



Scientists and climate governance: A view from the South

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ABSTRACT

The importance of science for climate governance has strengthened over time and the topic inspires prolific academic writing on the influence of scientists and scientific knowledge on policy decisions. One of the streams of research in the field is inspired by Cash’s (2003) seminal work highlighting how the role of scientists depends on perceptions of salience, credibility and legitimacy. Other views call for attention to the politics involved in scientific performance while influencing policy and on the local circumstances, considering the many ways in which societies relate to science and expertise. The role of scientists in climate governance is a contested issue, relevant for many research centres aiming to influence policy decisions given the urgency of the climate crisis. To better understand this role, we reviewed mainstream international literature and identified four main approaches, which we label: scientific usable knowledge, politics of science, critical approaches and hybrid approaches. We contrasted the results with the experience of scientists from a Chilean climate research centre, to provide a view from the South on the role of scientists in climate governance. Our results show that Cash’s approach was a common ground for Chilean climate scientists, upon which they build ideas on the importance of building long-term relationships between scientists and policy makers. However, they also acknowledged the need to take into consideration the role of politics in climate-related decisions and the power relations and actors’ interests.

1. Introduction

How do we understand the role of scientists in climate governance? This question has inspired prolific writing in the environmental sciences concerned with climate governance, published in mainstream international academic journals. The main issue of interest here is the influence of scientific knowledge on policy decisions (Cash et al., 2003; Kates, 2011; Lemos et al., 2012; Kirchhoff et al., 2013, 2015; Clark et al., 2016; Oliver and Cairney, 2019). The role of scientists in climate governance is often seen as providing evidence for informing policy (e.g., Gallo, 2017) and understood by some as part of a complex advising process (e.g., Vesely, 2017). An influential proposition within this literature is that the

role of scientists in the field of climate governance depends on perceptions of how relevant, credible and legitimate is their performance (Cash et al., 2003; Koetz et al., 2012). There are also calls for attention to the politics of science and technology, the local culture and the institutionalized ways in which societies relate to science and expertise (Jasanoff, 1990, 2005; Koetz et al., 2012; Miller, 2013; Miller and Neff, 2013; Van Kerkhoff and Pilbeam, 2017). The position of scientists in the field of climate governance has strengthened over time (Gupta et al., 2012), and this makes questioning their roles even more relevant.

Despite the existence of a corps of literature on scientific knowledge and climate governance, there is an important gap in the literature related to the Global South, understood as a relational and geopolitical

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entity, which imposes the need for developing situated knowledge consistent with each particular circumstance (Sapiains et al., 2020). As in other areas, mainstream literature on the role of scientists in climate governance issues is written mainly in the Northern hemisphere, it is mostly theoretical, and provides limited empirical contributions (Spruijt et al., 2014). Southern perspectives on climate governance are usually absent in such literature (Sapiains et al., 2020). As we concluded in previous work covering an extensive literature review, scientists from the South need to engage in a dialogue between situated knowledge and dominant theories on climate governance, using their experience and recognizing their cultural, social and psychological particularities (Sapiains et al., 2020). Situated knowledge refers to specific local knowledge that is valuable in the immediate situation (Haraway, 1998). Climate governance theories have been developed in relation to knowledge situated in contexts that are very different from those that predominate in the South.

To advance the development of a southern perspective on the role of scientists in climate governance, in this paper we use an action research approach, inspired by Freire's (1970, 1993) emancipatory theories, to foster dialogue between mainstream literature on the subject and the lived experience of a group of climate scientists in Chile. Specifically, a case study is undertaken for the Chilean Center for Climate and Resilience Research (CR)^{2,1}

Following this introduction, we present the methodology (Section 2) and the results of the literature review on knowledge and climate governance (Section 3). The results of our action research project discussing how the literature relates to the experience of researchers at (CR)² is presented in Section 4. Finally, Section 5 concludes with insights into the influence of scientific knowledge on policy in a Southern context.

2. Methodological approach

The questions guiding our inquiry are: What is the role of scientists in climate governance according to mainstream literature and how does it relate to the experience of a team of scientists situated in Chile?

The research strategy involved a literature review of mainstream international journals on the role of scientists in climate governance. The theoretical perspectives on this role gleaned from the literature were then used to establish a dialogue with the concrete empirical experience of scientists in our research centre, (CR)². We assume that the dialectic of reflection and practice (Freire, 1970, 1993) can provide insights on how local culture and historical circumstances influence the roles and perceptions of scientists in climate governance.

2.1. Literature review

The main motivation of our literature review was to deepen our understanding of the ways authors and disciplines approach knowledge and climate governance in mainstream international literature. The objectives were to identify the most prominent approaches, recurrent trends, and underlying assumptions in articles published by journals indexed in WoS and Scopus. The decision to use those data sources was based on the credibility they hold in the Chilean national research system. By no means we affirm that the reliance on these specific scientific indexes is unproblematic, but we take as a starting point that they have been selected as one of the key standards for measuring scientific productivity and funding in Chile.

Our team had been working in a systematic literature review on the concept of climate governance (see Sapiains et al., 2020), which covered 1157 articles in WoS and Scopus published between 2009 and 2017,

containing in their titles the word 'governance' and the word 'environment' or 'climate'. We identified a subset of literature referring to knowledge by including in the review record the question: does the article mention a role for science or knowledge in climate governance, either explicitly or implicitly? We selected 33 articles with theoretical discussions on knowledge and governance. We added to this core set of literature articles from WoS and Scopus, books and book chapters identified through snowballing references and following articles releases alerts set between July 2018 and March 2019, completing a total of 45 articles and book chapters. Every article had at least two readers; the whole research team took part in the process, synthesized in Fig. 1.

