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Science–policy interfaces in the face of climate change

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Vincent Blanford · Marie Hrabanski
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Climate Impacts and Challenges in Agriculture, Forests and Food Systems

Perspectives on the Global South

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Second Edition



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Chapter 27

Science–Policy Interfaces in the Face of Climate Change



Carolina Milhorange, Antoine Perrier, Julien Demenois, Vincent Freycon, Camille Piponiot, Paul Luu, Adèle Gaveau, Marie Hrabanski, and Sélim Louafi

Abstract The Covid-19 pandemic and climate-related crises have heightened demands to integrate scientific knowledge into policymaking, often through science-policy interfaces (SPIs) that facilitate dialogue between scientists and decision-makers. These complex issues require collaboration due to uncertainties and conflicting values. While evidence-based policymaking assumes science guides action, in reality political decisions are influenced by emotions, interests, and diverse knowledges. This chapter explores the non-linear nature of science-policy interactions, analyzing decision-making tensions and the role of SPIs in fostering collective learning on climate challenges.

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The Covid-19 pandemic, natural disasters exacerbated by climate change, and recurring food crises have reinforced societal demands to integrate scientific knowledge into political decision-making (Cairney et al. 2016; Weible et al. 2020). Moreover, numerous international conventions rely on scientific assessments, notably those conducted by the Intergovernmental Panel on Climate Change (IPCC) and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES).

The term “science-policy interface” (SPI) carries multiple definitions within the literature, but it is generally understood as an institutional arrangement, forum, process, or organization designed to facilitate dialogue between scientific advice and political decision-making. The establishment of these interfaces rests, among other things, on the hypothesis that certain particularly complex issues—such as global food security, climate change, or biodiversity loss—require close and dynamic interaction between scientists and policymakers. This necessity arises from the cross-sectoral nature of these challenges, the high degree of uncertainty surrounding the state of knowledge, and pronounced divergences regarding the values to be prioritized in addressing them (solidarity, efficiency, equity, responsibility, etc.) (Head 2022). Within this context, scientists strive to illuminate the multiple causes, values, and bodies of knowledge at stake, while establishing links between problems and potential solutions and providing analyses and interpretations capable of influencing political strategies.

However, the interactions between scientific research and political decision-making are not a novel subject. For over 40 years, the social sciences and humanities have studied these interactions, moving beyond the traditional linear model. This model rests on the assumption that knowledge precedes action and that the public—often perceived as insufficiently informed—can be enlightened by reliable information. The evidence-based policymaking approach exemplifies this model by postulating that policies should be grounded in scientific evidence to address societal challenges. Yet, this ideal encounters reality: scientific evidence is frequently contested, and the political process involves a diversity of actors with varied interests. In practice, policymakers mobilize a mixture of emotions, diverse knowledges, and cognitive shortcuts to advance their policies (Cairney 2013).

Thus, the interface between science and political decision-making, far from being linear or straightforward, raises fundamental questions about the nature and modalities of these interactions. This chapter is organized into three parts to explore these questions. First, it proposes an analytical framework for interactions between science and political decision-making, drawing on technocratic, decisionist, and pragmatist models. Second, it examines decision-making processes within SPIs, revealing the tensions, compromises, and power asymmetries that influence these interactions and the construction of public policies. Finally, it discusses the potential of SPIs to foster collective learning in the face of climate challenges, while addressing the issues related to their implementation and sustainability.

27.1 Revisiting Science–Policy Relations

This section provides a brief presentation of different analytical frameworks and concrete examples to explore the interactions between scientists, policymakers, and other actors in the climate and environmental fields (Boxes 27.1 and 27.2). It highlights the complex dynamics of these interactions, both in the formulation and implementation of public policies. The analysis invites a deeper understanding of political processes to better grasp the tensions and compromises that emerge from them.

