

Towards Knowledge Governance in Public Administration

Fronika de Wit^{1,2}, Alice Lourenço¹, Hugo Moreira¹ and Filipa Vala^{1,3}

¹Competence Centre for Planning, Policy and Foresight of the Public Administration-PlanAPP, Lisbon, Portugal

²Institute of Social Sciences, University of Lisbon, Lisbon, Portugal

³Center for Ecology, Evolution and Environmental Changes -CE3C, University of Lisbon, Lisbon, Portugal

Fronika.wit@planapp.gov.pt

Maria.lourenco@planapp.gov.pt

Hugo.moreira@planapp.gov.pt

Filipa.vala@planapp.gov.pt

Abstract: Today's public administration is increasingly dealing with wicked problems, involving high levels of complexity and uncertainty. Wicked problems, such as combating climate change, ask for multistakeholder approaches and the interweaving of diverse types of knowledge. Currently, however, public administration mainly works with Knowledge Management (KM): effectively using and producing in-house knowledge and developing organizational competences. To improve governmental responses to wicked problems, this paper proposes a shift in the public sector towards Knowledge Governance (KG), thereby expanding the practices of KM. The transdisciplinary field of KG focuses on structures and techniques that influence the processes of sharing and creating knowledge and the implications of types of knowledge on policy. A KG approach has proven to be more effective for addressing wicked problems through multilevel governance and system innovation. The objective of this paper is threefold. First, to summarize the state-of-the-art scholarship on KM and KG in a comparative perspective. Second, to showcase boundary organizations in public administration as an example of KG. And third, to discuss three critical factors for successful KG in public administration: 1. Establishing an institutional culture focused on system thinking and knowledge creation; 2. Reconceptualizing the concept of knowledge and address its inherent power imbalances; and 3. Enhancing active and meaningful multi-actor participation in public decision-making processes. In conclusion, we recommend boundary organizations, working on the knowledge-policy interface, for dealing with wicked problems and enhancing a paradigm shift towards KG.

Keywords: Boundary Organizations; Knowledge Governance; Knowledge Management; Public Administration

1. Introduction

Complex challenges, such as combating climate change, highlight the need to rethink current public administration practices and governance approaches. The uncertainty and complexity of these challenges requires considering dynamic and multifaceted forms of knowledge, including practitioner, experiential, and traditional knowledge (Feagan et al. 2019; Tengö et al. 2014). Recent scholarship highlights the need to create knowledge deemed actionable for policy decision-making through an iterative and dynamic process of co-creation between science and policy-making (Fazey et al. 2020; West, van Kerkhoff, and Wagenaar 2019).

Current practices in public administration, however, treat the concept of knowledge as something to be managed in-house on the organizational level. Almost 50 years ago, Henry (1974) introduced knowledge management (KM) as a new concern for public administration, describing it as "public policy for the production, dissemination, accessibility, and use of information as it applies to public policy formulation". KM has become not only a huge body of literature, but also a widespread organizational practice to identify, create, store, share and apply knowledge inside an organization (Dalkir 2013; Wiig 2002).

Although KM has proven to be effective on the organizational level, it lacks an institutional perspective of the concept of knowledge and fails to understand policy issues as ways of knowing (van Kerkhoff 2014). Half a century after Henry's call for KM in public administration, a growing body of evidence highlights the need for a new knowledge architecture in public administration. Research points to the urgency of implementing a knowledge governance (KG) approach to inform timely and wise decisions (Cummings et al. 2019; Oliver et al. 2021). KG focuses on processes of knowledge brokering and the implications of types of knowledge on policymaking. A practical example of KG are boundary organizations that aim to bring politics and science together in a variety of collaborative configurations (Clark et al. 2016; Guston 2001).

To improve policymaking for complex challenges, this paper highlights the need for more attention to KG in the public sector. Its objective is threefold: First, to present the state-of-the-art scholarship on KM and KG in a comparative perspective. Second, to showcase boundary organizations as an example of KG in public administration. And third, to discuss the potentials and pitfalls of a KG approach in public administration. We structure this discussion around three critical factors: 1. Establishing an institutional culture focused on knowledge sharing and system thinking; 2. Reconceptualizing and repoliticizing the concept of knowledge; and 3. Enhancing active multi-actor participation in public decision-making processes. In conclusion, we recommend boundary arrangements, working on the knowledge-policy interface, for dealing with wicked problems and enhancing a paradigm shift towards KG.

