The governance dimensions of water security: a review

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Water governance is critical to water security, and to the long-term sustainability of the Earth’s freshwater systems. This review examines recent debates regarding the governance dimensions of water security, including adaptive governance, polycentric governance, social learning and multi-level governance. The analysis emphasizes the political and institutional dimensions of water governance, and explores the relevance of social power—an overlooked yet important aspect of the water security debate. In addition, the review explores the intersection and potential synergies between water governance perspectives and risk-based approaches to water security, and offers critiques and suggestions for further research questions and agendas.

1. Introduction

The issue of water security—defined as an acceptable level of water-related risks to humans and ecosystems, coupled with the availability of water of sufficient quantity and quality to support livelihoods, national security, human health and ecosystem services—has been the object of increased academic and policy interest over the past decade [1,2]. Simultaneously, water governance—defined as the range of political, organizational and administrative processes through which community interests are articulated, their input is incorporated, decisions are made and implemented, and decision-makers are held accountable in the development and management of water resources and delivery of water services [3]—has been increasingly recognized as a critical contributor to the long-term sustainability of water resources [4–6]. Relatively little attention has, however, been paid to the governance dimensions of water security, a gap which this review addresses, through presenting a review of recent relevant debates, and exploring questions for further research.
The analysis presented below summarizes major contributions to the literature to date, and identifies questions for future research, covering a range of concepts, including: adaptive governance, polycentric governance, social learning, multi-level governance and social power. It is important to note that these dimensions of water security, while treated separately for the sake of conceptual clarity, are characterized by significant overlaps in practice. For example, the introduction of multi-level water governance (e.g. via devolution to lower scales of management) is often associated with polycentric governance (e.g. increased citizen participation, new decision-making processes and new types of stakeholders) [7–11]. By considering each of these concepts in turn, we hope to introduce a degree of conceptual clarity into the discussion of the governance dimensions of water security. Prior to this, we begin with a discussion of the synergies and distinctions between water security and integrated water resources management (IWRM) perspectives, with the goal of identifying the ways in which a water security perspective might differ, in an innovative fashion, from conventional IWRM approaches.

<table>
<thead>
<tr>
<th>concept</th>
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<td>polycentric governance</td>
<td>approach to decision-making comprising several independent centres and actors [13]</td>
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<td>social learning</td>
<td>exploratory and iterative process of ‘learning by doing’ whereby actors share experiences and ideas to remove constraints and resolve complex issues [14–16]</td>
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<tr>
<td>multi-level governance</td>
<td>negotiated, non-hierarchical exchanges between institutions at the transnational, national, regional and local levels, including relationships between governance processes at these different levels [17]</td>
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<tr>
<td>harmonization</td>
<td>process of achieving regulatory efficiency, effectiveness and clarity through legislative and policy standardization and centralization</td>
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<tr>
<td>subsidiarity</td>
<td>principle whereby a central authority does not take action (except in the areas which fall within its exclusive competence) unless it is more effective than action taken at lower scales</td>
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2. Water security versus integrated water resources management

Water security has been the subject of growing interest on the part of academic researchers over the past decade (figure 1). The concept of water security has been taken up in a broad range of disciplines across the social, natural and medical sciences [2]. Indeed, as figure 1 demonstrates, references to water security in the academic literature are nearly as prevalent as references to IWRM—a concept that dates back to the early twentieth century and which has arguably been the
Figure 1. Academic publications per year: water security (insecurity), IWRM and water governance (2000–2013).


dominant paradigm for water management for the past several decades [18]. Figure 1 similarly illustrates the increasing number of references to water governance over the last decade; this is, in turn, likely to be associated with the growing interest in questions of governance more generally. Despite IWRM remaining an influential paradigm for water-related research, figure 1 also suggests that scholarly interest is increasingly divided among three concepts (i.e. water security, water governance and IWRM), in the context of an upward trend in overall activity in water-related research over the past decade.

Water security shares key concepts in common with the IWRM paradigm [26], defined as ‘the unified or holistic management of water, land and other natural resources within the boundaries of entire river basins, watersheds or catchment areas’ [19, p. 32]. For example, both water security and IWRM emphasize linkages among sectors and between ecosystem and human health [29]. However, our interest in this review paper is in identifying the ways in which the governance dimensions of a water security perspective might differ, in an innovative fashion, from conventional IWRM approaches. In this regard, it is relevant to note that IWRM often emphasizes the importance of comprehensive management [25], whereas water security proponents emphasize uncertainty in our knowledge of (and ability to control) fresh water systems [20,21]. Furthermore, a water security perspective implies a focus on identifying, anticipating and responding to risk (weather or water-related shocks, threats or tipping points). A water security perspective also emphasizes the importance of thresholds, beyond which the resilience of coupled socio-ecological systems is threatened [30,31].