27.1.1 *Key Conceptual Models*

Three key models illustrate contrasting perspectives on the interface between science and policy-making, depending on the relative importance given to science or politics in terms of control and authority. These models, ranging from political predominance (decisionist model) to scientific predominance (technocratic model), are part of an academic conceptualisation developed over time thanks to the contributions of many thinkers in political science, philosophy, and sociology (including Jürgen Habermas, Sheila Jasanoff, Bruno Latour, Roger Pielke, Laurens Hessels, David Guston, John Dewey, among others). These models, referred to as ideal types, aim to illuminate the dynamics of interaction between science and public decision-making. They do not reflect the full richness of this literature and should not be interpreted as opposing frameworks or as reflecting the positions defended by specific actors (Dressel 2022).

The technocratic approach conceives political practice as the execution of directives defined by a scientific and technical elite. Rooted in a positivist vision of science, it seeks to guide public policies through “optimal” solutions, based on available knowledge. This approach is based on the idea that scientific expertise is sufficient to solve public problems, minimising the influence of power relations, values, and beliefs in decision-making. It suggests an intrinsic superiority of scientific solutions over those derived from a democratic and participatory debate based on societal and economic values. As a result, prescriptive science leaves little room for critical dialogue and negotiation between technical expertise and societal values.

The decisionist approach clearly distinguishes the roles of experts and policy makers, attributing to the latter the primary authority to define political objectives. In this model, science is limited to providing facts and technical options, while the final choices are made by political actors, according to their priorities and preferences. Once the objectives are established, science objectively determines the means to achieve them, thus preserving value-free research and a neutral role of science in public debates. This approach sees science as a reliable source of knowledge, capable of guiding concrete actions without interfering in the definition of values and objectives. However, by confining science to an instrumental role, this approach

neglects the need for collective reflection on complex issues that often require multi-actor negotiation or dialogue. It also raises questions about the real possibility of separating values from facts in scientific research and the ability of science to maintain its neutrality in political or social contexts imbued with values.

Critics of the approaches mentioned above highlight the deeply dynamic interactions between science and political decision-making, where values and political objectives influence not only scientific research, but also its application (Dressel 2022). The IPCC illustrates well how some individuals take on both scientific and political roles during their career, or even simultaneously, depending on the situation. Although IPCC reports are based on rigorous scientific work, they also formulate political diagnoses concerning the evolution of societies and propose strategic visions for the management of forests, soils and other ecosystems on a global scale (Louafi 2021).

The pragmatist approach considers the scientific and political spheres as interdependent, rather than separate. According to van den Hove (2007), this interdependence fosters constructive interactions, while encouraging dialogue and negotiation. This approach emphasises reflexivity, allowing scientific and political actors to constantly reassess and adapt their methods and perspectives based on feedback and contextual changes. This approach insists on the need to recognise and communicate the uncertainties inherent in science, thus enhancing transparency and collaboration. However, it presents challenges, including the risk of leading to epistemological relativism due to the social and historical construction of scientific knowledge, and the complexity of its practical application. Moreover, by explicitly admitting the social and politico-economic influences on scientific production, this approach may inadvertently encourage excessive politicisation of science.

The idea of co-production of scientific knowledge and social contexts dates back to the earliest research on science-policy interfaces. Yet, many international initiatives and some of the literature continue to rely on simplistic linear models, centred on science directly feeding political decisions. These approaches mask the complexity of the relationships between research and policy as well as the processes of formulating and evolving public policies.

Box 27.1 Agroforestry in Ivory Coast: Is Science an Arbiter of Political Decisions?

In Ivory Coast, although agroforestry is an ancient practice, it has seen a resurgence of interest since the mid-2010s, particularly as a response to increasing deforestation and to ensure the sustainability of cocoa production. Integrated into political discourse and sustainability standards, agroforestry is now seen as an increasingly consensual solution for the sustainability of cocoa. However, the decision regarding which agroforestry system to

(continued)

Box 27.1 (continued)

support involves political choices at the confluence of sometimes contradictory objectives. For example, agroforestry is practised both in areas previously cleared with the aim of reforestation and in preserved forests, leading to their deforestation or degradation (Zo-Bi and Hérault 2023).