Once the reading was completed, the team met and discussed the ontologies, epistemologies, theories and forms of knowledge identified by each reader. The team views converged into main themes, which varied across the articles: understanding of knowledge, participation in knowledge production (participants, legitimacy), understanding of power relations, work approaches and the role and treatment of uncertainty. We worked on four categories which grouped the different approaches to those themes and condensed our reading (see Section 3): usable scientific knowledge, politics of science, critical visions and hybrid approaches. We allocated the articles to categories and identified the most prominent references (snowballing), which were added to the readings. These categories allowed us to present and share our work for discussion with researchers from (CR)² as described in Section 4. The categories oversimplify the richness of the literature and should not be considered as definitive; nevertheless, they proved useful as devices for communicating and prompting a discussion. Within the reviewed literature, we also analysed authors' profiles, disciplinary fields and the type of approaches used. All the literature selected by these means was written by authors based in the Northern hemisphere.

2.2. Action research project

Results from the literature review were presented to a total of 72 colleagues in three workshops, posing questions to prompt participants to look critically at their perceptions of the world and their performance within it (Freire, 1993). We framed the interventions as an action research project (Colmenares et al., 2008; Reason and Bradburd, 2006), considering that it is an approach that changes practice, the understanding of our own doings and the situation in which they occur (De Oliveira Figueiredo, 2015; Kemmis et al., 2014). In preparation for the workshops, discussions of the literature review within the team of authors shaped our common understanding of theories on climate governance. The workshops created forums in which other (CR)² members could join as co-participants in the remaking and understanding of the practice of scientific involvement in climate governance in Chile and its relation to mainstream theory. We aimed at a process of collaborative learning on the possibilities and consequences of our practice in the field.

We organized three workshops, each guided by a question: What do we understand by climate governance? (first workshop, May 2018 with 24 participants); What are the roles of scientists in climate governance? (second workshop, October 2018 with 26 participants); What is the role of (CR)² in the Climate Change Act discussion in Chile? (third workshop, during the biannual meeting in November 2018, with 68 participants). Interventions involved group activities using material designed to present the literature, mind mapping, brainstorming, individual questionnaires and plenary discussions.

3. Results of the literature review

The relationship between knowledge and climate governance remains a challenge for academics and practitioners. However, among the different approaches to climate governance, systematically reviewed in Sapiains et al. (2020), there is shared agreement on the need to involve scientific knowledge in decision making, despite the different roles it

¹ (CR)² is founded by the Chilean government and gathers around 70 scientists from different disciplines, most of them academics working in different universities along the country. See Section 4.1

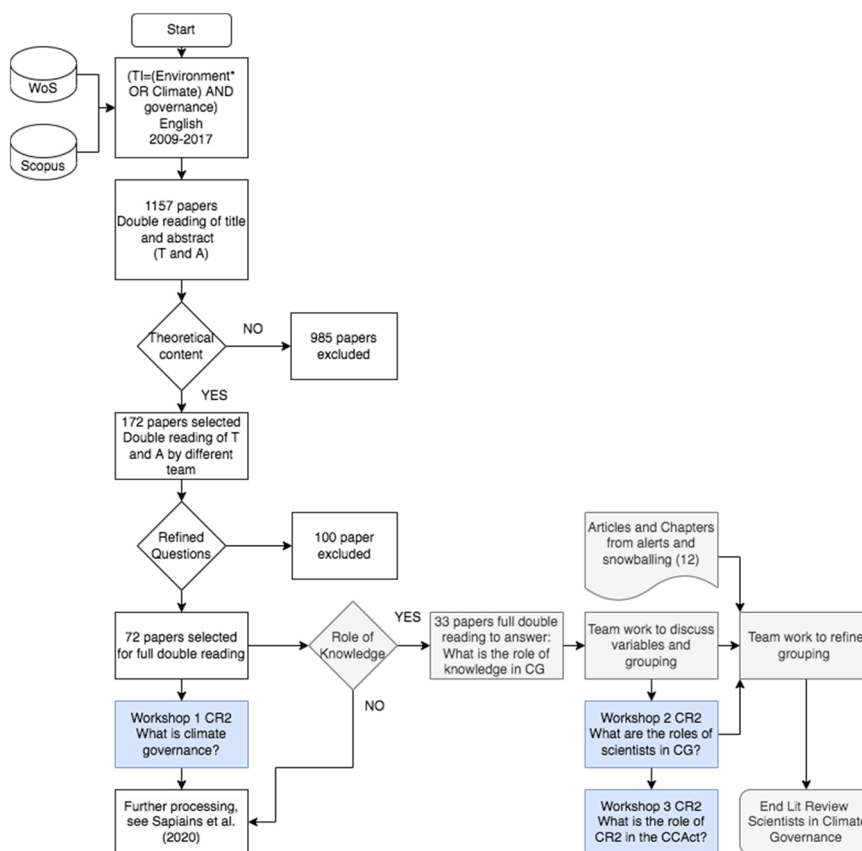


Fig. 1. Workflow of the process. Note: Activities in grey and blue of the flow chart are methods applied for this manuscript. Activities without colouring belong to methods used in Sapiains et al.

Source: Authors' elaboration.

may play. For example, by recognizing the role of the IPCC and other scientific organizations in framing problems, providing evidence, and engaging in policy matters. Climate governance could be presented as a multilevel web of interactions among different types of actors involved in climate-related decisions. The State is only one actor; other contributors include the private sector, international and transnational organizations, civil society and scientists.

The literature review in this section goes deeper into the role of scientists in climate governance and clusters the literature into four groups: usable scientific knowledge, politics of science, critical visions and hybrid approaches (See Fig. 1).