Some scholars have argued that the ‘constructive ambiguity’ of IWRM has enabled some ‘weak sustainability’ interpretations to occlude or evade the issue of mitigating and/or preventing specific threats, and confronting thresholds or ‘limits’ (beyond which a community, for example, might be considered water ‘insecure’) [2,32]. A water security approach, in contrast, prioritizes thresholds; indeed, the question of thresholds and acceptable levels of risk is, one could argue, central to the broader debate over environmental security. In contrast to IWRM, a water security
approach thus usually places greater emphasis on what Rockström et al. [30,31] term a ‘safe operating space’ for humanity. Here arises an important distinction between water security and IWRM perspectives. An IWRM perspective implies that water needs might be subjugated to land-use decisions; and moreover emphasizes the centrality of compromise between social equity, ecological integrity and economic growth. By contrast, a water security perspective emphasizes the primacy of water protection, often associated with an emphasis on minimum (or maximum) thresholds, acceptable levels of risk and reductions in vulnerability. From the latter perspective, compromise is not always possible or desirable.

In practice, of course, the distinctions between water security and IWRM are harder to draw (and, indeed, some might argue that water security is a complement to, or natural evolution of, IWRM). Many policy initiatives, in particular, contain aspects of both water security and IWRM approaches. For example, the European Water Framework Directive (WFD) emphasizes the importance of integrated watershed management (in line with IWRM), but also establishes thresholds (e.g. objectives and minimum standard levels for pollution of surface and groundwater resulting from emissions from all potential sources). Furthermore, while acknowledging that some control can be achieved through measurement at the source, the WFD recognizes that the risk and damage potential of chemical pollution is cumulative, and thus favours a ‘combined approach’, seeking to establish thresholds for cumulative impacts on fresh water bodies, which, in turn, serve as a guide for action on pollutant load reduction (prioritized on a risk basis) [33]. Nonetheless, the conceptual distinction is important, insofar as water security perspectives may be gradually complementing or even supplanting IWRM approaches (as one interpretation of figure 1 might suggest).

Another distinction between IWRM and water security approaches is that the latter also tends to place emphasis on the need for adaptive management, as a responsive approach that can reduce vulnerability and increase resilience in the context of evolving uncertainty. IWRM perspectives often stress the importance of comprehensive management in the context of trade-offs between protection of ecosystems and economic development (in line with the Brundtland Report-inspired conceptualization of sustainable development) [34]. By contrast, water security approaches are more closely associated with critiques of conventional command-and-control approaches to ecosystem management [35], often predicated on a systems perspective view that water (and indeed environmental) governance is a complex system that interacts with biophysical, technological and social systems [36]. An important premise from ‘systems theory’ follows: a degree of uncertainty is inherent in the management of such complex systems, to which governance frameworks (and managers) must adapt. This, in turn, justifies the concept of adaptive management, defined as a form of social coordination in which governance relies on networks that connect individuals, organizations, agencies and institutions at multiple organizational levels; nested polycentric institutional and decision-making arrangements; and collaborative, flexible, learning-based approaches to management (adapted from [12]).

What are the implications of adopting an adaptive management approach to water security (as opposed to a comprehensive management approach to IWRM)? First, adaptive management implies a greater degree of polycentrism in governance, in which a broader range of non-governmental actors and stakeholders play a role in decision-making. This implies polycentrism in research, as adaptive management implies the need for multi-disciplinary analyses of socio-ecological systems, simultaneously drawing on social science and ecological science perspectives. Equally important, this implies polycentrism in water management, given that a key justification for polycentric governance is the argument that social learning is enabled and improved through the involvement of a greater diversity of actors in on-the-ground management and decision-making processes. This justification underpins, for example, calls for public participation in environmental governance, a trend which is increasingly due to multiple factors, including awareness of the expertise available outside of government agencies, new

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3See, for example, the journal Ecology and Society (formerly the Journal of Conservation Biology) and the work of the Resilience Alliance.
approaches to citizen participation in environmental management more generally, and socio-economic restructuring in the context of neoliberalism [37–39]. From this perspective (and as explored below), environmental management processes that incorporate polycentric governance and social learning strategies—in turn facilitating the adaptation of management practices in response to changing socio-environmental conditions—are considered to be desirable.