In this context, some decision-makers see science as a legitimate arbiter for establishing the standards for implementing agroforestry systems favoured by public policies and international projects. However, this recognition can expose scientists to risks of instrumentalisation. They are regularly solicited by institutional actors and private companies to establish normative criteria concerning, for example, the number of trees per hectare, the species to plant, the necessary level of shade and the role of farmers in these systems. While these criteria and indicators may initially seem to be technical considerations, they are actually the result of political compromises and negotiations. Their application in rural areas and in the classified forests of Ivory Coast is not limited to a scientific approach, but also involves a delicate balance between economic, environmental and political imperatives (Di Roberto et al. 2023).

Box 27.2 The Role of Expertise in the Great Green Wall

The Great Green Wall project, launched in 2007 by eleven African countries, aims to restore and green the Sahelian lands over 7000 km, from the Atlantic to the Red Sea. However, despite strong political will and significant funding, its implementation remains uneven and the results achieved are mixed.

Several factors explain this partial failure. The policies of planting, largely based on biophysical scientific knowledge and professional and managerial approaches, has overlooked social and economic dimensions. This top-down designed project encountered various obstacles, including low participation of local populations in the restoration process (Cesaro et al. 2022). This approach generated tensions with pastoral communities, who saw their transhumance practices hindered. Moreover, local resource governance did not always respect established rules, exacerbating difficulties (Mugélé 2018).

In the face of these challenges, many researchers and technicians advocate for a better consideration of the sociopolitical specificities of each context. That's why, in recent years, various initiatives have been launched to encourage dialogues between scientists from different fields (social sciences, agronomy, environment, geography...) and political actors (Mugélé 2022).

27.1.2 Decision-Making Processes in Public Policy Design

In a context where the boundaries between science and political decision-making are fluid, it is essential to better understand the decision-making processes and the formulation of public policies. This invites a reassessment of certain preconceived ideas, particularly the one that science would provide objective and decisive knowledge for political decisions (Louafi 2021). This analysis also invites us to move beyond the simplistic vision of a unitary state, often reduced to the sole actions of ministers and Parliament. Three key messages emerge from this reflection:

Public policies go beyond state interventions alone and mobilise a multitude of actors at different levels, often in an uncoordinated manner. The boundaries between the public and private sectors become blurred, paving the way for a diversity of actors at the interface of these two spheres. This phenomenon, amplified by liberalisation, privatisation and globalisation, has fostered the development of various partnerships, the integration of private standards in the public sector, and the increasing involvement of NGOs, international agencies and private entities in the development and implementation of policies (Hassenteufel 2011).

Contrary to a rational vision centred on problem-solving and informed debates, the political process is often unpredictable and discontinuous. This process is shaped by the way decision-makers set priorities, establish objectives and choose specific instruments. A variety of public and private actors participate in it, sometimes forming coalitions around common paradigms—values, worldviews—to support or challenge certain decisions (Jenkins-Smith et al. 2014). The resulting policy is not necessarily dictated by science, but is rather influenced by factors such as the role of key actors, crises, economic contexts, negotiation frameworks, institutional changes and the support of other stakeholders.

Political decisions, taken at different levels, are accompanied by implementation processes often marked by vague objectives, conflicting interests and asymmetrical means. This opens the way for interpretations and decentralised decisions by the actors involved. Implementation reveals not only how a public programme is applied, but also how it is appropriated, sometimes deviating from its initial design (Lascoumes and Le Galès 2018).

These dynamics underline the importance of understanding the public action paradigms that intersect in the formulation of public policies as well as the tensions, power relations, bureaucratic routines and institutional factors that accompany them.

