

The top half of the book cover features a marbled paper design. On the left side, a prominent, thick, white, winding line represents a river or a major waterway, meandering through a complex pattern of green, blue, and white. The rest of the background is a dense, organic marbling in shades of green, blue, and white, resembling natural stone or water patterns.

EDITED BY

KEN

CONCA

ERIKA

WEINTHAL

≡ The Oxford Handbook of
**WATER POLITICS
AND POLICY**

THE OXFORD HANDBOOK OF

WATER POLITICS AND POLICY

THE OXFORD HANDBOOK OF

WATER
POLITICS
AND POLICY

Edited by

KEN CONCA

and

ERIKA WEINTHAL

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PREFACE

WATER is life. Yet water is inherently political. Due to its unpredictability in supply and quality, water is difficult to manage and govern, especially when shared by different users with different interests. As cities expand, urban populations are increasingly in competition with farmers and industry for access to water. Water is also the lifeblood of ecosystems; global environmental change, particularly climate change, is further intensifying competition among rival uses and users.

This volume thus places water front and center in the world of politics and policy. Water has emerged as a critical twenty-first century challenge, forcing policymakers to adjudicate between different uses, to address global water poverty, and to devise policies, laws, and institutions to manage water both domestically and globally in ways that are equitable, fair, and just. Inevitably, how these decisions are made tends to be highly contested and political.

To address the underlying challenges of governing water, we brought together a collection of authors with innovative perspectives on water. We have chosen to organize the chapters around macro-themes rather than around area-based case studies. We asked contributing authors to speak to their own areas of expertise through a critical lens but also that the chapters be forward-looking, focusing on emerging challenges, controversies, and policy dilemmas in their fields. Our introductory chapter examines the multiple meanings of water and lays out some of the larger historical moments and trajectories in water policy and politics.

This volume would not have been possible without the unwavering enthusiasm of the authors who contributed to this project. We are extremely grateful to them for their patience as we went back and forth on drafts. We are deeply thankful to the wonderful staff at Oxford University Press who helped shepherd this volume through from concept to publication and in particular Alexcee Bechthold, Angela Chnapko, Princess Ikatekit, and Tithi Jana. We also want to acknowledge Anne Kantel, Goueun Lee, and Abby Lindsay for their assistance.

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THE OXFORD HANDBOOK OF

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AND POLICY**

PART 1

INTRODUCTION

CHAPTER 1

THE POLITICAL DIMENSIONS OF WATER

KEN CONCA AND ERIKA WEINTHAL

WATER is unique and surprising. It provides no calories or nutrients but plays a unique life-sustaining role thanks to its curious physical properties: it is an extraordinary solvent, subject to capillary action, and one of the few substances that becomes less dense when changing from liquid to solid (Spellman 2015). In a world where nature routinely uses color and odor to mark significance, water has no hue or scent. Water's quantity on Earth is fixed, but that fixed stock cycles dynamically through solid, liquid, and gaseous phases. Water moves, but it does so quite unevenly, with average residence times that vary from a handful of days in the atmosphere to millennia in deep aquifers and the world's oceans. Water is abundant, yet most of that abundance is locked in places (underground aquifers, remote regions) or forms (ice, permafrost, cascading storm waters, saline oceans) that complicate or prohibit its use.

Water plays many physical, chemical, and biological roles: as a conduit for heat and nutrients, a key constituent of metabolic processes, a raw material for photosynthesis, and a habitat for organisms ranging from microbes to mammals. In simplest terms, it is the importance of water—to the farmer, the industrialist, the householder, the environmentalist—that makes it fundamentally political. If politics is, as Laswell (1936) famously put it, the art of deciding “who gets what, when, how,” it is no surprise that this unique, essential resource has a recurring political dimension. Actors exercise all of Lukes' (1974) well-known three faces of power in an effort to shape water outcomes. They lobby, protest, and offer various inducements to influence decision-making—as when protesters rally against a large dam project in India or farmers drive a procession of tractors into the city to remind the state of the importance of water for their livelihoods, as has been the case in California. Actors also seek to shape institutional agendas and rule-making processes around water—as seen in the ongoing battle in the United States to define what sorts of streams and wetlands qualify for protection under the Clean Water Act. And they strive to create embedded notions of legitimacy and the “rightness” of certain water uses or practices—as when as when the International Law

Association promulgated its 1966 “Helsinki Rules on the Uses of Waters of International Rivers” in an effort to shape the norms of legitimate behavior in internationally shared river basins.

