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Navigating the science-policy interface: Forest researcher perspectives

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ABSTRACT

There is growing interest – and need – among researchers and research organizations to contribute societally relevant work as well as to demonstrate the policy impact of their research. Diverse science-policy interfaces (SPIs) aim for scientifically informed policymaking by connecting scientists with policymakers. Effective SPIs need to be grounded in credibility, relevance and legitimacy; at the same time, however, they become part of the complex, politicised web of public policymaking. In this article we examine how forest researchers who participate in diverse SPIs in the context of the Global South navigate this complexity. We apply the concepts of credibility, relevance and legitimacy to explore the tensions researchers experience, as well as the strategies that researchers apply when responding to them. The research is based on in-depth interviews with 23 forest researchers and highlights (i) the tensions related to ensuring both policy and political relevance particularly in the context of research led SPIs; and (ii) tensions arising from the need to maintain credibility in the face of contestation and pressure to omit research critical of existing policies and practice and also the legitimacy of ‘experts’ operating within the SPI. Ensuring SPI effectiveness (research impact) also emerged as an additional source of tension. While multiple response strategies were identified, including knowledge co-production and strategic engagement with key policy actors, some of the tensions led to compromises, which we discuss. We conclude by highlighting the need to understand power relations in terms of both planning but also evaluating effective SPIs.

1. Introduction

The calls for science-informed decision-making and efforts for improved science-policy linkages are currently strong in diverse policy and research agendas (EEAC, 2019; UNEP, 2012). In the light of continuing forest loss and a worsening climate crisis, however, we can argue that research is to a large extent failing to influence decision-making. There are many explanations for this failure, including cultural and institutional barriers between scientists and policymakers and the lack of effectively communicated, policy-relevant knowledge (Cvitanovic et al., 2016; Oliver et al., 2014; Van Enst et al., 2014). Concurrently, there are diverse science-policy interfaces (SPIs) that aim for improved connections between science and policy. Overall, the SPIs differ greatly in their objectives, structures, processes, frequency and scale (Engels, 2005; Hermann et al., 2017; Sarkki et al., 2015). Further, SPIs may be rooted in linear science-policy models, where experts are

“speaking truth to power” (Beck, 2011; Wildavsky, 1979), or constructed as dynamic social processes with knowledge co-production (Sarkki et al., 2015; van den Hove, 2007).

The existing literature highlights that the influence and impact of science is highly dependent on how scientific information is perceived, especially on whether the information presented is perceived to be credible, relevant and legitimate (Cash et al., 2003). Credibility refers to the validity, reliability and adequacy of knowledge, relevance refers to the usefulness and usability for stakeholders, and legitimacy entails respect for stakeholders’ divergent values and beliefs (Cash et al., 2003; Sarkki et al., 2015; Weichselgartner and Kasperson, 2010). In their original work, Cash et al. refer to the perceptions of “relevant stakeholders” (Cash et al., 2003, p. 8086) which entail both SPI participants but also other policy actors, particularly in SPIs “enmeshed in institutional cultures and policy processes” (Hansson and Polk, 2018, p. 142). While fostering the perceptions of credibility, relevance and legitimacy

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is essential for the success of SPIs, it can be a complex task for environmental policy, since many environmental questions are wicked problems involving contested values, multiple actors and different problem framings (DeFries and Nagendra, 2017; Game et al., 2014). This translates into different criteria, perceptions and priorities over what counts as credible, relevant and legitimate information (Cash et al., 2003; Heink et al., 2015; Sarkki et al., 2013).

Many forest-related policy issues are also characterised as “wicked problems”, involving multiple actors with competing values and interests regarding how forests should be used, managed and governed, and by whom. These include urgent policy questions, ranging from climate and biodiversity conservation policies to national economic development and participatory governance. Currently, there are multiple SPIs with diverse groups of actors and agendas dealing with forest issues, and one of their main challenges is to be able to foster credibility, relevance and legitimacy simultaneously among different SPI participants (TAPIO, 2018). In the presence of multiple claims and interests, however, contestation and conflict is likely, and powerful policy actors may also selectively choose their preferred sources of expert advice (Strassheim and Kettunen, 2014). Given this complexity and diversity, forest related SPIs offer a particularly important and interesting field to understand the conflict and contestation in terms of ensuring effective SPIs.

This research seeks to understand how forest researchers navigate complex SPIs, and how they respond to the tensions that emerge when there are multiple actors and interests. Repeated activity and engagement (iterativity) have been highlighted as one of the major success factors of SPIs (Dilling and Lemos, 2011; Sarkki et al., 2015). Therefore, the analysis focuses on the perceptions of forestry researchers who have engaged with policymakers over several years and have long-term experience of research and policy engagement. Although the general challenges of SPIs are widely discussed in terms of the barriers that exist for research use (Nutley et al., 2007; Oliver et al., 2014), there is limited research examining the tensions that researchers may face when working in SPIs where multiple actors have different and conflicting views. A few such studies, however, have pointed to trade-offs between credibility, relevance and legitimacy that are needed to maintain the SPI effectively (Girod et al., 2009; Sarkki et al., 2013). Given that forestry scientists are increasingly expected to contribute with societally relevant work, and within policy domains characterised by strong power asymmetries among the actors involved, there is a need for lessons that can be drawn from such experiences to inform future science-policy engagements for a more sustainable future.

In the next sections, we will outline our conceptual framework referring to these issues, followed by a methods section presenting data collection and analysis of the interview material. The results section follows our framework, first showing the SPI involvement of informants, and then exploring tensions experienced by the interviewees, as well as their strategies in responding to these. Finally, in light of the current literature we discuss implications of such tensions when navigating science-policy interaction while striving for credibility, relevance and legitimacy, and we end the paper with a brief conclusion.

2. Conceptual framework

2.1. Effectiveness of science-policy interfaces (SPIs)

Complex environmental problem-solving requires not only policy implementation but also policy learning – the acquisition, translation, and exchange of information among actors with highly diverse interests, experiences and knowledge (Heikkilä and Gerlak, 2013). Policy learning, defined as “the updating of beliefs based on lived or witnessed experiences, analysis or social interaction” (Dunlop and Radaelli, 2012, p. 599) can be facilitated through effective SPIs that “contribute to positive change in the social, economic, and/or environmental problem context” (Belcher et al., 2015, p.12), particularly if they enable open

deliberation among all participants (Kowarsch et al., 2016). Naturally, the role of civil society, including NGOs is crucial in terms of policy learning, yet, in this article our focus is on SPIs and its science community, as these are increasingly recognized as important actors within environmental governance (Sarkki et al., 2019).

