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RETHINKING WATER GOVERNANCE: MOVING BEYOND WATER-CENTRIC PERSPECTIVES IN A CONNECTED AND CHANGING WORLD[‡]

ABSTRACT

From the "water-centric" perspective that is common within the world's large and diverse water community, water is of central importance, and improving water governance is self-evidently essential. Some water problems can be addressed using water-centric approaches such as watershed management. Unfortunately, evidence is mounting that suggests that many other water problems cannot because their causes and drivers, at scales from local to global, are partly or wholly external to those traditionally considered within the water sector. Water governance in these cases needs to better account for a range of external connections that strongly influence water-related outcomes of concern and contribute to governance failures. These connections frequently manifest through external actors, drivers, and institutions. We address this issue by critically reflecting on the limitations of water-centric perspectives; surveying the water governance literature to identify external connections that can influence water governance; examining the extent to which four major approaches address actors, drivers, and institutions that connect water governance to other sectors and decision making situations (Integrated Water Resources Management, water security, water-energy-food nexus, water resilience); and considering key conceptual and practical challenges of moving beyond water-centric approaches where this is warranted. Building on emerging thinking within the water community, we propose that key open questions requiring urgent

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attention relate to reconciling water-centric and non-water-centric approaches, thinking critically about boundary judgments, and re-thinking conceptual and practical approaches to water governance to better account for external connections. The article contributes to emerging conversations about the future of water governance in an increasingly complex, connected and rapidly changing world.

INTRODUCTION

> *[M]ost decisions about water are not made by water managers, but by decision-makers outside the 'water box'; that is, actors from the spheres of civil society, business and government leadership, whose decisions concerning policy formulation, resource allocation and other political and operational issues affect water directly (through allocation and demand) and indirectly (through various drivers of change)*
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> —United Nations World Water Development Report 4[1]

Globally, water is under pressure from many chronic and acute sources, including unsustainable resource use, climate change, population growth, land use change, pressure to meet growing demands for food and energy, and risks relating to social, economic, and environmental shocks.[2] Despite decades of sustained attention to these challenges, contamination, overuse, unsafe drinking water, inadequate sanitation, and degraded ecosystems remain persistent problems in countries around the world.[3] The failure to resolve these problems increasingly is attributed to shortcomings in water governance, rather than to a lack of scientific or technical capacity.[4]

The term "water governance" has many meanings. Here we use it to refer to the ways in which societies organize themselves to make decisions and take

1. 1 WORLD WATER ASSESSMENT PROGRAMME, THE UNITED NATIONS WORLD WATER DEVELOPMENT REPORT 4: MANAGING WATER UNDER UNCERTAINTY AND RISK 19 (2012) [hereinafter Report 4].

2. *See* C.J. Vörösmarty et al., *Global Threats to Human Water Security and River Biodiversity*, 467 NATURE 555, 555 (2010); JOHAN ROCKSTRÖM ET AL., WATER RESILIENCE FOR HUMAN PROSPERITY 4–5 (2014); Report 4, *supra* note 1, at 77–82, 133–46.

3. *See* 7 PETER H. GLEICK ET AL., THE WORLD'S WATER: THE BIENNIAL REPORT ON FRESHWATER RESOURCES 45–96 (2011); *see also* Claudia Pahl-Wostl et al., *From Applying Panaceas to Mastering Complexity: Toward Adaptive Water Governance in River Basins*, 23 ENVTL. SCI. & POL'Y 24, 24 (2012); Howard S. Wheater & Patricia Gober, *Water Security and the Science Agenda*, 51 WATER RESOURCES RES. 5406 (2015).

4. *See ,e.g.*, UNITED NATIONS WORLD WATER ASSESSMENT PROGRAMME, WATER FOR PEOPLE, WATER FOR LIFE: THE UNITED NATIONS WORLD WATER DEVELOPMENT REPORT 4, 30 (2003); Eduardo Araral & Yahua Wang, *Water Governance 2.0: A Review and Second Generation Research Agenda*, 27 WATER RESOURCES MGMT. 3945, 3945–96 (2013).

action regarding water.[5] Water governance involves numerous public and private actors, occurs at multiple scales and levels, and takes place through diverse mechanisms that include regulations, market tools, incentives and networks.[6] High-level diagnoses of shortcomings in water governance commonly point to factors such as a lack of leadership or political will, fragmented, uncoordinated and weak institutions, corruption, insufficient involvement or participation by citizens, and a failure to recognize key connections among the environmental, economic and social aspects of water.[7] The solution frequently proposed is "better" water governance.

Improving water governance through enhancing transparency, increasing accountability, engaging the public more effectively, reforming institutions, and focusing more on incentive structures is important.[8] However, these kinds of measures—on their own—may not be successful in cases where some or all of the main causes of problems are external to the water sector.[9] External connections that may strongly influence the extent to which desired water outcomes can be achieved include drivers, institutions, and actors that are not usually seen as being within the scope of water governance. These exist horizontally (e.g., within a watershed, basin, city, or region) and vertically (e.g., across multiple scales, such as from local to regional). The significance of these kinds of external connections is likely to increase rather than decrease. To illustrate, Biswas argues that "water problems of the future will continue to become increasingly more and more complex, and will become more and more intertwined with other development sectors like agriculture, energy, industry, transportation, and communication, and with social sectors like education, environment, health, and rural or regional development."[10] As Rockström et al. argue, this means that "local water management can no longer occur in isolation from social (e.g., sudden shifts in trade patterns and prices) and environmental processes at the regional to global scales (e.g., climate change and deforestation)."[11]

Water governance clearly needs to be situated within or connected to broader societal goals,[12] and to governance in other realms. How this can be accomplished is an open question in the water governance literature. In this article,

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5. Rob C. de Loë, *Water Governance in Canada: Challenges and Opportunities*, *in* RESOURCE AND ENVIRONMENTAL MANAGEMENT IN CANADA: ADDRESSING CONFLICT AND UNCERTAINTY 345 (5th ed. 2015).

6. *See* Maria Carmen Lemos & Arun Agrawal, *Environmental Governance*, 31 ANN. REV. ENV'T AND RESOURCES 297, 309 (2006).

7. *See, e.g.*, Pahl-Wostl, *supra* note 3, at 25; Report 4, *supra* note 1, at 143, 145.

8. *See* UNITED NATIONS DEP'T OF ECON. & SOC. AFFAIRS, THE GLOB. WATER P'SHIP, CATALYZING CHANGE: A HANDBOOK FOR DEVELOPING INTEGRATED WATER RESOURCES MANAGEMENT (IWRM) AND WATER EFFICIENCY STRATEGIES 10–11, 20–25, 29–31 (2004); Araral & Wang, *supra* note 4, at 3252–53.

9. *See* Report 4, *supra* note 1, at 4.

10. Asit K. Biswas, *Integrated Water Resources Management: A Reassessment*, 29 INT'L WATER RESOURCES ASS'N 248, 249 (2004).

11. ROCKSTRÖM ET AL., *supra* note 2, at 38.

12. *See* Mike Muller, *The 'Nexus' as a Step Back Towards a More Coherent Water Resource Management Paradigm*, 8 WATER ALTERNATIVES 675, 676 (2015); Cecilia Tortajada, *IWRM Revisited: From Concept to Implementation*, 30 INT'L J. WATER RESOURCES DEV. 361, 361–62 (2014).

we argue that a more systemic orientation is needed to identify and take account of critical connections between water and related sectors. We are not simply calling for more integration. To avoid paralysis by analysis and simply becoming overwhelmed, a more systemic approach to water governance should be based on a nuanced assessment of the external connections that matter in specific settings, an assessment of how and why they influence water governance, and deliberate delineation of what is inside and outside the scope of consideration in a particular water governance situation. This kind of assessment demands careful consideration of contextual factors such as the capacity of the people involved, the constraints under which decisions are being made, and whether or not it is even necessary to account for external connections to achieve desired outcomes.

Our argument unfolds as follows: we begin by clarifying what we mean by "water-centric" approaches. This is followed by a survey of the kinds of "external" connections that can influence water governance. We then critically consider the strengths and limitations of four interrelated ways in which the water community is already attempting to connect to key social and economic systems. These include integrated water resources management (IWRM), water security, water-energy-food nexus approaches, and new water resilience thinking. We conclude by reflecting on ways to get out of the "water box" through better accounting for the kinds of external considerations we have highlighted. The insights we offer are meant to lay the foundation for development of approaches that can be used by analysts and practitioners to move beyond water-centric approaches.

I. WATER-CENTRIC PERSPECTIVES AND THEIR LIMITATIONS

The international water community is a diverse group of researchers, policymakers, consultants, and advocates located in a host of government and non-government organizations and firms.[13] Its members tend to believe in the central importance of water in society, and share a common specialist language. As such, the international water community can be thought of as an epistemic community, or a group of people who "not only hold in common a set of principled and causal beliefs but also have shared notions of validity and a shared policy enterprise."[14] In the case of water, this shared enterprise relates to achieving desired water outcomes, such as clean, safe drinking water; sanitation; healthy aquatic ecosystems; and secure water supplies for industry and agriculture.

