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To cite this article: C.-L. Washbourne , N. Dendoncker , S. Jacobs , A. Mascarenhas , F. De Longueville , A. P. E. van Oudenhoven , M. Schröter , L. Willemen , S. Campagne , S.K. Jones , M. Garcia-Llorente , I. Iniesta-Arandia , F. Baró , J. Fisher , J. Förster , C. Jericó-Daminelo , J. Lecina-Diaz , S. Lavorel , B. Lliso , C. Montealgre Talero , A. Morán-Ordóñez , J.V. Rocas-Díaz , M.A. Schlaepfer & J. Van Dijk (2020) Improving collaboration between ecosystem service communities and the IPBES science-policy platform, *Ecosystems and People*, 16:1, 165-174, DOI: [10.1080/26395916.2020.1766573](https://doi.org/10.1080/26395916.2020.1766573)

To link to this article: <https://doi.org/10.1080/26395916.2020.1766573>



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Published online: 26 May 2020.



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







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Improving collaboration between ecosystem service communities and the IPBES science-policy platform

C.-L. Washbourne , N. Dendoncker , S. Jacobs , A. Mascarenhas^{d,e}, F. De Longueville^b, A. P. E. van Oudenhoven , M. Schröter , L. Willemen , S. Campagne , S.K. Jones^j, M. Garcia-Llorente , I. Iniesta-Arandia , F. Baró , J. Fisher^m, J. Försterⁿ, C. Jericó-Daminelo^o, J. Lecina-Diaz^p, S. Lavorel , B. Llisor^r, C. Montealgre Talero^s, A. Morán-Ordóñez^t, J.V. Roces-Díaz^u, M.A. Schlaepfer^v and J. Van Dijk^w

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ABSTRACT

The end of the first working program of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) provided an opportunity to draw lessons from its work. This perspective paper captures insights from ecosystem services (ES) researchers and practitioners, largely drawing from the European context (referred to herein as 'ES community'), on this key science-policy interface. We synthesize reflections from a workshop on how (i) IPBES can engage the ES community; (ii) the ES community can engage with IPBES; and (iii) individual scientists can contribute. We note that IPBES constitutes a great advancement towards multidisciplinary and inclusivity in ES research and practice. Key reflections for IPBES are that funding and visibility at ES research events could be improved, the contribution and selection processes could be more transparent, and communication with experts improved. Key reflections for the ES community include a need to improve policy-relevance by integrating more social scientists, researchers from developing countries, early-career scientists and policy-makers. Key reflections directed towards individual scientists include contributing (pro) actively to science-policy interface initiatives such as IPBES and increasing transdisciplinary research. These reflections intend to contribute to the awareness of challenges and opportunities for institutions, groups and individuals working on ES.

ARTICLE HISTORY

Received 9 May 2019
Accepted 29 April 2020

EDITED BY

Harini Nagendra

KEYWORDS

IPBES; ESP; community of practice; ecosystem services; science-policy interface

1. Introduction

In 2012, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES¹) was established as an international independent body under the auspices of the United Nations. The work of IPBES is grouped under four broad headings: (1) assessments, (2) policy support, (3) building capacity & knowledge and (4) communications & outreach. The assessment and policy support

work require IPBES to synthesize available knowledge on the current status and future projections of biodiversity and ecosystems conditions, and to identify policy-relevant tools and methodologies available for their conservation and restoration (Decision IPBES-2/5) (Timpte et al. 2018). IPBES performs assessments on the state of biodiversity and ecosystem services (ES) and their interlinkages, which include comprehensive syntheses from regional to global scales and across key thematic areas (e.g. pollination,

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scenarios and models, land degradation and restoration, multiple values of nature). These assessments are commissioned by the IPBES member states, performed by nationally nominated experts, and finally accepted by the plenary of states. The accomplishment of IPBES work programme and delivery of knowledge products (primarily reports) heavily relies on voluntary contributions of institutions and experts from diverse scientific disciplines and indigenous and local knowledge (ILK).