Much work on the effectiveness of SPIs has focused on government-mandated interfaces such as the Intergovernmental Panel on Climate Change (IPCC) and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) (Beck, 2011; Tengö et al., 2017). These are highly formal SPIs with formal and explicit structures, operating procedures and outputs. At the national level and sub-national levels, the science-policy arena is very heterogeneous as it is affected by the political and cultural setting of the country (Engels, 2005; Hermann et al., 2017). Thus, SPIs may take the form of scientific advisory committees advising national government, multi-stakeholder forums seeking to promote sustainable forest management (e.g. Governor’s Climate and Forest Task Force, Indonesia Palm Oil Platform), expert participation and facilitation of sub-national policy processes (e.g. processes related to developing strategies on Reducing emission from deforestation and forest degradation, REDD+) but also locally conducted transdisciplinary research processes. Multiple stakeholders participate in such forest-related SPIs, including government officials, forest communities and a diversity of experts from scientific and other organisations representing civil society and industry. Research funders also participate, and their preferences can play a crucial role in determining what, where and who is the target of science-policy (Turnhout et al., 2008). In fact, stakeholders have different expectations and demands for SPI effectiveness, emerging, for example, from their different views about the roles of scientists and scientific information (Pielke, 2007) or how effectiveness and impact can be demonstrated (Belcher et al., 2017).

2.2. Key attributes: Credibility, relevance and legitimacy

The influence and impact of science is strongly dependent on the way that different audiences perceive the credibility, relevance and legitimacy of the information (Cash et al., 2003; Cook et al., 2013; Sarkki et al., 2015; Weichselgartner and Kaspersen, 2010). Credibility is understood as the quality of the information, assessed by multiple criteria including validity, reliability and adequacy (Sarkki et al., 2015). Relevance, or salience, refers to the importance, significance and usefulness of the science and knowledge exchange to policy and societal needs (Belcher et al., 2015). Usefulness also includes the extent to which the knowledge is made accessible in different forms and at temporal and spatial scales needed and preferred by societal actors (Lemos and Morehouse, 2005). Legitimacy relates to issues of ethics and fairness in knowledge generation and knowledge exchange, including how different values, interests and perspectives are acknowledged and included (Belcher et al., 2015). These attributes are interlinked and overlapping (for a more complete discussion on these interlinkages, see for example Belcher et al., 2015; Heink et al., 2015 and Sarkki et al., 2015.)

Although previous studies have criticised the insufficiency of this framework in terms of understanding the influence of scientific advice on policy (Dunn and Laing, 2017; Hansson and Polk, 2018), it can provide understanding about the tensions that emerge in SPIs where participants have conflicting values, beliefs and interests regarding the policy issue (Tangney, 2017). For example, researchers in SPIs need to deal with the contestation that doubts the credibility of scientific information and expertise (Sabatier, 1988; Turnhout et al., 2008; Yamamoto, 2012). If SPI participants have different expectations regarding the role of science (Nutley et al., 2007; Steel et al., 2004), scientists may face pressures to shift from “honest brokering” to issue advocacy (Pielke, 2007). Limited equity among participants in SPIs also causes tensions, particularly when power asymmetries across levels of governance leads to ignorance of local level needs (Di Gregorio et al., 2019), or when the

structural dominance from the North disregards the interests of the Global South. The IPCC, for example, has been criticised in this regard (Engels, 2005; Haas, 2004). Further, given that the ethical risks related to SPIs are not typically well identified and addressed, such as how potential influence peddling should be dealt with (Tremblay et al., 2016), there is a risk that SPIs, in their efforts to ensure policy relevance, need to make compromises in terms of credibility and legitimacy.

2.3. Strategies to foster credibility, relevance and legitimacy

The literature provides wide theoretical and empirical discussion on how to foster credibility, relevance and legitimacy in SPIs (Belcher et al., 2015; Oliver and Cairney, 2019; Sarkki et al., 2015). Although SPIs are diverse in terms of their processes, strategies, objectives and the policy contexts in which they operate, the general emphasis is on the generation of high-quality, policy-relevant research, which is communicated in a clear, timely and inclusive manner. Moreover, the role of continuous, long-term engagement and trusted relationships with policymakers are crucial, which is often achieved through transdisciplinary research practices and knowledge co-production (Belcher et al., 2015; Cvitanovic et al., 2016; Young et al., 2014). Formal recognition and legal mandates contribute to legitimacy of SPI, although legitimacy has other aspects, including the sociological legitimacy of the participating actors which is grounded in perceptions on social acceptance (Tallberg and Zürn, 2019).

3. Methods

The objective of this paper is to analyse how experienced researchers engaged in forest policy in the Global South at different governance levels perceive and respond to the tensions inherent in SPIs. Hence, we built our sample by identifying an international forest research organisation (henceforth 'ORG') and approached scientists linked to this organisation as employees or associates. The selected organisation has since its formation explicitly focused on research informing forest-related policy processes, and is organised in a matrix structure with theme-oriented teams that draw on multiple science disciplines, including social sciences, rather than being organised by individual disciplines.

ORG has since its establishment engaged in broad collaborations, and participated in and contributed to diverse processes, frameworks, panels and conventions governing forests and landscapes at global, national and subnational levels. Many of its researchers have had a long history of using collaborative research and knowledge co-production practices. ORG highlights its commitment to societal impact and encourages an "impact culture", which refers to explicitly defined, designed and implemented research and accompanying activities. To this end, it employs a large communication and media outreach team. Thus, ORG serves as an interesting case study to explore the challenges that emerge in a diverse range of science-policy interactions, from local decision-making at the village level to national and global policy decision-making arenas.