Members of epistemic communities tend to make similar *boundary judgments*, in other words, decisions about which concerns are relevant to the context in which they are operating.[15] Boundary judgments are necessary in water

13. *See* Annika Kramer & Claudia Pahl-Wostl, *The Global Policy Network Behind Integrated Water Resources Management: Is it an Effective Norm Diffusor?*, 19 ECOLOGY & SOC'Y, no. 1, 2014, at art. 11; Farhad Mukhtarov & Andrea K. Gerlak, *Epistemic Forms of Integrated Water Resources Management: Towards Knowledge Versatility*, 47 POL'Y SCI. 101 (2014).

14. Peter M. Haas, *Introduction: Epistemic Communities and International Policy Coordination*, 46 INT'L ORG. 1, 16 (1992).

15. *Cf.* RAY ISON, SYSTEMS PRACTICE: HOW TO ACT IN A CLIMATE-CHANGE WORLD (2010) (explaining that transgenics, the introduction of novel or alien genes into an organism, distinguishes traditional plant breeding practices from the creation of genetically modified organisms); Werner Ulrich,

governance. For example, Blomquist and Schlager argue that "boundaries that define the reach of management activities determine who and what matters. Inside the boundaries, individuals and groups may participate in decision making and have their interests, values, and concerns addressed. Those who fall outside the boundaries have fewer and indirect ways of participating."[16] Thus, the issue is not that people make boundary judgments; these judgments are necessary to constrain the scope of water management and governance. The concern is whether or not the judgments made about boundaries are nuanced enough to bring the right people, drivers, and institutions inside the scope of water governance.

We argue that the kinds of boundary judgments that members of the water community commonly make, which we discuss in detail below, can lead to what we refer to as water-centric approaches to governance. From a water-centric perspective, water is viewed as a bounded, self-evident—and self-evidently *important*—policy sector. People who hold a water-centric perspective may assume that other societal actors do or should share a strong normative concern for water, and will be willing and able to change their behavior to fit the solutions proposed by the water community. This assumption is not warranted. Actors and institutions outside the water sector have diverse and diverging interests, values, and concerns that can differ markedly from those of the members of the water community. While some of these actors will accept (and be encompassed by) a water-centric perspective, many others will not. For water governance, this can become a critical problem if the actors in question are central in some way, perhaps not previously recognized, to achieving desired water outcomes, yet not included.

An archetypical example of a water-centric boundary judgment is the common assumption in the water community that the watershed, catchment, or basin is an appropriate unit for making decisions and taking actions. From this perspective, governance is normatively based on hydrological boundaries, and watershed or river basin organizations are seen as logical institutional structures.[17] Pursuing water governance strictly according to hydrological boundaries, critics suggest, is unlikely to resolve politically contested and multi-scalar water problems; moreover, successful implementation of new institutional setups on this

Some Difficulties of Ecological Thinking, Considered from a Critical Systems Perspective: A Plea for Critical Holism, 6 SYS. PRAC. 583 (1993) (using the example of a systems analyst deciding which resources ought to be part of the system's environment).

16. William Blomquist & Edella Schlager, *Political Pitfalls of Integrated Watershed Management*, 18 SOC'Y & NAT. RESOURCES 101, 105 (2005).

17. *See generally* FRANÇOIS MOLLE, PLANNING AND MANAGING WATER RESOURCES AT THE RIVER-BASIN LEVEL: EMERGENCE AND EVOLUTION OF A CONCEPT (2006).

basis can be elusive.[18] For reasons such as these, critiques of the assumptions underlying water governance based on watershed boundaries are growing.[19]

At a basic level, the challenge is to recognize critical mutual interdependency between the water sector and other sectors.[20] For example, at the local scale, strengthening linkages between water management and land use planning is a long-standing challenge.[21] The failure to address these linkages in practice has prompted renewed interest in water-land connections in recent years.[22] Water-land interactions at the local scale ought to be among the more tractable problems given that the systems in question co-exist in space, and the people most responsible for addressing them often belong to the same local organization (e.g., water managers and land use planners employed by a town or city). Hence, the consistent failure around the world to address local water-land interactions[23] does not bode well for more complex problem situations where actors, drivers, and institutions may be temporally, spatially, or politically far apart.

Three contemporary examples of more complex problem situations where water outcomes are strongly shaped by external connections include international trade involving virtual water, biofuel production, and land and water "grabbing."

- Virtual water refers to international trade in goods that are water-intensive to produce. It is a mechanism by which water-scarce nations gain the benefits of access to water-intensive goods through trade with countries with greater water endowments.[24] Hence, domestic water impacts may be linked to much broader political-economic forces.[25]

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18. *See* Helen Ingram, Beyond Universal Remedies for Good Water Governance: A Political and Contextual Approach (Jan. 2008) (unpublished paper presented at the Water For Food: Quantity and Quality in a Changing World, Zaragoza, Spain, June 24–27, University of Arizona and University of California, Irvine) (on file with author) (illustrating that claimed benefits of watershed-based governance are frequently not achieved in practice); THE POLITICS OF RIVER BASIN ORGANISATIONS: COALITIONS, INSTITUTIONAL DESIGN CHOICES AND CONSEQUENCES (Dave Huitema & Sander Meijerink eds., 2014) (demonstrating that successful implementation of river basin organizations around the world is highly variable, often due to weaknesses in institutional design).

19. *See e.g.*, MOLLE, *supra* note 17; François Molle, *River-basin Planning and Management: The Social Life of a Concept*, 40 GEOFORUM 484 (2009); Ingram, *supra* note 18; Alice Cohen & Seanna Davidson, *The Watershed Approach: Challenges, Antecedents, and the Transition from Technical Tool to Governance Unit*, 4 WATER ALTERNATIVES 1 (2011).

20. *See* Cecilia Tortajada, *Water Governance: A Research Agenda*, 26 INT'L J. WATER RESOURCES DEV. 309, 311 (2010).

21. *See* Nicole Carter et al., *Closing the Circle: Linking Land Use Planning and Water Management at the Local Level*, 22 LAND USE POL'Y 115 (2005).

22. *See, e.g.*, M. Falkenmark et al., *Overcoming the Land-water Disconnect in Water-scarce Regions: Time for IWRM to go Contemporary*, 30 INT'L J.WATER RESOURCES DEV. 391 (2014); ROCKSTRÖM ET AL., *supra* note 2, at 38.

23. *See* Patricia Gober et al., *Why Land Planners and Water Managers Don't Talk to One Another and Why They Should!*, 26 SOC'Y AND NAT. RESOURCES 356 (2013).

24. *See generally* A.Y. Hoekstra, *Water Security of Nations: How International Trade Affects National Water Scarcity and Dependency*, *in* THREATS TO GLOBAL WATER SECURITY 27 (J. Anthony A. Jones et al. eds., 2009).

25. *See* J.A. Allan, *Water in the Environment/Socio-Economic Development Discourse: Sustainability, Changing Management Paradigms and Policy Responses in a Global System*, 40

- Biofuel production can drive land use change and impact water resources and quality,[26] but may also be linked to broader domestic or international policy. For instance, biofuel production in the Mississippi River basin, linked to the U.S. Energy Policy Act of 2005, may have worsened the "dead zone" in the Gulf of Mexico.[27] Similarly, the European Union target for biofuels in transport fuels appears to be driving palm oil production in parts of the world such as South East Asia, and thus contributing to local water quality concerns.[28]
- Land and water "grabbing" refers to resource appropriation without fair compensation in developing countries by powerful multinational companies or foreign governments.[29] This is a concern in light of emerging global food and water security challenges.[30]

Examples such as these demonstrate that some kinds of water problems are strongly connected to or influenced by forces that may be difficult or impossible to address from within a water-centric frame. This is true at all scales—from local to international.

II. EXTERNAL CONNECTIONS THAT CAN INFLUENCE WATER GOVERNANCE

It is increasingly recognized at the international level that water governance outcomes are strongly connected to decisions made in other areas.[31] The ability to cross boundaries between sectors and to connect water governance to other domains—sometimes referred to as "connective capacity"[32]—is emerging as a priority. Here we focus on three sources of external connections that need to be accounted for in moving beyond water-centric perspectives in water governance.

GOVERNMENT AND OPPOSITION 181 (2005); Suvi Sojamo et al., *Virtual Water Hegemony: The Role of Agribusiness in Global Water Governance*, 37 WATER INT'L 169 (2012).

26. *See generally* Siwa Msangi et al., *Biofuels, Food Security, and the Environment: A 2020/2050 Perspective*, *in* GLOBAL CHANGE: IMPACTS ON WATER AND FOOD SECURITY 65, 65–94 (Claudia Ringler et al. eds., 2010).

27. UNION OF CONCERNED SCIENTISTS, THE ENERGY-WATER COLLISION: MANAGING THE RISING TIDE OF BIOFUELS 1 (2010).

28. Report 4, *supra* note 1, at 41.

29. *See generally* Jennifer Franco et al., *The Global Politics of Water Grabbing*, 34 THIRD WORLD Q., 1651 (2013).

30. *See, e.g.*, OVERSEAS DEV. INST., CONFRONTING SCARCITY: MANAGING WATER, ENERGY AND LAND FOR INCLUSIVE AND SUSTAINABLE GROWTH (2012).