IPBES builds on earlier initiatives to deliver the first intergovernmental, global and inclusive assessments on biodiversity, ecosystem services (ES) and their contribution to human wellbeing and sustainable development. From a science-policy perspective, IPBES also brings the academic concepts on environment/nature-society interactions to a global policy arena. Methodologically, IPBES aims further than previous initiatives (e.g. Millennium Ecosystem Assessment, 2005; *The Economics of Ecosystems and Biodiversity*, 2010) by pursuing a clear commitment to multi- and transdisciplinary approaches that cover diverse types of knowledge, worldviews and regions (Max-Neef 2005; Timpte et al. 2018; Vadrot et al. 2018; Christie et al. 2019). The effectiveness of such a science-policy body relies on its success in achieving collaborations with a range of stakeholders in order to generate and convey a robust knowledge base and recommendations to decision-makers and the wider society.

With the start of the new IPBES rolling work programme, up to 2030, we reflect on how a varied group of ES researchers and practitioners have engaged broadly with this science-policy interface. A recent review of IPBES priorities (Stevance et al. 2020) advises that a more strategic and collaborative approach to stakeholders is needed for IPBES to achieve its anticipated transformative impact. Our perspective piece draws inspiration from this review, and the stakeholder perspectives that it presents should help to take forward the conversation around where and how engagement at the science-policy-interface on biodiversity and ES is achieved. The aim of this perspective paper is to present lessons learned, constructive criticism, and recommendations regarding the interaction between the IPBES process and the wider ES community.

2. Analytical approach

Discussion between the authors was stimulated by an interactive workshop ‘The IPBES experience – advancing ES thinking?’ at the Ecosystem Services Partnership (ESP) European Conference 2018 (15–19 October) held in Donostia/San Sebastián (Spain). The workshop particularly aimed to capture experience of those involved in the IPBES Regional Assessment Report on

Biodiversity and Ecosystem Services for Europe and Central Asia, which involved several ESP members. ESP conferences have taken place annually since 2008 and are a key meeting place for those working across a range of ES topics. They are organized by ESP, which was itself launched in 2008 to provide a global platform for communication on research and practical implementation of the ES approach. It is an important joint initiative of the multiple organizations of the ES community that connects ES scientists, policy makers and practitioners (Roo-Zielinska et al. 2019). ESP conferences thus provide a unique opportunity to collect and gather representative views of the broader ES community on its role in science-policy interaction. ESP is an ‘IPBES collaborative supporter’, was an ‘accredited Observer’ for the IPBES Plenary 7, and collaborates with the IPBES Technical Support Unit on Capacity Building.

Following the workshop, and through subsequent analysis and discussion, the authors sought to reflect on and suggest improvements for the interaction of the ES community with IPBES, with potential insights to engagement with science-policy interfaces in general. The workshop, analysis and discussion process and the development of the final manuscript has included people with varying degrees of familiarity with IPBES, including some who had been directly involved in IPBES in a technical capacity, others who had observed the IPBES process or were working on it as a research object, as well as some who had little or no direct involvement with IPBES.

2.1. Workshop design and outcomes

The workshop was a 1.5-hour, world café style interactive session. Attendance to the workshop was by open invitation, and the session was advertised through the ESP Conference Programme, on social media, and by word of mouth throughout the conference. A full description of the workshop, including the program/agenda and methodology is included in supplementary materials (SM1). The overarching discussion points were: 1) What can the ES community learn and benefit from the experience accumulated during the first IPBES working program? 2) How can science more effectively help tackle the global challenges addressed by IPBES?

Participants were asked to reflect on their personal understanding of and experience with IPBES, framed around three question areas:

- (1) Lessons and recommendations for IPBES on engaging the ES community (framed as ‘ESP community’)
- (2) Lessons and recommendations for the ES community (framed as ‘ESP community’) from IPBES

- (3) Lessons and recommendations for individual scientists

2.2. Analysis following workshop

Drawing upon the issues identified during the workshop, the authors digested and discussed key themes for further consideration. This was done in the context of existing and emerging literature on the topic, to highlight the most pressing current lessons and recommendations for the interaction between the IPBES process and the wider ES community.

