ecosystem services: a taxonomy of plural values and valuation methods. *Environmental Values*, 27(1): 29–53.
- Arias-Arévalo, P., Martín-López, B. & Gómez-Baggethun, E. (2017). Exploring intrinsic, instrumental, and relational values for sustainable management of social–ecological systems. *Ecology and Society*, 22, 4.
- Barton, D. N., Andersen, T., Bergland, O., Engebretsen, A., Moe, S. J., Orderud, G. I., ..., Vogt, R. D. (2016). Eutropia: integrated valuation of lake eutrophication abatement decisions using a Bayesian belief network. In Z. P. Niel (ed.), *Handbook of Applied Systems Science* (pp. 297–320). Routledge.
- Bigger, P. & Robertson, M. (2017). Value is simple. Valuation is complex. *Capitalism Nature Socialism*, 28(1), 68–77.
- Boeraeve, F., Dendoncker, N., Jacobs, S., Gómez-Baggethun, E. & Dufrène, M. (2015). How (not) to perform ecosystem service valuations: pricing gorillas in the mist. *Biodiversity and Conservation*, 24(1), 187–197.
- Chaplin-Kramer, R., Sharp, R. P., Weil, C., Bennett, E. M., Pascual, U., Arkema, K. K., ..., Daily, G. C. (2019). Global modelling of nature’s contributions to people. *Science*, 366, 255–258.
- Crouzat, E., Arpin, I., Brunet, L., Colloff, M. J., Turkelboom, F. & Lavorel, S. (2018). Researchers must be aware of their roles at the interface of ecosystem services science and policy. *Ambio*, 47(1), 97–105.
- Dendoncker, N., Keune, H., Jacobs, S. & Gómez-Baggethun, E. (2013). Inclusive ecosystem service valuation. In S. Jacobs, N. Dendoncker & H. Keune (eds.), *Ecosystem Services: Global Issues, Local Practices* (pp. xix–xxviii). Elsevier.
- Díaz, S., Demissew, S., Carabias, J., Joly, C., Lonsdale, M., Ash, N., ..., Zlatanova, D. (2015). The IPBES conceptual framework – connecting nature and people. *Current Opinion in Environmental Sustainability*, 14, 1–16.
- Díaz, S., Pascual, U., Stenseke, M., Martín-Lopez, B., Watson, R. T., Molnár, Z., ..., Shirayama, Y. (2018). An inclusive approach to assess nature’s contributions to people. *Science*, 359(6373), 270–272.
- Fagerholm, N., Torralba, M., Burgess, P. J. & Plieninger, T. (2016). A systematic map of ecosystem services assessments around European agroforestry. *Ecological Indicators*, 62, 47–65.
- Gómez-Baggethun, E., Barton, D., Berry, P., Dunford, R. & Harrison, P. (2016). Concepts and methods in ecosystem services valuation. In M. Potschin, R. Haines-Young, R. Fish & R. K. Turner (eds.), *Routledge Handbook of Ecosystem Services* (pp. 99–111). Routledge.
- Hejnovic, A. P. & Rudd, M. A. (2017). The value landscape in ecosystem services: value, value wherefore art thou value? *Sustainability*, 9(5), 850.
- Hill, R., Kwabong, P., Guiomar, N.-P., Breslow, S. J., Buchori, D., Howlett, B., ..., Tahi, B. (2016). Biocultural diversity, pollinators and their socio-cultural values. In S. G. Potts, V. L. Imperatriz-Fonseca & H. T. Ngo (eds.), *The Assessment Report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services on Pollinators, Pollination and Food Production* (pp. 276–359). Secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.
- Horcea-Milcu, A.-I., Abson, D. J., Apetrei, C. I., Duse, I. A., Freeth, R., Riechers, M., ..., Lang, D. J. (2019). Values in transformational sustainability science: four perspectives for change. *Sustainability Science* 14(5): 1425–1437.
- IPBES (2015). *IPBES/4/INF/1: Preliminary Guide Regarding Diverse Conceptualization of Multiple Values of Nature and Its Benefits, Including Biodiversity and Ecosystem Functions and Services (Deliverable 3(d)). Report of the Fourth Session of the Plenary of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services 2015*. Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.
- IPBES (2018a). The regional assessment report on biodiversity and ecosystem services for Europe and Central Asia, IPBES/6/INF/6/Rev.1. Retrieved from <https://www.ipbes.net/assessment-reports/eca>.
- IPBES (2018b). The regional assessment report on biodiversity and ecosystem services for Africa, IPBES/6/INF/3/Rev.1. Retrieved from <https://www.ipbes.net/assessment-reports/africa>.

- IPBES (2018c). The regional assessment report on biodiversity and ecosystem services for the Americas, IPBES/6/INF/4/Rev.1. Retrieved from <https://www.ipbes.net/assessment-reports/americas>.
- IPBES (2018d). The regional assessment report on biodiversity and ecosystem services for Asia and the Pacific, IPBES/6/INF/5/Rev.1. Retrieved from <https://www.ipbes.net/assessment-reports/asia-pacific>
- IPBES (2019). The global assessment report on biodiversity and ecosystem services, Deliverable 2(c). Retrieved from <https://www.ipbes.net/global-assessment-report-biodiversity-ecosystem-services>
- Jacobs, S., Dendoncker, N. & Keune, H. (2013). Editorial: no root, no fruit – sustainability and ecosystem services. In S. Jacobs, N. Dendoncker & H. Keune (eds.), *Ecosystem Services: Global Issues, Local Practices* (pp. xix–xxviii). Elsevier.