31. *See, e.g.*, Report 4, *supra* note 1 (arguing that water should not be viewed as a sector); THE WORLD ECON. FORUM WATER INITIATIVE, WATER SECURITY: THE WATER-FOOD-ENERGY-CLIMATE NEXUS (2011) (linking water availability and quality to a host of geopolitical issues likely to arise in future decades); ASIAN DEV. BANK, THINKING ABOUT WATER DIFFERENTLY: MANAGING THE WATER-FOOD-ENERGY NEXUS (2013) (arguing that a water-food-energy nexus approach is required); FOOD & AGRIC. ORG. OF THE UNITED NATIONS, THE WATER-ENERGY-FOOD NEXUS: A NEW APPROACH IN SUPPORT OF FOOD SECURITY AND SUSTAINABLE AGRICULTURE (2014) (arguing that the world's food needs can only be met if water availability and food security are considered together).

32. *See* Jurian Edelenbos & Ingmar van Meerkerk, *Connective Capacity in Water Governance Practices: The Meaning of Trust and Boundary Spanning for Integrated Performance*, 12 CURRENT OPINION IN ENVTL SUSTAINABILITY 25, 25 (2015).

We group these under the broad headings "drivers," "institutions," and "actors." Together, these capture important external connections that influence the extent to which desired water outcomes can be achieved.

A. Drivers

Following Levy and Morel,[33] we use the term *drivers* to refer to overarching socio-economic or environmental forces that influence or exert pressure on a system. Many drivers of change influencing water systems lie well outside the water sphere.[34] Commonly cited drivers include climate change, population growth and demographic shifts, land use change, urbanization, and industrialization.[35] Drivers such as these can be the product of broader shifts in social and cultural values, global trade patterns, technologies, and geopolitics.[36] The relative importance of different drivers varies depending on the types of water issues of concern, and the particular context of a situation (as defined by its social, ecological, institutional, political, and economic dimensions). Examples of major drivers that are often identified in global-scale water literature include the following:

- Population growth and demographic shifts will influence water governance in different ways at different scales (e.g., through decision-making processes at national, regional, and local levels).[37] Growing populations place additional demands on already scarce water resources. At the same time, urbanization, rising income levels, and increasing standards of living all impact water quality and quantity.[38]
- Climate change is a critical concern for future water governance. This is true not only of climate change impacts (e.g., water scarcity, extreme events, ecological change) but also of the effects of mitigation actions, such as carbon sequestration and a switch to cleaner energy sources, and adaptation actions, including desalination, dams, inter-basin water transfers, and other infrastructure investments.[39] These kinds of actions may be adaptive or maladaptive.[40]

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33. *See* UNITED NATIONS ENV'T PROGRAMME, GLOBAL ENVIRONMENT OUTLOOK 5, 7 (2012).

34. *See* Joyeeta Gupta & Claudia Pahl-Wostl, *Global Water Governance in the Context of Global and Multilevel Governance: Its Need, Form, and Challenges*, 18 ECOLOGY AND SOC'Y, no. 4, 2013, at art. 53, pg. 2.

35. *See generally* WORLD WATER ASSESSMENT PROGRAMME, THE UNITED NATIONS WORLD WATER DEVELOPMENT REPORT 3: WATER IN A CHANGING WORLD (2009) [hereinafter Report 3]; ASIAN DEV. BANK, *supra* note 31.

36. *See generally* Report 3, *supra* note 35.

37. *See generally* Report 4, *supra* note 1.

38. *See generally* JILL BOBERG, LIQUID ASSETS: HOW DEMOGRAPHIC CHANGES AND WATER MANAGEMENT POLICIES AFFECT FRESHWATER RESOURCES (2005).

39. *See, e.g.*, Simon Fane et al., *Incorporating Climate Change into Urban Water IRP*, *in* INTEGRATED RESOURCE PLANNING FOR URBAN WATER-RESOURCE PAPERS 98 (2011).

40. *See* Jamie Pittock, *National Climate Change Policies and Sustainable Water Management: Conflicts and Synergies*, 16 ECOLOGY AND SOC'Y, no. 2, 2011, at art. 25.

- Agricultural production, linked to global trade systems, has huge implications for water consumption and water quality given increasing global demand for food and biofuels due to population growth and changing global dietary patterns.[41]
- Increasing global energy demands place pressure on both water quality and quantity. Electricity production requires significant water resources for cooling in fossil fuel plants, which affects water quality through raising water temperature, and for turning turbines in hydropower plants, which requires construction of infrastructure that alter natural flow patterns. Increasing demand for biofuels can similarly impact land and water resources.[42]
- Increasing urbanization globally will have implications for water due to growing urban and industrial demand, sewage, urban runoff, and the need for sustainable urban water infrastructure.[43]
- Finally, concerns regarding interconnected global risks (e.g., water, food, and energy security; climate change; geopolitical stability; global economic system) link water governance to wider societal systems and powerful new interests and agendas in fundamentally new ways.[44]

B. Institutions

Institution refers to "a cluster of rights, rules, and decision-making procedures that gives rise to a social practice, assigns roles to participants in the practice, and guides interactions among occupants of these roles."[45] Institutional interplay[46] between water governance regimes and other resource regimes and policy sectors is becoming increasingly significant. The concept of governance regimes "refers to the interdependent long-lived structural features of a governance system," including both institutions and actor networks.[47] As evident from the previous discussion of drivers,[48] policy regimes that commonly interact with water governance are numerous and include those for energy, defense, food, environmental protection, land use planning, climate change, public health and community wellbeing, and global trade, to name a few.

Understanding interplay among different governance regimes is vital because the effectiveness of a regime is linked not only to its own characteristics

41. *See, e.g.*, ROCKSTRÖM ET AL, *supra* note 2 (focusing on practices linked to intensification of production, such as growing use of irrigation and reliance on chemicals for pest control and plant nutrition that harm water quality).

42. *See generally* ASIAN DEV. BANK, *supra* note 31; Report 4, *supra* note 1.

43. *See generally* Report 4, *supra* note 1.

44. *See generally* NAT'L INTELLIGENCE COUNCIL, GLOBAL TRENDS 2030: ALTERNATIVE WORLDS (2012); WORLD ECON. FORUM, GLOBAL RISKS 2015 (10th ed. 2015).

45. INSTITUTIONS AND ENVIRONMENTAL CHANGE: PRINCIPAL FINDINGS, APPLICATIONS, AND RESEARCH FRONTIERS, at xxii (Oran R. Young et al. eds., 2008).

46. "Institutional interplay occurs when the operation of one set of institutional arrangements affects the results of another or others." *Id.* at xvi

47. Claudia Pahl-Wostl et al., *From Applying Panaceas to Mastering Complexity: Toward Adaptive Water Governance in River Basins*, 23 ENVTL. SCI. & POL'Y 24, 25 (2012).

48. *See supra* Part II.A.

but also to its interplay with other regimes.[49] For example, studies of the effectiveness of river basin organizations around the world have revealed that wider institutional factors can have a strong role in influencing the dynamics and outcomes of water governance within a river basin itself.[50] Law and regulation from within and outside the water sphere fundamentally affect what can and cannot be achieved through water governance initiatives.[51] Around the world, legal decisions relating to indigenous rights and title for land and natural resources are emerging as a critical factor shaping access to water.[52] Even more broadly, international trade institutions (e.g., multilateral and bilateral agreements) affect virtual water through impacts on global trade patterns.[53] Thus while understanding and accounting for institutional factors beyond water governance regimes is extremely challenging, it is likely to be vital for addressing many complex multi-scalar water governance challenges.

C. Actors

For analytical purposes, we use the term *actors* to refer to identifiable entities (i.e., organizations or individuals) whose actions affect water-related issues of concern, whether directly or indirectly, and whether the actors themselves are aware of these effects or not. Even with this constraint, an enormous range of actors must be considered. Governments are key actors in the water realm. Actors within governments exist at multiple jurisdictional levels and within numerous non-water policy sectors. Other important actors in most countries are found in water utilities (whether public or private), research organizations, non-government organizations (local, national, international), civil society, business interests (e.g., agriculture, mining, manufacturing), and hybrid organizations (e.g., partnerships, commissions). In a developing country context, foreign donors, including national government aid agencies and multilateral banks, have significant influence; to illustrate, foreign donors have promoted IWRM water reforms to national governments during the last two decades.[54] Other key actors include indigenous

49. *Cf.* Thomas Gehring & Sebastian Oberthür, *Interplay: Exploring Institutional Interactions*, *in* INSTITUTIONS AND ENVIRONMENTAL CHANGE: PRINCIPAL FINDINGS, APPLICATIONS, AND RESEARCH FRONTIERS, *supra* note 45, at 187 ("Today it is widely recognized that 'the effectiveness of specific institutions often depends not only on their own features but also on their interactions with other institutions.'").

50. *See generally* KEN CONCA, GOVERNING WATER: CONTENTIOUS TRANSNATIONAL POLITICS AND GLOBAL INSTITUTION BUILDING (2006); THE POLITICS OF RIVER BASIN ORGANISATIONS, *supra* note 18.

51. *Cf.* Patricia Wouters & Sarah Hendry, *Promoting Water (Law) for All: Addressing the World's Water Problems—A Focus on International and National Water Law and the Challenges of an Integrated Approach*, 20 J. WATER L. 45, 45, 48–49 (2009) (noting the difficulty of identifying 'water law' in a national context and the necessity of a legal framework as a prerequisite to IWRM).