Polycentrism implies the involvement of multiple actors at multiple scales; hence, a second innovative aspect of a water security approach is the emphasis on multi-level governance. As explored in greater detail below, multi-level governance processes (e.g. multi-stakeholder watershed management platforms) have been initiated in many jurisdictions for a variety of reasons, including increased emphasis on watershed-based and integrated management of environmental issues, awareness of the multi-level causes and impacts of water-related threats (particularly, although not uniquely, with regard to the water–energy–food nexus), and concern over the implications of climate change for water resources—the study and mitigation of which is necessarily multi-scalar. This provides a distinct contrast to the watershed-focused emphasis of IWRM.

This discussion of multi-level governance suggests a third innovative aspect of the governance dimensions of a water security perspective: attentiveness to issues of social power. Given the threats to human and environmental security mentioned above, the water security debate is characterized by preoccupation with the likelihood of both violent and non-violent conflicts [40], as demonstrated by recent debates over the water-related implications of the global ‘land grab’ [41]. The existence of these conflicts underscores the need for robust, multi-level and polycentric governance mechanisms and processes of social learning designed to mitigate trade-offs and resolve conflicts between users, sectors and nation-states [42], and also calls attention to the social, political and institutional aspects of water governance. Debates over water security thus emphasize the multi-scalar, complex nature of global conflicts at the ‘nexus’ of rapidly growing water, energy and food demands in the context of globalized trade in commodities (and ‘virtual water’), in which the existence of robust watershed-based mechanisms is a necessary but probably insufficient condition for conflict mitigation and resolution.

In summary, a comparison of water security and IWRM approaches suggests that there are (at least) three innovative governance dimensions of the water security paradigm that merit further analysis. First, water security perspectives emphasize the inherent uncertainty in the management of complex socio-ecological systems, and thus foreground an adaptive management paradigm, in which polycentric governance fosters social learning (and hence robust adaptation). Second, water security perspectives emphasize multi-scalar linkages within and beyond the watershed, which is neither the sole nor (often) the primary unit of analysis and water management. Third, water security emphasizes the centrality of social power, in a variety of modalities (both legal and illegal) and scales (from the local to supranational), in negotiating conflicts generated by tensions at the water–energy–food nexus. Below, we explore each of these three innovative governance dimensions of water security in turn.

### 3. Adaptive governance and water security: the potential contributions of polycentric governance and social learning

Adaptive governance has recently attracted a growing amount of interest as a promising strategy for contemporary resource management contexts characterized by complexity and uncertainty. This is particularly the case given global climate change, which simultaneously threatens the short- and long-term sustainability of resources such as the world’s freshwater supplies [3,13,43–45]. Two interrelated concepts are at the core of the adaptive governance framework: polycentric governance and social learning. We discuss each of these concepts in turn.

Polycentric governance, which can be traced back to Ostrom et al. [36], is defined as an approach to decision-making comprising several independent centres and actors [13]. Proponents argue polycentric governance systems—especially those with enough redundancy—are better
suited to respond to changes and uncertainties, making them more resilient than mono-centric governance systems [45]. This echoes critiques from the natural sciences (notably from ecology and conservation biology) regarding the pitfalls of command-and-control management approaches, and the need for adaptive management that supports resilience in socio-environmental systems [35]. These approaches emphasize the complexity of such systems, and hence their inherent uncertainty, while warning that complexity must not be deployed as an excuse for inaction but should rather be understood as an important contextual guide for the design of decision-making processes. Building on these critiques of command-and-control management, adaptive management was subsequently developed as a paradigm (which deliberately contrasted with ‘command-and-control’ management) better suited to environmental governance in the context of uncertainty [51,52].

This focus on polycentric governance parallels recent debates over the putative shifts from conventional ‘government’ towards ‘governance’ in resource management, political science and public administration more broadly. Such a transition is often associated with devolution processes, whereby managerial responsibilities are increasingly borne at the local scale (as outlined above) as well as with a redistribution of decision-making power among the various scales and social actors. In many accounts, polycentric governance also implies that non-governmental (and particularly community) actors play a more significant role in environmental management than in the past [53–57].

