

'Glocal' water governance: a multi-level challenge in the anthropocene

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The water crisis is a crisis of governance. A literature review reveals that this crisis concerns definitional issues, issues of ownership and access, boundary issues, the multiple uses of water, and the levels at which water should be managed. Paradigms for managing water have evolved from integrated water resource management through more experimental and learning based adaptive governance to understanding that water is not a sector but a cross-cutting issue and should perhaps be dealt with through the 'nexus' approach. The literature reveals a toolbox of policy instruments, infrastructures and institutions for managing water but concludes that solutions need to be crafted in a context relevant manner taking the relevant drivers of water use and misuse into account.

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[4]; the way ownership and rights to water are dealt (away) with [5]; the way links to other issues, sectors and levels are framed and organized; and the way comprehensive governance and management systems are designed — whether integrated water resource management [6], adaptive governance [7], or the nexus approach and sustainable governance. All these processes bring to surface potential conflicts and synergies between formal and informal systems, between hierarchical and local systems, and between economic power and social values (see [Figure 1](#)).

Hence, this paper enquires into the state-of-the art of water governance science today. It focuses primarily on the knowledge and perspectives developed over the last decade with respect to the global state of water governance. It examines how this new thinking helps in preparing for water governance challenges in the anthropocene — the era of dominant human influence on the earth. It is on the basis of a literature review as well as a review of recent policy documents [8,6,9].

This paper examines the diversity of issues in water governance with a focus on issues raised more recently: The rise of new discourses and principles; the rise of new instruments, organizational structures, and best practices; and new thinking regarding the achievement of coherence in water policies. This is followed by conclusions regarding the challenge of governing water in the anthropocene.

Issues for, and discourses on, water governance

Water governance needs to take several issues into account including what kinds of water should be governed. Traditionally water was classified as surface and ground water and later wastewater was also treated separately. Most governance however was focused on surface water; only later also including wastewater. Ground water governance is still in its infancy partly because the extent of ground water resources is not well known at least in many parts of the developing world [10], its invisibility, lack of knowledge about how these resources move, and how to organize collective action. Increasingly, there are discussions of also including green water (or the water embodied in trees and plants), atmospheric water and virtual water [11] (the water embodied in traded products — e.g. coffee, but also computers) into water accounting and management. Some virtual water studies show that

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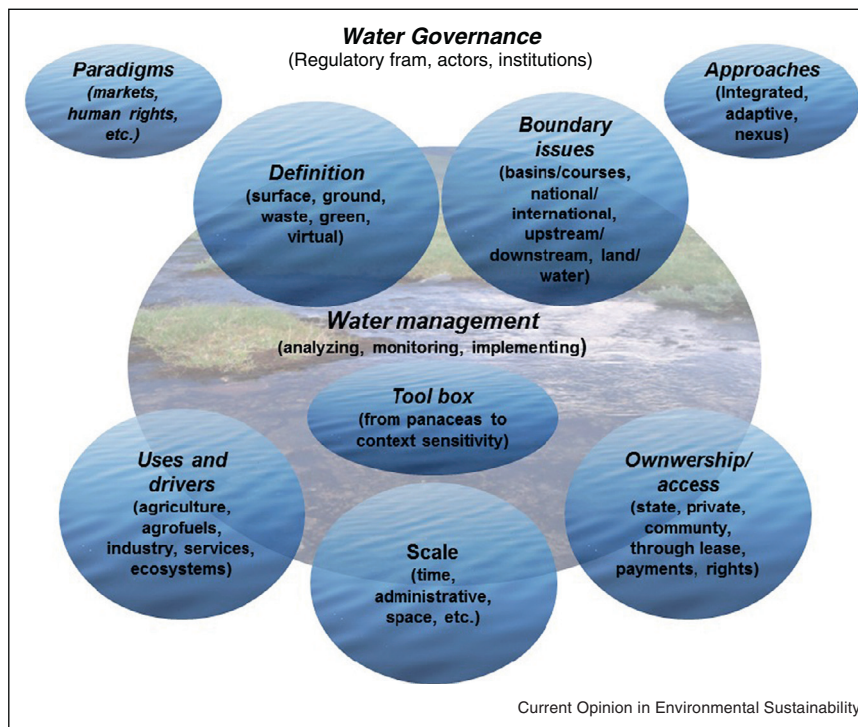
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Introduction