52. *See generally, e.g.*, OUT OF THE MAINSTREAM: WATER RIGHTS, POLITICS AND IDENTITY (Rutgerd Boelens et al. eds., 2010).

53. *See generally* A.Y. HOEKSTRA, WATER SECURITY OF NATIONS: HOW INTERNATIONAL TRADE AFFECTS NATIONAL WATER SCARCITY AND DEPENDENCY (J. Anthony A. Jones et al. eds., 2009).

54. *See* Ingram, *supra* note 18; François Molle, *River-Basin Planning and Management: The Social Life of a Concept*, 40 GEOFORUM 484, 490–91 (2009); *see generally* THE POLITICS OF RIVER BASIN ORGANISATIONS, *supra* note 18.

peoples, who have historically have been treated as marginal and thus not consequential to governance.[55] However, this is changing in response to a global movement toward the assertion of indigenous rights, and those indigenous peoples already are, or are emerging as, critical actors around the world.

Private actors inside and beyond the water sphere are also becoming increasingly relevant to water governance. These include actors directly linked to water (e.g., companies involved in agribusiness, energy/power, mining/resource extraction, manufacturing, food, forestry, transport, construction, and tourism), as well as others indirectly linked to water (e.g., financial institutions, investors, insurance companies). Such historically private actors are inadequately recognized in water governance, yet this is changing.[56] Understanding the materiality of water to private interests and their exposure to water-related risks (e.g., commercial risks linked to supply chains interrupted by flooding or water shortages; political risks such as policy change and sovereign risk; legal/regulatory and contractual risks; operational risks; and reputational risks such as social license and social conflict) is a growing concern at the international level;[57] exposure of financial institutions and investors to such risks is seen as a leverage point for addressing water issues by driving improved practices throughout investment portfolios and supply chains. In response to this growing awareness, some multinational companies are becoming involved in high-level policy and decision-making for water, not only individually but also as powerful groupings—arguing that business has a key role in managing cross-sectoral interactions between water, energy, and food.[58] Accordingly, the increasing significance of private actors beyond the water sphere raises questions about the role of governments in setting robust institutional frameworks for fruitful private sector involvement in water governance that serves public good outcomes.[59]

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55. *See generally*, OUT OF THE MAINSTREAM: WATER RIGHTS, POLITICS AND IDENTITY, *supra* note 52.

56. *See, e.g.*, Peter Newborne & Nathaniel Mason, *The Private Sector's Contribution to Water Management: Re-Examining Corporate Purposes and Company Roles*, 5 WATER ALTERNATIVES 603 (2012).

57. *See, e.g.*, UNITED NATIONS ENV'T PROGRAMME FIN. INITIATIVE, HALF FULL OR HALF EMPTY? A SET OF INDICATIVE GUIDELINES FOR WATER-RELATED RISKS AND AN OVERVIEW OF EMERGING OPPORTUNITIES FOR FINANCIAL INSTITUTIONS (2007).

58. *See, e.g.*, Peter Newborne & Nathaniel Mason, *The Private Sector's Contribution to Water Management: Re-Examining Corporate Purposes and Company Roles,* 5 WATER ALTERNATIVES 603 (2012); *see also* Matthias Leese & Simon Meisch, *Securitising Sustainability? Questioning the Water, Energy and Food-Security nexus*, 8 WATER ALTERNATIVES 695 (2015); Suvi Sojamo et al., *Virtual Water Hegemony: the Role of Agribusiness in Global Water Governance*, 37 WATER INT'L 169 (2012).

59. *See* Stephen Brammer et al., *Corporate Social Responsibility and Institutional Theory: New Perspectives on Private Governance*, 10 SOCIO-ECONOMIC REV. 3 (2012); *see also* Newborne & Mason, *supra* note 58.

III. HOW THE WATER COMMUNITY HAS ADDRESSED EXTERNAL CONNECTIONS

Recent attention to ways in which water governance is connected to other sectors[60] emerges from a long tradition in the field. Reflecting recognition of the shortcomings of water-centric perspectives, the water community is pursuing several different, and sometimes interrelated, approaches to addressing connectivity. In this section, we briefly examine the major characteristics of four key approaches and perspectives, focusing especially on the extent to which they recognize and account for the kinds of external connections discussed in this article. We begin with the existing, and arguably dominant, approach: Integrated Water Resources Management (IWRM). We then consider water security, water-food-energy nexus, and water resilience. Importantly, each of these concepts on its own is a vast and productive area of research and practice. Therefore, our critiques are necessarily bounded and focused on the extent to which each area considers connections that influence water governance.

A. Integrated Water Resources Management

IWRM focuses on recognizing hydrological interdependencies (e.g., upstream/downstream, competing users and uses) in order to account for previously ignored externalities through adopting a basin perspective. Its proponents advocate governance based on hydrological units (basins and watersheds), stakeholder involvement, "good governance" principles, and economic efficiency,[61] and it essentially reflects a set of norms about how water should be managed.[62] IWRM "was developed by environmental scientists, water resource engineers and economists in the late 1980's and the 1990's . . . [as] a response by water resource planners to the negative outcomes of past water resource policies."[63] It was shaped by several international meetings,[64] and is promoted by a global epistemic community comprised of international knowledge and policy organizations, UN bodies, non-government organizations, multilateral banks, and foreign donors[65]. As Ingram[66] highlights, IWRM dominated international water policy discourse over

60. *See, e.g.*, Jurian Edelenbos & Ingmar van Meerkerk, *Connective Capacity in Water Governance Practices: the Meaning of Trust and Boundary Spanning for Integrated Performance*, 12 CURRENT OPINION IN ENVTL. SUSTAINABILITY 25 (2015).

61. *See* Torkil Jønch-Clausen & Jens Fugl, *Firming up the Conceptual Basis of Integrated Water Management*, 17 WATER RESOURCES DEV. 501 (2001); Neil S. Grigg, *Integrated Water Resources Management: Unified Process or Debate Forum?* 30 INT'L J. OF WATER RESOURCES DEV. 409 (2014); David Benson et al., *Water Governance in a Comparative Perspective: From IWRM to a 'Nexus' Approach?*, 8 WATER ALTERNATIVES 756 (2015); GLOB. WATER P'SHIP, TOWARDS WATER SECURITY: A FRAMEWORK FOR ACTION (2000).

62. *See, e.g.*, Kramer & Pahl-Wostl, *supra* note 13.

63. John Anthony Allan, *Integrated Water Resources Management is More a Political than a Technical Challenge*, 50 DEV. WATER SCI. 9 (2003).

64. Examples of these include the 1977 Mar del Plata conference, the 1992 International Conference on Water and the Environment, i.e., the "Dublin conference," and the 1992 UN Conference on Environment and Development. *See generally* Muller, *supra* note 12.

65. *See, e.g.,* Kramer & Pahl-Wostl, *supra* note 13; Mukhtarov & Gerlak, *supra* note 13.

66. Ingram, *supra* note 18.

the last two decades and became "the reference point to which all other arguments end up appealing."[67]

Critics have suggested that IWRM is generally weak in addressing external connections because it takes a strongly water-centric perspective.[68] For example, although IWRM was a major improvement on previous technically-focused approaches to managing water[69] and has helped to shift the focus beyond state actors,[70] it has been critiqued for a lack of regard to the institutional and political challenges linked to pursuing governance reform based on basin boundaries,[71] and for its inadequate recognition that the spatial extent of problems and their causes often aligns poorly with biophysical boundaries.[72] Within the water community, the term "problemshed," which appears to have entered the literature in the late 1960s,[73] has been rediscovered and used recently as an alternative to describe networks of causes and effects associated with a water problem that may be inside or outside a watershed or basin.[74] While IWRM was originally designed to account for such cross-sectoral linkages (e.g., between water, land, agriculture, industry, and environment) and vertical linkages (e.g., across basin, national and transboundary scales),[75] these objectives have largely not been achieved in practice. The mixed record of IWRM in addressing water issues[76] is therefore at least partly due to inadequate consideration of actors, drivers, and institutions beyond basin boundaries.

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67. CONCA, *supra* note 50, at 126.

68. *See, e.g.*, Joyeeta Gupta & Claudia Pahl-Wostl, *Editorial on Global Water Governance,* 18 ECOLOGY AND SOC'Y, no. 4, 2013, at art. 54; Frank Jaspers & Joyeeta Gupta, *Global Water Governance and River Basin Organisations*, *in* THE POLITICS OF RIVER BASIN ORGANISATIONS, *supra* note 18, at 38; Asit K. Biswas, *Integrated Water Resources Management: A Reassessment,* 29 INT'L WATER RESOURCES ASS'N 248 (2004).

69. *See generally* Allan, *supra* note 63.

70. *See* Hakan Tropp, *Water Governance: Trends and Needs for New Capacity Development*, 9 WATER POL'Y 19, 26 (2007).

71. *See e.g.*, Ingram, *supra* note 18; Francois Molle, *River Basin Planning and Management: The social life of a concept,* 40 GEOFORUM 484 (2009); THE POLITICS OF RIVER BASIN ORGANISATIONS, *supra* note 18 (demonstrating that successful implementation of river basin organizations around the world is highly variable, often due to weaknesses in institutional design).