One of the major advantages of polycentric governance, according to its proponents, is the degree to which social learning is facilitated, in turn supporting adaptation, improving resilience and increasing water security [14–16]. Following from a recognition of a need to implement policies despite the uncertainty, unpredictability and frequent lack of comprehensive knowledge associated with contemporary water management contexts, proponents define social learning as an exploratory and iterative process of ‘learning by doing’ whereby actors share experiences and ideas to remove constraints and resolve complex issues [14,15]. In other words, water management is defined as a trial-and-error process through which feedback loops allow the system to learn from the outcomes of previously implemented policies [12,14,43,46]. Social learning also emphasizes the role of informal actors and shadow networks in providing novel management and governance ideas that challenge the frames of reference or status quo of a particular governance structure [58–60]. For example, Pahl-Wostl et al. [58] demonstrate that the some polycentric water governance initiatives may foster the integration of social, natural and engineering perspectives (and also between ‘soft’ and ‘hard’ approaches), allowing social learning to occur.

As this example suggests, a focus on increasing collaboration between actors is implicit in both polycentric governance and social learning discussions. Increasing collaboration, in turn, increases adaptive capacity of governance systems, which will bring about greater resilience—a desirable goal, given ‘shocks’ (rapid and extreme changes to systems) which we face—in turn enhancing short- and long-term water security for all stakeholders and users involved [43]. Increased resilience, of course, depends on the integration of water and land management, in turn implying the establishment of more complex governance structures—enhancing redundancy but also potentially complicating decision-making processes and the achievement of a shared vision and goals among stakeholders. In other words, adaptive governance requires increased collaboration, but the complexity of socio-environmental systems poses challenges to such collaboration.

This suggests a series of potential outstanding issues and criticisms facing adaptive governance strategies, as explored below. First, how feasible is the implementation of the strategies outlined above? What are the possible limitations to operationalizing strategies of adaptive governance beyond their analytical potential? In a context in which water governance systems are often working with limited resources and decision-making institutions are being

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4 Adaptive water governance is also related to parallel discussions on adaptive co-management [15,44,46] that have been taking place in resource management scholarship since the 1970s [43,47–50].
criticized as cumbersome bureaucracies with overlapping structures, adaptive governance strategies and a focus on multi-stakeholder collaboration, redundancy and social learning opportunities seem perhaps incongruous.

Second, what could a focus on adaptive governance be missing? Adaptive governance might imply an increased focus on adaptation but reduced emphasis on mitigation. Compare, for example, the emphasis on adaptation and mitigation strategies in discussions related to global climate change ([61–63] for water resource-specific accounts) versus the focus on adaptation characteristic of water governance literature (at the expense, one might argue, of mitigation of water insecurities through explicit attention to underlying factors and causes of such insecurities). We consider it worthwhile to ask what a clear focus on mitigation might imply for water security. For example, it may align adaptive governance more directly with the premises and practices of adaptive co-management models used in other resource sectors.

Our third and final critique asks: does a focus on social learning potentially occlude the importance of power dynamics between the actors involved? Despite promising efforts by adaptive governance literature to recognize the role of power [13,14,64], few accounts extend their concerns and exploration of power disparities beyond the inclusion of informal and marginalized actors. Could an emphasis on ‘social learning’ serve to obscure the power imbalances between legitimate actors in water governance contexts? What might the implications be for water security? We turn to the question of power relations between such actors in the final section, prior to which we consider issues of multi-level governance.

4. Multi-level governance and water security

Water security debates include several (at times competing) perspectives when it comes to the issue of scale. Research in different disciplines tends to prioritize different scales: for example, hydrologists focus on the watershed, whereas political scientists tend to focus on the nation-state [2]. Proponents of the national-scale perspective argue that water should be managed in line with national interests, for the benefit of the national economy and the country’s population [65]. For example, Egypt has recently declared the Nile River a matter of ‘national security’, and other countries have proposed definitions of water security. However, there appears to be a high degree of variation in definitions across jurisdictions. In a review of the concept of water security, Cook & Bakker [2] discuss such variegation between contexts such as Australia, where water security is defined as an issue of water availability on a watershed basis, versus the Middle East and North Africa region, where discussions are generally focused on regional-based sharing of scarce resources in the face of increasing demand and geopolitical tensions.