The challenge of the water crisis [1] is first and foremost a 'crisis of governance'. It cannot be simply addressed through technocratic and depoliticised management and engineering processes — it is essentially a deeply political challenge [2,3] from global to local (glocal) level. The political dimension of this challenge ranges from the way water is 'defined', 'conceptualized', and valued; to the way water boundaries are delineated for the purpose of management — the issue of scale, place and position

Figure 1



Key challenges in global water governance.

water intensive products are grown often in increasingly water scarce regions and are exported often to water rich regions. These studies reveal the nature of water use and water exports and often suggest that there are major equity issues involved on the production and export side, as well as on the use and import side. However, it is often risky to take policy decisions on the basis of such analyses as these may not take into account the existing socio-political contexts and the availability of alternatives for the local producers [12]. Nevertheless, such analysis can shed light on future policy directions and water related implications of policy choices. Finally, there is contestation about whether the focus should be on watercourses *or* basins which would include watershed areas and thus expand water-based jurisdiction into the terrains of land use. This latter issue is particularly important in the context of international water law, where we can see a shift from discussions on basins as in the Helsinki Rules on the Uses of Waters of International Basins [13] to an emphasis on watercourses in the UN Watercourses Convention of 1997 [14]. We believe that water governance needs to take into account all water, including green water and virtual water, and should also include watershed areas. In doing so, water governance will become tangential to other governance issue areas and create new challenges to water governance and potential conflict or overlaps with other issue regimes.

Another critical issue that influences water governance is the issue of who has ownership over water and who can get access to water. Typically, states have sovereignty over water resources within their territory — such claims of sovereignty can range from being absolute to limited. Absolute territorial sovereignty is the claim to absolute control over water resources flowing through a territory, sometimes even including control over the related hydrological data. Absolute integrity of state territory is the claim to continue to receive the precise quantity and quality of water as flowing into the country from an upstream country as in the past. Limited territorial sovereignty recognizes that states can use water flowing through their jurisdiction as they wish but they cannot cause harm to others. However, countries can also base their claims on historical use and prior appropriation [15]. Transboundary water disputes are on the rise [16,17]. Within these disputes, these historical claims are increasingly coming under pressure as societies argue in favour of more equitable sharing of water resources between upper riparians and between those who have lower access to water. Such equitable sharing of water is a corner stone of the UN Watercourses Convention of 1997 [18]. The Nile river basin is an example of a conflict where the downstream nations argue in favour of historical use, while upstream nations call for equitable water sharing [19].

Water ownership domestically can be traced back through history. Initially water was owned by communities, individuals or the state: In Hindu law water was owned by communities [20]; in the Islamic tradition water ownership could be gained by human labour — that is, well-digging could help locals gain ownership over water; in the Roman tradition water ownership could be community ownership, individual ownership and state ownership. The struggle to control access to water led to processes that institutionalized the results of power conflicts over water [21]. This led to situations in which invaders and colonizers could control water resources by changing the paradigms of water control [5]. Or such rules were more subtly modified by newer paradigms of water control — whether communism (where the state owned water), liberalization (where water resources can be owned by private parties and those who do not own water can access water through payments and licenses), the rights of indigenous peoples (which recognizes traditional community ownership of or access to water), human rights (where each human is guaranteed access to a minimum quantity of water for survival purposes) [22,23] or national security (where shortage of water leads states to control the use of water resources). In many parts of the world, such modified rights were contested or had to compete with local historical claims. The legitimacy of local claims is increasingly being recognized through theories of legal pluralism. Legal pluralism argues that multiple systems of governance may operate in the same jurisdiction [5]. Understanding ownership of, and access to, water is critical to developing a legitimate, equitable, and effective governance system.