2. The management and governance of knowledge

The concept of knowledge is complex, multilayered and multifaceted and lacks a uniform understanding. Heissig (2009) presents a list of 29 “knowledge dichotomies” found in the literature, including, among others: tacit vs explicit knowledge; individual vs collective knowledge; internal vs external knowledge; and knowledge as a process vs knowledge as a product. To highlight the difference between “information” and “knowledge”, scholars often use the data – information – knowledge – wisdom (DIKW) hierarchy (Ackoff 1989). Where data and information are related to researching and connecting parts, knowledge and wisdom are about the formation of a whole and interacting and reflection on the whole. Also, where information is an end-product that can be stored and analyzed, knowledge is process-based: it is internalized by the knower, and as such is ‘shaped’ by their existing perceptions and experiences. Knowledge is referred to as the way people interpret, understand and apply meaning to the world and to their experiences (Clarke, B., Stocker, L., Coffey, B., Leith, P., Harvey, N., Baldwin, C., ... & Haward 2013).

Knowledge management (KM) also falls short of a common understanding and definition (Heisig 2009). KM approaches can be divided into two schools of thought: the “codification” or “people-to-system” school and the “personalization” or “people-to-people” school (Hansen, Nohria, and Tierney 1999). Where the first emphasizes the importance of knowledge collection and managing digital information, the second approach focuses on connecting knowledge and managing social relations. As knowledge is inseparable from reflection and dialogue between individuals about their experiences, KM implies not only managing digital information, but, most importantly, managing social relations. According to Liebowitz (2019), the heart of KM is sharing knowledge, making connections, and generating new ideas through collaboration and interaction.

KM is mainly concerned with social relations and knowledge sharing inside the organization. However, collaboration across organizational boundaries can promote new ideas through building on different epistemic perspectives and backgrounds (Liebowitz 2019). These different perspectives are also called knowledge systems (Tengö et al. 2014, 2017), such as scientific knowledge, local or indigenous knowledge, and technical knowledge. Knowledge governance (KG) offers a conceptual basis from which to think critically about the interweaving of these knowledge systems of ways of knowing for more inclusive decision-making.

Both KM and KG are based on creating a knowledge-supportive culture that stimulates learning and transferring knowledge. Van Kerkhoff (2014) points to “a fuzzy line” between both fields, particularly evident in the private sector literature. There are, however, fundamental differences between KM and KG (see Table 1). The KG approach focuses on the deployment of governance mechanisms that influence knowledge processes, such as creating, sharing, accessing, and using knowledge (Foss 2007). Governing knowledge processes means choosing governance structures and mechanisms to favorably influence processes of transferring, sharing, integrating, using, and creating knowledge (Foss and Michailova 2009).

Van Kerkhoff (2014) presents KG as related to the ‘institutional layer’, a scale above KM, better suited for multi-level, complex challenges. It is broader in scope than KM, which sits within the domain of projects and organisations, and is concerned with the institutional structures, i.e. rules and norms that enable or constrain knowledge management decisions. KG goes beyond discussing knowledge questions and sharing knowledge in workshops, and is about “engaging actors in innovative ways of solving societal issues” (Gerritsen, Stuiver, and Termeer 2013, 605). In contrast with a decisionist and a technocratic model, KG is based on a co-production model: it values both scientific and non-scientific considerations (Hulme 2009). KG is based on networks of actors and processes that enable these actors to draw on various forms of knowledge and connect it across sites

(Wyborn et al. 2016). In summary, KG is a more flexible essentially network-based polycentric architecture for knowledge and evidence gathering and flow than the typical static, unidirectional KM structure.