3.1. Usable scientific knowledge

A significant portion of the literature is inspired by the seminal text of Cash et al. (2003) on the so-called 'knowledge systems' applied to sustainable development that '(...) mobilize knowledge that is seen as salient, credible and legitimate in the world of action' (Cash et al., 2003: 8088). Science is understood in terms of effectiveness and can be integrated into decision-making through 'boundary management' or 'boundary work carried out at the interface between communities of experts and communities of decision makers' (Cash et al., 2003: 8086). The three characteristics highlighted in this approach – salience, credibility and legitimacy – are often cited (Koetz et al., 2012; Lemos, 2015; van Kerkhoff and Pilbeam, 2017) as well as their corollaries –communication, translation and mediation (van Kerkhoff and Pilbeam, 2017)– which reveal the influence of this model within the literature.

In this context, the tasks of communication, translation and mediation are indispensable to present information in a usable format for policymakers or managers. These activities are the primary domain of

the so-called 'boundary organizations': the 'organizations that play an intermediary role between the science and policy arenas' (Cash et al., 2003) that can connect with other boundary organizations, prompting 'boundary chains' (Lemos, 2015: 49).

Lately, literature shows also the emerging importance of involving stakeholders in this process, allowing them a certain degree of co-production within the policy-science interface between the 'producers and users of knowledge' (Kirchhoff et al., 2013; Lemos, 2015; Frantzeskaki and Kabisch, 2016; van Kerkhoff and Pilbeam, 2017; Hoppe et al., 2017; Oliver and Cairney, 2019). Some authors (Cook and Overpeck, 2019) have identified this model as the linear model of science-policy interaction, where scientists 'have an analytical role, furnishing information in a dispassionate way for the guidance of those in power' (Owens in Cook and Overpeck, 2019). An extreme version of this approach is that scientists play, at best, the role of the 'honest broker' (Pielke, 2007; Oliver and Cairney, 2019). However, the consideration of the relational attributes of salience, credibility and legitimacy depends on a social judgement by relevant actors in the relationship.

3.2. Politics of science

A prolific literature on the role of scientists from scholars in international relations is present in our literature review, and it accounts for the major part of the sample, ranging from more 'pure' to more hybridised approaches. Its distinctive feature is a greater attention to international dynamics of power and commonly observed patterns of international cooperation among scientists (e.g. a significant number of papers highlighting the role of the IPCC). As Hoppe and colleagues explain: 'from a macro-perspective, science-policy interactions are ongoing co-productions between the scientization of politics and the

politicization of science' (Hoppe et al., 2017: 284).

An important part of this literature draws on Haas' work on epistemic communities (1992) as political entrepreneurs within the international environmental and climate change field. According to some authors (Saunders et al., 2017), the framework of the epistemic communities suggests a separation between science and policy, acknowledging the usability of science and advocating for the independence and autonomy of science to preserve its political influence. Accordingly, this would guarantee epistemic communities an authoritative role to 'speak truth to power' (Haas, 2004). The sources of the authority of these 'science networks' (Gupta, 2012; Rousselin, 2015) are also linked to the mutual recognition among peers within the community, and the search for scientific consensus on certain topics, resulting in international scientific cooperation, sometimes institutionalized via the 'epistemic institutions' (Meyer, 2013), such as the IPCC, the IPBES, the International Whaling Commission, etc.

At the intersection with more critical visions, questions of legitimacy and legitimation are present in the debate about the credibility of the scientific record of the epistemic communities, especially after the controversies surrounding the IPCC praxis in terms of transparency (Gupta, 2012; Koetz, 2012; Beck et al., 2014; Gupta, 2016; Hoppe et al., 2017) or the logic underlying some 'technologies of government' such as environmental assessments (Assmuth and Lyytimäki, 2015; Cashmore et al., 2015). Indeed, there is an imperative of 'challenging the boundaries of science' (van Bommel et al., 2016) by focusing on co-production at the science-policy interface aiming at overcoming the linear model of knowledge production (Assmuth and Lyytimäki, 2015; Cashmore et al., 2015; van Bommel et al., 2016; Gupta, 2016).

In summary, these authors highlight 'the influence of science geopolitical settings [and] the existence and dynamics of epistemic communities' (Cashmore et al., 2015: 92). They also analyse the power dynamics in a climate change governance context, where the nature of power and the political problem are respectively unorganized and unstructured (Robertson, 2010; Koetz et al., 2012; Vink et al., 2013; Gupta, 2016; Pasztor, 2017; Hoppe et al., 2017). In these realms, the classic paradigms of environmental management cannot be applied to a super wicked problem such as climate change (Patt, 2017). As Biermann and Pattberg observe: 'global environmental governance, which is inherently future oriented, has thus increasingly come to rely on new forms of evidence and new forms of validity and reliability of empirical knowledge' (Biermann and Pattberg, 2012: 274).

3.3. Critical visions

In our review, we found references to critical perspectives as sources for theory building. Indeed, some authors acknowledge the need for integrating the insights from science technology and society studies (STS) as well as post-colonial studies, feminist studies, and indigenous studies. From a critical theory perspective, complex narratives on climate change governance and knowledge would need to consider the vast universe of possibilities for action. Yet these authors do not seek to establish strategies or definitive models that could apply to any context in any situation, but rather they try to cover technical and lay work, scientists and practitioners' views, by emphasizing ethnographic/sociological methods and case studies (Steffek, 2009; Taylor, 2012; Rathwell, 2015; Di Giminiani, 2016; Delgado and Strand, 2010; Taber, 2017; Corral and Monagas, 2017). These critical visions are still considered marginal—at least in quantitative terms—within the scientific production on the role of knowledge in climate governance.