This divergence of approaches is of interest, given that the watershed (or river basin) scale has received much attention within water management debates over the past few decades. Watershed-based governance has been initiated in numerous countries, often associated with appeals for increased citizen participation (see [10,66–76], for examples from South Africa; [39], for the Lower Mekong basin; [77], for Chile; [78], for New Zealand; [79], for India; and [4], for a review of 29 cases from Europe, Latin America, Africa and Asia). A water security perspective, in contrast, implies the rescaling of governance—a suggestion that some water researchers and practitioners have welcomed, as the tendency of different scientific disciplines to conduct water-related research at different scales presents significant challenges to interdisciplinary research on water security [2].

Many practitioners have also welcomed multi-level governance, given their long-standing concern regarding ‘scalar mismatches’ (or ‘scalar failures’), which refer to situations in which a lack of coordination between scales weakens water governance institutions and undermines efficient and effective water management. Multi-level governance often entails a process of rescaling along one or more of three axes: ‘up’ from nation states, ‘down’ to local levels of government (e.g. the delegation of responsibility to municipalities), and ‘out’ from geopolitical units (e.g. the nation-state, the province, the state, the parish) to new scales (e.g. watersheds) [53,80–84]. This concept provides a welcome alternative to singular scale
analyses and particularly state-centric analyses, insofar as it assumes *a priori* the importance of addressing scalar interdependencies and cross-scale policy externalities [18,85–95]. These rescaling processes are not, of course, mutually dependent nor are they unidirectional or spatio-temporally homogeneous. Nonetheless, a distinct trend is discernible and has underpinned changes in the practices and processes of water governance in a variety of locales [11,18,85]. In many instances, these watershed-based approaches have been developed in tandem with regional and/or transboundary approaches to water governance. For example, Zeitoun et al. [96,97] offer an analysis of cooperation and conflict between riparian countries of the Upper Jordan River, arguing that greater water security will be achieved through focusing on the international watershed scale, as a means of fostering collaboration processes between different nation-states.

From a water security perspective, these scalar discussions and rescaling processes and the emergence of multiple models of multi-level governance (which parallel broader trends in environmental governance more generally) raise three interrelated critiques. First, it is important to acknowledge the utility and limitations of any particular scale of governance. One pertinent example in this respect is that of watershed governance. Discussions in the water governance literature often indicate the benefits of addressing environmental issues on a watershed basis [88,98,99]. A common, yet at times implicit, presumption in the literature is that human, environmental and social decisions can be integrated through watershed-level governance instruments in ways that may not be possible through conventional national political jurisdictions. In many instances, these assumptions are legitimated through appeals to the IWRM literature. IWRM proponents often assert the necessity of multi-agency integrated management of land and water resources on a watershed basis, thereby implying governance across jurisdictional and political boundaries and prioritizing the involvement of multiple local actors in water management [20,21,100]. However, critics have argued that the adoption of the watershed as a scale for governance ultimately results in the conflation of governance tools, hydrological boundaries and IWRM [66,71], limiting the effectiveness of governance processes due to the artificial constraints posed by a local focus.

The second point follows: although multi-level governance approaches often prioritize the watershed as the primary scale for decision-making, the watershed is not necessarily the optimal scale from which to address complex water security challenges. For example, energy–water security trade-offs (often referred to as the water–food–energy ‘nexus’) [101] are recognized to be of increasing urgency, particularly given the growing importance of ‘virtual water’ flows, notably those associated with global trade [102]. Given the multiple scales at which—and spatial and temporal distanciation via which—these trade-offs occur, reliance on watershed management alone may be insufficient. This is exacerbated by the fact that subsurface hydrological gradients may not correspond with surface topography—necessitating multi-level and integrated analyses of surface and groundwater [103]. In short, a watershed-focused approach is important but perhaps insufficient for adequately addressing the water security challenge: balancing human and environmental water needs in order to safeguard essential ecosystem services and biodiversity across the global water system [71].