Table 1: Comparing Knowledge Management (KM) to Knowledge Governance (KG)

KM	KG
Organizational layer	Institutional layer
Knowledge processes	Knowledge systems/ Ways of knowing
In-house	Networked
Linearity	Circularity
Monocentric	Polycentric
Knowledge taken for granted	Critical perspective on knowledge processes
Knowledge as a private asset	Knowledge as a global public good/human right
Convention	Innovation
Centralized governance	Combined decentralized, interactive and self-governance
Present-oriented	Future-oriented
Interdisciplinarity	Transdisciplinarity
Organizational management	Boundary management
Dissemination of knowledge	Collaborate knowledge production
Managerial thinking	System thinking
Informing civil society	Active public participation
Decisionist model	Co-production model

Source: Elaborated by the authors, adapted from Van Kerkhoff, 2014; Oliver et al., 2021; Gerritsen et al., 2013; Foss, 2007; Hulme, 2009).

Gerritsen et al. (2013) point to five main principles of KG, which can be contrasted with the KM approach. First, where KM is implemented through a top-down, centralized approach, KG is based on combined decentralized, interactive and *self-organization* (1). Second, although KM looks at knowledge from an interdisciplinary perspective, KG goes a step further and aims for *transdisciplinary knowledge production and dissemination* (2). It goes beyond the disciplinary fields and aims for the unity of knowledge (Nicolescu 2010). Third, KG highlights *social learning* (3) about policies to be able to change them and enhance policy innovation. Fourth, KG is based on *reflexivity* (4): where KM takes knowledge for granted, KG critically analyses knowledge processes. Fifth and last, KG needs *boundary management* (5) and improve the knowledge-policy interplay. The next section takes a closer look at the concept of boundary management and showcases examples of boundary organizations in public administration.

3. Boundary organization in public administration

Boundary organizations (BOs) are crucial to gaining impact with KG (Gerritsen et al. 2013). The concept was first introduced by Guston (1999) to describe those organization that ‘straddle the shifting divide between politics and science’. Expanding on the concept, Clark et al. (2016) go beyond the organizational level and point to the importance of networked governance. They describe this knowledge-policy interplay as “boundary arrangements”: a variety of collaborative configurations mediating the boundary between science and public sector organizations and working towards evidence-based policy.

In what knowledge is concerned, the challenges faced by public administrations entities in the policy cycle and advice ecosystem are threefold: 1.) to identify and access knowledge produced elsewhere to design, monitor, evaluate and advise policy; 2) to identify and produce the knowledge required to those goals (the knowledge “content” challenge); and 3.) to digest this knowledge into a shape so it can be of use to policy- and decision makers in their tasks (the knowledge “form” challenge). While apparently simple to enunciate, these phases do not correspond to discrete institutional arrangements. As such, while conceptually useful to define the challenges faced by public administration, a BO is a difficult object to define. Likewise, the term “knowledge broker” is useful to describe the work of professionals dealing with knowledge transfer but may in practice be difficult to define within the realm of the public policy ecosystem.

3.1 The goal of evidence-based policy

Keeping these difficulties in mind, let us now turn to the idea of evidence-based policy. Generally, everybody agrees that evidence-based policy is important. The debate usually centres around what constitutes “evidence” (Sienkiewicz and Mair 2020). Scientific knowledge is part of the “package” of evidence usable in policymaking because science, while not perfect, is perceived as a reliable process to gather information. Policy problems then

have at least two dimensions: an analytical, scientific dimension and a normative one. Designing evidence-based policy is difficult because it must balance societal values, political priorities, competing interests *and* scientific knowledge. Whether the solution to a given problem falls more under the realm of science depends on how technical an issue is, and at what point of policy intervention the evidence is required (Sienkiewicz and Mair 2020).

Based on a survey by the Finish Innovation Fund SITRA that collected responses from professionals at the interface of knowledge and decision-making, Hellstrom and Ikaheimo (2017) recognize two approaches for using knowledge in decision-making. The *linear approach* ensures that information is produced for specific questions. The *dynamic approach* sees knowledge production as an interactive process where experts and decision-makers contribute to formulate questions and make sense of the information from the start. To be productive, these interactions require specific skills and training (see Hellstrom and Ikaheimo 2017; Topp et al. 2018).