If it is water’s value that creates its politics, it is also the case that water’s properties give that politics definitive shape. First and foremost, water flows—making it challenging to capture, accumulate, or possess in a legal or economic sense. Its cyclic character rejects our familiar spatial forms of social and political organization; water cuts across even the most comfortable and stable boundaries that humans construct between neighbors and nations. Because water is unevenly distributed in space and time, trapping, storing, and moving it is essential for human use—yet doing so is often costly and usually contentious. Water is of variable quality, for reasons both natural and social; geologic context matters, as do pollution, purification, and other forms of physical or chemical alteration by human activities. Poor water quality may be concealed from all but the most sophisticated testing processes, meaning that some organized means of monitoring and regulating water quality is essential to public health. During the water crisis in the American city of Flint, Michigan, residents were first alerted when they found their water discolored and bearing a strong odor, largely due to the presence of iron. Yet it was colorless, odorless lead that carried the most devastating health consequences (Hanna-Atisha et al. 2016). In Bangladesh, the poorly planned and unmonitored proliferation of deep tubewells, funded in part by aid agencies seeking to improve upon contaminated surface water and shallow wells, produced a public health crisis, with arsenic exposure affecting millions (Das et al. 2004).

Such difficulties of capturing water, moving it, evaluating it, and protecting or purifying it—in short, of making it “sit still” for governance—combine to give water perhaps its most fundamental political characteristic: challenges of collective action. Water demands coordination and cooperation to preserve its quality, to build the infrastructure required for its use, and to allocate its myriad benefits in ways that preserve and improve, rather than undermine, social order. The difficulties of finding a durable, equitable path to cooperation around water—and the political, economic, ecological, and moral consequences of failing to do so—are recurring themes of this volume.

The politics of water are further complicated by the fact that it carries many inherently *social* meanings. Water is more than just a life-sustaining resource and the lifeblood of ecosystems—it is also the lynchpin of cultures around the world, a potent symbol of national progress and technical mastery, and a human right according to the United Nations (UN; United National General Assembly 2010). If the complexities and consequences of producing, controlling, allocating, and managing water are central to its politics, so too are its potent symbolic connotations. Water is a foundational symbol in all of the world’s major religions (Oestigaard 2009). In Islam, water is the origin of life. For Hindus, water is a key symbol of spiritual cleansing and a central element of ritual purification. The Judeo-Christian tradition also stresses water’s role in cleansing, purification, and regeneration, from baptism to the Great Flood of Noah. Buddhist burial traditions liken departure from this life to water spilling beyond a containing vessel. It

is a short distance from such concepts to social practices, as in the Koranic teaching that water should be freely available and that surplus water may not be withheld.

Secular symbols abound as well. Jawaharalal Nehru, the first prime minister of India, famously declared dams and other massive public works projects to be the temples of modern India—and the young nation's commitment to their construction rose to a level approaching religious devotion. When South Africa threw off white-minority rule, it also discarded decades of water law that had served primarily as a means of social control. One of the nation's leading poets, Antjie Krog, graced the official report on a new national water policy with the epigraph "With water we will wash away the past" (Conca 2006). For the modern nation-state, water has often symbolized progress through technical mastery and the domination of nature. Pattberg (2007, 1) characterizes Europe's ability to dominate nature—"to follow this destructive path with such stubbornness and ingenuity"—as a central element in the rise of the modern nation-state. The artwork at China's Three Gorges Dam depicts three muscular men locked in heroic embrace as they struggle to control the waters of the Yangtze. The image would have been equally at home on a project of the Tennessee Valley Authority, or the mammoth construction works of Amazônia or the Nile, or as a logo for Israel's National Water Carrier project and its mission to make the desert bloom (Alatout 2008).

The tensions among these many material and symbolic meanings generate social conflict. Water's role as a commodity is often in tension with its role in sustaining critical ecosystem services or local livelihoods. Thus, large investments to set aside agricultural land to supply remote markets, often referred to as "land grabbing," may also constitute a form of water grabbing, by disrupting localized uses by human and natural systems that require renewable flows (Mehta et al. 2012; Franco, Mehta, and Veldwisch 2013). Water's usefulness as a tool in industry—for power generation, cooling, or the disposal of waste—often collides with its importance for public health, as seen in the range of health risks facing communities that live in the vicinity of large dams (Scudder 2005; Tilt, Braun, and He 2009). Water's centrality as a symbol of national progress often collides with localized understandings of the proper order of things, as for the estimated 40 million to 80 million people whose livelihoods and social ties have been swept aside for the construction of large dams (World Commission on Dams 2000).