The reference to Jasanoff, 1990, 1995, 2004, 2012 works and STS approaches is common among some authors, in reference to the argument 'that the unitary and self-perpetuating positivist dimension of scientific knowledge ignores the plurality and heterogeneity of world-views, and hence the chiefly local dimension of knowledge' (Jasanoff and others in (Obermeister, 2017: 80). This argument is the basis for several authors to introduce the role of underlying epistemologies

(Taylor, 2012; Williams, 2013; Rathwell et al., 2015; Obermeister, 2017; van Kerkhoff and Pilbeam, 2017; Brinkman, 2017), advocating for 'epistemological pluralism' or 'polycentric global epistemologies' (Rathwell et al., 2015) as well as the well-known approach of the 'civic epistemology' (Jasanoff, 2005; van Kerkhoff and Pilbeam, 2017). The aim is to acknowledge that in a context marked by significant uncertainty about facts and where values are in dispute and the stakes are multiple, the need for integrating different types of knowledge becomes crucial.

Along the same lines, some authors examine different power asymmetries, including those linked to knowledge and gender. This work has its roots in feminist philosophies of science and history, as well as in feminist geographers. In this sense, Donna Haraway's (1988) concept of 'situated knowledge' has a significant footprint in some of the works examined (Leino and Peltomaa, 2012; Bee et al., 2015). For Haraway, 'situated knowledges are about communities, not about isolated individuals. The only way to find a larger vision is to be somewhere in particular' (Haraway, 1988: 590). This conception rejects 'the ideological doctrines of disembodied scientific objectivity' and, as Bee et al. (2015) observe: 'the ways of being and knowing that are produced through contemporary climate governance produce a profound dismissal of non-science based forms of knowledge and a failure to consider the everyday space in which action and responsibility are negotiated and enacted under highly uneven power relations' (Bee et al., 2015: 4).

To sum up, there is a greater emphasis within these approaches on co-production of knowledge in local contexts and 'mutual learning' (Williams, 2013) through experimentation (Taylor, 2012; Paschen, 2014; Delgado and Strand, 2010), often from the perspective of gender or indigenous studies (Taylor, 2012; Williams, 2013; Assmuth, 2015; Bee et al., 2015; Obermeister, 2017; Rathwell et al., 2015; Delgado and Strand, 2010). Their interest is somehow to demolish the expert-lay dichotomy, towards a model including further lay participation (Steffek, 2009; Williams, 2013; Assmuth, 2015; Delgado and Strand, 2010). There is also an explicit critique of the pervasiveness of Western epistemologies in the construction of knowledge (Taylor, 2012; Williams, 2013; Rathwell, 2015).

3.4. Hybrid approaches

A final category that can be identified, hybrid approaches, is a combination of the previous categories. In fact, a subset of articles integrates at least two of the three previous approaches, prompting a more nuanced comprehension of key issues and recurrent trends within the literature.

In this approach, authors acknowledge the implicit or explicit assumptions about the limitation of examining the subject of study from a single perspective—some authors consider that interdisciplinary work is imperative while addressing this issue (Rathwell et al., 2015; Saunders et al., 2017; van Kerkhoff and Pilbeam, 2017). For authors who integrate two approaches in a more pragmatic fashion (Rathwell et al., 2015; van Kerkhoff and Pilbeam, 2017), 'learning by doing' would be a key feature (Williams, 2013; Saunders et al., 2017), including borrowing from the usable knowledge concepts discussed above or more critical visions such as STS or indigenous studies.

Similarly, we observe that a bigger picture of knowledge and power emerges while integrating classic 'usable knowledge' ideas and 'politics of science' visions (Koetz, 2012; Meyer, 2013; Hoppe, 2013), notwithstanding that some of the 'politics of science' foundational schools and authors (e.g. Haas, 2004) could be situated within the linear model of science-policy interaction (Cook and Overpeck, 2019), aligned with the idea of unidirectional transfer of knowledge from scientists to 'the power'. On the other hand, the main purpose for the authors to integrate insights from critical perspectives in their analysis would be to approach the role of knowledge within climate governance holistically, stressing the need for understanding that 'knowledge is dynamic, unstable and

does not necessarily easily settle into any pre-given categories' (Leino and Peltomaa, 2012: 160): and that there are 'ways of knowing, ways of seeing' (Boyd, 2010; Leino and Peltomaa, 2012; Williams, 2013).

When critical visions meet the politics of science approach, which has a strong focus on international dynamics, heterodox approaches emerge, as different epistemological stances merge. For example, situated knowledge's authors have a manifest will to develop a 'theory for action', in which 'effective governance of situated knowledge [would] require [d] dynamic interaction between the global norms and local forms of life' (Jasanoff and Martello in Leino and Peltomaa, 2012: 161). This would have thus its resonances in the way some authors explore the genesis of some 'objects' of climate governance. An example would be the 'framing' of the problem of climate change by scientists (Allan, 2017a, 2017b) bringing the topic to the political agenda, or the emergence of deforestation as an object of climate change governance (Boyd, 2010) decoupled from, for example, the biodiversity governance field. When critical visions meet the politics of science a need for understanding why, how, from where, and who structures a problem emerges (Bee et al., 2015; Allan, 2017a; Allan, 2017b). As a consequence, there is an implicit reconsideration of power structures settled a priori, especially concerning the 'framing' of certain problems of public interest: knowing and knowledge are therefore acts of power (Leino and Peltomaa, 2012; Taylor, 2012; van Kerkhoff and Pilbeam, 2017) and 'deliberation, negotiation and co-construction of knowledge become key functions in societies' (Assmuth, 2015).