72. *See e.g.*, Peter P. Mollinga et al., *Politics, Plurality and Problemsheds: A Strategic Approach for Reform of Agricultural Water Resources Management*, 25 DEV. POL'Y REV. 699 (2007); Seanna L. Davidson & Rob C. de Loë, *Watershed Governance: Transcending Boundaries*, 7 WATER ALTERNATIVES 367 (2014).

73. *See* Joseph L. Fisher, *The Natural Environment*, 371 THE ANNALS OF THE AM. ACAD. OF POL. AND SOC. SCI. 127, 139 (1967); Alan Randall, *Coasian Externality Theory in a Policy Context*, 14 NAT. RESOURCES J. 35, 50, 52 (1974).

74. Mollinga, *supra* note 72; Davidson & de Loë, *supra* note 72.

75. *See* Torkil Jønch-Clausen & Jens Fugl, *Firming up the Conceptual Basis of Integrated Water Resources Management,* 17 INT'L J. WATER RESOURCES DEV. 501 (2001).

76. *See, e.g.*, Ingram, *supra* note 18; Wietske Medema et al., *From Premise to Practice: A Critical Assessment of Integrated Water Resources Management and Adaptive Management Approaches in the Water Sector*, 13 ECOLOGY AND SOC'Y, no. 2, 2008, at art. 29.

B. Water Security

Water security is an emerging perspective within the broader water governance discourse during the last decade[77] and reflects growing concern among practitioners and scholars about the vulnerability of human and natural systems to water-related threats.[78] Concepts of water security have arisen from several related perspectives, including human security, national security, and global security.[79] A human security perspective emphasizes water security for economic growth and poverty alleviation.[80] In turn, a national security perspective emphasizes water security at the national level and broader water-related threats to geopolitical instability.[81] A global security perspective likewise emphasizes interconnected global risks associated with systems such as global water, energy, food, climate change, and economic systems.[82] Thus, there are multiple perspectives on water security,[83] making it a "contested and normative concept."[84]

In terms of accounting for external connections, a focus on water security allows consideration of societal and institutional factors and risks beyond hydrological boundaries because it emphasizes "multi-scalar linkages within and beyond the watershed, which is neither the sole nor (often) the primary unit of analysis and water management."[85] A growing focus on water security has emerged in response to the failure of IWRM to adequately address water-related societal objectives[86] and because of a general desire to respond more effectively to water-related vulnerabilities and risks.[87] Increasingly, water security is also being linked

77. *See generally* David Grey & Claudia W. Sadoff, *Sink or Swim? Water Security for Growth and Development*, 9 WATER POL'Y 545 (2007); Christina Cook & Karen Bakker, *Water Security: Debating an Emerging Paradigm*, 22 GLOBAL ENVTL. CHANGE 94 (2012); Howard D. Wheater & Patricia Gober, *Water Security and the Science Agenda,* WATER RESOURCES RES. (2015).

78. *See, e.g.*, Karen Bakker, *Water Security: Research Challenges and Opportunities*, 337 SCI. 914 (2012).

79. Jeremy Allouche et al., *Water Security: Towards the Human Securitization of Water?*, 12 WHITEHEAD J. OF DIPL. AND INT'L REL. 153, 165 (2011).

80. *See generally* ANNABELLE HOUDRET ET AL., THE WATER NEXUS: CHALLENGES AND OPPORTUNITIES FOR DEVELOPMENT COOPERATION (Nina Odenwalder ed., 2010); Grey & Sadoff, *supra* note 77.

81. HOEKSTRA, *supra* note 24, at 31–32. *See generally* NAT'L INTELLIGENCE COUNCIL, *supra* note 44, at 30–37.

82. *See* THE WORLD ECON. FORUM WATER INITIATIVE, *supra* note 31, at 6.

83. Cook & Bakker, *supra* note 77, at 95. *See, e.g.*, Dustin Garrick & Jim W. Hall, *Water Security and Society: Risks, Metrics, and Pathways*, 39 ANN. REV. OF ENV'T AND RESOURCES 611, 614–15 (2014) (elaborating on the differences between cost-benefit and tolerable risk approaches to managing water risks); Wouters & Hendry, *supra* note 51, at 45 (focusing on national and interntational water law perpectives).

84. Allouche, *supra* note 79, at 153.

85. Karen Bakker & Cynthia Morinville, *The Governance Dimensions of Water Security: A Review*, 371 PHIL. TRANSACTIONS OF THE ROYAL SOC'Y A: MATHEMATICAL, PHYSICAL AND ENGINEERING SCI., Sept. 30, 2013, at 1, 5, http://rsta.royalsocietypublishing.org/content/roypta/371/2002/20130116.full.pdf.

86. *See*, *e.g.*, Muller, *supra* note 12, at 675 (noting the failure of Dublin's IWRM).

87. Bakker & Morinville, *supra* note 85, at 3–4.

with other types of resource security issues (such as energy and food security), especially in light of emerging concerns about the water-energy-food nexus.[88]

Water security thinking is connected much better to other social, economic, and political concerns than is IWRM. Nonetheless, it remains a highly water-centric perspective because water is still seen as the primary cause for concern within highly multi-priority and contested situations. For example, water is considered as deserving of special attention because it is "the gossamer that links together the web of food, energy, climate, economic growth, and human security challenges."[89] Regardless of the perceived importance of water by the water community, it is unlikely to be privileged to the same extent by actors in other problem domains. Thus, a water-centric problem framing such as water security is unlikely to be relevant to these actors.

C. Water-Energy-Food Nexus

The water-energy-food nexus refers to an emerging perspective that focuses on the linkages and trade-offs among water, energy, and food systems.[90]. It emerged in response to concerns such as resource scarcity and non-traditional security issues, shocks and crises in global resource and economic systems since 2008, and uncertainties and risks due to climate change.[91] Muller argues that the water-energy-food nexus can be seen as a response to the perceived failure of IWRM, specifically the lack of emphasis on "what water may do for society rather than what society should do for water."[92] The water-energy-food nexus perspective is gaining traction among some business groups,[93] national governments,[94]

88. *See supra* Part III.C; *see generally* LIVIA BIZIKOVA ET AL., THE WATER-ENERGY-FOOD SECURITY NEXUS (2013), http://www.iisd.org/pdf/2013/wef_nexus_2013.pdf [https://perma.cc/P5HL-FBNV]; HANS GUNTER BRAUCH ET AL., FACING GLOBAL ENVIRONMENTAL CHANGE: ENVIRONMENTAL, HUMAN, ENERGY, FOOD, HEALTH AND WATER SECURITY CONCEPTS (Patricia Kameri-Mbote et al. eds., 2009).

89. THE WORLD ECON. FORUM WATER INITIATIVE, *supra* note 31, at 1.

90. HOLGER HOFF, UNDERSTANDING THE NEXUS: BACKGROUND PAPER FOR THE BONN2011 NEXUS CONFERENCE (2011).

91. Mariel Yarbrough, Book Note, 14 U. DENV. L. REV. 418 (2011) (reviewing THE WORLD ECONOMIC FORUM WATER INITIATIVE, WATER SECURITY: THE WATER-FOOD-ENERGY-CLIMATE NEXUS (2011)); JEREMY ALLOUCHE ET AL., WATER AND THE NEXUS: NEXUS NIRVANA OR NEXUS NULLITY? A DYNAMIC APPROACH TO SECURITY AND SUSTAINABILITY IN THE WATER-ENERGY-FOOD NEXUS (2014).

92. Mike Muller, *The 'Nexus' as a Step Back Towards a More Coherent Water Resource Management Paradigm*, 8 WATER ALTERNATIVES 675 (2015).

93. Mariel Yarbrough, *supra* note 91; *see generally* Benson et al., *supra* note 61.

94. NAT'L INTELLIGENCE COUNCIL, *supra* note 44; ORGANISATION FOR ECON. CO-OPERATION AND DEV., WATER SECURITY FOR BETTER LIVES: A SUMMARY FOR POLICYMAKERS (2013).

international organizations,[95] economic institutions,[96] international water forums, and in global sustainability discourses.[97]

Nexus thinking is based on arguments that the growing global demand for water, energy and food by an expanding and increasingly affluent population will lead to scarcity and potential crises during coming decades. Oft-cited figures include forecasted increases in agricultural production of approximately 70 percent by 2050 and 50 percent in energy demand by 2035,[98] as well as a possible 40 percent gap between freshwater demand and supply by 2030.[99] Proponents of the water-energy-food nexus perspective specifically aim to move beyond a water-centric perspective by shifting the focus from a single sector to "a cross-sectoral and dynamic perspective" that "considers the different dimensions of water, energy and food equally and recognizes the interdependencies of different resource uses."[100] This perspective aims to provide a common focus for engaging diverse actors (including business) with a cross-sectoral perspective of a resource-constrained future—something that has failed to happen under traditional IWRM (or even sustainable development) perspectives.[101] Nonetheless, the extent to which the water-energy-food nexus has moved beyond a project of the water community is being questioned.[102]

A variety of different nexuses have been proposed in the literature—spanning water, energy, food, land, minerals, health, and climate change.[103] This demonstrates that although proponents frequently refer to "the" nexus, there are in fact many possible nexuses among different sets of issues in any particular context. What is most important is "nexus thinking," rather than any particular reified version of a nexus.[104] Hence, while a nexus perspective is a way to expand the scope for understanding and addressing water issues beyond a traditional water-

95. FOOD & AGRIC. ORG. OF THE UNITED NATIONS, *supra* note 31; *see generally* Claudia Ringler et al., *The Nexus Across Water, Energy, Land and Food (WELF): Potential for Improved Resource Use Efficiency?*, in 14 GLOBAL WATER NEWS 6 (2014).