These water collisions bring to the surface some of the most fundamental political questions of our time: Where is the boundary between public and private? Between global and subnational? Between state and society? Between necessity and luxury? Can our relationships to water be sorted out through familiar institutional arrangements, grounded in science, the state, the market? Are traditional modes of negotiation and conflict resolution adequate? Or do we require new modes of knowing, deciding, and allocating? How do the answers to these questions change in today's increasingly complex water landscape, in which the private sector and other nonstate actors play an increasing role in water's governance? In all of this, what constitutes power, and who should wield it? What is fair and just, and who gets to decide?

These questions form the heart of this volume and cut across its chapters and sections. The book surveys water politics and policy across a wide array of issues, draws

on insights from many different disciplines, and examines water dynamics at multiple scales and levels of social aggregation, from local communities to national polities, regional geopolitics, and global commerce. We seek to capture the importance of place and the particular histories of water use in different locales but also the global pressures pushing for harmonization across law, policies, and practices for managing water. With this introduction, we begin by depicting some of the main historical trajectories in water politics, shaped by both local and global forces that often are in collision with each other. The last section of the introduction covers the organization of the volume, which is based on a set of macro-themes rather than being organized by place or discipline.

WATER TRAJECTORIES

History shows us that, while the most fundamental political questions about water are recurring ones, water's politics is hardly static. Rather, its evolution has been shaped by a combination of variable local factors and some readily identifiable global forces. On the one hand, every place has its own water circumstances, characterized by the intersection of the material, institutional, and cultural meanings of water discussed previously. Matthew Gandy's work on Mumbai, for example, demonstrates how water both reflects and recreates persistent social inequality. Gandy (2008) traces the historical development of the city's water infrastructure, demonstrating how capture of the Indian state by the middle class limited the scope of public goods that the state proved willing to provide, while a consistently technocratic approach to water administration left it unable to respond to the challenges of growth in a landscape badly fragmented by social divisions and overlapping forms of authority.

Donald Worster's environmental history of the American West operates at a more aggregate scale than Gandy's cityscape-level view, telling the story of the colonization of that vast region one river basin at a time. Again, however, we see a historical trajectory strongly influenced by the political, economic, and social character of a particular place. For Worster (1992), the process of "settling" the American West was nothing less than the construction of a hydraulic society: "a social order based on the intensive, large-scale manipulation of water and its products in an arid setting" (p. 7), yielding "a culture and society built on, and absolutely dependent on, a sharply alienating, intensely managerial relationship with nature" (p. 5). That construction project, far from being the result of mythic American "rugged individualism," was the direct result of the particular character of the American state and the aspirations of regional economic elites.

Transnational water politics is also shaped by place-specific factors. With the dissolution of the Soviet Union, the former Central Asian republics found themselves arrayed in a new configuration. Centralized decision-making from Moscow on land use and water allocation was supplanted by an uneasy upstream-to-downstream alignment for the newly independent nations, along the Amu Darya and Syr Darya rivers feeding the Aral Sea. As Erika Weintal (2002) demonstrates, the ensuing politics of regional water

cooperation was shaped not only by predictable factors of state power and geographic position. It also grew out of local history and contingency, including the specific mechanisms of land use and social control bred in the Soviet era, as well as the need of the new nations to make manifest their sovereignty through international commitments.

Such place-specific accounts are rooted not only in the distinct hydrology of a locale but also its particular legal, institutional, and political-economic developments. Yet, in collecting the stories of different water places, certain broad trajectories can also be seen: the centrality of agricultural development in deltaic and rain-fed locales in shaping of modern, state-based governance of water; the subsequent push upstream to tap water as a source of power for industry, forcing nonincremental adjustments in legal and policy frameworks as the water interests of industry took their place beside those of agriculture; and the rise of urban agendas emphasizing water quality and the reliability of allocated supplies. Some of the common policy responses that have followed in the wake of these evolutionary tendencies, writ large, include growing commodification of the resource, increased pressures to sever water rights from land rights or riparian position in order to make it available to a wider cast of users, the rise of environmental regulations, and increased attention to the role of water in sustaining critical ecosystem services.

The pressures driving these historic moments of transition may build gradually, but change often appears when windows of opportunity open. Regime change often leads to the rewriting of a nation's water laws and regulations, as seen in settings as varied as postapartheid South Africa, in Brazil after the generals, and in the United Kingdom with the rise of Margaret Thatcher's neoliberal agenda. While they may be managed through negotiations, transitions may also be the product of social conflict or even political violence. Thus, the "water war" clash between protesters and troops over water privatization in Cochabamba, Bolivia, triggered a wave of antiprivatization initiatives in Latin America, often rooted in alliances cutting across class and ethnicity (Spronk 2007). Contentious street politics and assertive trade-union mobilization in South Africa helped trigger that country's shift to a "free water" minimum allocation policy (Conca 2006).