3. Results and discussion

In total, 44 participants took part in the workshop. All workshop participants were asked to locate their current work against two key axes, in order to understand the spread of disciplinary relationships to natural or social systems, and the level of affiliation that they felt with the ES community (as represented by ESP, due to the setting of the workshop) and IPBES. Although affiliations were diverse, the majority of participants considered themselves as more closely affiliated with ESP than to IPBES and working on natural systems rather than on social systems (Supplementary Material 2, Figure 1). 34 participants from the workshop (including all paper authors) provided additional details on their gender, career stage, discipline, regional focus and engagement with IPBES. These participants were 56% female and 44% male, with 47% self-reporting as early-career, 29% mid-career and 24% established in their career. The main disciplines represented included ecology, biodiversity, geography, environmental science, sustainability science, ecological economics and socio-ecological systems/science. As this conference was regional (European), the sample of opinions collected was largely limited to responses from those working in an on the European context. The majority were based in Europe (85%) and working on the European area (74%), though many had additional regional focuses or worked in a broader global context. 53% of these participants were involved, or had previously been involved, with IPBES in one or more roles including delegates to IPBES plenaries, IPBES Fellows, IPBES assessment authors, Multidisciplinary Expert Panel members, reviewers and stakeholders. 31% of those involved with IPBES were authors or reviewers for the European and Central Asia (ECA) assessment. We conclude that the participants represented a relatively diverse group on this basis.

A broad range of topics were included in responses from the participants, from methodological issues around inter- and transdisciplinarity, multiple values, wording and concepts and linkages, to participation and involvement. An initial mapping of the thematically organized responses to the three questions (i–iii) presented in

Section 2.1 is detailed in Supplementary Material 2, Table 1. Thematically grouped sticky notes from the workshop can be seen in Supplementary Material 3. Further thematic analysis was undertaken to draw out major themes of discussion emerging from the workshop. Table 1 demonstrates how lessons and recommendations were grouped across each of these themes. These were framed by the authors as:

- (1) inclusion – of different stakeholders, disciplines and worldviews
- (2) accessibility – to become a contributor to the work programmes of IPBES
- (3) impact – on real-world decision-making processes
- (4) content – including the key framings used in the discussion of ES issues

A summary of points under each theme is presented for the IPBES, for the ES community and for the individual scientists. Lessons are indicated as positive statements or negative statements and recommendations as bullet points.

Sections 3.1 to 3.3 present the integrated outcomes of the workshop and the subsequent analysis by the authors, regarding the three guiding questions (Section 2.1).

3.1. Lessons and recommendations for IPBES

IPBES constitutes a great advancement in bringing different disciplines together around biodiversity and ecosystem services themes, and highlighting their policy relevance. ‘Multiculturality’ and inclusiveness are highlighted as positive aspects of the IPBES initiative. The increasingly transdisciplinary approach of IPBES is also acknowledged to have led to the inclusion of different forms of knowledge, worldviews, and values (see also Tengö et al. 2017), including active efforts to integrate ILK into their assessments. For instance, in the last five years IPBES has hosted 23 ILK events in 11 different countries,² in an effort to more closely engage with and integrate the inputs of Indigenous Peoples and Local Communities. However, workshop participants suggested that IPBES has not been inclusive enough. ‘Expertise and region gaps’, were particularly noted, where representatives of non-academic knowledge systems and non-western regions are still underrepresented. Some considered IPBES to still have a disciplinary bias or that some types of ecosystems (such as terrestrial) are studied more than others (Díaz-Reviriego et al. 2019). Yet, it is acknowledged that filling these gaps is not an easy task (e.g. reaching all relevant participants who would like to be part of IPBES remains difficult) (Kovács and Pataki 2016). Nevertheless, currently ongoing IPBES assessments³ such as the ‘Values Assessment’, the ‘Transformative Change Assessment’, or the ‘Business and biodiversity assessment’ are expected to start bridging this

Table 1. Workshop discussion summary. + indicates positive statements, – indicates negative statements. Statements as formulated by workshop participants.