A third critique relates to the issue of polycentric governance discussed above, insofar as proponents of watershed governance often invoke the claim that ‘local’ or ‘community’ control is necessarily positive [104–108]. Watershed governance is often advocated as a means for improving efficiency, access and sustainability [18,84,85,109–112], yet various authors note that it is important to retain a healthy scepticism regarding the extent of rescaling, which may in some instances be what Ribot [113] terms a ‘charade’. Indeed, despite apparent rescaling to the local level, decision-making power may remain situated with government-led processes in provincial or national capitals—as states can be loath to share ‘real’ power. For example, Norman & Bakker’s [114] study of transboundary water demonstrates that states retain power despite the ostensible rescaling of Canada–USA transboundary resources to the local scale—severely curtailing the power of local actors. The critique follows: to what degree does rescaling necessarily empower actors at local scales (e.g. the neighbourhood, the region or the watershed) [104–108]?
Warner’s [71] empirical analysis of multi-stakeholder platforms (MSPs) at the watershed level underscores this issue. Warner’s detailed analysis of MSP processes highlights the reluctance of power holders to share their decision-making responsibilities. Similarly, the limited legal powers conferred upon MSPs (frequently the case in watershed governance processes) constrain their capacity for concrete action—reducing their role to a ‘dissemination’ platform. Further, Warner argues, the disjuncture between participants’ expectations and MSP performance quickly results in disillusionment. Thus Warner contends that, while multi-stakeholder governance initiatives such as the MSP might be exciting and popular, the framework is not a panacea. Rather, specific criteria—such as substantive delegation of decision-making power, inclusion, sustainable funding, trust between participants and science-based decision-making—are necessary preconditions for successful multi-stakeholder governance processes.

A water security perspective implies, in other words, the need for multi-scalar governance. Yet this raises a new set of questions. One relevant issue is the compatibility of international water law regimes with water security, and their potential to create a sufficiently robust context for water security. In a review of the concept of water security and international law, for example, Leb & Wouters [115] argue that, on the one hand, a focus on national security questions linked with issues such as scarcity and upstream pollution may lead to what they call the ‘securitization of water’ in which water is located at the centre of politicization (and militarization) processes likely to exacerbate regional and global insecurity. On the other hand, their review of international legislation, protocols, treaties and agreements, such as the 1992 UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes, suggests that there is the potential for an alternative view of water security, based on resource management principles to be addressed jointly, via cooperation among nation-states (see also [116,117]). Similarly, in his review of transnational water governance, Conca [18] traces the emergence of a global regime of international waters culminating, in his reading, with the 1997 UN Watercourses Convention. While recognizing that the core principles of the convention are essential to the long-term protection of international water bodies, Conca nonetheless highlights several of its limitations and suggests that the convention also fails to address central and contentious issues and thus might be more about designing acceptable interstate deals than about safeguarding water security.

The preceding critiques provide useful caveats regarding the potential of rescaling processes and multi-level governance for questions of water security. Namely, the critiques draw attention to the conceptual pitfalls of the ‘local trap’: the assumption that the local scale, local actors and local organizations (however defined) are normatively ‘better’ environmental stewards [118] or that rescaling necessarily empowers local actors. They also suggest that a focus on the international scale similarly raises issues for water governance (albeit different from those associated with the watershed). While rescaling processes and multi-level governance approaches offer important avenues to pursue water security (at multiple scales), several limitations remain. This, in turn, suggests the need for a nuanced approach to such governance dimensions of water security, especially given that the creation of new spaces and institutions through rescaling processes often entails (contested and incomplete) transformations in networks of hierarchy and power [83,119,120]—an issue which we explore in the following section.

5. Political and institutional dimensions of water security: the issue of social power

Questions of social power are central dimensions of water security debates, insofar as insecurity arises not only through poor management decisions, suboptimal governance processes, insufficient science and evolving environmental pressures, but also through power relations, confrontation (whether violent or non-violent) and competition between political and socio-economic interests with respect to land and water ownership and control. Attention to the
political and institutional dimensions of water governance as well as to questions of social power, as we explore below, thus represents an important area of focus for water security perspectives.

In a review of the causal structure of famine, Watts & Bohle [121] follow Chambers’s [122] definition of vulnerability and highlight three basic aspects: (i) the risk of exposure to crisis, stress and shocks; (ii) the risk of inadequate capacities to cope with stress, crisis and shocks; and (iii) the risk of severe consequences of crisis, risk and shocks. Furthermore, building on Sen’s [123] concept of entitlements, which recognizes that experiences of famine often have more to do with individuals’ lack of entitlements rather than a decline in absolute food availability, Watts & Bohle [121, p. 47] conceptualize vulnerability as the ‘risks associated with large-scale entitlement deprivation [which are] often posed as a function of market perturbations or market imperfection’. In this sense, from a governance perspective, vulnerability—or exposure to risks and insecurities—also involves questions of social power. Watts and Bohle [121], drawing on Kent [124], further discuss how, from an empowerment approach, vulnerability (and thus insecurity) also arise from powerlessness vis-à-vis decision-making processes. Vulnerability can thus arise from a lack of rights (property rights and political rights to make claims on the state, in particular), which again illustrates the importance of social power.5