In short, a wider view is supposed to provide a more complex and nuanced understanding of the role of scientific knowledge in policy decisions. However, potential dilemmas and contradictions can arise when integrating two epistemologically different approaches. The motivation for a wider view also brings tensions. For example, 'fixing' a narrower approach by adding a certain perspective to gain wider acceptance, especially considering that two approaches could have their own epistemologies based on different worldviews.

3.5. A blind spot in mainstream literature: Views from Latin America

The literature review systematically covered articles in mainstream international journals, indexed in WoS and Scopus. As with any selection of a bigger universe, it produces blind spots, in this case a significant lack of relevant literature on climate governance from the South. The results reinforce the idea that Latin American scholars are misrepresented in mainstream international academic literature on climate governance (Sapiains et al., 2020); and that their voices and publications circulate in other spaces, despite their potential to contribute to the literature on climate and environmental governance, including relationships between humans and nature (Blanco Wells and Gunther, 2019).

Latin American intellectuals have been part of the global debate on environmental sustainability from its beginnings in the 1960 s, constituting a tight regional network with strong international links and original contributions (Estenssoro, 2014; Vanhulst, 2019). Unequal power relations have been a central concern in Latin American environmental thinking evidenced in widespread criticism of dominant discourses and support for rather radical transformative perspectives (Leff, 2012; Ulloa, 2017; Svampa, 2019). Many authors understand the environmental crisis as a political issue, where environmental and social variables are clearly related. Their discourse on socio ecological sustainability relates to the local experiences of colonization, Latin America's peripheral position in the global market economy, economic dependence on extractive or raw material industries, and the unregulated exposure to pollution and environmental degradation (Estenssoro, 2014; Vanhulst, 2019). Climate change, as a singular topic, has not been a central topic for Latin American environmental scholars; as they tend to understand it as one more of the problems caused by inequality, and another reason to embark on the bigger task of unveiling the structural causes of uneven development (Postigo et al., 2013).

Another stream of Latin American literature we could relate to the

role of scientists in climate governance comes from the geopolitics of knowledge in the context of modernity and colonialism (Rivera Cusicanqui, 2018; Mignolo, 2001, 2002, 2007). This literature is also unspecific in relation to climate change. In this tradition authors discuss, for example, the relationships between science and society, taking an emancipatory stand close to subaltern and decolonial studies (Rivera Cusicanqui and Barragán, 1997; Medina et al., 2014).

A few years ago, ECLAC brought together the "founding thinkers of sustainable development" who wrote a book discussing the major environmental and development issues being debated in the region and the world (Gligo et al., 2020). This book confirms what we assumed tentatively from our readings: the main discussion amongst Latin American scholars is not focused on climate change as a singular issue, because they understand the environmental crisis, aggravated by climate change, to be the result of an "unbalanced, unjust and exclusionary international economic order" (our translation). They question the current style of development, presented as the only possible path for humanity under the implausible idea of unlimited growth. This might be one explanation of the misrepresentation of Latin American scholars in our review.

4. Mainstream literature versus practice in the South: Case study

As a case study to situate a Southern perspective towards the literature review, we use the case of our research centre. (CR)² was founded in 2013, initially for five years and renewed for the period 2019–2023. Its funding comes from a government grant for centres of excellence, the FONDAP program, founding around a dozen selected centres for five-years and renewable for another five. (CR)² has a record of outstanding performance evaluations—measured mainly by publications in mainstream international journals and a yearly external review made by an international scientific panel. The organizational model considers approximately 60 part-time researchers and 15 staff members. Researchers are doctoral graduates from different disciplines, most of them did their postgraduate studies in the U.S. and Europe, and a majority hold contracts in different universities throughout the country and are committed to a dedication of roughly ten hours a week to contribute to (CR)² research performance. The Center's long-term goal is to become and remain a major player in developing climate and resilience science and contribute to the country's goals of achieving low-carbon, sustainable development according to the Paris Agreement and the Sustainable Development Goals (SDGs) ((CR)², 2017). The case is used to examine how the literature reviewed relates to (CR)² scientists' perspectives and insights.

In this section, we discuss the context of scientific production in Chile, and the results from the three workshops, each responding to a question: what this group understands for climate governance, the roles of scientists in climate governance, and the role of an institution like the (CR)² in the Climate Change Act discussion in Chile, from the dialogue between mainstream literature and personal experience. The process of the workshops is synthesized in Fig. 3.

4.1. Production of scientific knowledge in Chile

The research community and the amounts of funding allocated for research in Chile are small compared to other OECD countries (Anon, 2015). Production of scientific knowledge is concentrated in universities which compete for research grants to fund their research endeavours. Since the University Reform of 1981, financial support for public and private universities has come in more than 80% from students' fees, the highest participation among OECD countries. Direct State grants are limited, reaching a maximum of 25% for some State-owned universities. The competition for research funding is intense and involves private and public universities, as well as other research institutes. The Chilean research system is not an exception in Latin America, although it is more