	IPBES	ES community	Individual scientists
Inclusion Lessons	<ul style="list-style-type: none"> + Great advancement in bringing different disciplines together + Increased policy relevance + 'Multiculturality' + Inclusiveness + Transdisciplinary approach - Not inclusive enough - Lack of cross sectoral engagement - Low diversity of stakeholders - Expertise and region gaps - Disciplinary bias 	<ul style="list-style-type: none"> + ESP is considered to have created an open, inclusive, and multidisciplinary community - Reluctance to opening up to new ideas and perceptions outside the community's comfort zone 	<ul style="list-style-type: none"> + While multidisciplinary is perceived as a challenge, there is a broad consensus on the added value of working with other disciplines ± Transformative effect on the type of research questions and science programs that individuals are likely to pursue in the future
Recommendations	<ul style="list-style-type: none"> • Generate guidelines for intercultural, multidisciplinary working • Improve balance/representation of regions, genders, disciplines and knowledge systems • Be inclusive by closing expertise gaps • Increase funding to support developing region authors 	<ul style="list-style-type: none"> • Increase flexibility by being more open to the evolution of worldviews and concepts, and striving for increased policy-relevance 	<ul style="list-style-type: none"> • Improve and foster communication with stakeholders (such as NGOs, indigenous groups, private sector, research organizations) • Don't feel threatened when stakeholders do not agree with frameworks/concepts of scientists
Accessibility Lessons	<ul style="list-style-type: none"> - Unclear how to become involved - Restrictive nomination process - 'Top down' governance/decision-making - Perceived lack of transparency in IPBES processes - Intensive workload - Lack of financial or other support 	<ul style="list-style-type: none"> - Weak integration of social scientists and early-career researchers, - Few participants from developing countries, - Strong influence by academia, and less so by civil society, policymakers or business sectors 	<ul style="list-style-type: none"> - Difficulties related to participating in IPBES' inter-, multi- and transdisciplinary work - Being involved in IPBES is reported as time-consuming, and potentially prejudicial to researchers without permanent positions, particularly for early-career researchers - Exclusion of groups that are not financially supported by IPBES and cannot afford to work pro bono for IPBES

(Continued)



Table 1. (Continued).

	IPBES	ES community	Individual scientists
Recommendations	<ul style="list-style-type: none"> • IPBES to more actively and proactively involve research networks • Make clearer how individual professionals could contribute to the IPBES process • Increase transparency about the selection processes 	<ul style="list-style-type: none"> • Be more collaborative, integrating more social scientists, researchers from developing countries, and young and early-career researchers • Open to engage actors from outside academia • Learn about how the plurality of worldviews shapes decisions 	N/A
Impact Lessons	<ul style="list-style-type: none"> - Policy impact 'remains to be seen' - Disagreement on policy engagement mechanisms - Lack of clarity on involvement of political and law professionals - Lack of dialogue between IPBES and broader ES community - Lack of dialogue between IPBES and society 	<ul style="list-style-type: none"> - Feel that engagement with policy and policy-makers within ESP is poor + Links with IPBES should be improved, for instance by inviting IPBES authors to ESP conferences 	<ul style="list-style-type: none"> - IPBES related work is also perceived as 'too focused on policies', which can hinder the development of science
Recommendations	<ul style="list-style-type: none"> • Improve communication between IPBES and networks of experts • Regular keynotes and presence of active IPBES chairs at conferences like ESP • Appropriate capacity and resources to enable implementation of recommendations • Assessments and resulting recommendations should target clearly defined policy processes and decision makers 	<ul style="list-style-type: none"> • Strengthen engagement with policymakers, 'on the ground practitioners', and other stakeholders (NGOs, private sector, scientific networks among others) • Policymakers should be invited to conferences like ESP as keynote speakers and presenters • ES community should strive for extracting policy-relevant messages • ES community should 'find out the big questions' and encourage scientists ... to collaborate and address them 	<ul style="list-style-type: none"> • Engage in research that addresses timely context-specific policy problems, not personal research agendas • Make research more accessible to other stakeholders • Participate in networks like the ESP and aim for policy-relevant work • Those involved in both ESP & IPBES are recommended to act as knowledge-brokers • Focus on presenting results and not dwelling too much on principles and definitions • Go outside one's comfort-zone
Content Lessons	<ul style="list-style-type: none"> - Challenges with introduction of Nature's Contributions to People (NCP) as alternative to ES and the role of IPBES in setting this 	<ul style="list-style-type: none"> - Individuals from the ES community have been too 'territorial', applying a 'stepping in my garden kind of attitude', acting like 'the owners of the ES concept' 	N/A
Recommendations	<ul style="list-style-type: none"> • Stronger inclusion of power relations • Stronger focus on socio-environmental justice aspects • Openly tackling critical issues and disagreements 	<ul style="list-style-type: none"> • Do not get lost in the numerous discussions on concepts and get 'married' to concepts. Avoid constraints and embrace flexibility depending on the context 	<ul style="list-style-type: none"> • Exchange knowledge (communication between researchers) • Translate and synthesize knowledge • Develop shared rather than individualistic research agendas to increase the strength of the community • Collaborate across disciplines by enlarging one's network, which allows continuous learning • Become more aware of the limitations of your field, and be open-minded by looking at the world through different worldviews • Integrate insights from other disciplines and different worldviews, which can provide a wider vision, spark new scientific questions and provide more opportunities for developing new knowledge

disciplinary gap by considerably broadening the types of experts and disciplines involved. Notably, there has been a large increase in the proportion of social scientists participating as authors of these newer assessments when compared to previous IPBES products such as the Regional and Global Assessments, in which natural scientists played a larger role. One point of discussion for future improvement by IPBES was around the generation of further specific guidance to support this kind of intercultural, multi- and trans-disciplinary working.