But the politics of water also transcends place in important ways, responding to larger global forces, both material and ideational. Thus, another recurring theme in the chapters that follow is the interaction between diverse, place-specific conditions on the one hand and the often homogenizing forces of international law, modern science, technological innovation, and transnational finance on the other. For example, the 1977 Mar del Plata conference—the first global water summit—charted an agenda focused primarily on drinking water and sanitation. It was followed by a UN declaration in 1980 marking the 1980s as the International Drinking Water Supply and Sanitation Decade. Subsequent failure to make progress on this water-supply agenda—with global access rates barely keeping pace with global population growth—played a role in the rise of a new paradigm of integrated water resources management (IWRM). Rather than stressing infrastructure construction and supply expansion, IWRM viewed water primarily as a challenge of better governance and smarter management (Lubell and Edelenbos 2013).

Good water governance would have to coordinate across multiple (and often competing) uses, needs, and interests. IWRM thus championed multisectoral, multiuser, information-intensive, and participatory approaches to water management, as well as new institutional forms such as water user associations and river basin organizations. Dozens of countries have now inscribed (if not always fully implemented) IWRM-inspired governance rules and practices, such as greater cost recovery and pricing reforms, user associations, basin organizations, and national permitting schemes for water use. Many have done so by enacting new national framework legislation on water. At the same time that national framework laws are themselves an IWRM-inspired notion, intended to supplant fragmented, sector-specific legal and institutional arrangements, criticism of IWRM's hegemony, which blocks alternative solutions for managing water, is also growing (Giordano and Shah 2014).

A second powerful extra-local force has been the rise of international economic agendas promoting privatization, the liberalization of international trade in services, and the "structural adjustment" of developing-country economies. As these ideas took root in mainstream international development circles in the late 1980s and early 1990s, the water sector emerged as a chief target for change, leveraged through foreign investment and loan conditionality, at a time when privatization was also gaining currency in several industrialized countries (Bakker 2010). Though often resisted by popular mobilization, and failing to reach some of the more expansive views of the potential for private-sector market share, there has been a clear global trend toward the marketization of water resources, whether in the guise of privatization or in instances where water remains largely in the hands of the state. This trend sits in ambiguous relation to the aforementioned governance principles of IWRM. On the one hand, IWRM's emphasis on efficiency and the importance of conservation incentives is generally convergent with the higher prices for water implied by the privatization and structural-adjustment agendas; its emphases on equity and participatory governance less so. The tension is apparent in the so-called Dublin Principles, crafted in the run-up to the 1992 Earth Summit as a way to raise the profile of water issues therein. Principle 4 of the Dublin Statement on Water and Sustainable Development asserted that "Water has an economic value in all its competing uses and should be recognized as an economic good," while the notes accompanying the statement of that principle flagged the importance of recognizing water as a human right (International Conference on Water and the Environment 1992). The delegates, representing a cross-section of global water expertise, ratified the statement without making clear how these two principles are to be reconciled.

A third powerful global force, presaged at both Mar del Plata and Dublin, is the idea of water as a human right. There are specific references to water access in existing human-rights treaty law—notably, in the Convention on the Elimination of All Forms of Discrimination against Women (1979) and the Convention on the Rights of the Child (1989). As explicated by the UN Committee on Economic, Social and Cultural Rights (2002), however, the primary basis for finding the right was the importance of water for other rights more clearly enumerated in international law, such as the rights to health, food, and development. Even this more circumscribed foundational basis for a

human right to water, and a narrow enumeration of what that right entails, proved to be contentious and hard-won given the historical opposition of some powerful member-states (most notably, the United States) to the “creation” of new socioeconomic rights through such UN findings. Nevertheless, on July 28, 2010, the UN General Assembly passed Resolution 64/292, explicitly recognizing a human right to water. The right was conceived narrowly, in terms of “safe and clean drinking water and sanitation,” without speaking either to the protection of freshwater ecosystems essential to water quality and sustainable supply or to the participatory rights of citizens in water governance decision-making. Goal 6 on water of the 2015 Sustainable Development Goals, while not referring specifically to a human right to water, reinforces the need to take a broader approach, explicitly referencing the protection of water quality and the participation of local communities in decision-making (Conca 2016). While much attention has focused on the human right to water globally, scholars working with indigenous communities are recognizing the importance of linking water rights to indigenous rights in light of the 2007 UN Declaration on the Rights of Indigenous Peoples (von der Porten and de Loë 2013).