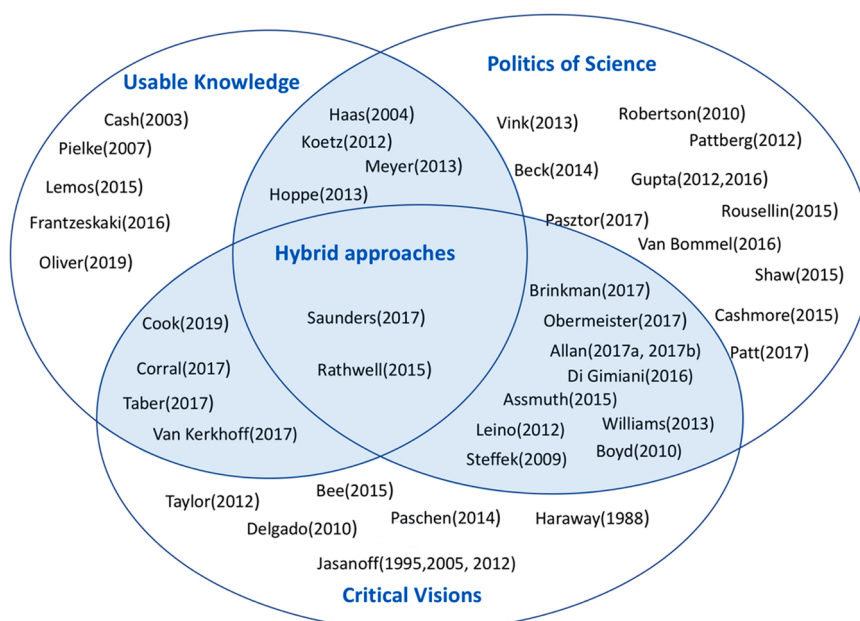


Fig. 2. Clusters of Literature on Knowledge and Climate Governance. Note: For space reasons, Fig. 2 includes only first authors and no spaces. Source: Authors' elaboration.

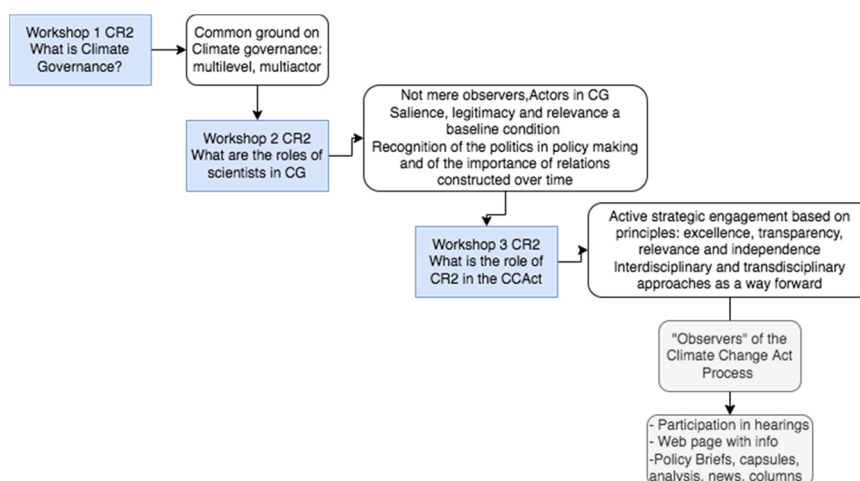


Fig. 3. The three workshops with scientists from (CR)². Source: Authors' elaboration.

extreme in its dependence on funding from students' fees.

Universities and research centres have strong ties with government and often complement government capacities by acting as official laboratories for regulation requirements, members of advisory boards, and competitors of the private sector in providing expert consulting. The neoliberal ideal of a small technocratic state, predominant in Chilean politics, has made the State dependent on external advice for scientific and technical issues and it created a market populated by a diversity of offerings, and universities' limited research budgets create incentives for competing for consultancy projects.

The research funding policy in Chile is guided by the ideals of scientific excellence and usable knowledge, closer to the first approach identified in the literature review. The main funding agency, ANID (National Agency for Research and Development, formerly CONICYT), bases its processes of selection and evaluation on scientific performance, measured by numbers of publications in international indexed journals. After the publishing criteria come indicators on the lines of 'usable science', in the political line to the subsidiary role of the state in the

promotion of a market-oriented economy, established in the 1980's Constitution. Projects receiving public allocations should be accountable by contributing with formation of human capital and provision of evidence for policy making. Since its implementation in the mid 1980 s, this approach can be considered successful in reaching its goals of scientific performance considering Chile increased seven times its scientific publications in WoS (Web of Sciences indexes) (Cárdenas et al., 2015:7).

However, the construct of 'excellence' in terms of presence in international rankings may clash with the 'usability' of scientific results. The unevenness of the global terrain upon which research takes place seems to be a common feature in the Global South. For example, Collyer (2016) calls attention to the maintenance of North-South inequalities partly as consequence of the centrality of academic publishing in knowledge production. Connell (2014) shows the double effort of 'Southern knowledge workers' having not only to achieve a place in the global labour system based on publication indexes but also create research programmes and get funding to address local problems. This problem has been discussed also by Latin American scholars at least

since the 1990 s (Arellano Hernández et al., 2012; Invernizzi and Davyt, 2019) and it remains unsolved (Beigel, 2018a, 2018b).

In Chile, Environmental and Climate Sciences are relatively new research areas. The field of environmental policy began its development in the 1990 s, as in most Latin American countries (O’Ryan and Ibarra, 2017). The first comprehensive Chilean Environmental Law, enacted in 1994, makes it compulsory to include scientific evidence in government environmental management decisions and introduces, for the first time in Chilean Law, processes of consultation (public hearings). Regarding climate change, Chile is a signatory of the main global climate agreements, the country ratified the Paris Agreement and presented its National Determined Contributions in 2017. In July 2018, the Ministry of Environment announced the preparation of a project for a Climate Act to be presented to the Parliament. Chile was the originally designated host country for COP25, but the event finally took place in Spain due to social unrest in Chile the last term of 2019.

4.2. Exploring the (CR)² experience

As part of (CR)²’s institutional development process, there is a continued tension for defining what its specific role should be, as a privileged publicly-funded research centre on climate science. This section presents results from 2018, when the initial funding period was ending and we were applying for a five-year continuation grant.