Both accepting the information used and perceiving the process of using knowledge as legitimate affect decision-making: shared knowledge, that is, knowledge that results from a joint question formulation, research development and interpretation process, increases the impact of knowledge on decision-making (Hellstrom and Ikaheimo 2017). The SITRA survey results suggest that most participants feel that the responsibility for taking the initiative to interact is shared by all actors at the knowledge/decision-making interface (Hellstrom and Ikaheimo 2017). Science and policy will be brought closer together by engaging them in co-creation at all stages of policymaking (Sienkiewicz and Mair 2020).

3.2 Examples of Boundary Organizations

This is where BOs in public administration come in. Table 2 summarizes four examples of BOs. Three examples of national level entities (the Office of Evaluation Sciences (OES), a US federal organization; the French, *France Stratégie*; and the Prime Minister Office's interministerial group of Finland) and a transnational BO (the Joint Research Centre (JRC), a service of the European Commission). These are examples of what we may describe as strategies/architectures for KG specifically to address wicked problems, and the number of such flexible network structures seems to be increasing in public administration. We contend that they are increasing because they are more efficient at providing the evidence/knowledge required for decision making.

Our last example, the JRC, sees itself and other BOs as institutions whose task is to both bridge the gap between scientific disciplines and policy fields by producing knowledge, and to act as lighthouses, helping policymakers to navigate knowledge and information produced by others (Šucha and Dewar 2020). To this end, it has been experimenting and implementing strategic activities that foster the relationships between scientists and policymakers and the collaboration around research needs for policy. To increase the relevance and uptake of research for policymaking, special entities focused on knowledge for policy in several priority areas (e.g., migration and demography, disaster risk management, among others) were set up. These centres seek to define the problems to be solved in given fields and collect policy-relevant knowledge, by engaging scientists, policy makers and other stakeholders.

Table 2: Examples of Boundary Organizations in Public Administration

	Who	Where	What	How
1	The Office of Evaluation Science (OES)	Entity of the federal US government at the General Services Administration's (GSA) Office	Designs and conducts evaluations of existing programs and evidence-based program changes on a demand basis.	Partners with federal agencies; brings in Academic affiliates and fellows as required
2	<i>France Stratégie</i>	Autonomous institution at the centre of government	Provides analyses and proposals, expert advice on policy drafting and assessment analyses of public policies, conducts planning and foresight studies.	Directs a network of eight sectoral public entities, with expertise in different areas; Promotes public debate and engagement on collective choices of social, economic, and environmental issues seeking to cover the plurality of points of view.
3	Joint Government Analysis, Assessment and	Inter-ministerial group at the Prime Minister of Finland's Office	Provides analyses, assessment and research activities to support decision making and	Publishes an annual governmental plan for analysis, assessment and research in support of decision-making that defines research priorities addressing

	Who	Where	What	How
	Research Activities		knowledge-based working practices and management	the knowledge needs and establishes funding lines for projects that address them.
4	Joint Research Centre (JRC)	European Commission's science and knowledge service	A cross-European Commission that supports evidence-based policymaking, through the Knowledge4Policy (K4P) platform	Through multidisciplinary teams, including scientists and knowledge brokers, which work with policymakers at: 1. <i>Knowledge Centres</i> that develop research to help inform policy; and 2. <i>Competence Centres</i> that develop tools to help analyse scientific knowledge and data. Created Communities of Practice starting with stakeholders' mapping and keen to promote citizen engagement.

Source: (French Republic 2022; Government of Finland 2022; JRC 2022; United States government 2022).

4. Critical factors for knowledge governance in public administration

Boundary organizations are a first step towards a shift from KM to KG in public administration. However, for this shift to be successful, we highlight three critical factors: 1.) the creation of an institutional culture of system thinking; 2.) the reconceptualization of the concept of knowledge; and 3) the enhancement of active multistakeholder participation. Finally, we provide a future perspective and reflect on the process of creating a BO by looking into the recently created Portuguese Competence Centre for Planning, Policy and Foresight in Public Administration – PlanAPP.