The combination of these extra-local forces—an emerging global discourse on good water policy, donor-driven funding streams and conditionalities, rights activism, and the transnational political economy of water—have produced homogenizing pressures on national policy frameworks. Today, climate change appears poised to continue this stepwise rewriting of the politics of water. There has always been great uncertainty surrounding water (When will it rain? Is this water safe to drink?), but climate change adds entirely new dimensions to such uncertainty. Stationarity, we are told—the ability to gauge the climate system’s future configuration by examining its past behavior—is dead (Milly et al. 2008). At a minimum, the effects of a changing climate create pressure for better predictive models and “early warning” capability. More fundamentally, climate change is beginning to drive a shift in water governance schemes toward resilience, adaptive frameworks, and greater attention to risk management (Pahl-Wostl et al. 2007; Conca 2015). According to the UN’s World Water Assessment Programme (2012), “Projected pressures on water resources lie outside the control of water managers. These can significantly affect the balance between water demand and supply—sometimes in uncertain ways—and thus create new risks for water managers and users. Such increasing uncertainties and risks necessitate a different approach to water management strategies.” Climate-smart adaptation to protect urban water systems has been a major theme of C40, the network of global cities seeking to catalyze and coordinate climate adaptation, with improvements to stormwater capture and flood mapping among the five most common climate-adaptation actions taken (C40 2015, 43). Adaptation occurs on all scales: household surveys conducted by Sharma et al. (2016) found extensive anticipatory flood-proofing investments (in money and time) being made by poor households in Indore, India, to the extent that total investments were roughly comparable to the losses incurred annually in flood-related episodes.

The limits to better management as a response also come into focus, however. Climate change promises to drive not only demands for better anticipatory action and risk

management but fundamentally new ways of ordering human affairs, from the location of population centers to the organization of food and energy production and distribution (Lobell et al. 2008). Coping with climate change also highlights the importance of social capital that provides the necessary fabric for individuals and communities to engage in collective action (Adger 2003; Paul et al. 2016). If so, we may be on the cusp of a shift in the rules around water as fundamental as those seen when civilization first sprouted around abundant water resources, or when large concentrations of people in urban areas triggered the active municipal management of drinking-water supplies and sanitation, or when industry eclipsed agriculture in profits and power and began demanding its slice of the water pie.

SCHOLARSHIP ON WATER POLITICS AND POLICY

Research on water has both driven and responded to the worldly developments sketched previously. Technical studies in water engineering have a long history, including the accompaniment of innovations in dam construction such as the Roman use of concrete and mortar, Mongol development of the arch dam, and Spanish innovations leading to the buttress dam (https://watershed.ucdavis.edu/shed/lund/dams/Dam_History_Page/History.htm). The rise of the modern public health movement extended water research into the biological sciences (Juuti, Katko and Vuorinen 2007)—and triggered conflict between “sanitary engineering” with its preference for water filtration at the point of use and public health professionals favoring sewage treatment (Tarr and Jacobson 1987).

Social-science research on water has been spurred by several developments and clustered in several thematic areas. Emphasis on irrigation as a rural development strategy following World War II produced mixed effects: raising rural incomes in many parts of the world and boosting commodity production but distributing benefits unevenly, often taking a significant environmental toll, and often failing to deliver the wider benefits envisioned in terms of growth poles for economic transformation and social welfare gains (Svendsen and Turrall 2007). Growing recognition of these complex, mixed effects has triggered extensive research on the role of water in smallholder economics (Rockstrom, Barron, and Fox 2003; Fox, Rockstrom, and Barron 2005; Crow and Swallow, this volume), distributive consequences along the lines of class, gender, geography, and ethnicity (Zwarteveen 1997; Van Koppen, this volume), and social impact assessment. Irrigation governance has also been at the center of the turn toward more participatory approaches to water management, generating a substantial literature on the possibilities and limitations of multistakeholder platforms and other participatory approaches (Warner 2006).

A second broad trajectory of water social science has focused on challenges of common-property resource management. Water-based resource systems—including

fisheries, groundwater, irrigation schemes, mangroves, and various riverine or coastal-zone resource systems—have been at the heart of the extensive body of research on community-based management of common property resources, building on the seminal work of Elinor Ostrom (1990; see also Dolšák and Ostrom 2003). The mobile character of water resources in particular has injected questions of scale in this body of research, as scholars have grappled with the question of whether users are better able to manage shared water systems at localized or more aggregate scales (Fischhendler 2003, 2005) and, more generally, the fit between naturally defined “watersheds” and socially constructed “problemsheds” (Islam and Susskind 2012; Keulertz et al., this volume).