96. *See* ASIAN DEV. BANK, *supra* note 31; WORLD ECON. FORUM, MANAGING OUR FUTURE WATER NEEDS FOR AGRICULTURE, INDUSTRY, HUMAN HEALTH AND THE ENVIRONMENT (2008); ORGANISATION FOR ECON. CO-OPERATION AND DEV., *supra* note 94.

97. *See* ALLOUCHE ET AL., *supra* note 91; Benson et al., *supra* note 61, at 756; Matthias Leese & Simon Meisch, *Securitising Sustainability? Questioning the 'Water, Energy and Food-security Nexus'*, 8 WATER ALTERNATIVES 695 (2015).

98. HOFF, *supra* note 90, at 4; FOOD & AGRIC. ORG. OF THE UNITED NATIONS, *supra* note 31.

99. 2030 WATER RES. GRP., CHARTING OUR WATER FUTURE: ECONOMIC FRAMEWORKS TO INFORM DECISION MAKING iv (2009).

100. FOOD & AGRIC. ORG. OF THE UNITED NATIONS, *supra* note 31, at 4, 6 (2014).

101. *See* ALLOUCHE ET AL., *supra* note 91; FOOD & AGRIC. ORG. OF THE UNITED NATIONS, *supra* note 31; Benson et al., *supra* note 61, at 756–73; Claudia Ringler et al., *The Nexus Across Water, Energy, Land and Food (WELF): Potential for Improved Resource use Effeciency?*, 5 CURRENT OPINION IN ENVTL. SUSTAINABILITY 617, 617–24 (2013); FOOD & AGRIC. ORG. OF THE UNITED NATIONS, *supra* note 31; Benson et al., *supra* note 61, at 756–73.

102. *See* ALLOUCHE ET AL., *supra* note 91; Ringler et al., *supra* note 101, at 617–24.

103. *See* Benson et al., *supra* note 61, at 756–73; UNITED NATIONS ECON. & SOC. COMM'N FOR ASIA AND THE PACIFIC, THE STATUS OF THE WATER-FOOD-ENERGY NEXUS IN ASIA AND THE PACIFIC.

104. *See* Benson et al., *supra* note 61, at 756–73 (2015); Mike Muller, *The 'Nexus' as a Step Back Towards a More Coherent Water Resource Management Paradigm*, 8 WATER ALTERNATIVES 675, 675–94 (2015).

centric view, ambiguities and tensions inherent in making boundary judgments cannot be avoided any more easily in nexus thinking than under IWRM or water security perspectives.

The novelty and added value of a water-energy-food nexus perspective has also been critiqued in several other ways. A particular weakness is poor regard for the governance implications of a nexus perspective.[105] Integration challenges within any single resource sector are immense, as demonstrated by experience under IWRM.[106] These integration challenges are much greater when considering multiple resource sectors simultaneously. Adding to the challenges, governance regimes for other resource systems tend to have differing characteristics. For example, water governance typically involves a strong role for public actors, while governance for energy typically involves a strong role for both public and private actors, and governance for food is largely dominated by private actors. Nexus discourse to date has also been strongly apolitical, focusing largely on resource efficiency and technical and market-based responses to scarcity, while downplaying issues of equity, access, and power; this may be due to the central role of business (largely multinational corporations) in shaping and promoting this agenda to date.[107]

D. Water Resilience

Water resilience is a relatively new concept that builds on aspects of the previous three perspectives. Rockström et al.[108] characterize water resilience as the role of water in achieving broader social-ecological resilience, which is taken as "the capacity of social-ecological systems to adapt or transform in response to unfamiliar, unexpected and extreme shocks." Resilience thinking around water has emerged as a way of managing for resilience in the face of uncertainty and change. Water resilience is argued to be a useful lens for moving beyond the traditionally managerial (i.e., linear, instrumental) leanings of IWRM, and thus to better cope with uncertainty, dynamics, and environmental change.[109] Water resilience is closely linked to the idea of adaptive water governance, which emphasizes flexibility, learning, and adaptation in polycentric (i.e., characterized by multiple decision centers) and multi-level (e.g., local, regional, national, global) water governance systems.[110] Adaptive water governance is growing in importance as a theme in theoretical and empirical water governance literature.[111]

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105. *See* ALLOUCHE ET AL., *supra* note 91, at 8; Benson et al., *supra* note 61, at 760.

106. *See* Asit K. Biswas, *Integrated Water Resources Management: A Reassessment*, 29 INT'L WATER RESOURCES ASS'N 248, 248–56 (2004).

107. *See* Jeremy Allouche et al., *Technical Veil, Hidden Politics: Interrogating the Power Linkages Behind the Nexus*, 8 WATER ALTERNATIVES 610, 610–26 (2015); Matthias Leese & Simon Meisch, *Securitising Sustainability? Questioning the 'Water, Energy and Food-Security Nexus'*, 8 WATER ALTERNATIVES 695, 695–709 (2015).

108. ROCKSTRÖM ET AL, *supra* note 2, at 262.

109. *See* Victor Galaz, *Water Governance, Resilience and Global Environmental Change—A Reassessment of Integrated Water Resources Management (IWRM)*, 56 WATER SCI. & TECH. 1 (2007).

110. *See* Dave Huitema et al., *Adaptive Water Governance: Assessing the Institutional Prescriptions of Adaptive (Co)management from a Governance Perspective and Defining a Research Agenda*, 14 ECOLOGY AND SOC'Y, no. 1 2009, at art. 26; Claudia Pahl-Wostl, *A Conceptual Framework for*

Water resilience thinking pays considerable attention to critical external forces such as climate change, teleconnections, population dynamics, and other key drivers.[112] However, the extent to which water resilience accounts for connections between water and other sectors in governance is unclear. Conceptually, this resilience perspective offers advantages due to its emphasis on polycentricity, multi-level interactions, dynamics, and context, which could provide greater opportunity to analytically account for relevant external connections compared to a traditional IWRM perspective.[113] However, theoretical and empirical studies to date still tend to emphasize processes that are internal to water governance and have yet to comprehensively recognize and account for the wide range of potential external connections that can strongly influence adaptive water governance processes and outcomes. In this regard, water resilience thinking remains strongly water-centric. Furthermore, although the analytical and normative potential of water resilience, and related ideas from adaptive water governance, are becoming accepted within the scholarly community, water resilience is not yet strongly connected to policy and practice because of major challenges in its practical implementation. The challenge of implementing or enacting a water resilience perspective parallels longstanding challenges of implementing IWRM and adaptive management within institutional contexts that do not allow for the flexibility, experimentation, learning, and collaboration that is normatively required under such approaches.[114]

IV. MOVING BEYOND WATER-CENTRIC PERSPECTICES IN A CONNECTED AND CHANGING WORLD

As demonstrated by the brief survey in the previous section, many people within the water community already have recognized the need to connect water with other domains so that desired water outcomes can be achieved more effectively. Among these bodies of literature, a rich foundation of ideas, experiences and tools already exists. Nonetheless, the four perspectives considered here remain heavily water-centric and this may limit their utility as a platform for engaging actors external to the water sector. For example, Allouche et al.[115]

Analysing Adaptive Capacity and Multi-level Learning Processes in Resource Governance Regimes, 19 GLOBAL ENVTL. CHANGE: HUMAN AND POL'Y DIMENSIONS 354, 354–65 (2009); Ray Ison et al., *Sustainable Catchment Managing in a Climate Changing World: New Integrative Modalities for Connecting Policy Makers, Scientists and Other Stakeholders*, 25 WATER RESOURCES MGMT. 3977, 3977–92 (2011).

111. *See* Nathan L. Engle & Maria C. Lemos, *Unpacking Governance: Building Adaptive Capacity to Climate Change of River Basins in Brazil*, 20 GLOBAL ENVTL. CHANGE 4, 4–13 (2010); Patrick Huntjens et al., *Institutional Design Propositions for the Governance of Adaptation to Climate Change in the Water Sector*, 22 GLOBAL ENVTL. CHANGE 67, 67–81 (2012); Claudia Pahl-Wostl et al., *From Applying Panaceas to Mastering Complexity: Toward Adaptive Water Governance in River Basins*, 23 ENVTL. SCI. & POL'Y 24, 24–34 (2012); Huitema et al., *supra* note 110.

112. *See* ROCKSTRÖM ET AL., *supra* note 2, at 47–50, 52, 110–33.

113. *See generally id*.; Huntjens et al., *supra* note 111; Pahl-Wostl, *supra* note 3.

114. *See* Medema et al., *supra* note 76; Barbara A. Cosens & Mark Kevin Williams, *Resilience and Water Governance: Adaptive Governance in the Columbia River Basin*, 17 ECOLOGY AND SOC'Y, no. 4, 2012, at art. 3; Carina Wyborn & Stephen Dovers, Editorial, *Prescribing Adaptiveness in Agencies of the State*, 24 GLOBAL ENVTL. CHANGE 5, 5–7 (2014).