IPBES forms an important science–policy interface between global governance institutions (the United Nations), regional and national governments, communities of practice and ILK. Effective engagement of a wide range of stakeholders, including scientists, with IPBES has been a critical aim, to ensure the inclusion of the diverse range of perspectives needed for a global and inclusive assessment on biodiversity and ecosystem services. IPBES' role as a boundary organization requires that its activities and knowledge products should engage and be relevant to these multiple stakeholders (Guston 2001). From its conception, IPBES has taken a more inclusive and diverse approach than the comparative IPCC (UN's process, Intergovernmental Panel on Climate Change) (Brooks et al. 2014; Kenter 2018). The extent to which IPBES achieved its aim of collating and integrating knowledge from multiple evidence sources has been discussed in some detail (Tengö et al. 2017; Hill et al. 2020). Some of the points raised by workshop participants were notable in reflecting broader debates in science about traditional power structures and increasing access to institutional organizations and science-policy processes for underrepresented groups, as well as opposition to dominant economic and law systems (Chapron et al. 2019).

Such integration across disciplines and science-policy boundaries can lead to contestation of theories and concepts (e.g. ES as a contested concept; Schröter et al. 2014), especially between scientists and stakeholders from different continents and various scientific and cultural backgrounds (Sandbrook et al. 2019). The global effort led by IPBES has resulted in debates on the role of Western science, the power of information and predominant terminology, the important but challenging task of including globally representative ILK and communities and the importance of considering multiple values and socio-cultural preferences (Hotes and Opgenoorth 2014; Turnhout et al. 2014; Hansjürgens et al. 2017). One particularly visible, open debate was the adoption of the 'Nature's Contributions to People' (NCP) concept as one of the six major inclusive elements of the IPBES conceptual framework (Díaz et al. 2015, 2018). Points of debate included for instance the

extent to which NCP clearly draws upon previous related work, includes non-western science perspectives, or speaks more clearly to policy and practice (Braat 2018; Faith 2018; Kenter 2018; Maes et al. 2018; Kadykalo et al. 2019). In the broader discussion around IPBES work programmes, focusing too much on challenges, disagreements and controversy around concepts (e.g. Masood 2018) risks diluting the impact of the clear and endorsed key messages. While critical debate is essential to advance understanding, coherence of key findings is needed to realize societal impact. It is noted that IPBES is still at an early stage of its development (8 years, contrasted with 32 years for the IPCC), and these tensions are being progressively identified and engaged as the work progresses (Stenseke and Larigauderie 2018).

On a practical level, workshop participants felt that it was sometimes unclear how to become involved in IPBES, because of the restrictive nomination process at the national level for authorship roles and lower visibility of other opportunities. Participants identified this as a particularly relevant issue for involvement of scientists from developing countries, due to potential lack of access to relevant networks and resources, or early career researchers (ECRs), although there are specific mechanisms that allow such participation (e.g. the IPBES fellowship program,⁴ gap filing nominations). These perspectives are in line with previous studies reporting that the balance of regions, genders, disciplines and knowledge systems represented within IPBES expert groups is still disproportionately dominated by male natural scientists from the Global North (Timpte et al. 2018). Increasing communication and transparency are seen as key to improvement, particularly 'opening up these procedures and practices to pluralism and contestation ... (an) important step in the production of environmental expertise that is not only credible and salient, but also democratically legitimate' (Díaz-Reviriego et al. 2019, p. 462). This review paper also suggests that 'reaching out to and attracting social scientists, humanities experts and ILK experts and holders has proven to be a complicated issue The literature suggests that addressing this would require communication strategies that clearly identify their importance, role and contribution to IPBES. (pg. 459)'

Participants identified other practical difficulties related to participating in IPBES' work. Being involved in IPBES is noted as time-consuming, and potentially prejudicial to researchers without permanent positions, particularly for early-career scientists (who may already be under other pressures related to impact and relevance, e.g. Chapman et al. 2015) or scientists with family situations preventing them from devoting sufficient time to such a process. It requires a trade-off with other research and

engagement activities and a mindfulness of priorities for personal work, community contribution and wider impact. While it is documented during specific calls, participants also suggest increased transparency in *'what joining IPBES entails in terms of commitments'*. Participants who actively took part in IPBES note that the quality of the assessments *'depends on the willingness of the scientists to dedicate time and money to the [IPBES] project'*.