4.2.1. Understanding climate governance

An initial paper by scientists of (CR)² proposed the need to advance a polycentric approach to climate governance in Chile (Arriagada et al., 2018), concluding that it did not adequately consider, for example, asymmetries of power observed in Chile. Building on that, (CR)² scientists agreed that key characteristics of climate governance are its multilevel and multi-actor dimensions and the need to consider power relationships.

(CR)² scientists realized that they were not mere observers in the field. They were actors in the field of climate governance in Chile, at different interconnected levels, including government agencies, state organisms, other research centres and international organizations. Scientists observed a relative absence of the (CR)² relations with civil society. The transnational approach of the Centre through belonging to and promoting relations with international organizations (e.g. International networks of research centers) was highlighted along with its role as a provider of scientific evidence. Discussion showed the importance of values and principles for every actor playing a role in climate governance. Participants mentioned the relevance of the (CR)²’s declared principles, including excellence, transparency, relevance and independence ((CR)², 2017).

4.2.2. Discussing the role of scientists in climate governance

(CR)² scientists shared Cash’s proposition about useful science, thus their science should be considered salient, legitimate and credible to be useful (Cash, 2003). However, despite acceptance of ‘usable science’ as a reasonable relationship between science and climate governance, scientists’ were aware of the role of politics in climate-related decisions and the importance of taking into consideration power relations and actors’ interests. Salience, legitimacy and credibility were a baseline condition required for playing a significant role in policy discussions, in particular for providing sound evidence. From this baseline, the specific roles played by scientists ultimately depended on actors’ power positions and on the active strategic engagement from the scientists’ part.

The perspectives provided by the literature on ‘politics of science’ resounded with the experience of most of the scientists. Having performed as expert advisers in Chilean climate governance, they recognized the political side of decision-making. The idea of ‘usable knowledge’ seemed for a majority too simplistic and even naive. Scientists’ experience coincided with Koetz et al. (2012) in recognizing that relationships with decision makers were cultivated over time. They

found it difficult to communicate uncertainty when giving policy advice and they observed absence of non-scientific knowledge in climate governance.

According to the Latin American literature, the idea of ‘usable science’ permeates regional science and technology policy (Arellano Hernández et al., 2012), and it is clearly present in the Chilean funding system. The expectations of science to be useful coexist with demands for excellence, where excellence is primarily measured by the funding agencies as the number of international publications in high impact indexed journals. However, (CR)² scientists’ experience and Latin American literature agree in arguing that these two requirements do not necessarily lead to the desired policy relevance (Beigel, 2018a, 2018b).

Scientists also recognized that (CR)² had ‘good marks’ in the terms of the funding agency. Scientists published in highly ranked international journals and belonged to international scientific networks; both characteristics contributed to gain them credibility and legitimacy in the local context. They have a relevant presence in local media and their Reports to the Nation (e.g., (CR)², 2017) provide evidence of efforts to make science ‘usable’. However, they were not satisfied with their self-perceived low impact on influencing climate policy. Their experience resonates with Latin American literature on knowledge production, where the political dimension has been highlighted as a distinctive feature throughout history to influence policy making (Arellano Hernández et al., 2012; Kreimer and Vessuri, 2018). A conclusion of the Workshop pointed towards ‘being more aware of the politics’ in climate governance.

Another area of shared understanding in our group of scientists was acknowledgment of the complexity of climate governance. In their views, different perspectives should be considered to address this wicked problem, and a way forward should be interdisciplinary and transdisciplinary approaches. The recognition of multiple possibilities for strategies and action resounded with ‘critical visions’ and ‘hybrid approaches’ in our literature review, although it stayed mainly within the integration of different types of *scientific* knowledge. Albeit it was not clear how these could or should be undertaken. Even so, interdisciplinary research is a developing trend in the Centre with growing attention and commitment. Conscientious efforts to go in this direction include the definition of ‘integrative questions’,² to organize collective work.

As a conclusion, we observed an underlying common ground for the discussion in tacit understandings of the profound social, political and cultural rules governing the acceptance of certain knowledge practices, what Jasanoff (2005) has called ‘civic epistemology’. On the one hand, the figure of the expert is part of policy making in Chile’s technocratic tradition and university researchers hold high credibility, particularly those from the ‘traditional’ universities.³ Trustworthiness of scientists remains high in times where politicians and government officers have lost credibility. On the other hand, scientists’ values and beliefs mirrored Latin America’s traditions of public universities contributing to the foundation of the Republics and the historical movements reinforcing their social role, for example, the Cordoba’s Reform, Argentina 1918, with deep influence all over the region (Silva, 2008). From a hybrid approach, the appeal of ‘usable knowledge’ can be explained by the cultural patterns, mentalities and collective behaviours present in Chilean society and by our group of scientists as members of that society. In this sense, this hybrid approach appeared tacitly in the discussion, close to the proposition of ‘knowledge governance’ (van Kerkhoff and

² Integrative questions are a device within the Center which aims at fostering synergies and collaboration among researchers on a chosen topic or question for a specified period of time. It usually results in a comprehensive report addressed to the nation and one or more collective papers.

³ ‘Traditional universities’ is a term often used to name universities created before the 1980’s Reform and represented by the Council of University Chancellors (CRUCH, for its name in Spanish).

Pilbeam, 2017) -which draws together Cash's et al. knowledge systems for sustainability with Jasanoff's civic epistemology-. Our scientists recognized that interventions took place in a knowledge system inserted in a society with profound and stable patterns of social, political and cultural practice, forming the rules of a civic epistemology.