4.1 Institutional culture of system thinking

A first critical factor for successful KG in public administration is the institutional transformation to a culture of system thinking in public administration. System thinking is a cognitive style (a mentality or way of thinking) that recognizes the emerging complexity of sociotechnical systems (Meadows 2009). Heissig (2009) points to the institutional culture as the most critical factor for successful KM and highlights the importance of creating a knowledge-oriented culture. This knowledge-sharing culture is a critical factor for both KM and KG. However, when talking about KG, this knowledge-oriented culture needs to be placed inside a system: a transdisciplinary, multi-level and multi-actor context. Successful boundary organizations and KG arrangements are those that have adjusted to their context of policy networks and multidimensional context (Hoppe and Wesselink 2014). Scholars also highlight the importance of creating a “system mindset” and placing public policies into the bigger picture of system innovation (Gerritsen, Stuiver, and Termeer 2013; Vergragt 2013).

However, confronting this system mindset with the dominant paradigms and mental structures of public administration highlights the need for a paradigm shift to overcome three barriers: 1) from "command and control" governance towards a high degree of unloosing and flexibility; 2. from a strong focus on incontrovertible planning for concrete results towards a high degree of emergency and serendipity; and 3. from strictly imposed planning towards creating a space for learning and reflection (Nevens et al. 2013). Also, especially in relating to complex challenges such as climate change, public administration often uses a sectoral rather than a more integrative approach. Research shows, however, that citizens that see climate change through a system thinking lens and understand it as a complex system, are more likely to recognize its risks and the co-benefits of climate action (Lezak and Thibodeau 2016).

4.2 Reconceptualizing knowledge

A second factor for enhancing successful KG is the reconceptualization of knowledge and knowledge-based interactions. Research points to the reconceptualization of knowledge as a global public good instead of a private asset (van Kerkhoff 2014). Looking at knowledge as “commons” means developing arrangements for overcoming the various dilemmas associated with sharing and producing information, innovation and creative works (Hess and Ostrom 2006). It also implies the re-politicization of wicked problems, such as climate change, to include more democratic debate and argument, based on a wider discussion of values, norms and experiences (Rice, Burke, and Heynen 2015). Without explicit boundary organization and KG, complex issues may be de-politized,

running the risk of creating crises of legitimacy (Clarke, B., Stocker, L., Coffey, B., Leith, P., Harvey, N., Baldwin, C., ... & Haward 2013).

Therefore, research needs to examine the black box of the power/knowledge nexus and hierarchy of knowledge systems and knowledge-based interactions in public administration (Avelino and Wittmayer 2016; Foss and Michailova 2009). It needs to address critical questions of power and contested claims to knowledge and expertise within its services. Scholars point to the important role of the “knowledge broker” for successful KG (Mourato, Bussler, and de Wit 2020). Knowledge brokers are responsible for facilitating the sharing and transfer of knowledge across knowledge systems and thereby steward long-term institutional networks. For public administration that means enabling policy-makers to acquire and value expert knowledge that otherwise would not have been incorporated into the policy-making process (Michaels 2009).

4.3 Participatory governance

A third and last critical factor for successful KG is the mainstreaming of participatory, multi-actor approaches in public administration. Increasing stakeholder involvement in governance implies that new modes of jointly creating and exchanging knowledge may need to be taken into account (van der Molen, van der Windt, and Swart 2016). Arnstein (1969) describes a “ladder of participation” with eight rungs, corresponding to the extent of citizen power in decision-making processes. Her ladder ranges from solely informing civil society about plans and projects, to providing them decision-making power and control over the final decision. Successful KG needs to step up its ambitions in relation to participatory approaches and provide opportunities for active and meaningful participation, thereby introducing public values and enhancing higher levels of trust in governmental decision-making (Beierle and Konisky 2000).

Although participatory approaches have often been presented as the silver-bullet for complex governance, a closer look to the concept of participation highlights naïve assumptions about its complexity and implications. Cooke and Kothari (2001) criticize the participatory discourse and its legitimization of hegemonic perspectives and knowledge systems instead of challenging them. They highlight the danger of obscuring “politics of participation” and the risk of it becoming an instrument of control. Participation and participatory decision-making processes are often promoted and even imposed by funding organizations and could lead to extended state control over people and their knowledge (Bixler 2014). Therefore, Cooke et al. (2021) highlight the importance of reflecting on the knowledge co-production process and assess whether its partnerships are truly respectful and inclusive.