In clear the key recommendations for IPBES are:

- Continue to support, promote and guide inter-cultural, multidisciplinary working
- Continue to improve balance/representation across stakeholders recognising power relations
- Openly tackle critical issues and disagreements
- Increase the conditions (e.g. funding) to support developing regions and ECR participants
- Increase transparency and visibility of, and communication around, IPBES opportunities and processes
- Continue to (pro-)actively engage research networks

3.2. Lessons and recommendations for ES community

Given that the workshop discussion took place during an ESP event, many participants' comments were directed towards the ESP, as an element of the ES community. Several of the comments were supportive of the ESP, its work was considered as *'relevant'*, and as having *'helped greatly to push ES into the high-political agenda'*. ESP is considered to have created an open, inclusive, and multidisciplinary community in which experts from one field strive to be understood by experts from other fields. Several participants expressed the view that ESP has become a space for dialogue to *'make links between natural and social scientists'*. Reflections on the broader ES community (represented by workshop participants and the author team), include weak integration of social scientists and early-career researchers, few participants from developing countries, reticence to opening up to new ideas and perceptions outside the community's comfort zone, and a strong influence by academia, and less so by civil society, policymakers or business sectors. A similar recognition that diverse experts from the fields of social sciences should be represented in and involved at different stages of IPBES and its assessments has already been identified by other authors (see Vadrot et al. 2018; Stenseke and Larigauderie 2018; Jetzkowitz et al. 2018). This may reflect inherent difficulties of attracting and engaging a fully representative community in this diverse area of research and practice. A possible hypothesis emerging is that the poor representation of some disciplines (most notably from social sciences and

humanities) in IPBES might be a mere reflection of the representation of those disciplines in the wider ES community.

A widely shared recommendation from workshop participants was to engage actors from outside academia. Participants felt in particular that engagement with policy-makers within the ES community could be improved. Appropriate engagement in this science-policy space likely requires skills delivered through peer learning, fellowship programs and mentoring programs, as well as more explicit reflexive debates on the posture of researchers and institutions towards policy (see, e.g. Crouzat et al. 2018). Other specific approaches were suggested for addressing this issue: for example, policy-makers should be invited to events such as ESP conferences as keynote speakers and presenters, highlighting the *'big questions'*, then encourage scientists within the ES community to collaborate to address them following an iterative approach. It is also important to be clear about what the objectives are – what is policy-relevant and which studies aim at improving general understanding. Several participants stressed that the ES community should learn how the plurality of worldviews shapes decisions (Primmer et al. 2017), to help understand how to make ES research more policy relevant. As stated by Pascual et al. (2017, p. 14), *'a pluralistic valuation approach is likely to be more time and resource consuming than an approach based on value-monism, but it is likely to be more equitable, which is a prerequisite of any sustainable pathway'*.

Key recommendations for ES community are:

- Increase engagement with and openness to other knowledge systems and world views, beyond ES
- Encourage collaboration (especially on the *'big questions'* facing policy-makers and across disciplines), including specifically researchers from developing countries, ECRs and actors from outside academia
- Strive for increased policy-relevance and collective action to extract policy-relevant messages

3.3. Lessons and recommendations for individual scientists

Lessons and recommendations for individual scientists are topically consistent with the lessons for IPBES and the ES community.

Participants suggested involving more stakeholders in one's research, in agreement with Oubenal et al. (2017) who raised the issue of stakeholder integration in IPBES. Participants also recommended not feeling threatened when stakeholders do not agree with frameworks/concepts of scientists. As stated by Balvanera et al. (2017, p. 1), *'increased co-generation of IPBES products with stakeholders as well as with*

supporting scientific, conservation and development agencies worldwide can also enhance the current capacities of the platform'.