The interviewees were selected to represent a diversity of gender, age, geographical location and job category. In-depth, semi-structured interviews were carried out with 23 researchers, most of whom had been working in ORG for a decade or more. Thirteen interviews were conducted by the lead author over Skype and ten were face-to-face interviews, mostly at ORG headquarters. The interviews were held between April 2019 and July 2019 and lasted from 55–80 min. An overview of interviewed researchers is given in Table 1.

Personal relationships with the informants facilitated access and enabled relatively free discussions about the challenges related to their work. While these relationships were a strength on the one hand, the authors also acknowledge a risk of bias in selection and during conversation. In addition, levels of trust established through work, for example, may result in the interviewee revealing more than they had intended or providing information they may later regret (Kvale, 2006).

Table 1

Overview of the interviewed researchers (23 in total).

Category	Number of researchers
Researchers with 10+ years of experience of science-policy within ORG	20
Researchers originating from the Global South	14
Women researchers	7
Researchers in senior positions	16
Researchers with a strong national or regional focus (Asia, Africa and Latin America)	18
Researchers referring to international SPIs	12
Researchers referring to national and sub-national SPIs	23
Researchers referring to co-production of knowledge	11

To manage these risks, the interviewees were able to review transcripts of their own interviews.

The interviews were akin to a conversational interview (Lavrakis, 2008), although they also pursued specific pre-defined topics. For a list of interview questions, see Annex A. During the interview, the researchers were asked to discuss their current or past experiences of SPIs, the challenges they faced and how they responded to those challenges. Further, interviewees were prompted to reflect on the challenges they faced related to credibility, relevance, legitimacy and funding, and their responses to these challenges. The interviews were recorded, transcribed and analysed using Atlas.ti.

The qualitative analysis was guided by the framework of credibility, relevance and legitimacy and, as an initial step, the data were coded deductively following these meta-categories drawn from theory. This resulted in 26 credibility, relevance and legitimacy related challenges. Inductive coding was also applied, in order to identify the different SPIs, additional challenges as well as the response strategies discussed by the interviewees. We identified 15 SPIs across 4 policy levels, 12 additional challenges (e.g. funding, government policies, project management) and 22 responses. The coding scheme can be found in Annex B. Within the material that was coded as challenge, we focused our analysis on statements discussing tensions, i.e. contestation, conflict and incompatibility within SPI but also related to the SPI. These tensions were grouped into 4 categories presented in Table 3.

4. Results

4.1. Science-policy interfaces (SPIs)

Researchers' SPI activities typically focused on a specific country or region such as the Congo Basin, and involved SPIs at multiple policy levels (Table 1). A wide diversity of SPIs was identified (Table 2), such as international framework conventions, multi-stakeholder platforms consisting of government, civil society, industry and local forest communities, and knowledge co-production processes. In addition to describing specific SPIs, interviewees also frequently referred to their activities in more generic terms such as discussing specific requests from national and sub-national policy-makers, or mentioning their informal relations with high-level key decision-makers.

The SPIs were also often referred to in terms of their objectives, discussed here as the different phases of the policy cycle, from agenda-setting to policy evaluation.¹ Agenda-setting and policy design activities were mentioned by the informants across all SPIs and policy levels, as they related to getting (specific) forestry issues on decision-makers' priority agenda and aimed at contributing to the design of forest-related plans, strategies and regulations. Policy implementation involved activities that concerned the translation of international commitments into

¹ We acknowledge the overlaps in the policy cycle stages. However, it serves as a useful heuristic tool for discussing the goals of the SPIs.

Table 2
An overview of SPIs.

SPI	SPI examples	Level
Participation in existing SPIs		
framework conventions and other non-binding agreements	UNFCCC, CBD, the Bonn Challenge	international, national
intergovernmental organisations	IPCC, Central African Forest Observatory (OFAC)	international
multi-stakeholder platforms and other policy dialogues	Congo Basin Forest Partnership, Grupo REDD+ (Peru), Indonesia Palm Oil Platform	international, national, sub-national
official government policy processes (by request or as a part of participatory governance)	expert assistance for committees revising forest law, providing comments on legislative plans	national, sub-national
Establishment and participation in SPIs based on ORG and collaborator research initiatives (from now on “research-led SPIs”)		
workshops related to ORG research	workshops and seminars aimed at knowledge exchange and capacity-building, project advisory committees	international, national, sub-national
transdisciplinary research, knowledge co-production	participatory action research, participatory prospective analysis	sub-national
Other SPIs		
informal relations with decision-makers	informal meetings and chats, including participation in the same social events, chats in WhatsApp	national, sub-national

national commitments or concerns over how to support a local government partner in policy implementation. Policy evaluation was referred to less commonly (by five interviewees), although research evaluating public policies and research-based policy was frequently mentioned. Policy evaluation was particularly topical for researchers working on REDD+ (Reducing emissions from deforestation and forest degradation), a policy mechanism to halt tropical deforestation and forest degradation developed under the convention on climate change (UNFCCC). Further, SPIs that built on knowledge co-production, such as participatory research, often targeted different phases of the policy cycle simultaneously. As an example, a participatory research project designed a policy strategy for improving smallholder livelihoods and helped in its implementation at different policy levels.

4.2. Tensions in science-policy interfaces

Several of the tensions discussed by the interviewees related to achieving and maintaining policy relevance and effectiveness. To begin with, policy actors participating in SPIs often had diverse expectations about the role of science and expertise. Many interviewees emphasized that their role was to inform and facilitate policy-making. However, they were requested by other SPI participants, in powerful roles due to their formal authority to be prescriptive and to provide clear policy solutions. One interviewee, while discussing a heated national debate over climate policies and the role of forests, referred to policy maker’s request to know the maximum forest harvesting quota that would comply with the climate policy targets:

“We get asked by the policy makers how much is it feasible to log forests. We don’t want to give that figure, because it cannot be determined. If there is a lot of logging, then [the decision maker] needs to make emission reductions in other sectors. And that’s not the role for a researcher to decide [where to make reductions], but the role of the decision maker.”

Interviewees also stressed that in the research-led SPIs in particular, the topics often addressed low political priorities, such as strengthening

Table 3
An overview of tensions, affected SPI types and scientists’ responses.