Climate, forestry and agricultural policies reveal tensions and synergies between various objectives: environmental conservation, food security and socio-economic development. These objectives, often interconnected but sometimes contradictory, are particularly evident in the management of landscapes modified by human activity. In West Africa, particularly in Ghana and Côte d'Ivoire, the cultivation of cocoa, coffee, rubber and oil palm, established on former forest landscapes, illustrates the effects of the disappearance of more than 80% of forests since 1900 (Aleman et al. 2018). These territories, mixing agricultural lands, areas abandoned due to lack of fertility and residual forest fragments, embody the tensions between socio-economic imperatives, biodiversity conservation, indigenous peoples' rights and pressures from global agricultural markets. The construction of public policies for these

spaces requires an integrated approach, taking into account varied spatial and temporal scales as well as complex interactions and conflicts between sectors.

Finally, in the current context, marked by populism and disinformation, the complexity of interactions between science and politics becomes even more apparent. The administration of Donald Trump in the United States illustrates how scientific and democratic issues can be reduced to oversimplified narratives, leading to polarised decisions and reductive slogans. The rise of a “post-truth era” questions the authority of scientific work in public debate, weakening not only trust in science, but also certain democratic foundations (Soneryd and Sundqvist 2023). However, many works agree that science cannot be dissociated from society. Scientists, far from reducing reality to simplifications, enrich it and play an active role in social transformation processes.

27.2 Science–Policy Interfaces at the Nexus of Climate, Food Systems, and Ecology

This section explores the diversity of Science-Policy Interfaces (SPIs) in the climate field and their interconnections with food and ecological issues, examining their operation at different scales and in various contexts. Drawing from international, national, and territorial examples, it highlights their objectives, whether it be to contribute to the construction of public policies or to promote collective learning. It also analyses the structural and contextual challenges related to the production and application of scientific knowledge, incorporating North-South asymmetries and cross-sectoral issues.

27.2.1 How Science–Policy Interfaces Operate from Global to Local Levels

SPIs materialise in multiple ways and operate at different levels, notably through informal consultations, seminars, networks, projects, interaction platforms, and other spaces (Wagner et al. 2023). These spaces pursue various objectives: the synthesis and dissemination of knowledge, capacity building, support for policy implementation and monitoring, and the establishment of partnerships.

In the fields of climate change, agriculture, and forests, international initiatives such as the IPCC for the United Nations Framework Convention on Climate Change, the IPBES for the Convention on Biological Diversity, the science-policy interface of the United Nations Convention to Combat Desertification and Land Degradation, the High-Level Panel of Experts on Food Security and Nutrition, and the “4 per 1000” Initiative illustrate significant examples (Box 27.3). For instance, with the publication of six assessment reports and numerous special reports since 1990, the IPCC has accumulated over 35 years of dialogue between climate scientists and government representatives.

At the national level, numerous more or less formal bodies exist, such as multi-stakeholder committees responsible for formulating and monitoring national climate change policies. Among these examples are Brazil's expert group on climate change, the national REDD+ commission (Reducing Emissions from Deforestation and Forest Degradation) of Côte d'Ivoire, the national committee on climate change in Senegal, and the High Council for Climate in France. At a territorial level, committees are emerging to monitor the implementation of public policies and to manage concrete issues such as the impacts of climate change on the intensification of water crises.

Furthermore, research and development projects are increasingly adopting innovative approaches, such as territorial observatories. These structures specialise in the systematic collection and analysis of data to monitor and understand specific phenomena. For example, the Observatory of Socio-Environmental Dynamics (Odyssey) examines land use transformation in certain Amazonian territories by gathering and producing data from satellite monitoring, climatic and hydrological surveys, pollution analyses, and studies of socio-political dynamics. The aim is to put this data at the service of society and stimulate "citizen science", by mobilising rural unions and facilitating political change processes (European Commission 2020).