Building on this research, a substantive body of scholarship has demonstrated how power dynamics—shaped by factors such as gender, race, caste and class—influence water allocation and hence water security [8,79,126–130]. For example, through a case study of water access and arsenic contamination in Bangladesh, Sultana [128] contends that subjectivities are reproduced through use, control and access to (different types of) water resources, thereby reinforcing inequities. Specifically, Sultana’s study shows how relations to water resources are impacted by (gendered) identities and everyday practices in ways that heighten exposure to arsenic poisoning for some women and their families. As depicted by this case study, water insecurity arises not only through poor management, governance decisions and other technical factors—as it is often highlighted in the water governance literature—but also through social relations. A similar point is made by Islar [131], in the context of land and water grabbing. In a study of privatized small-scale hydropower development in Turkey, Islar illustrates the linkages between processes of land and water grabbing and the denial of water rights resulting from recent hydropower development. Her analysis highlights the linkages between what she considers neoliberal development processes, a lack of rights and entitlements and the resulting insecurities for both river ecosystems and the livelihoods of the communities living along and relying on those rivers.

Islar’s case study makes a more general point: in many cases, access to water resources might even be driving land enclosure processes (see also [41,132,133]). Access to water for irrigation, mining activities or hydropower development is often an important but ‘silent’ issue in large-scale land deals, which are often negotiated directly between national governments and purchasers in the absence of consultation with local actors, in turn resulting in exacerbated water insecurity for local populations.

In short, social power is a key factor in explaining water insecurity. Yet the converse is equally true: social power is an enabling condition for water security. Ostrom’s [37] seminal analysis of the commons (or common-pool resource management), for example, demonstrates that, under specific conditions, cooperation and collective action can lead to the sustainable management of common-pool resources, including water. Similarly, Wolf’s [134] review of transboundary river basins and associated management bodies or treaties established in each context underlines the potential for cooperation in instances of shared management of water resources [90,134–136]. This is particularly true given that water wars are not strategically rational, hydrographically effective or economically viable, and thus shared interests and the benefits of cooperation outweigh

5This point provides a useful insight and suggests that risk-based frameworks might offer a useful approach as they allow for the inclusion of both social and physical variables as well as multiple stakeholders at multiple scales, while creating a shared analytical basis for decision making regarding water-related trade-offs and conflicts [125]. It is not clear, however, how risk-based frameworks might resolve inequities that are rooted in social power; at the very least, without considering social power, they risk the same pitfalls as conventional approaches.
‘conflict-inducing characteristics’ [134]. Zeitoun & Warner [97] inject a note of caution, however, in arguing that traditional water governance approaches tend to treat cooperation (collaboration or co-management) as unproblematic in contexts marked by power asymmetries [97]. Rather, they suggest, both scholars and practitioners should be attentive to potential power disparities and inequalities—even in instances of apparently successful water governance.

These examples highlight the importance of analysing the concentration of power via articulated processes of accumulation and governance—particularly when they entrench and reproduce power imbalances through (in)access to resources. An important caveat to this statement is the recognition that the state’s role in resource allocation is often complex. For example, Ferguson’s [137] analysis of the ‘unintended consequences of development’ (in a case study of failed hydrodevelopment projects in Lesotho) underscores how failure to meet stated goals further legitimizes state (and capitalist) interventions through the implementation of new development projects—which further exacerbate inequality. Fairhead & Leach’s [138] study of desertification in Guinea demonstrates how contemporary analyses ‘misread’ landscape processes and thereby misattributed the causes of desertification to population growth and overutilization of forest resources by local communities. Yet, these conclusions were mobilized by state and international actors to justify development interventions, often viewed as a (mis)appropriation of local resources by local actors and exacerbating desertification (in Fairhead & Leach’s reading). These cases provide examples of instances in which power relations are highly complex, and do not necessarily operate in direct alignment with specific stakeholders’ identities and agendas.