- Jacobs, S., Dendoncker, N., Martín-López, B., Barton, D. N. D. N., Gómez-Baggethun, E., Boeraeve, F., ..., Washbourn, C.-L. (2016). A new valuation school: integrating diverse values of nature in resource and land use decisions. *Ecosystem Services*, 22, 213–220.
- Jacobs, S., Martín-López, B., Barton, D. N., Dunford, R., Harrison, P. A., Kelemen, E., ..., Smith, R. (2018). The means determine the end – pursuing integrated valuation in practice. *Ecosystem Services*, 29, 515–528.
- Jerico-Daminello, C., Edda, S. & Burgues, I. (2015). Improving decision-making for hydroelectric dam development through valuing local ecosystem services: case study of the Sao Luiz de Tapajos Hydroelectric project, Brazil. In S. Jacobs, N. Dendoncker, D. Barton & E. Gómez-Baggethun (eds.), *Integrated Valuation of Ecosystem Services in Science-Policy Practice*. Proceedings of the 8th Conference of the Ecosystem Services Partnership, 9–13 November 2015, Stellenbosch, South Africa. Retrieved from <http://www.esconference.org/esconference2015#.WCI70tzbfM>.
- Kelemen, E., Barton, D., Jacobs, S., Martín-López, B., Saarikoski, H., Termansen, G., ..., Turkelboom, F. (2015). *Preliminary Guidelines for Integrated Assessment and Valuation of Ecosystem Services in Specific Policy Contexts, EU FP7 OpenNESS Project Deliverable 4.3*. European Commission.
- Klain, S. C., Olmsted, P. Chan, K. M. A. & Satterfield, T. (2017). Relational values resonate broadly and differently than intrinsic or instrumental values, or the new ecological paradigm. *PLoS ONE*, 12(8), e0183962.
- Liquete, C., Piroddi, C., Drakou, E. G., Gurney, L., Katsanevakis, S., Charef, A. & Ego, B. (2013). Current status and future prospects for the assessment of marine and coastal ecosystem services: a systematic review. *PLoS ONE*, 8(7), e67737.
- Martín-López, B., Gómez-Baggethun, E., García-Llorente, M. & Montes, C. (2014). Trade-offs across value-domains in ecosystem services assessment. *Ecological Indicators*, 37, 220–228.
- Martín-López, B., Leister, I., Cruz, P. L., Palomo, I., Grêt-Regamey, A., Harrison, P. A., ..., Walz, A. (2019). Nature's contributions to people in mountains: a review. *PLoS ONE*, 14(6), e0217847.
- McDermott, M., Mahanty, S. & Schreckenberg, K. (2013). Examining equity: a multidimensional framework for assessing equity in payments for ecosystem services. *Environmental Science & Policy*, 33: 416–427.
- Nieto-Romero, M., Oteros-Rozas, E., González, J. A. & Martín-López, B. (2014). Exploring the knowledge landscape of ecosystem services assessments in Mediterranean agroecosystems: insights for future research. *Environmental Science & Policy*, 37: 121–133.
- Pascual, U., Balvanera, P., Díaz, S., Pataki, G., Roth, E., Stenseke, M., ..., Maris, V. (2017). Valuing nature's contributions to people: the IPBES approach. *Current Opinion in Environmental Sustainability*, 26, 7–16.
- Pascual, U., Phelps, J., Garmendia, E., Brown, K., Corbera, E., Martin, A., ... Muradian, R. (2014). Social equity matters in payments for ecosystem services. *Bioscience*, 64(11), 1027–1036
- Phelan, A. & Jacobs, S. (2016). Facing the true cost of fracking: social externalities and the role of integrated valuation. *Ecosystem Services*, 22B, 348–358.
- Pielke Jr, R. A. (2007). *The Honest Broker: Making Sense of Science in Policy and Politics*. Cambridge University Press.
- Poole, A. K. (2018). Where is Goal 18? The need for biocultural heritage in the Sustainable Development Goals. *Environmental Values*, 27(1), 55–80.
- Rincón-Ruiz, A., Arias-Arevalo, P., Nuñez-Hernandez J. M., Cotler, H., Caso, M. A., Meli, P., ..., Waldron, T. (2019). Applying integrated valuation of ecosystem services in Latin America: insights from 21 case studies. *Ecosystem Services*, 36, 100901.
- Rozzi, R. (2012). Biocultural ethics: recovering the vital links between the inhabitants, their habits, and habitats. *Environmental Ethics*, 34(1), 27–50.
- Šunde, C., Sinner, J., Tadaki, M., Stephenson, J., Glavovic, B., Awatere, S., ..., Chan, K. (2018). Valuation as destruction? The social effects of valuation processes in contested marine spaces. *Marine Policy*, 97, 170–178.
- Temper, L., McGarry, D. & Weber, L. (2019). From academic to political rigour: insights from the 'tarot' of transgressive research. *Ecological Economics*, 164, 106379.
- Tengö, M., Brondizio, E. S., Elmqvist, T., Malmer, P. & Spierenburg, M. (2014). Connecting diverse knowledge systems for enhanced ecosystem governance: the multiple evidence base approach. *AMBIO*, 43, 579.
- Turnhout, E., Waterton, C., Neves, K. & Buizer, M. (2013). Rethinking biodiversity: from goods and services to 'living with'. *Conservation Letters*, 6(3), 154–161.
- WWF (2018). *Living Planet Report – 2018: Aiming Higher*. WWF.