Transboundary water relations have also been a focal point for social science research. Scholarship in international relations has long been intrigued by the mobile, transboundary character of water in internationally shared river basins, which problematize conceptions of sovereignty (Conca 2006) and create natural experiments for cooperation and conflict theory (Bernauer 1997). Asymmetries of power and interest between upstream and downstream riparians have led some to emphasize the conflict potential of international waters (Gleick 1993). However, as it has become apparent that states often find ways to manage their disagreements and actively cooperate around water (Wolf et al. 2003), an extensive body of research has developed around the effectiveness of various institutional design features of cooperative accords (Tir and Stinnett 2012; Zawahri and Gerlak 2009) and the diffusion of particular normative approaches to codified cooperation (Conca, Wu, and Mei 2006). Water has also been a central focal point in the literature on policy “securitization,” which examines the consequences of framing specific policy domains as matters of national security (Cook and Bakker, 2012).

The emphasis on cooperation in much of the international relations literature on water is not to suggest that water cannot be a focal point for conflict or violence. A growing body of work has documented local, “communal-scale” conflict dynamics around water. These episodes include not only distributive conflicts triggered by drought or water resource capture (Raleigh and Urdal 2007; Böhmelt et al. 2014; Li 2016) but also contentious politics around the terms of access to water in the face of privatization efforts or the loss of water access through land displacement (Swyngedouw 2005). Water has also figured prominently in the literature on transnational activism, in particular as international solidarity networks of environmentalists and human rights activists have coalesced around such localized focal points of contention (Khagram 2004; Conca 2006).

Water has also been a recurring focal point in the fields of environmental history and environment-culture studies. Within environmental history, there has been particular attention to the role of hydraulic engineering works and other efforts to tame and control water resources (Rogers, Brown, and Garbrecht 2004; Ball 2016), sometimes drawing upon Wittfogel’s concept of a “hydraulic society” (Worster 1992). More recently, scholarship has explored long-enduring trajectories of “modernization” that involve the interplay of environmental and developmental transformations, as in Swyngedouw’s (2015) work on the role of waterscapes in Spain’s postcolonial political-economic development and Gandy’s (2014) distillation of the linkages between nature and concepts

of modernity in shaping the “urban imagination” in the cities of Paris, Berlin, Lagos, Mumbai, Los Angeles, and London. Water also figures prominently in the political ecology literature. Piers Blaikie, whose 1985 book *The Political Economy of Soil Erosion in Developing Countries* is widely credited with launching the political ecology school, later applied the approach to “natural” disasters (Blaikie et al. 1994), with drought and flooding figuring prominently.

The growing recognition that human actions have committed the world to some significant measure of anthropogenic climate change, together with the fact that water is the principal delivery mechanism for the resulting effects, has triggered a growing body of research on resilience and adaptive capacity in the operation, planning, and governance of water systems. Within this work, the concepts of risk management and decision-making under uncertainty have figured prominently (Haasnoot et al. 2012; Gersonius et al. 2013; Poff et al. 2016). An influential early case involved scholarship on adaptation to flood risks in the Thames River around the city of London (Dessai and Hulme 2007; Lonsdale et al. 2008). Much of this work has stressed adaptation to extreme-weather risks and the destabilization of water supplies and has taken a relatively depoliticized approach of stressing socially optimal aggregate outcomes. An emerging strand of work, however, injects a political dimension into water risk assessment by exploring distributive consequences (Conca 2015; Shi et al. 2016) and Subramanian et al. (2014) applying a risk-management framework to the politics of cooperation in shared river basins.

ORGANIZATION OF THE BOOK

The chapters that follow explore water policy and politics across different types of water resources and uses, across different levels of scale, and from varied disciplinary perspectives that include political science, economics, public policy, geography, sociology, public health, anthropology, and law. Many of the chapters tackle specific mechanisms that influence how water is governed, including but not limited to the diffusion of ideas about good water policy, the normative role of international water law, the devolution of water governance to local authorities, and the role of private companies in managing water systems. To capture the complexity of ideas and actors involved in water policy and politics, we have organized the book into six thematic sections, on poverty, rights, and ethics; food, energy, and health; the politics of scale; economics and management; transboundary water; and the politics of knowledge. In inviting authors to contribute, we consciously sought a blend that included different disciplinary backgrounds, areas of regional and functional expertise, and points of view. We also looked for authors doing cutting-edge, forward-looking work. All contributors were asked to conclude their chapters with a forward-looking discussion of emerging challenges, controversies, and policy dilemmas related to their topic.