115. ALLOUCHE ET AL., *supra* note 91, at 11.

emphasize that the water-energy-food nexus idea has emerged primarily from within the water world, and question whether the conventional framing of water, energy, and food as being in a contested trade-off relationship has actually reduced its ability to influence policy in the energy and food realms. In all four perspectives reviewed here, we conclude not only that consideration for what we characterize as "external connections" is inadequate, but also that the water-centric nature of each perspective inherently constrains its ability to address these connections more effectively.

New frames are needed that move beyond water-centric assumptions. As a starting point, in this section we explore three key conceptual and practical ways to build on progress to date within the water community about how to move beyond water-centric perspectives in water governance. These include reconciling water-centric and non-water-centric approaches, applying a critical awareness of boundary judgments, and re-thinking water governance to account for critical connections. Together, these provide a foundation for moving beyond water-centric approaches. Importantly, we view these ideas as *additive*. They complement a variety of complementary strands of thought emerging in the water governance literature, and beyond.[116]

A. Reconciling Water-Centric and Non-Water-Centric Approaches

We have argued that the extent to which the outcomes desired by the water community (e.g., clean water, healthy aquatic ecosystems, sustainability) can be achieved may be strongly linked to an ability to recognize and account for critical 'external' considerations. The failure to address these connections within contemporary water-centric approaches, we suggest, contributes to the persistence of water problems. More systemic approaches clearly are needed. However, as previous efforts to integrate water and related concerns have shown, the political, social, and economic transaction costs associated with more systemic approaches are high.[117] From a practical perspective, it is important to ask whether or not a particular water problem can and should be treated as a sectoral or cross-sectoral problem, and at what scale.[118] Put another way, some water problems clearly can and should be addressed inside the water box, while others may require breaking out of the water box. How can we make that determination?

We suggest that a water-centric perspective is likely to be appropriate when the practical scope of causes, effects, and interests associated with a water issue are relatively clear, uncontentious, and bound by sector. For example, issues such as operational decision-making about water supply and wastewater treatment infrastructure, installation of water-sensitive urban infrastructure by a local government, or stream restoration on public lands may be amenable to water-centric approaches. Numerous actors, drivers, and institutions beyond the specific

116. *See generally* Edelenbos & van Meerkerk, *supra* note 32; VICTOR GALAZ ET AL., CONNECTED RISKS, CONNECTED SOLUTIONS (2014).

117. *See* D.J. Merrey, *Is Normative Integrated Water Resources Management Implementable? Charting a Practical Course with Lessons from Southern Africa*, 33 PHYSICS & CHEMISTRY EARTH 899, 901–902 (2008). *See also* Mukhtarov & Gerlak, *supra* note 13; Muller, *supra* note 12.

118. *See* Gupta & Pahl-Wostl, *supra* note 34.

problem situation will certainly exist in these cases. Nonetheless, it may not be necessary to address them. Instead, the tasks in question may be amenable to resolution through conventional, water-related channels of planning and decision-making.

In contrast, drawing strongly on insights that emerged from experiences with the approaches discussed above in Part III a more systemic approach that takes account of key connections that can influence water governance is likely to be necessary when the following kinds of circumstances exist:

- Issues cross multiple policy sectors (e.g., food, water, energy, security, health) and operate at multiple scales (e.g., local, regional, national, global).
- Water-centric concepts such as basins and watersheds do a poor job of capturing key external actors, drivers and institutions.
- The interests, perspectives, and actions of multiple actors outside the traditional water sector influence whether desired water outcomes can be achieved.
- Disagreements or controversies exist inside and outside the water sector about the existence of problems, appropriate solutions, and causes and effects.
- Interactions among problems, actors, drivers, and institutions can only be fully recognized and understood from a systemic perspective.

While criteria such as these are a useful starting point for deciding whether or not a water-centric approach is appropriate, applying them successfully will require critical awareness of the boundary judgments that relate to each of these concerns.

B. Thinking Critically About Boundary Judgments

Making appropriate boundary judgments in a particular situation is crucial for deciding whether a water-centric perspective is appropriate, and for deciding the scope needed to identify relevant external connections. This requires some ability to understand causes, effects, and interests involved in a water issue, and whether they can be meaningfully bounded within the water sector, or whether boundaries are much more open, ambiguous, and multi-scale. The typical approach in water governance is to base boundary judgments principally on hydrological boundaries. As argued earlier in the article, this assumes that the most important causes, effects, and interests are contained by hydrological boundaries, but under this view many other social, economic, and political causes and effects that transcend hydrological boundaries may be neglected.[119] There will also be many different views among actors outside the water sector about valid ways of making boundary judgments, for example, whether decisions and actions should instead be based on other considerations, such as administrative or political jurisdictions.

A variety of boundary judgments are salient. Judgments about how water issues are addressed across various spatial and organizational levels are a key

119. *See* Blomquist & Schlager, *supra* note 16, at 101, 105–106, 113.

consideration.[120] Gupta and Pahl-Wostl[121] suggest that different issues may be addressed at different levels, such as a local level (e.g., access to water and sanitation by communities), a state/national level (e.g., infrastructure and land use planning, policies for responding to climate change), a transboundary level (e.g., managing international river basins and aquifers), or a global level (e.g., creating overarching discourses, policy coherence). While this is a reasonable suggestion, issues at any of these levels may also be strongly influenced by actors, drivers, and institutions associated with other sectors and scales that need to be accounted for. Temporal boundary judgments are another key consideration. For example, a full assessment of the impacts of climate change on an urban water system may not be required for short-term planning over a five-year timeframe, but would be extremely important for long-term planning over a 30-year timeframe. From a policy process perspective, van Meerkerk et al.[122] highlight boundary judgments related to substantive issues (e.g., how issues, relevant problem domains, and values are delineated), participation issues (e.g., which actors are involved and how), structural issues (e.g., the structure of a policy process), and contextual issues (e.g., the broader environment and external factors around the policy process). More generally, Ulrich[123] highlights the importance of both analytical boundary judgments (i.e., what currently exists) and normative boundary judgments (i.e., what is desirable). Ulrich's approach highlights issues of values, power, knowledge, and legitimation as inherent aspects of making boundary judgments in multi-actor situations, issues that demand critical awareness and reflection by analysts and policymakers.[124]

Nonetheless, we assume that it is neither possible nor desirable to account for all relevant external connections. We furthermore assume that accounting for each additional connection likely involves considerable social, economic, and political transaction costs. This creates a dilemma: in cases where a water-centric approach is not appropriate, we need to account for a much wider range of external connections in order to improve water governance, but trying to account for all possible connections will be overwhelming and guarantees "paralysis by analysis." Consequently, approaches that account for external connections need to be strategic so that they can be operationalized. A key goal in making boundary choices should therefore be to identify and account for only the factors and interactions that matter

120. *See generally* Ingar van Meerkerk et al., *Water Managers' Boundary Judgments and Adaptive Water Governance— An Analysis of the Dutch Haringvliet Sluices Case*, 27 WATER RESOURCES MGMT. 2179 (2013).

121. Gupta & Pahl-Wostl, *supra* note 34, at tbl.2.

122. van Meerkerk et al., *supra* note 120, at 2181–82, tbl.1.

123. Ulrich, *supra* note 15, at 17.

124. *See, e.g.*, Marie Claire Brisbois & Rob C. de Loë, *Natural Resource Industry Involvement in Collaboration for Water Governance: Influence on Processes and Outcomes in Canada,* 60 J. OF ENVTL. PLAN. & MGMT. (forthcoming 2017) (published online Aug. 5, 2016), http://www.tandfonline.com/doi/full/10.1080/09640568.2016.1182899; Marie Claire Brisbois & Rob C. de Loë, *State Roles and Motivations in Collaborative Approaches to Water Governance: A Power Theory-based Analysis*, 74 GEOFORUM 202 (2016).

most in a particular situation.[125] Important lessons on how to proceed in such a diagnosis can be drawn from the "mixed scanning" method of decision-making. This technique involves simultaneously considering the local, incremental problem situation, as well as the broader, longer-term context in order to strategically identify broader factors that may influence the local problem situation.[126] Diagnostic approaches, such as those based on social-ecological systems thinking, will also be particularly useful to provide guidance for structured analysis of new situations.[127] In fact, diagnostic approaches are increasingly being applied to complex water governance problems.[128]

Fundamentally, implementing the perspective we advocate here will be considerably more difficult than the water-centric approach of using hydrological boundaries to delineate what is within or outside the scope of analysis. It demands critical awareness to make appropriate boundary judgments in the face of uncertainty and ambiguity. Where uncertainty refers to a "lack of knowledge or information about a phenomenon", ambiguity refers to "the simultaneous presence of multiple frames of reference to understand a certain phenomenon."[129] Ambiguity "emerges from the simultaneous presence of multiple valid and, sometimes conflicting ways, of framing a problem."[130] Both uncertainty and ambiguity about water issues, especially those that cannot be fully articulated from a water-centric perspective, mean that making boundary judgments requires critical awareness of the problem at hand, its context, the causes and effects of the problem, the range of actors and interests involved, and agenda setting and framing processes (e.g., whose problem is being addressed). By the same token, the problem of "external connections" is partly a consequence of making water-centric boundary judgments in the first place, although it also reflects the broader challenge of understanding how any particular problem is connected to wider factors and contexts within which it is embedded. Hence, both the existence of external connections and the need for boundary judgments are interdependent dilemmas that need to be addressed simultaneously.