TENSIONS (Links to credibility, relevance, legitimacy, and effectiveness)	Type of contestation, conflict or incompatibility	Main types of SPIs affected	Response strategies
Achieving and maintaining policy or political RELEVANCE	Powerful SPI participants demand solutions and prescriptive advice	diverse	Clarifying the role of science or SPI; knowledge co-production
	Lack of political interest, dominant voices dismiss or reframe policy problem	sub-national and national SPIs based on research initiatives	strategic planning of SPIs; knowledge-co-production; issue framing, capturing of new policy windows; active engagement with decision makers; continuous and strategic collaborations with relevant policy actors
	Dynamic policy context: policy and decision maker changes		conducting high quality research; long-term engagement with SPI participants (i.e. building and maintaining scientific reputation)
Upkeeping CREDIBILITY	Validity of scientific results and expertise is questioned, actively undermined or rejected by SPI participant	diverse SPIs, national and sub-national	respondents did not have clear strategies for dealing with this tension, but did acknowledge the need for sensitivity and strategic behaviour when communicating critical results
	Powerful SPI participant requests omissions (e.g. in research plan, publication, communication)	SPIs based on research initiatives	Humbleness and critical self-reflection to assess/ensure own/ORG legitimacy; conducting high-quality research; long-term engagement with SPI participants (i.e. having reputation); strategic collaborations with relevant policy actors; knowledge-co-production
LEGITIMACY of expert participation	Legitimacy of experts contested because they are “outsiders”, including their foreign origin	diverse SPIs, national and sub-national	strategic collaborations with relevant policy actors; knowledge-co-production that aims also for increased collaboration
	multilevel governance challenges, different levels of authority	national and sub-national SPIs	strategic planning; strategic collaborations with relevant policy actors;
Ensuring SPI EFFECTIVENESS	Achieving and demonstrating research impact	sub-national and national SPIs based on research initiatives	strategic collaborations with relevant policy actors;

smallholder livelihoods or tenure security in indigenous lands, implying that dominant or highly influential policy makers chose not to get involved in such topics. Gaining political support, which was essential for influencing public policy, involved long-term engagement with key politicians and government representatives, but the relationships could be disrupted by policy swings that changed political agendas and key decision-makers. The new key official, however, often had no prior knowledge about the SPI or its objectives and hence researchers had to renew their efforts to build political relevance. Moreover, the new key person might support different political priorities and thus have no interest in supporting the current SPI.

A key aspect of the researchers' SPI involvement was the importance of ensuring that SPIs were based on rigorous and high-quality science. In this regard, tensions emerged from value- and interest-based contestation of science and expertise, particularly in SPIs addressing nationally or locally contested topics with powerful interests either involved in or targeted by measures and data discussed in these SPIs, such as drivers of deforestation or otherwise sensitive issues such as the quality of the government's official data. In these cases, the validity of the researchers' data could be questioned by an SPI participant, whose interests could be severely affected by the data. Government actors were mentioned as a particularly sensitive audience if the SPI discussed the inaccuracies in official government data, such as forest maps or import-export statistics. For example, a few interviewees discussed the generation of high-resolution forest and land use maps, which exceeded the quality of the government maps. When these maps were discussed together with the government officials, the researchers' maps were rejected because the new maps did not use the government's official data, and as a result were different compared to the official versions.

In addition to contestation, a few of the interviewees also referred to cases where their SPI partners wanted to limit or change the scientific content, including seminar organizer requests to omit topics from a seminar talk, as well as requests to change the content of a research paper that criticised the implementation of a development project funded by the partner. The SPI partner could also set conditions for research, such as asking researchers not to ask detailed questions about a forest community's customary tenure arrangements, as forest rights were a source of ongoing conflict between the local community and the government. Since the SPI partner had the authority over issuing field research permits, the research topics were limited to neutrally perceived topics, such as evaluating how the community benefits from the forests.

A refusal to censor or limit the content of a speech or publication resulted in missing public talks and in conflicts with partners. In fact, the public dissemination of critical evaluations had damaged existing partner relationships with government-affiliated actors in the past, and had inflicted reputational harm on the scientists, or even on the whole ORG. Further, although critical narratives could be discussed in scientific journals, they did not offer a fruitful starting point for stakeholder collaboration, as one of the interviewees pointed out:

“You can't say I have solid research that shows that you are corrupt. That's very good probably for a publication, but it's useless in terms of changing what is happening and you need to come to terms with what you want to do and how you want to influence the change.”

Also researchers' participation in SPIs could become a source of contestation. A few interviewees discussed SPIs where another participant perceived the researcher as an outsider who duly did not have the right to participate. Coming from the outside related to the position that the ORG or the scientists held, typically with regard to the perception of being an international (i.e. not domestic) actor in national affairs. These concerns were manifested, for example, in the form of questions as to why an international organisation would get involved in national and local governance issues, or the position that an international ORG should take in a regional research network.

Contestation also emerged at the more personal level. The question

of foreign origin was particularly strong for some of the scientists from the Global North working with a strong focus on a particular country. One scientist pointed out that his legitimacy to participate had been contested not because he was a scientist but because he was a foreigner representing an international organisation and talked about national decision-making on climate change. On the other hand, a few of the scientists, who were foreign but of similar origins (e.g. same official language), considered that coming from outside was an opportunity, as having the identity of a “foreigner” helped them to detach from national politics. However, the opportunity was highly context-specific and dependent on the policy audiences, as well as on historic power relations, e.g. colonial pasts of actors' origin.

Effectiveness of SPIs emerged as an additional source of tensions, particularly due to the tensions brought by on-going competition between government actors and pressures to demonstrate research impact. Good working relationships between different government actors were perceived to be critical for effective SPIs, however, interviewees discussed how competition between national and sub-national governance levels over the distribution of rights and responsibilities hindered co-ordination and collaboration. In terms of demonstrating research impact, interviewees highlighted that although research impact of a research project could be planned to a degree (e.g. using strategic planning tools), it also hinged on cumulative efforts by a diversity of actors as well as an element of luck. Thus, research impact was highly unpredictable. Further, while policy relevance had been emphasised since the ORG was established, the recent year changes in the research funding, currently based on individual funders and funding calls, entailed policy impact being built within short project time frames (typically 3–5 years). This was particularly challenging when the impact involved transformational changes and thus required changes in economic, governance or regulatory frameworks, including policies, institutions and attitudes. Additionally, interviewees discussed funders' preferences for funding policy engagement activities but not research activities, particularly research that entailed time-consuming data collection.