The chapters comprising Part Two of the volume explore issues surrounding the endurance of widespread global water poverty and the challenges faced by many of the

world's people to attain clean water and improved sanitation. Uniting the chapters in this section is a focus on the role of water in alleviating poverty and improving human livelihoods, addressing vulnerability, and fostering water equity and justice. The chapters provide a nuanced account of the many complex relationships between water and poverty to understand the different pathways through which water access or infrastructure may mitigate or deepen poverty. Authors underscore universal access to clean water and sanitation as a fundamental human right, which is necessary for poverty alleviation and strengthening livelihoods. The chapters, and in particular the contribution by Barbara van Koppen, further highlight the ways in which the exclusion of women and other groups based on ethnicity and identity in the decision-making process can result in inequities in the water sector, especially pertaining to income-producing water uses. The section also contains a chapter by Sue Jackson that examines water injustices experienced by Indigenous communities and the need for water governance to better reflect Indigenous laws, values, and practices.

Part Three broadly examines water's relationship to food, energy, and health. While a large literature exists on water and health, especially pertaining to water, sanitation, and health, the chapters in this section also highlight the interlinkages between water and other resource sectors; in particular, through the lens of what has come to be known as the "nexus," they discuss interactions linking water, energy, and food. As noted in the contribution by Martin Keulertz and Anthony Allan, sustainable water management will depend increasingly upon understanding long supply chains that take into account not just farmers but also food traders, food manufacturers, retailers, and, ultimately, consumers. As such, the authors in this section utilize the concept of institutional "problemsheds" to analyze the politics of the water-energy-food nexus through a focus on multiscale institutions that include formal regulatory institutions, comparative political systems, informal norms and practices of resource access and management, corporate supply chains, consumer behavior, and the impacts of financial and commodity markets.

While helpfully drawing out these wider intersectoral connections, the nexus literature has focused primarily on water in terms of quantity—that is, how energy and food production demand water inputs and how water production demands energy. The contribution by Weinthal, Vengosh, and Neville demonstrates that greater attention must also focus on quality issues—for example, the impact of energy production on water quality, as increasingly evident with coal and shale gas development.

Part Four focuses on the politics of scale. Because water resources may either be physically located within political/jurisdictional borders or straddle those borders, chapters in this section examine different institutional mechanisms for governing water across different scales (global, national, and local), drawing on examples from several different world regions. In asking how and why scale matters for water politics and policy, the chapters highlight the ways in which political boundaries complicate effective water governance, owing to the many actors and institutions that affect water flows and use within and across various types of socially constructed borders. Managing water across scales is becoming even more complicated due to climate

change impacts on water availability. Many of the chapters in this section examine the local aspects of water politics and policy, with a particular focus on the trend toward decentralization of water management. As a result, chapters here highlight the plethora of actors at the local level that are experimenting with policies to meet both local demands and those of higher levels of government and mitigate local water conflicts. The contribution by Hughes and Mullin, which focuses particularly on the United States, discusses how communities are introducing new forms of pricing, regulations, and contracts to better distribute water and build resilience. Elsewhere in the world, many urban residents access water through informal networks, as is the case in India. Whereas the conventional understanding of informal has focused on private water vendors in developing countries, the contribution by Ranganathan provides a more robust understanding of the “informal” to take into account the entire water system, often with roots in particular historical contexts.

The chapters in Part Five shift the focus to water politics as seen through the specific lenses of economics and law. Because water is unpredictable in supply and quality, is difficult to contain or direct, is notoriously difficult to manage well, and provides a range of different benefits to different economic sectors, scholars have looked extensively at the problem of pricing and market policies for managing water more efficiently. The chapter by Peterson and Hendricks highlights many of the challenges of introducing water pricing policies and markets to protect and conserve water resources, due to broader concerns about affordability and fairness. Yet, as the chapter by Garrick and Svensson notes, even when market mechanisms may improve efficiency and provide funding to maintain infrastructure, such approaches cannot proceed effectively in the absence of a strong legal framework. Indeed, a common theme across the chapters is the importance of the institutional foundations for supporting water markets that take into account property rights reforms, transactions costs, and path dependency. Other chapters in this section, particularly those by Cullet and Bakker, discuss trends in water-sector reform that raise tensions between willingness to pay and efficiency reforms on the one hand and equity and justice concerns on the other. This section also surveys the highly contentious debates surrounding attempts at water privatization and water markets. Ultimately, issues of governance undergird many of the arguments in this section about the role of markets, pricing, and other self-governing institutions at the local and transboundary levels. Chapters provide illustrations from a range of cases, including China, India, Australia, and the United States.