4.4 Looking forward: the strategic setting of PlanAPP and REPLAN

Taking stock of these critical factors, we showcase the recently created Portuguese Competence Centre for Planning, Policy and Foresight in Public Administration (PlanAPP). PlanAPP provides a unique opportunity to strategically reflect on and combine lessons learned from both the knowledge and policy front in its institutional knowledge architecture. It aims to contribute to define public policy goals, indicators, and targets, monitor public policy program implementation, and coordinate assessment and monitoring studies of economic, social and environmental policy impacts. PlanAPP also presides REPLAN, the Portuguese Network of Planning and Foresight Services Public Administration.

PlanAPP’s strategic setting is that of a BO, with REPLAN as a main network for knowledge brokering and co-creation. Indeed, the setting of REPLAN considers the possibility of creating inter-ministerial groups, which may be open to stakeholders and experts outside the Public Administration, fostering subsequent knowledge (by practice) pollination into the remaining public administration, and contributing to institutionalize the relationship between knowledge producers (in academia and elsewhere) and policy- and decision-makers – a relationship that in Portugal remains poorly developed.

5. Conclusion

This paper sheds light on a paradigm shift towards KG in public administration. KG goes beyond KM and works on the institutional level, through a network governance approach. We compare KM to KG and highlight the latter’s potential for addressing complex challenges, as it provides an innovative, transdisciplinary and systemic approach toward knowledge systems. In addition, it supports a more politically- and socially sensitive intervention, avoiding the pitfalls of managerialist approaches (West et al., 2019). KG improves evidence-based policymaking through boundary organizations that work on the knowledge-policy interplay, of which we showcase four empirical examples. These examples highlight the need to focus on institutional design and for

new principles for institutional practices to close the gap between knowledge and policy, (Sienkiewicz and Mair, 2020). Current practices of KM in public administration will not be able to close this gap. To improve our understanding of BOs and their role in enhancing successful KG, we recommend further research and strategic reflection on the institutional setting of newly created BOs, such as the Portuguese PlanAPP. Following Hellstrom and Ikaheimo (2017), we believe that the development of the interaction between knowledge and decision-making is a central strategic competence and governance challenge. Instead of managing knowledge processes through KM, meeting this challenge requires greater societal dialogue and the creation of a shared vision for the future through KG.