4.3. Strategies to mitigate tensions

Many of the strategies discussed by the interviewees focused on ensuring policy relevance, particularly in research-led SPIs, including knowledge co-production processes and building strategic collaborations with relevant policy actors (e.g. national universities, government agency staff, civil society organizations). These collaborations could also help to respond to changes in dynamic policy contexts and were felt to strengthen legitimacy of the expertise. In order to take policymakers' different interests into account, researchers highlighted the need to use different problem framings. For example, in order to highlight the damages from illegal logging, a researcher could approach the Ministry of Finance and emphasise the lost tax revenues accruing to the national government due to unrecorded timber sales.

In terms of different expectations of the role of science, while researchers discussed the potential of knowledge co-production processes, many interviewees also self-reflected on the difficulties of determining and creating useful knowledge for policy making. Humbleness, critical self-reflection and awareness of not being able to effectively respond to tensions were also common when researchers discussed tensions related to expert legitimacy, pressures to omit critical research as well as the difficulties of demonstrating research impact. For example, researchers could discuss how these tensions originated beyond the SPI, including colonial legacies or were interlinked in a complex manner to policy audiences outside the SPI.

In order to respond to the contestation related to scientific information, interviewees highlighted the role of rigorous and transparent research, so that methodological choices and research findings could be explained and defended. Many interviewees also emphasised that they had not faced contestation related to the credibility of the research

because of their personal and organizational reputation and their familiarity with policymakers. Further, particularly for those interviewees working in their national country in the Global South, politeness and cultural sensitivity emerged as important strategies for mitigating the tensions that emerged when the research was critical of government policies. For example, discussions could take place informally. However, on some occasions interviewees also discussed that maintaining good working relationships required refraining from presenting certain issues. Sensitivity was also required when SPIs involved topics underpinned by strong value connotations, such as SPIs on social justice and equity. One of the researchers highlighted the need for “double discourse” because overemphasis on social justice could drive away SPI participants whose position and power would be negatively affected by promotion of social justice. On the other hand, other researchers perceived that it was critical to be very open about the social justice aims of the SPIs.

Taken together, these strategies underline that researchers who aimed to inform government policies through research-led SPIs in particular, such as knowledge co-production, or whose work entailed communicating research critical of existing policies and practice, felt the need to actively manage tensions. Building good relationships with policymakers was essential for political relevance, however, there also was a pressure to uphold these good relationships and hence researchers were not able to discuss critical, scientific research in a completely open manner, as they also create pressures to maintain the benevolence in these relationships. Damaged relationships not only harmed the SPI but also affected researchers' opportunities for future collaborations.

5. Discussion

While many studies have addressed features and strategies for effective science-policy interactions (Oliver and Cairney, 2019; Young et al., 2014), including pathways to alter power asymmetries and ensure more deliberative and democratic science-policy interactions (Dryzek et al., 2019), there remains a gap in research that addresses the tensions that emerge in these interactions (Beck and Mahony, 2018). In this article, we have sought to identify how forest researchers perceive and respond to these tensions by using the credibility, relevance and legitimacy framework (Cash et al., 2003). Existing research has highlighted tensions between engaging in time-consuming SPI activity and ensuring academic career progress (Sarkki et al., 2013). This was not a focus of concern for our interviewees, who were all established researchers in an organisation that explicitly claims strong impact orientation. However, interviewees discussed tensions in terms of achieving and demonstrating research impact, including the difficulty to ensure sufficient funding of research activities, given their funders' preferences for funding policy engagement rather than scientific activities. Given that high-quality, transparent research was emphasised as essential for defending interest-based contestation, we found a significant contradiction between funding preferences and the prerequisites of effective SPIs. Previous research has also discussed how funding decisions may favour certain types of problem framings (Huesemann, 2002) or, as our case shows, solution framings or those research narratives that posit a clear impact between individual research projects and policy change (Boswell and Smith, 2017).

A few of the interviewed researchers also discussed occasions when their research was perceived to be too critical of existing policies and programs, and when powerful SPI participants requested changes to the research and SPI content. This puts researchers in an extremely uncomfortable position between the requirements for research integrity and independence (e.g. All European Academies, 2017) and the specific interest-driven demands that extended peer-community involvement eventually entails (Funtowicz and Ravetz, 1993). Questions about the independence and autonomy of policy informing research have been widely raised in the context of post-normal science as well as regulatory science (Funtowicz and Ravetz, 1993; Jasanoff, 1994), and our research reveals that these are crucial concerns also for topical forest policy

debates and ‘demands’ within. How ‘uncomfortable’ indeed this position of a researcher is becomes obvious when reflecting over potential implications of such demands – with self-censorship to maintain relationships on the one hand, or on the other refusal that would jeopardise the possibility to conduct research that would inform the SPI itself. This dilemma and the vulnerable position critical research often has in SPIs is reflected in the calls for more strategic approaches to SPIs by our informants. The impact literature referred to in this paper suggests as one possible response strategy engagement with diverse actors from civil society and state to ensure that research can be brought to policy without compromising the individual researchers. Our findings also highlight the importance of pushing (gently) for a political environment in which diverse positions remain voiced, and are listened to.

Researchers' self-censorship is a topic not well covered by current forestry research. Given the abovementioned tensions and the fact that sensitivity as a response strategy was highlighted repeatedly in the interviews, it seems likely that different forms of self-imposed censorship occur, particularly in SPIs that are less formalised and visible. The implications of researchers' self-censorship for the credibility of the SPIs remain unclear but they involve clearly a conflict of interest, which is a potential source of reputational risk for the SPIs and their participants (Tremblay et al., 2016). We encourage more discussion and openness within the research community about these tensions between scientific independence and political relevance, but also within wider society, in order to recognize that scientific freedom can not be taken for granted within SPIs. The interest- and value-based contestation of scientific information experienced by our interviewees highlighted how power asymmetries and institutional arrangements can prevent the acquisition and dissemination of new knowledge (Gerlak et al., 2018; Strassheim and Kettunen, 2014), and thus inhibit SPIs' ability to foster collective learning. In the literature, the contestation of science typically concerned the certainty and validity of the data (Oreskes, 2004; Sarewitz, 2004), but our interviewees also discussed how the sources of data could be politically unacceptable, such as the case concerning high-quality forest maps that were not using the official (low-quality) data. Researchers' legitimacy to participate in SPIs could also be questioned if another SPI participant considered the researcher an outsider due to their organizational or national background (i.e. internationals). However, this type of contestation seems context-specific as it was not widely reported among international scientists, suggesting that tensions can be mitigated by long-term activity in the country.