Box 27.3 The International Initiative "4 per 1000: Soils for Food Security and Climate"

Launched by France at COP21 in 2015, the International Initiative "4 per 1000: Soils for Food Security and Climate" promotes the idea that an annual increase of 0.4% in soil carbon stocks through adapted agricultural or forestry practices could significantly contribute to combating climate change and its effects. It reflects the long-standing efforts of science to integrate this solution into the political agenda (Kon Kam King et al. 2018). The French Minister of Agriculture at the time played a role in promoting this agenda at the international level. Its political adoption is also linked to the promise of reconciling adaptation and mitigation of climate change, an issue often contentious between countries of the Global South and Global North, and which was central in the negotiations of the Paris Agreement. It is also a multi-stakeholder platform facilitating dialogue between various stakeholders from the political, scientific, entrepreneurial, production, and civil society worlds.

The "4 per 1000" Initiative, along with other initiatives and coalitions (Global Soil Partnership, Adaptation of African Agriculture, Climate Action for Sustainable and Healthy Soils, Coalition for Agroecology), has contributed to bringing the issue of soils and their health to the forefront of the international agenda, thanks to ongoing dialogue among all actors, including decision-makers and scientists, not to mention producers. Indeed, with its more than 800 partners worldwide, it remains to this day one of the few global multi-stakeholder partnerships working on the issues of soil carbon, soil health for the benefit of combating climate change, desertification, biodiversity erosion, and food insecurity.

For more information, see: <https://4p1000.org/>

27.2.2 *Embedding Political and Learning Processes of Science–Policy Interfaces*

Political processes, as well as the tensions and compromises inherent in the construction of public policies, are also manifested within the ISPs, where negotiations are developed at multiple levels.

A striking example is the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD), conducted from 2003 to 2008. This process aimed to assess the impact of agricultural technologies on reducing hunger and poverty, while raising awareness within the IPCC about the importance of agricultural issues in the context of climate change. It highlighted the increasing interconnection between agriculture and climate, as well as the need for interdisciplinary and inclusive approaches to address global challenges. However, the IAASTD also had to reconcile scientific expertise and the inclusion of diverse perspectives. The quantitative models used for future scenarios were criticised for their reductive nature, excluding certain solutions, particularly in Africa. Moreover, the debate on genetically modified crops exacerbated divisions between industrial and sustainable agriculture, leading to the withdrawal of representatives from the biotechnology industry (Scoones 2009).

Similar tensions appear in the work of the IPBES, particularly regarding the links between biodiversity and agriculture. Its first report, published in 2015 and focusing on pollination, highlighted controversies related to the use of chemical inputs and their effects on biodiversity (Duperray et al. 2017). In the field of food security, disagreements over the rise in food prices in 2007–2008 led to the creation, in 2009, of the High-Level Panel of Experts on Food Security and Nutrition (HLPE) within the United Nations Committee on World Food Security. Since 2021, this issue has been broadened to include dimensions of equity, access to healthy food and underlying agricultural models.

These sociopolitical tensions vary according to contexts. Since the late 2000s, numerous scientific observatory projects have emerged to monitor, quantify and document large land acquisitions. However, the production of large-scale data involves trade-offs influenced by stakeholders, local realities and available resources. For example, in Cameroon, internal divergences have hindered the dissemination of data on land acquisitions, while in Madagascar the Land Observatory limits the disclosure of sensitive information due to its ministerial affiliation. Moreover, data production is faced with technical and logistical constraints, requiring qualified human resources. Their use must also meet the needs of target actors. In Senegal, for example, a mismatch between the expectations of civil society organisations and the format of the produced data has limited their impact (Grislain et al. 2023).

In parallel, the production of research and expertise within the framework of international cooperation and North-South relations raises crucial questions. These relations highlight power asymmetries and dynamics that directly influence the impact of scientific knowledge on policies.