From the days of the Mesopotamian civilization [24] to today, one of the largest users of water is agriculture for food and fibre — about 70% of freshwater use. However, energy may rapidly become a major competitor for water resources. In recent years, the promotion of alternative energy sources including biofuels as a way to mitigate greenhouse gas emissions has led to large-scale change of agricultural land use from food to energy crops; a challenge that can lead to local conflict [25] (Islar Mine, PhD thesis, Lund University, 2013) and difficult trade-offs between policy-objectives. Arguments have been put forward in particular by governments that policy should be framed around the water-food-energy-nexus (see *Integrated, adaptive and nexus governance* section).

Water pricing is advocated as one way to address the water scarcity problem through promoting the rational use of water [26] and public private partnerships as a way to promote efficient and optimal water use. Such water pricing and partnerships theoretically lead to efficient and effective water management. While this may well be the case in certain contexts, water pricing may sometimes price water out of the reach of the poor [27,28], although in some cases the poor already pay more than

others for water access. The notion of water as an economic good and water pricing has also led to social movements promoting the human right to water. Where the water is used for high profit uses such as urban golf courses it might lead to a drain of water from country sides where this water is valued but not priced. Public private partnerships on water may also be successful in some cases, but may often be negotiated under international commercial law and create new challenges for local people when such contracts are breached.⁴ Overall, water is arguably more a political than an economic good [29]. Furthermore, in many developing countries there are many informal providers of water services, either because the state has withdrawn from many public sector roles or because the state is unable to provide such roles. These informal drinking water providers have played a critical role in setting up infrastructure and provide access to about 50% of Africans [30]. While such informal providers have been generally seen as temporary solutions to be replaced by formal improved systems, an alternative is to upgrade these existing systems. There are, however, increasingly political conflicts between formal and informal systems where formal systems often construct the definition of informality as a way to control the system.

Crucially, water systems are intertwined with other natural systems. Water withdrawal in combination with water pollution may lead to a concentration of toxic elements within the water body and may minimize its ability to provide water ecosystem services, that is, the provisioning, regulatory, supporting, and cultural services that a healthy water ecosystem provides. Local land use may also have a significant impact on the ability of the water-based ecosystems to regenerate. It may be impossible to manage the water body without taking into account local spatial planning, but to treat the local area as simply the physical watershed will not adequately take into account the multiple functions of land. Global change and deforestation are yet other factors influencing local hydrological cycles.

Not only is the water system connected to other ecological systems, also within the water system itself, all water is connected — ground and surface, fresh and ocean, national and international, green, and virtual water. A dominant issue is that of where to draw boundaries on water issues in order to make them manageable. Clearly, administrative boundaries already provide an institutional infrastructure for water governance. However, hydrologists have often challenged this arguing that the river should be treated as a hydrological unit calling for river basin management. The counter-argument is that water is a sovereign resource and should be managed for the benefit of all in a specific country. Or that it is not just the physical dimensions of a water body that should

⁴ For example, the case of Bechtel in Cochabamba.

determine the scale of management but rather that all relevant social and biophysical aspects need to be taken into account in a discussion of the narratives and politics of place (location), position (relative — upstream/downstream) and scale (local, national, regional or global) [4].

Over history the discourses and principles on water have evolved from local to global [5]. While for decades the focus has been on local and basin level, increasingly, there are arguments for also taking the global level into account. These arguments include global climate change, global level drivers of water use [31], the role of multinational corporations in water, the role of trade in water and virtual water, the implication of water footprints in terms of fairness and the increasing role of water as a geopolitical resource [11]. At the same time, while international law traditionally has not intervened in domestic water issues, international law also increasingly tends to deal with domestic water issues through the human rights paradigm and through treating water as one system [32].

Within countries dry and wet areas are linked through democratic processes and these linkages may lead to solutions such as water linking projects [33]. With multiple competing uses of water, institutions may resolve these conflicts through substitutive, complementary, accommodating and competing processes [34]. Such processes may also apply water rights (sovereignty, equity, no harm, participation, dispute resolution), human rights (to water and sanitation) and environmental principles (sustainable development, polluter pays principle, liability and compensation, precautionary principle, environmental standards) as a way to deal with the above-mentioned challenges [35].