The credibility, relevance and legitimacy framework has provided useful insights into the complex relationships between science and policy. However, a more nuanced understanding of the policy context, policy actors and their interlinked relationships is needed. For example, network analysis can aid understanding of information exchange between actors, and whether network structures lead to the exclusion of certain actors (Oliver and Faul, 2018; Wagner et al., 2020). Deeper understanding of power relations is also crucial, including the sources and types of power, particularly in SPIs where multiple policy actors can claim the right of participation (Fritz and Binder, 2020).

6. Conclusions

Credibility, relevance and legitimacy have become a popular conceptual tool for understanding the challenges and prerequisites of effective SPIs, and our research contributes to this growing body of literature by discussing the tensions inherent in SPIs where multiple actors with conflicting values and interests participate. While researchers can to a certain extent respond to tensions, for example by iterative, collaborative knowledge practices, some of the tensions remain particularly difficult to address, and we see a trade-off between critical engagement in research-led SPIs and maintaining relationships with important policymakers. Further, the requirements of funders that favour development solutions are not well aligned with the publication requirements of academic advancement, and consequently cause tension not only for

those already involved in SPIs, but particularly for new researchers engaging with SPIs, whose careers are not well established. It is of concern that barriers may exist which differentially affect researchers with less influence in their academic field, and those for whom resisting pressures from funders or other actors in the SPI is culturally challenging or institutionally impossible.

Our research has also highlighted that in SPIs across all levels of governance, especially with regards to effectiveness of research-led SPIs, understanding power relations is crucial. In addition to the political structure, the origin of power may also be financial, including research funders, whose funding decisions and criteria greatly influence the design, implementations and continuity of SPIs. Given that power imbalances influence SPIs' ability to foster policy learning, understanding power dimensions and dynamics in SPIs is crucial for researchers who wish to plan for more effective impact pathways, but it also is needed in order to more clearly assess to what extent SPIs are based on independent scientific advice or advice that is considered pleasant by those powerful in SPIs.

CRedit authorship contribution statement

Maria Ojanen: Conceptualization, Methodology, Formal analysis, Investigation, Data curation, Writing - original draft, Writing - review & editing, Supervision, Project administration, Funding acquisition. **Maria Brockhaus:** Conceptualization, Methodology, Writing - original draft, Writing - review & editing. **Kaisa Korhonen-Kurki:** Conceptualization, Methodology, Writing - original draft, Writing - review & editing. **Gillian Petrokofsky:** Conceptualization, Methodology, Writing - original draft, Writing - review & editing.

Declaration of Competing Interest

The authors report no declarations of interest.

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Appendices A–B. Supplementary data