The IPCC illustrates these issues well. Its work, divided into three groups, addresses different aspects of climate change: Group I assesses scientific knowledge; Group II analyses the impacts and possibilities for adaptation; and Group III explores mitigation solutions. This latter group, directly linked to political considerations, plays a key role in diplomatic discussions, particularly during the approval of summaries for policymakers. Since the adoption of the Paris Agreement in 2015, nationally determined contributions have strengthened the importance of SPIs at the national level, with the IPCC playing an increasing role in the development of climate strategies. Experts sit on scientific committees, advise executive members or directly participate in decision-making bodies such as the Ministries of Environment or Science (Przyck and Gaveau 2023). However, despite an increase in the number of experts from the South since the 1990s, these represented only 39% of participants in the 6th report (AR6) (Przyck 2022). This structural imbalance reflects the dominance of Northern institutions, better equipped in terms of infrastructure (such as supercomputers) and having stronger institutional networks. Other factors contribute, such as insufficient selection of authors by certain national focal points in the South, the absence of author remuneration, and limited interactions between scientific institutions, states, civil society and the private sector, as well as sometimes unsuitable communication resources (Yamineva 2017).

The science-policy dialogue can also be envisaged as a process of collective learning, drawing on various forms of knowledge, sectors and disciplines, and going beyond scientific knowledge (Cairney et al. 2016). This process relies on the collaboration of multiple actors and on the integration of different knowledge systems. It thus contributes to producing actionable knowledge, essential for facilitating the implementation of collective actions.

However, the limited interaction of the IPCC with other SPIs at the international level hinders the possibilities for intersectoral learning on common challenges. In response, an informal process was launched in 2023 in Montpellier, France, to pool the collective intelligence of expert groups working on climate, biodiversity, health and food systems. The aim is to strengthen connectivity between local, national and global scales, and to structure a community of practice for SPIs. This project emphasises the transformation of agri-food systems as a key lever for addressing the interdependent challenges of sustainable development (Caron et al. 2022). It aims to promote cross-disciplinary collaboration among SPIs, to overcome compartmentalised thinking and practices, to improve stakeholder representation, and to better connect scales, from local to global.

27.3 Conclusion

This chapter has analyzed the role of SPIs in addressing the interconnected challenges of climate change, food issues, and ecological problems. It has presented interpretive frameworks to better understand these interfaces, while highlighting the diversity of action scales and contexts in which they operate.

Drawing on work that emphasizes the deep interweaving of science and society, this chapter has illuminated the active role of scientists in processes of social transformation. Far from reducing reality to simplifications, science enriches debates and informs collective choices. A focus on political processes has allowed for the exploration of the tensions and compromises inherent in interactions between scientists, policymakers, and other actors in the formulation and implementation of public policies. This approach goes beyond linear visions that see science as a purely technical influence on political decisions. The examples studied show that SPIs are negotiation spaces where divergent interests, power asymmetries, and legitimacy issues converge.

Furthermore, SPIs offer significant potential to promote collective learning processes involving a diversity of actors: scientists, governments, civil society, and populations. These processes allow for broadening perspectives on climate challenges, questioning paradigms that hinder political change processes, and redefining action approaches.

However, major challenges persist, particularly in terms of co-production of knowledge and consideration of scientific uncertainties, in a context where trust in scientific work is increasingly questioned in public debates. In addition, the weak integration and coordination among the many existing SPIs at the global scale limit their effectiveness. A careful contextualisation of these spaces is essential, taking into account the needs for resources, skills, and funding to ensure their sustainability.

Beyond financial or coordination challenges, it is essential to understand local power dynamics, rivalries between interest groups, and to contributions from research and other forms of knowledge. These dimensions influence the quality and nature of dialogues in various institutional and territorial contexts. Moreover, the establishment of coordination platforms must avoid creating ephemeral structures, often dependent on short-term international development projects. Geopolitical issues, as well as the influence of international organisations and development agencies on public policies in Southern countries, also deserve particular attention.

Finally, research should not be limited to a role of alert or technical expertise aimed at guiding institutional reforms. A reflective and dynamic approach is essential to make science a lever of transformation in the face of global challenges.

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