References

- Ackoff, Henry. 1989. "From Data to Wisdom." *Journal of Applied Systems Analysis*, Vol.16: 3-9.
- Arnstein, Sherry R. 1969. "A Ladder Of Citizen Participation." *Journal of the American Planning Association* 35(4): 216–24.
- Avelino, Flor, and Julia M. Wittmayer. 2016. "Shifting Power Relations in Sustainability Transitions: A Multi-Actor Perspective." *Journal of Environmental Policy and Planning*.
- Beierle, Thomas C., and David M. Konisky. 2000. "Values, Conflict, and Trust in Participatory Environmental Planning." *Journal of Policy Analysis and Management*.
- Bixler, R Patrick. 2014. "From Community Forest Management to Polycentric Governance: Assessing Evidence from the Bottom Up." *Society & Natural Resources* 27(2): 155–69.
<http://www.tandfonline.com/doi/abs/10.1080/08941920.2013.840021>.
- Clark, William C. et al. 2016. "Boundary Work for Sustainable Development: Natural Resource Management at the Consultative Group on International Agricultural Research (CGIAR)." *Proceedings of the National Academy of Sciences* 113(17): 4615–22. <https://pnas.org/doi/full/10.1073/pnas.0900231108>.
- Clarke, B., Stocker, L., Coffey, B., Leith, P., Harvey, N., Baldwin, C., ... & Haward, M. 2013. "Enhancing the Knowledge–Governance Interface: Coasts, Climate and Collaboration." *Ocean and Coastal Management* (86): 88–99.
- Cooke, B., and U. Kothari. 2001. *Participation: The New Tyranny?* London and New York: Zed Books.
- Cooke, Steven J. et al. 2021. "Knowledge Co-production: A Pathway to Effective Fisheries Management, Conservation, and Governance." *Fisheries* 46(2): 89–97. <https://onlinelibrary.wiley.com/doi/10.1002/fsh.10512>.
- Cummings, Sarah, Suzanne Kiwanuka, Helen Gillman, and Barbara Regeer. 2019. "The Future of Knowledge Brokering: Perspectives from a Generational Framework of Knowledge Management for International Development." *Information Development*.
- Dalkir, Kimiz. 2013. *Knowledge Management in Theory and Practice Knowledge Management in Theory and Practice*. Routledge. <https://www.taylorfrancis.com/books/9781136389757>.
- Fazey, Ioan et al. 2020. "Transforming Knowledge Systems for Life on Earth: Visions of Future Systems and How to Get There." *Energy Research and Social Science* 70(December).
- Feagan, Mathieu et al. 2019. "Redesigning Knowledge Systems for Urban Resilience." *Environmental Science and Policy* 101: 358–63.
- Foss, Nicolai J. 2007. "The Emerging Knowledge Governance Approach: Challenges and Characteristics." In *Organization*, Foss, Nicolai J., and Snežina Michailova. 2009. *Knowledge Governance*. Oxford University Press.
<http://www.oxfordscholarship.com/view/10.1093/acprof:oso/9780199235926.001.0001/acprof-9780199235926>.
- French Republic. 2022. "France Stratégie." <https://www.strategie.gouv.fr/thematiques>.
- Gerritsen, Alwin L., Marian Stuiver, and Catrien J.A.M. Termeer. 2013. "Knowledge Governance: An Exploration of Principles, Impact, and Barriers." *Science and Public Policy*.
- Government of Finland. 2022. "Government's Analysis, Assessment and Research Activities." <https://tietokayttoon.fi/en/frontpage>.
- Guston, David H. 1999. "Stabilizing the Boundary between US Politics and Science: The Role of the Office of Technology Transfer as a Boundary Organization." *Social Studies of Science*.
- . 2001. "Boundary Organizations in Environmental Policy and Science: An Introduction." *Science, Technology, & Human Values* 26(4): 399–408. <http://journals.sagepub.com/doi/10.1177/016224390102600401>.
- Hansen, M. T., N. Nohria, and T. Tierney. 1999. "What's Your Strategy for Managing Knowledge?" *Harvard business review* 77(2): 106–16.
- Heisig, Peter. 2009. "Harmonisation of Knowledge Management – Comparing 160 KM Frameworks around the Globe." *Journal of Knowledge Management* 13(4): 4–31.
<https://www.emerald.com/insight/content/doi/10.1108/13673270910971798/full/html>.
- Hellstrom, S., and H.P. Ikaheimo. 2017. *Knowledge in Decision-Making in Finland: Towards Greater Dialogue. SITRA Working Paper*. <https://media.sitra.fi/2019/11/04160029/the-future-of-knowledge-use-in-societal-decision-making.pdf>
- Henry, Nicholas L. 1974. "Knowledge Management: A New Concern for Public Administration." *Public Administration Review* 34(3): 189. <https://www.jstor.org/stable/974902?origin=crossref>.
- Hess, Charlotte, and Elinor Ostrom, eds. 2006. *Understanding Knowledge as a Commons Understanding Knowledge as a Commons*. The MIT Press. <https://direct.mit.edu/books/book/3807/understanding-knowledge-as-a-commons-from-theory-to>.
- Hoppe, Robert, and Anna Wesselink. 2014. "Comparing the Role of Boundary Organizations in the Governance of Climate Change in Three EU Member States." *Environmental Science and Policy*.