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References

- All European Academies, 2017. *The European Code of Conduct for Research Integrity*. All European Academies (ALLEA), Berlin, Germany.
- Beck, S., 2011. Moving beyond the linear model of expertise? IPCC and the test of adaptation. *Reg. Environ. Change* 11 (2), 297–306. <https://doi.org/10.1007/s10113-010-0136-2>.
- Beck, S., Mahony, M., 2018. The IPCC and the new map of science and politics. *Wiley Interdiscip. Rev. Clim. Change* 9 (6). <https://doi.org/10.1002/wcc.547>.
- Belcher, B.M., Rasmussen, K.E., Kemshaw, M.R., Zornes, D.A., 2015. Defining and assessing research quality in a transdisciplinary context. *Res. Eval.* 25 (1), 1–17. <https://doi.org/10.1093/reseval/rvv025> *J Research Evaluation*.
- Belcher, B.M., Suryadarma, D., Halimanjaya, A., 2017. Evaluating policy-relevant research: lessons from a series of theory-based outcomes assessments. *Palgrave Commun.* 3 (17017) <https://doi.org/10.1057/palcomms.2017.17>.
- Boswell, C., Smith, K., 2017. Rethinking policy 'impact': four models of research-policy relations. *Palgrave Commun.* 3 (1), 44. <https://doi.org/10.1057/s41599-017-0042-z>.
- Cash, D.W., Clark, W.C., Alcock, F., Dickson, N.M., Eckley, N., Guston, D.H., Jäger, J., Mitchell, R.B., 2003. Knowledge systems for sustainable development. *Proc. Natl. Acad. Sci.* 100 (14), 8086–8091. <https://doi.org/10.1073/pnas.1231332100>.
- Cook, C.N., Mascia, M.B., Schwartz, M.W., Possingham, H.P., Fuller, R.A., 2013. Achieving conservation science that bridges the knowledge-action boundary. *Conserv. Biol.* 27 (4), 669–678. <https://doi.org/10.1111/cobi.12050>.
- Cvitanovic, C., McDonald, J., Hobday, A.J., 2016. From science to action: principles for undertaking environmental research that enables knowledge exchange and evidence-based decision-making. *J. Environ. Manage.* 183, 864–874. <https://doi.org/10.1016/j.jenvman.2016.09.038>.
- DeFries, R., Nagendra, H., 2017. Ecosystem management as a wicked problem. *Science* 356 (6335), 265–270. <https://doi.org/10.1126/science.aal1950>.
- Di Gregorio, M., Fatorelli, L., Paavola, J., Locatelli, B., Pramova, E., Nurrochmat, D.R., May, P.H., Brockhaus, M., Sari, I.M., Kusumadewi, S.D., 2019. Multi-level governance and power in climate change policy networks. *Glob. Environ. Change* 54, 64–77. <https://doi.org/10.1016/j.gloenvcha.2018.10.003>.
- Dilling, L., Lemos, M.C., 2011. Creating usable science: opportunities and constraints for climate knowledge use and their implications for science policy. *Glob. Environ. Change* 21 (2), 680–689. <https://doi.org/10.1016/j.gloenvcha.2010.11.006>.
- Dryzek, J.S., Bowman, Q., Kuyper, J., Pickering, J., Sass, J., Stevenson, H., 2019. *Deliberative Global Governance*. Cambridge University Press.
- Dunlop, C.A., Radaelli, C.M., 2012. Systematising policy learning: from monolith to dimensions. *Polit. Stud.* 61 (3), 599–619. <https://doi.org/10.1111/j.1467-9248.2012.00982.x>.
- Dunn, G., Laing, M., 2017. Policy-makers perspectives on credibility, relevance and legitimacy (CRELE). *Environ. Sci. Policy* 76, 146–152. <https://doi.org/10.1016/j.envsci.2017.07.005>.
- EEAC, 2019. *A new science-policy-society interface for the 2030 agenda: the role of European Advisory Councils on the environment and sustainable development*. EEAC Documents.
- Engels, A., 2005. The science policy interface. *The Integrated Assessment Journal* 5 (1), 7–26.
- Fritz, L., Binder, C.R., 2020. Whose knowledge, whose values? An empirical analysis of power in transdisciplinary sustainability research. *Eur. J. Futures Res.* 8 (1), 3. <https://doi.org/10.1186/s40309-020-0161-4>.
- Funtowicz, S.O., Ravetz, J.R., 1993. Science for the post-normal age. *Futures* 25 (7), 739–755. [https://doi.org/10.1016/0016-3287\(93\)90022-L](https://doi.org/10.1016/0016-3287(93)90022-L).
- Game, E.T., Meijaard, E., Sheil, D., McDonald-Madden, E., 2014. Conservation in a wicked complex world; challenges and solutions. *Conserv. Lett.* 7 (3), 271–277. <https://doi.org/10.1111/conl.12050>.
- Gerlak, A.K., Heikkilä, T., Smolinski, S.L., Huitema, D., Armitage, D., 2018. Learning our way out of environmental policy problems: a review of the scholarship. *Policy Sci.* 51 (3), 335–371. <https://doi.org/10.1007/s11077-017-9278-0>.
- Girod, B., Wiek, A., Mieg, H., Hulme, M., 2009. The evolution of the IPCC's emissions scenarios. *Environ. Sci. Policy* 12 (2), 103–118. <https://doi.org/10.1016/j.envsci.2008.12.006>.
- Haas, P., 2004. When does power listen to truth? A constructivist approach to the policy process. *J. Eur. Public Policy* 11 (4), 569–592. <https://doi.org/10.1080/1350176042000248034>.
- Hansson, S., Polk, M., 2018. Assessing the impact of transdisciplinary research: the usefulness of relevance, credibility, and legitimacy for understanding the link between process and impact. *Res. Eval.* 27 (2), 132–144. <https://doi.org/10.1093/reseval/rvy004>.
- Heikkilä, T., Gerlak, A.K., 2013. Building a conceptual approach to collective learning: lessons for public policy scholars. *Policy Stud. J.* 41 (3), 484–512. <https://doi.org/10.1111/psj.12026>.
- Heink, U., Marquard, E., Heubach, K., Jax, K., Kugel, C., Neßhöver, C., Neumann, R.K., Paulsch, A., Tilch, S., Timaues, J., Vandewalle, M., 2015. Conceptualizing credibility, relevance and legitimacy for evaluating the effectiveness of science-policy interfaces: challenges and opportunities. *Sci. Public Policy* 42 (5), 676–689. <https://doi.org/10.1093/scipol/scu082>.
- Hermann, A.T., Høgl, K., Pregonnig, M., 2017. Science-policy interactions in Austrian, Dutch, and Swiss climate policy: a comparative account. *J. Environ. Policy Plan.* 19 (2), 168–182. <https://doi.org/10.1080/1523908X.2016.1180238>.
- Huesemann, M.H., 2002. The inherent biases in environmental research and their effects on public policy. *Futures* 34 (7), 621–633. [https://doi.org/10.1016/S0016-3287\(02\)00004-6](https://doi.org/10.1016/S0016-3287(02)00004-6).
- Jasanoff, S., 1994. *The Fifth Branch: Science Advisers as Policymakers*. Harvard University Press.
- Kowarsch, M., Garard, J., Rioussat, P., Lenzi, D., Dorsch, M.J., Knopf, B., Harris, J.-A., Edenhofer, O., 2016. Scientific assessments to facilitate deliberative policy learning. *Palgrave Commun.* 2 (1), 16092. <https://doi.org/10.1057/palcomms.2016.92>.
- Kvale, S., 2006. Dominance through interviews and dialogues. *Qual. Inq.* 12 (3), 480–500. <https://doi.org/10.1177/1077800406286235>.
- Lavrakis, P., 2008. *Conversational interviewing*. Encyclopedia of Survey Research Methods. Sage Publications. <https://doi.org/10.4135/9781412963947>.
- Lemos, M.C., Morehouse, B.J., 2005. The co-production of science and policy in integrated climate assessments. *Glob. Environ. Chang. Part A* 15 (1), 57–68. <https://doi.org/10.1016/j.gloenvcha.2004.09.004>.
- Nutley, S.M., Walter, I., Davies, H.T.O., 2007. *Using Evidence. How Research Can Inform Public Services*. Bristol University Press, Bristol, UK.
- Oliver, K., Cairney, P., 2019. The dos and don'ts of influencing policy: a systematic review of advice to academics. *Palgrave Commun.* 5 (1), 21. <https://doi.org/10.1057/s41599-019-0232-y>.
- Oliver, K., Faul, M.V., 2018. Networks and network analysis in evidence, policy and practice. *Evid. Policy A J. Res. Debate Pract.* 14 (3), 369–379. <https://doi.org/10.1332/174426418X15314037224597>.
- Oliver, K., Innvar, S., Lorenc, T., Woodman, J., Thomas, J., 2014. A systematic review of barriers to and facilitators of the use of evidence by policymakers. *BMC Health Serv. Res.* 14 (1), 2. <https://doi.org/10.1186/1472-6963-14-2>.
- Oreskes, N., 2004. Science and public policy: what's proof got to do with it? *Environ. Sci. Policy* 7, 369–383.