C. Re-thinking Water Governance to Account for External Connections

Finally, it is important to reflect on how water governance must be different in response to the challenges of making boundary judgments and

125. *See generally* Merrey, *supra* note 117; Bruce Mitchell, *Integrated Water Resource Management, Institutional Arrangements, and Land-use Planning*, 37 ENV'T & PLAN. A 1335 (2005); Mollinga et al., *supra* note 72.

126. Amitai Etzioni, *Mixed-scanning: A 'Third' Approach to Decision-making*, 27 PUB. ADMIN. REV. 385, 389–90 (1967).

127. *See generally* Elinor Ostrom, *A General Framework for Analyzing Sustainability of Social-ecological Systems*, 325 SCI. 419 (2009).

128. *See generally* Pahl-Wostl et al., *supra* note 3, at 355; Dustin Garrick et al., *Managing Hydroclimatic Risks in Federal Rivers: A Diagnostic Assessment*, 371 PHIL. TRANSACTIONS OF THE ROYAL SOC'Y 3 (2013).

129. A. Dewulf et al., *Integrated Management of Natural Resources: Dealing with Ambiguous Issues, Multiple Actors and Diverging Frames*, 52 WATER SCI. & TECH. 116 (2005).

130. M. Brugnach & H. Ingram, *Ambiguity: The Challenge of Knowing and Deciding Together*, 15 ENVTL. SCI. & POL'Y 60, 61 (2012).

accounting for external connections. We argue that more systemic approaches are needed that situate water governance within broader social-ecological[131] and political-economic[132] contexts and dynamics. But more "integration" is not necessarily the answer. As argued here, such systemic approaches require strategic ways of identifying and understanding a wide range of potential drivers, institutions, and actors that lie beyond the water sphere but may nonetheless influence water governance activities and outcomes. Unfortunately, cultivating awareness of boundary judgments and accurately diagnosing which external connections are relevant—as difficult as this will be—is likely to be a modest challenge compared to *addressing* those connections in all the contexts within which governance occurs.

Governing water differently—and thereby escaping the water box—is incredibly difficult due to deep path dependency. Societies around the world have found numerous ways to organize themselves to make decisions and take actions regarding water. Nonetheless, despite widely divergent environmental, social, political, and economic contexts, a common thread that runs through the water governance regimes that exist in almost every country is a water-centric perspective. To illustrate, systems for determining rights to access water in many western countries are based on a limited number of broadly similar rules that have evolved over centuries (e.g., riparian rights, prior allocation, market mechanisms).[133] Similarly, river basin organizations as an institutional form are ubiquitous around the world, and are found in developed and developing countries.[134]

Water-centric institutions contribute to issue framing that reflects conventional views on the types of factors and interactions that matter in water governance; these framings make it hard to "see" drivers, institutions, and actors that are outside the water sphere. For example, in its 2009 report the UN World Water Assessment Programme observes that "the decisions that determine how water resources are used or abused are not made by water managers alone."[135] Instead, the report's authors argue, these decisions are made by leaders in governments, civil society, and the private sector. This diagnosis is accurate, but the prescribed solution remains essentially water-centric: "These leaders must learn to recognize water's role in attaining their objectives and act accordingly."[136] This approach is problematic because it assumes that actors such as economic ministries, mining, energy, and agribusiness companies, banks, and other powerful actors that influence how water resources are used and abused will want to engage with the water sector on *its* terms. As we have argued previously, there is little reason to think that this is the case. Hence, the water community may need to start rethinking

131. *See generally* A. Wiek & K.L. Larson, *Water, People, and Sustainability—A Systems Framework for Analyzing and Assessing Water Governance Regimes*, 26 WATER RESOURCES MGMT. 9 (2012); Garrick et al. *supra* note 128.

132. *See generally* Allan, *supra* note 63; Ingram, *supra* note 18; Araral & Wang, *supra* note 4.

133. *See generally* ECON. & SOC. COMM'N FOR ASIA & THE PACIFIC, PRINCIPLES AND PRACTICES OF WATER ALLOCATION AMONG WATER-USE SECTORS, U.N. Doc. ST/ESCAP/SER.F/80 (2000).

134. *See* THE POLITICS OF RIVER BASIN ORGANISATIONS, *supra* note 18.

135. Report 3, *supra* note 35, at i.

136. *Id*. at 3.

whether existing water-centric institutions are even capable of dealing with the kinds of external connections that are becoming increasingly significant in water governance. Institutional reform may be needed, but this is likely to be difficult. Major institutional reforms involve significant social, political, and economic costs, in part because they challenge existing power structures.[137]

The perspectives reviewed in Part III, including from proponents of the approaches and from their critics, offer a middle ground between the status quo and wholesale institutional reform. For example, scholars have argued for the need to focus on the actual spatial extent of problems and their causes, rather than assuming that these are captured by watershed or basin boundaries, in framing water problems.[138] Allan, for instance, argues that a "problemshed" perspective "forces us to shift the analysis from a hydro-centric focus to a comprehensive approach embracing the political economy and other relationships that are part of operational water allocation and use."[139] Whether or not one adopts the term problemshed, the concept it expresses is sound because focusing on the actual spatial extent of problems and their ecological, social, economic, and political causes can help transcend hydrological boundaries. This can improve the potential for identifying relevant external connections because the scope of analysis is not prematurely confined to hydrological boundaries.

Critics of contemporary approaches have also drawn attention to the importance of political dimensions of water governance and the role of broader political economic contexts in shaping water governance.[140] For example, Ingram argues for the need to "bring back the art of politics" because "any meaningful change in water management is likely to be accompanied by a good deal of resistance and strategic maneuvering," and be inextricably linked to wider factors such as societal values, inequalities, and political agendas, including other sectoral concerns such as agriculture and energy.[141] This is particularly salient in light of the growing role of powerful private actors such as multinational firms, banks, and insurance companies in water governance, which increasingly are discovering that their core business activities are exposed to water-related risks. The traditional water community has been slow to recognize the growing importance of these actors.

CONCLUSION

In an increasingly interconnected world where the magnitude and severity of the challenges is growing, a water-centric perspective is no longer appropriate for all problems. But adopting a less water-centric stance presents major

137. *See generally* ORAN R. YOUNG ET AL., INSTITUTIONS AND ENVIRONMENTAL CHANGE: PRINCIPAL FINDINGS, APPLICATIONS, AND RESEARCH FRONTIERS (2008).

138. *See, e.g.*, Allan, *supra* note 25; Mollinga et al., *supra* note 72; Davidson & de Loë, *supra* note 72; Muller, *supra* note 12; YOUNG ET AL., supra note 137, at 8.

139. Allan, *supra* note 25, at 128.

140. *See, e.g.*, *id*.; Peter P. Mollinga, *Water, Politics and Development: Framing a Political Sociology of Water Resources Management*, 1 WATER ALTERNATIVES 7 (2008); François Molle, *Water, Politics and River Basin Governance: Repoliticizing Approaches to River Basin Management*, 34 WATER INT'L 62 (2009).

141. Ingram, *supra* note 18, at 7–8.

challenges. First and foremost, a more systemic perspective that better accounts for external connections is likely to make governance even more challenging. "Paralysis by analysis" is a real concern, especially if "more systemic" is inappropriately conflated with "more integration." Policy makers, administrators, and practitioners already experience real limits on their ability to address complex problems, if for no other reason than they operate under legal and other institutional constraints. Thus, more systemic approaches need to be strategic, pragmatic, and sensitive to context. Different kinds of approaches will be needed to reflect the enormous diversity that exists globally in actors, discourses, scales, environmental conditions, and governance regimes. These approaches will draw in various ways on the vast fund of experience that already exists within the water community through efforts to implement IWRM and the other perspectives discussed in Part III, and on growing attention to connectivity in water governance.[142] Diversity in approaches to identifying and addressing external connections that influence water governance not only is realistic, but also desirable. Indeed Ingram[143] calls for "clumsy solutions"[144] that appeal to different value-sets and rationales as a strategy that can enhance the likelihood of finding workable solutions to complex water issues in particular contexts.

There is tremendous scope for the water community to engage with water-related issues (e.g., energy, food, environmental protection, land use planning, urban design, climate change adaptation, public health and community wellbeing, transport, global trade, and defense) in new policy and decision-making arenas. This will require an ability to accurately diagnose the external connections that matter, to revisit the boundary judgments that must be made in addressing water challenges, and to rethink the ways in which water governance takes place. At the same time, this will require a willingness on the part of the water sector to engage with actors from other sectors who will have very different vocabularies and worldviews. We view fulfilling these requirements as essential for making progress on current and emerging water challenges.

142. *See, e.g.*, Edelenbos & van Meerkerk, *supra* note 32.

143. Ingram, *supra* note 18, at 13, 17.

144. Marco Verweij et al., *Clumsy Solutions for a Complex World: The Case of Climate Change*, 84 PUB. ADMIN. 817 (2006).