Finally, the group expressed a preference for trying out new strategies to influence climate governance in Chile. We saw legitimacy and the legitimization process in the sense presented by Leino and Peltomaa (2012), i.e., as context specific and interdependent phenomena. Taking an active role involves not only accumulating scientific knowledge but also learning to build relationships with actors in climate governance, particularly policy makers.

4.2.3. (CR)² and Proactive Policy Involvement

In July 2018, the government announced the beginning of a process of drafting a bill for the first Climate Change Act of the country. The project opened with a participatory process before its presentation to the Congress. The Governance and Interface team of the (CR)² saw this as an opportunity for proactive involvement. Our team proposed scientists to get involved in activities related to the discussion of the Act, actively contributing via the 'Climate Change Act Observatory',⁴ a website providing information on the process of elaboration and discussion of the law. This initiative aimed at filling information gaps fostering effective participation of different social actors, including legislators and civil society. The Observatory was introduced as a (CR)² initiative contributing to transparency in the legislative process of the Climate Change Act.

The scientists of (CR)² agreed that this was an important opportunity to influence policy-making and the invitation to contribute was accepted by most (CR)² members. They saw opportunities for themselves in providing scientific evidence and outreach, spreading information to citizens, monitoring and discussing scientific issues related to the law. Other discussions took place, particularly on participation in technical committees and possibilities for taking a proactive advisory role. However, there were doubts relating to how that involvement could jeopardize the Center's independence and how could the (CR)² maintain a position for providing scientific evidence that was considered credible and legitimate.

An important conclusion was that if (CR)² wants to influence decisions regarding climate governance, it is not enough to do excellent and relevant science, neither to have a reputation of a credible and legitimate voice to advise policy making or to understand the politics of climate governance. All the above were seen as conditions enabling the opportunity of providing evidence that could be considered in climate governance. To be part of the discussion towards climate action, (CR)² needed a seat at the table. This implied proactive involvement as a Centre, and not only at the individual level, supported by (CR)² shared values, and the country's civic epistemology, with believes in a duty of science to serve the country, providing evidence as a legitimate and credible voice. Active participation in the Climate Change Act Observatory was a first experience towards taking that seat and there was enough willingness to give it a try as collective action.

5. Conclusion

The role of scientists in climate governance is a contested issue, relevant for many research centres aiming at having influence in policy decisions given the urgency of the climate crisis. To better understand this role, we did a revision of international mainstream literature and identified four main approaches, which we labelled: scientific usable knowledge, politics of science, critical approaches and hybrid approaches. It also shows a blind spot regarding literature from the Global South.

Inspired by action-research traditions, literature findings were discussed with (CR)² members during three workshops designed to better define the role of the Centre in influencing climate governance in Chile. The need for science to be relevant, credible and legitimate to be usable (Cash, 2003) was a common ground, and it seemed amenable to views proposing to improve the relationship between climate scientists, policy makers and other actors. Building long-term relationships between scientists and policy-makers (Koetz et al., 2012) was deemed a key component of such an approach. However, there was discussion on adopting a role based on the proposition of a collaborative model of relations between scientists and other societal actors, which acknowledges the political nature of science for policy and recognizes the uneven opportunities of political influence among actors (Koetz et al., 2012; Allan, 2017a, 2017b). Latin American tradition of awareness of unequal power relations weighed in the willingness of this privileged group in taking responsibility for active involvement in influencing policy.

Despite acceptance of usable science as a reasonable relationship between science and climate governance, the role of politics in climate-related decisions and the importance of taking into consideration power relations and actors' interests was considered necessary. Cash's proposal relating to the characteristics of science is necessary, but not sufficient. It is useful to get a "seat at the table", i.e., to take a position recognized by policy makers. This is key because the role that scientists play ultimately depends on the actors' positions and their active strategic engagement in policy discussions. The need to get a "seat at the table" was perhaps the main desire brought to light by the exercise and the strategic objective embraced by (CR)² at the end of 2018. The following two years saw an active involvement of (CR)² in climate governance, in the Scientific Committee for COP25 and as a technical advisor during the discussion of the Climate Change Act.

Afterword

The process of slow and steady work in prompting an internal discussion on the role of scientists in climate governance in Chile was overtaken by a series of tumultuous events. In January 2019, the Ministry of Environment made the unexpected announcement that COP25 would take place in Chile by the end of the year, in October a deep social crisis took government officials by surprise. COP25 was finally moved to Spain and Chile has still to address social demands arising in 2019. (CR)² took a place in the Scientific Committee for COP25 and as an official technical advisor in the Law discussion. This proactive strategy is being monitored by colleagues at the Centre. It shows new challenges for keeping the safe ground of having recognition as doing relevant science that is legitimate and credible, under the self-declared values of excellence, transparency and independence.

CRedit authorship contribution statement

Conception and design of study: Cecilia Ibarra, Guadalupe Jiménez, Raúl ORyan, Rodolfo Sapiains; Acquisition of data: Cecilia Ibarra, Guadalupe Jiménez, Raúl ORyan, Gustavo Blanco, Luis Cordero, Ximena Insunza, Pilar Moraga, Rodolfo Sapiains; Analysis and interpretation of data: Cecilia Ibarra, Guadalupe Jiménez, Raúl ORyan, Gustavo Blanco, Luis Cordero, Ximena Insunza, Pilar Moraga, Rodolfo Sapiains; Drafting manuscript: Cecilia Ibarra, Guadalupe Jiménez, Raúl ORyan; Revising the manuscript critically for important intellectual content: Maisa Rojas, Gustavo Blanco, Luis Cordero.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

⁴ www.leycambioclimatico.cl

Data Availability

No data was used for the research described in the article.

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