- Pielke, R.J., 2007. *The Honest Broker: Making Sense of Science in Policy and Politics*. Cambridge University Press.
- Sabatier, P., 1988. An advocacy coalition framework of policy change and the role of policy-oriented learning therein. *Policy Sci.* 21, 129–168.
- Sarewitz, D., 2004. How science makes environmental controversies worse. *Environ. Sci. Policy* 7 (5), 385–403. <https://doi.org/10.1016/j.envsci.2004.06.001>.
- Sarkki, S., Niemelä, J., Tinch, R., van den Hove, S., Watt, A., Young, J., 2013. Balancing credibility, relevance and legitimacy: a critical assessment of trade-offs in science-policy interfaces. *Sci. Public Policy* 41 (2), 194–206. <https://doi.org/10.1093/scipol/sct046>.
- Sarkki, S., Tinch, R., Niemelä, J., Heink, U., Waylen, K., Timaeus, J., Young, J., Watt, A., Neßhöver, C., van den Hove, S., 2015. Adding ‘iterativity’ to the credibility, relevance, legitimacy: a novel scheme to highlight dynamic aspects of science-policy interfaces. *Environ. Sci. Policy* 54, 505–512. <https://doi.org/10.1016/j.envsci.2015.02.016>.
- Sarkki, S., Balian, E., Heink, U., Keune, H., Nesshöver, C., Niemelä, J., Tinch, R., van den Hove, S., Watt, A., Waylen, K.A., Young, J.C., 2019. Managing science-policy interfaces for impact: interactions within the environmental governance meshwork. *Environ. Sci. Policy* 113, 21–30. <https://doi.org/10.1016/j.envsci.2019.05.011>.
- Steel, B., List, P., Lach, D., Shindler, B., 2004. The role of scientists in the environmental policy process: a case study from the American west. *Environ. Sci. Policy* 7 (1), 1–13. <https://doi.org/10.1016/j.envsci.2003.10.004>.
- Strassheim, H., Kettunen, P., 2014. When does evidence-based policy turn into policy-based evidence? Configurations, contexts and mechanisms. *Evid. Policy A J. Res. Debate Pract.* 10 (2), 259–277. <https://doi.org/10.1332/174426514X13990433991320>.
- Tallberg, J., Zürn, M., 2019. The Legitimacy and Legitimation of International Organizations: Introduction and Framework. <https://doi.org/10.1007/s11558-018-9330-7>.
- Tangney, P., 2017. What use is CRELE? A response to Dunn and Laing. *Environ. Sci. Policy* 77, 147–150. <https://doi.org/10.1016/j.envsci.2017.08.012>.
- TAPIO, 2018. *Tools for Improving Science-Policy Interaction in Forestry – Approaches in Leveraging Forest Research in Northern and Central European Countries*. Tapio Reports 36. TAPIO.
- Tengö, M., Hill, R., Malmer, P., Raymond, C.M., Spierenburg, M., Danielsen, F., Elmqvist, T., Folke, C., 2017. Weaving knowledge systems in IPBES, CBD and beyond – lessons learned for sustainability. *Curr. Opin. Environ. Sustain.* 26–27, 17–25. <https://doi.org/10.1016/j.cosust.2016.12.005>.
- Tremblay, M., Vandewalle, M., Wittmer, H., 2016. Ethical challenges at the science-policy interface: an ethical risk assessment and proposition of an ethical infrastructure. *Biodivers. Conserv.* 25 (7), 1253–1267. <https://doi.org/10.1007/s10531-016-1123-9>.
- Turnhout, E., Hisschemöller, M., Eijsackers, H., 2008. Science in Wadden Sea policy: from accommodation to advocacy. *Environ. Sci. Policy* 11 (3), 227–239. <https://doi.org/10.1016/j.envsci.2007.07.004>.
- UNEP, 2012. *21 Issues for the 21st Century: Results of the UNEP Foresight Process on Emerging Environmental Issues*. United Nations Environment Programme (UNEP), Nairobi, Kenya.
- van den Hove, S., 2007. A rationale for science-policy interfaces. *Futures* 39 (7), 807–826. <https://doi.org/10.1016/j.futures.2006.12.004>.
- Van Enst, W.I., Driessen, P.P.J., Runhaar, H.A.C., 2014. Towards productive science-policy interfaces: a research agenda. *J. Environ. Assess. Policy Manag.* 16 (01), 1450007. <https://doi.org/10.1142/S1464333214500070>.
- Wagner, P.M., Ylä-Anttila, T., Gronow, A., Ocelík, P., Schmidt, L., Delicado, A., 2020. Information exchange networks at the climate science-policy interface: evidence from the Czech Republic, Finland, Ireland, and Portugal. *Governance*, pp. 1–18. <https://doi.org/10.1111/gove.12484> n/a.
- Weichselgartner, J., Kaspersen, R., 2010. Barriers in the science-policy-practice interface: toward a knowledge-action-system in global environmental change research. *Glob. Environ. Change* 20 (2), 266–277. <https://doi.org/10.1016/j.gloenvcha.2009.11.006>.
- Wildavsky, A., 1979. *Speaking Truth to Power: The Art and Craft of Policy Analysis*. Transaction Publishers, Piscataway, NJ, US.
- Yamamoto, Y.T., 2012. Values, objectivity and credibility of scientists in a contentious natural resource debate. *Public Underst. Sci.* 21 (1), 101–125. <https://doi.org/10.1177/0963662510371435>.
- Young, J.C., Waylen, K.A., Sarkki, S., Albon, S., Bainbridge, I., Balian, E., Davidson, J., Edwards, D., Fairley, R., Margerison, C., McCracken, D., Owen, R., Quine, C.P., Stewart-Roper, C., Thompson, D., Tinch, R., Van den Hove, S., Watt, A., 2014. Improving the science-policy dialogue to meet the challenges of biodiversity conservation: having conversations rather than talking at one another. *Biodivers. Conserv.* 23 (2), 387–404. <https://doi.org/10.1007/s10531-013-0607-0>.