One reason for this complexity (which social scientists might term a lack of ‘legibility’) is the articulation of governance processes with technical discourses. Anthropological perspectives such as Li’s [139] concept of ‘rendering technical’ offer productive avenues to query the implication of confining these discussions (including those regarding water security) to the ‘technical’ realm. An overemphasis on technical issues may, in this sense, contribute to a view of governance as a (straightforward) ‘recipe’ [64]. Viewing governance in technical or formulaic terms, in other words, runs the risk of overlooking context and power dynamics that shape governance in crucial ways. By contrast, a social power perspective on water security contends that water insecurity arises not only as a result of technical factors, but also as a result of power relations and socio-economic and political dynamics. As we have shown, water governance processes are characterized by significant power asymmetries. This implies that attempts to reduce water insecurity must grapple not only with issues of scale, social learning and articulation of decision-making between multiple actors but also with the dynamics of social power and social relations.

6. Conclusion

This review paper has explored the governance dimensions of water security debates. On the one hand, the paper has brought a water security focus to bear on key concepts within water governance debates: adaptive governance, polycentric governance, multi-level governance, social learning and social power. On the other hand, we have emphasized the governance dimensions of water security debates, raising a set of questions that may be germane to future research in this area, which we list below.

On the topic of social power: what are the consequences of power imbalances with respect to equitable water access? Do state-dominated governance practices play a role in creating a level playing field in which such power imbalances are mitigated? If so, the appropriate (and continuing) responsibility of states should be a central question in the debate over the place that adaptive and multi-level governance should play in addressing water security. For example, could states play an important part in levelling the field between different actors in polycentric governance processes, or would other non-governmental actors assume such responsibilities?
In turn, this raises a related set of questions regarding the negotiation of polycentric and multi-level governance processes. Here, we wish to sound a cautionary note: despite the potential advantages of polycentric and multi-level governance for supporting adaptive management and social learning, it is not always the case that they will be practical or appropriate approaches. In particular, two key questions must be asked.

First, do the potential advantages of polycentric and multi-level water governance outweigh the disadvantages? On the one hand, practitioners may be attracted by the possible advantages: access to ‘local’ expertise, which can improve the quality of decision-making; the ability to adapt regulatory programmes to meet local conditions; empowerment of stakeholders (particularly those traditionally marginalized); reinforcement of ‘social trust’ between stakeholders, and reduction of conflict over competing uses; greater cooperation in information sharing; greater political legitimacy (and thus enforceability) of water management planning outcomes. But these must be weighed against potential disadvantages: a focus on local environmental interests to the exclusion of regional or national environmental concerns; a risk of politically workable solutions, rather than environmentally optimal solutions; unequal representation of stakeholders at the local level; long-term sustainability undermined by large amounts of volunteer time required (‘burn-out’); greater overall costs and more time required to produce outcomes, such as water use or watershed plans.

Second, which aspects of water-related governance should remain under the control of state actors? As highlighted above, polycentric and multi-level governance are likely to be appropriate when exploring integrated solutions for complex problems that traditional command-and-control programmes have been unable to address (such as non-point source pollution and urban run-off control, agricultural practices reform, or integrated land- and water-use planning); however, this does not imply that all decision-making should be necessarily distributed or articulated among multiple scales or non-state actors. For example, governments may wish to retain control over key aspects of setting regulatory standards (e.g. water quality, particularly with respect to ecological concerns). Once these standards are set, it may be beneficial to delegate specific decisions (e.g. regarding land- and water-use practices or the sequencing of restoration or water improvement projects). Similarly, if targets are set for water use (e.g. low-flow limits in streams), including restrictions on demand, it may be appropriate to delegate decisions about strategies for water conservation, recycling and reuse—particularly where enabling laws are to be adopted by a number of different jurisdictions at various scales.

In short, achieving water security requires coordinating actors within the context of overarching water-related standards and targets—backed up by legislation and associated regulations and monitoring and enforcement powers—which may be optimally designed and set by higher orders of government rather than local actors. Another, simpler way to articulate this argument is to assert that reducing water insecurity requires an adaptive approach to water governance, viewed as a constantly evolving process in which subsidiarity and harmonization must be balanced. Harmonization may be defined as the process of achieving regulatory efficiency, effectiveness and clarity through legislative and policy standardization and centralization. Subsidiarity is defined as the principle whereby a central authority does not take action (except in the areas which fall within its exclusive competence) unless it is more effective than action taken at lower scales. The deployment of polycentric and multi-level governance strategies must strive to achieve an appropriate balance (which may be different in each jurisdiction) between harmonization and subsidiarity in support of increased water security. As this review has highlighted, this balance is likely to be a moving target, necessitating the incorporation of flexibility and resilience in the design of our governance systems—mimicking the characteristics we seek to foster in socio-environmental systems more generally.

References