- Hulme, Mike. 2009. *Why We Disagree about Climate Change : Understanding Controversy, Inaction and Opportunity*. Cambridge, UK: Cambridge University Press.
- JRC. 2022. "Joint Research Centre." https://ec.europa.eu/info/departments/joint-research-centre_en.
- van Kerkhoff, Lorrae. 2014. "Knowledge Governance for Sustainable Development: A Review." *Challenges in Sustainability* 1(2): 82–93.
- Lezak, Stephen B., and Paul H. Thibodeau. 2016. "Systems Thinking and Environmental Concern." *Journal of Environmental Psychology*.
- Liebowitz, Jay. 2019. *Knowledge Management Handbook Collaboration and Social Networking, Second Edition*. CRC Press.
- Meadows, Donella. 2009. *Thinking in Systems - a Primer*. ed. Diana Wright. London, UK: Earthscan.
- Michaels, Sarah. 2009. "Matching Knowledge Brokering Strategies to Environmental Policy Problems and Settings." *Environmental Science and Policy* 12(7): 994–1011.
- van der Molen, Franke, Henny J. van der Windt, and Jac A.A. Swart. 2016. "The Interplay between Knowledge and Governance: Insights from the Governance of Recreational Boating in the Dutch Wadden Sea Area, 1981-2014." *Environmental Science and Policy*.
- Mourato, João, Alexandra Bussler, and Fronika de Wit. 2020. "Interweaving Knowledge Systems Through Sustainability Governance." In *Partnerships for the Goals. Encyclopedia of the UN Sustainable Development Goals.*, eds. W. Leal Filho et al. Springer, Cham.
- Nevens, Frank, Niki Frantzeskaki, Leen Gorissen, and Derk Loorbach. 2013. "Urban Transition Labs: Co-Creating Transformative Action for Sustainable Cities." *Journal of Cleaner Production* 50: 111–22. <http://dx.doi.org/10.1016/j.jclepro.2012.12.001>.
- Nicolescu, Basarab. 2010. "Methodology of Transdisciplinarity – Levels of Reality , Logic of the Included Middle and Complexity." *Transdisciplinary Journal of Engineering and Science*.
- Oliver, Tom H. et al. 2021. "Knowledge Architecture for the Wise Governance of Sustainability Transitions." *Environmental Science & Policy* 126: 152–63. <https://linkinghub.elsevier.com/retrieve/pii/S146290112100277X>.
- Pereira, Ângela Guimarães, and Thomas Völker. 2020. "Chapter 8 - Engaging With Citizens." In *Science for Policy Handbook*, eds. Vladimír Šuch and Marta Sienkiewicz. Elsevier, 78–95.
- Rice, Jennifer L., Brian J. Burke, and Nik Heynen. 2015. "Knowing Climate Change, Embodying Climate Praxis: Experiential Knowledge in Southern Appalachia." *Annals of the Association of American Geographers* 105(2): 253–62. <http://www.tandfonline.com/doi/abs/10.1080/00045608.2014.985628>.
- Sienkiewicz, Marta, and David Mair. 2020. "Against the Science–Policy Binary Separation." In *Science for Policy Handbook*, eds. Vladimír Šucha and Marta Sienkiewicz. Elsevier, 2–13. <https://linkinghub.elsevier.com/retrieve/pii/B9780128225967000012>.
- Šucha, Vladimír, and Marion Dewar. 2020. "Chapter 3 - Institutional Framework for the Science–Policy Interaction." In *Science for Policy Handbook*, eds. Vladimír Šucha and Marta Sienkiewicz. Elsevier, 20–30.
- Tengö, Maria et al. 2014. "Connecting Diverse Knowledge Systems for Enhanced Ecosystem Governance: The Multiple Evidence Base Approach." *Ambio* 43(5): 579–91.
- . 2017. "Weaving Knowledge Systems in IPBES, CBD and beyond—Lessons Learned for Sustainability." *Current Opinion in Environmental Sustainability* 26–27: 17–25.
- Topp, Lene, David Mair, Laura Smillie, and Paul Cairney. 2018. "Knowledge Management for Policy Impact: The Case of the European Commission's Joint Research Centre." *Palgrave Communications* 4(1): 87. <http://www.nature.com/articles/s41599-018-0143-3>.
- United States government. 2022. "Office of Evaluation Sciences." <https://oes.gsa.gov/>.
- Vergragt, Philip J. 2013. "Beyond Politization of Technology and Sustainability: A Plea for Visioning." *Foundations of Science*.
- West, Simon, Lorrae van Kerkhoff, and Hendrik Wagenaar. 2019. "Beyond 'Linking Knowledge and Action': Towards a Practice-Based Approach to Transdisciplinary Sustainability Interventions." *Policy Studies* 40(5): 534–55.
- Wiig, Karl M. 2002. "Knowledge Management in Public Administration." *Journal of Knowledge Management*.
- Wyborn, Carina et al. 2016. "Future Oriented Conservation: Knowledge Governance, Uncertainty and Learning." *Biodiversity and Conservation*.