Integrated, adaptive and nexus governance

Different communities in the water world have different rationalities and different elements that they wish to focus on — hydrologists and engineers look at technological options and the characteristics of the river; market experts focus on economic efficiency and the market; lawyers and administrators on formal boundaries and rules; ecologists on ecosystem services; political and social scientists on power configurations and inequalities; while anthropologists and sociologists focus on informal systems and the creation of informality [2]. However, the ethical basis of dealing with water issues remains contested [36], and the role of efficiency, equity, sustainability and security of water supply in a globalising world are debated [37]. Paradigms are overlapping, and at different stages of evolution in different parts of the world from government to governance, and from centralization to decentralization [38]. The notion of managing water through engineering works (the hydraulic paradigm) is increasingly being complemented by other paradigms such as Integrated Water Resource Management (IWRM), adaptive management and the nexus approach.

IWRM is seen as an important way to manage water by most academics [39–42] and policy makers.⁵ IWRM follows from single purpose water management, through multi-purpose, to integrated water management [43,44]. IWRM includes catchment and river basin management. IWRM is defined as ‘a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems’ [45]. It is seen as the way to integrate all relevant environmental, social and economic issues, to reflect the biophysical reality, to integrate all relevant stakeholders, and it builds on the latest knowledge. However, the precise content of the concept is not clear [46] and it gives little practical guidance [47]. Furthermore, IWRM is difficult and possibly very expensive to implement (J.B. Agyenim, PhD thesis, VU University, 2011), and there are few successful examples in the developing world [42,48]. The attempt at implementing this concept in much poorer and contextually very different countries makes this a complicated issue, not least because its underlying values are often not shared by local people and its relevance to local contexts is under challenge. IWRM needs an institutional framework and knowledge base that is often not available.

Adaptive management complements IWRM by focusing on the unpredictable nature of socio-economic systems and privileges polycentric governance above other approaches at the bioregional scale, public participation, and experimental approaches. However, none of these approaches are easy to apply [49,7,50–52]. Some scholars emphasize the need for systemic transformations in governance and management which requires a combination of adaptive management, social learning and institutional change [53,50] thereby underscoring the critical role of learning in improving water management [54]. Such approaches are seen as distinct from approaches on the basis of controlling a predictable system with a centralized, relatively hierarchical governance mechanism with limited stakeholder participation.

Some argue that effective water management spills over into other sectors like energy and agriculture, or land and forest management. They go beyond water management to call for integrated resources management (IRM) or integrated resource and environmental management (IREM) [55]. Some have argued that water governance should be part of sustainable development [56–58]. In recent years, the discussion has moved to what is branded as the nexus approach. This nexus approach sees water not as a sector or issue area but as a cross-cutting issue

⁵ 2002 World Summit on Sustainable Development, Johannesburg, the 2nd (2000) and 3rd (2003) World Water Forums [44] and even at the 4th in 2006 and the 5th in 2009.

which requires changes in governance in all relevant sectors [59,60]. This is on the basis of the argument that water governance cannot of itself regulate land, agriculture or other issues in society but that water issues need to be taken into account in each of these other governance processes.

Instruments and organizations: From simplistic panaceas to context-sensitive system design

Within these broader governance frameworks, idealized design principles (panaceas) have been applied in water policy and management for decades. Such panaceas include institutional (e.g. privatization), technological (e.g. centralized wastewater treatment), infrastructural (e.g. dams, interbasin transfers) and organizational panaceas (e.g. river basin organizations (RBOs) and stakeholder participation). However, they have often ignored the importance of societal and cultural context as well as historical tradition [61–63].

Within these different panaceas, a tool box of best practice instruments has been developed which provides a menu of options from which one can choose to improve water governance in a specific context. Such options need to be, however, designed and implemented in such a way that they can fit into or adjust to local contexts [5]. Best practice instruments include regulatory instruments such as trade restrictions on water, decentralization processes, principles of water management, rules of water management, spatial planning for water management, water ownership, access rules for water, reporting, monitoring, and law enforcement. They also include economic instruments like subsidies, taxes, tradeable water permits, payments for ecosystem services, grants, and micro-credits. And certainly, suasive and research instruments, including research, monitoring, public awareness and education, are part of the set of best practices that also contain community based management systems.