While multi- and transdisciplinarity is perceived as a challenge, there is a broad consensus on the added value of working with other disciplines for a scientist (Nissani 1997; Simon et al. 2018). Multidisciplinarity implies a 'huge learning curve' and is seen as both inspiring and rewarding. A few participants nevertheless identified difficulties related to participating in IPBES' inter-, multi- and transdisciplinary work. IPBES related work is also perceived by some as 'too focused on policies', which can hinder the development of science. This may represent a tension in, or issues in understanding of, IPBES key areas of interest and operation between different communities and the extent to which the remit of IPBES is perceived as 'scientific' vs 'policy focussed'. As noted in section 3.1., being involved in IPBES is reported as time-consuming and requires a trade-off with other research and engagement activities. This trade-off also applies to financing in some cases, which can result in exclusion of groups that are not financially supported by IPBES and cannot afford to work pro bono for IPBES.

Those who had participated in an IPBES assessment were in a privileged position to observe the gap between existing knowledge and the novel information necessary to provide clear answers to policy makers. For example, some participants felt that the regional IPBES reports fell short of providing clear, concise answers to the questions that had been put forth by national policy-makers. Such observations had a transformative effect on the type of research questions and science programs that individuals were likely to pursue in the future. Those involved in IPBES were recommended to act as knowledge-brokers, i.e. people who translate and communicate knowledge (Meyer 2010; Crouzat et al. 2018). Being involved and actively engaged in a network such as ESP was also seen as significantly beneficial for the work and connections of individual researchers in ES.

Key recommendations for individual scientists are:

- Integrate insights from other disciplines and different worldviews
- Improve and foster communication with a range of stakeholders (especially outside your comfort zone) for inspiration and continuous learning
- Seek support and commitment from employing organizations to dedicate the time needed to work at the science-policy interface
- Make research more accessible through exchange, translation and synthesis
- Engage in research that addresses timely context-specific policy problems

- Participate in networks like ESP

We believe that this perspective paper provides a range of timely and previously unreported insights. However, we recognise a number of limitations (Sovacool et al. 2018). Of particular note is the representative nature of the perspectives reported for the wider ES community. Noting that a small number of perspectives are captured, we know that this represents a range of experience in engaging with IPBES at different levels and a disciplinary spread. Further investigative work in this space could seek to capture a more diverse range of perspectives from the ES community and tie these to a more detailed understanding of various demographic characteristics.

4. Conclusion

The creation of IPBES constitutes a milestone towards multi- and transdisciplinarity and multiculturalism in nature-society research and practice. Lessons and recommendations can be drawn from the experiences with the first work program by those working in and around IPBES, to close persisting regional and expertise gaps, increase transparency and encourage collaboration. We summarise reflections from a workshop and emerging discussions from a range of ecosystem services (ES) researchers and practitioners largely drawing from the European context. Recommendations to IPBES include increasing supportive conditions (e.g. funding), particularly for those from developing countries and ECRs (expanding on current contributions in this space such as the IPBES Fellows Scheme), being (pro)actively engaged in ES research spaces such as conferences, increasing transparency on contribution and selection processes, and improving communication. Recommendations to the ES community include working towards being more collaborative and policy-relevant by integrating more social scientists, researchers from developing countries, ECRs and policy-makers to increase policy and societal relevance. Moreover, the ES community needs to further open-up to multiple views and values. In general, the ES community need to strengthen its capacity to engage in science-policy processes by developing tailored skills. In particular, the design of policy-relevant assessments requires skills in knowledge brokering, and facilitating co-design involves the management and operation of transdisciplinary teams at the science-policy interface, which are still not commonly honed. Individual scientists who choose to work in the science-policy interface are encouraged to contribute actively to their knowledge communities and to IPBES while recognising the limits of their fields and focusing on policy-relevant research accessible to diverse audiences.

Critical reflection is useful for identifying pathways to an improved science-policy interface. We call on the IPBES and ES communities to use these

reflections by ramping up efforts to overcome challenges to effective science-policy engagement going forward, and enable us as institutions, communities and individuals to successfully work together in creating a sustainable human-nature relationship.

Notes

1. See <https://www.ipbes.net/>.
2. <https://ipbes.net/ilk-events>.
3. <https://ipbes.net/assessing-knowledge>.
4. <https://www.ipbes.net/ipbes-fellowship-programme>.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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