Other issues being examined are whether decentralization of water governance and stakeholder engagement, in fact, leads to greater empowerment of local actors (N. Amma-Anokye, PhD thesis, VU University, 2011). Empirical analysis shows that in some cases increased local activity has not been accompanied by either enhancement of local decision-making power or decreasing nation state power [64]. Increasingly there is consensus on the need to manage water as a multi-level resource because of the teleconnections between different scales, levels and sectors that deal with water [65].

Water governance has evolved from community governance to densely institutionalized bodies through RBOs and community based organizations (CBOs) [66]. These structures are layered organizational frameworks. Comparative assessments [67,68] show that design features

that affect the success of such organizations include whether data have been taken into account, the relationship between the hydrological and administrative entity, ecological boundaries, principles of water governance, and the tool box of instruments that can be used for water governance. It is also essential that these RBOs have clear mandates and functions, are financially viable, and operate in accordance with the principles of good governance with both upward and downward accountability [69].

Positive impacts can be detected in regulatory frameworks that are more encompassing, integrate different dimensions of sustainability, provide umbrella frameworks that can be tailored to context rather than prescribing details of implementation at lower levels (e.g. the UNECE Water agreements [70,71], the European Water Framework Directive [72], European Floods Directive, National Water Act in South Africa [73,74]). The UN Watercourses Convention also provides such broad guidelines.

It is important for water resources to be managed in a coherent, internally consistent, manner. However, the diversity of levels at which decisions are taken and the diversity of actors that make decisions in a diversity of local contexts imply that such coherence may not be easy to achieve. For example, a critical element of adaptive or integrated governance is to engage stakeholders in decision-making. But if stakeholders are engaged at different levels, they may also make different choices on the basis of their specific historical or contextual circumstances and different power configurations. So where the stakeholder process is genuine, there is a very good chance that policy processes and choices will be different at different levels of scale and in different places, and hence inconsistent [75].

Good governance which includes a focus on effectiveness, efficiency, legitimacy, participation, the absence of corruption, the rule of law, and responsiveness is also something that cannot be imposed from outside (G. Anders, PhD thesis, Erasmus University, 2005). It needs to evolve from the local administrative culture. But although good governance is seen as a way to achieve multi-level coherence, there is a trilemma tension between effectiveness, participation and legitimacy [76]. Too many trade-offs are possible between these goals.

Ultimately, all the panaceas — whether ideological or instrumental — need to be contextualized and tailored to local circumstances if they are to be effective. Industrial accidents can also lead to large-scale pollution of international waters and although there have been arrangements to deal with this at the European level [77] this is not the case globally. In the meanwhile, the scarcity of fresh water in specific contexts and global driving forces

leading to higher water consumption for energy and other uses makes water an increasingly potent geo-political issue.

Challenges in the anthropocene

Water is at the core of sustainable development as it is closely linked to a number of key global challenges [78]. There will be a need to further develop a global vision on water management and governance [79]. Current water governance at the global level is diffuse and spread through the UN system [80] and water law is mostly regional in nature [81]. Although UN Water tries to coordinate water issues at global level, its mandate is limited [82]. There is thus a vacuum in water governance at the global level.

It will increasingly become important to find a way to manage groundwater sustainably and in conjunction with surface waters [83,84]. The need to deal with existing and plural water ownership will be necessary as a condition for legitimate water policy. The use and misuse of water and its ecosystem services is likely to multiply significantly in the coming century. The role of other sectors in determining how water is used will become increasingly more prominent. The global drivers affecting hydrological systems and water demand and use will also influence water production and consumption patterns worldwide. There will be need for climate proofing water agreements [85] as well as greater focus on dealing with droughts [86] and floods [87]. There will also be increasing need to focus on benefit sharing [88,89] rather than national security concerns.

This also implies that our governance skills need to make substantial progress. Such progress requires a normative framework that is democratically decided at global level; that recognizes the multiple efforts of actors and networks at all levels of governance; and may serve as a catalyst to enhance coherence between levels and actors. Plenty of paradigms, discourses, and traditions in water governance, as well as economic, regulatory, and knowledge instruments in water management are available to design and implement such a normative framework and water governance in the anthropocene in general. However, all these should merely serve as guiding concepts; Policies, instruments and organizational frameworks need to be elaborated, implemented, and adapted at the appropriate level and in a specific context.

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