Part Six tackles the complex questions surrounding transboundary water politics. Scholarship on international water politics has been defined largely by a focus on the drivers of water conflict and cooperation. Zawahri's chapter offers a survey of qualitative and quantitative studies on patterns of conflict and cooperation in transboundary basins, distilling a number of institutional factors that have contributed to the effectiveness of water treaties to manage water disputes. While the conventional wisdom has been that states are more likely to cooperate than enter into conflict when managing shared water resources, several of the authors in this section take a more critical

and future-oriented perspective. Specifically, the contributions by Öjendal and Rudd and by Petersen-Perlman et al. point to the need for cooperation and conflict studies to pay greater attention to several dynamic factors in order to understand better the prospects for water-related conflict at multiple scales. These include the effects of climate change on water availability and rights, the role of changing water demand through the water-energy-food nexus, and the impacts of growing populations. Indeed, Raleigh's chapter on water conflict in sub-Saharan Africa demonstrates that contestation over access to water is increasingly leading to patterns of marginalization, exclusion, and potentially conflict. Moving forward, cooperation over water is likely to require more attention to building adaptive capacity. One of the positive findings from studying transboundary waters/international water has been the importance of river basin organizations, as discussed in the chapter by Gerlak and Schmeier. Cross-cutting themes raised in several of the chapter contributions include the need to update transboundary water management approaches to cope with global climate change and the important role of stakeholder participation for flexible, robust forms of cooperation. Cases in this section cover the Nile, Mekong, Meuse, Teesta, and Aral Sea river basins as well as more broadly concerning how water resources are used and managed across Africa.

The chapters in Part Seven underscore the importance of information for decision-making, particularly in the context of building systems capable of resilient planning and adaptive response. The chapter by Mukhtarov and Daniell explores how information and ideas about water policy models are transferred, disseminated, and adapted. Different hegemonic policy models about water governance exist at different levels of scale; these include ideas about IWRM, water user associations (WUAs), and river basin organizations, which have become increasingly standardized and adopted across multiple political units globally. The chapter explores how ideas move and are translated from the predominant hegemonic discourse into particular local contexts. The chapter by Lubell and Balazs examines perhaps the leading example of such diffusive processes, IWRM. In an effort to get beyond static debates about top-down versus bottom-up governance, the authors look at IWRM through the lenses of adaptive governance and barriers to collective action. They describe a reformulated research agenda on IWRM that stresses the fit with the local socioecological and institutional context in addition to core questions about environmental and social outcomes. Lemos and Kirchhoff then take up one of the key challenges to adaptive water governance—making effective use of scientific knowledge and information regarding climate change. Not only is information about climate change projections necessary for policymakers to make informed decisions about changing water availability and quality, but participation by different stakeholders (including WUAs and river basin councils) can be enhanced by access to information. Nevertheless, as the chapter demonstrates, even as knowledge and information about climate change become more available and usable, a series of disconnects between how knowledge is produced and how it is used complicate the prospects for climate-smart, adaptive water governance.

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PART 2

POVERTY, RIGHTS,
AND ETHICS

CHAPTER 2

WATER AND POVERTY

Pathways of Escape and Descent

BEN CROW AND BRENT M. SWALLOW

INTRODUCTION

A focus on water and poverty is justified by the centrality of water access, use, and control in the making of wealth and poverty, social divisions, and social change. An understanding of the many and complex connections between water and poverty may identify opportunities to reduce different dimensions of poverty.

Poverty is a multidimensional set of phenomena best illuminated with a range of perspectives. Two perspectives are used in this chapter because they help to clarify the pathways under discussion. The first and most widely known representation of poverty is income poverty: having too little income to be able to consume a minimum basket of commodities. Putting this measure of deprivation in social context is the second idea of relational poverty: poverty as the consequence of historically developed economic and political relations (Mosse 2010).

This chapter seeks to understand how water access, use, and management are implicated in processes leading to escape from poverty and descent into poverty. There are two bodies of literature addressing this question. One focuses on economics and policy advice on water and poverty (such as Namara et al. 2010 and Smith 2004) and suggests, for example, that the spread of irrigated agriculture can reduce poverty. This literature focuses primarily on income poverty and uses the individual household as a unit of analysis. Our attention in this chapter is primarily on the pathways or scenarios in which changing water use leads to poverty reduction as identified by this literature. A second literature contributes historical analysis of social change associated with water and poverty (e.g., Mollinga 2014; Swyngedouw 2004). This work sees the spread of irrigation, for example, contributing to the accumulation and dispossession inherent to capitalism, to male bias, and to the exclusion of particular groups by ethnicity or identity. We add

some insights from this second literature and in our conclusion sketch how the two literatures might be reconciled.

The first, and most substantial, section of this chapter investigates what is known about three pathways, described primarily in the literature on policy and economics, through which access to and control of water provide routes out of poverty. These pathways operate through (i) irrigation, (ii) potable water, and (iii) domestic-productive water. Then, in the second section, we examine how water infrastructure and irrigation projects have often caused descent into poverty for some of the affected people. In the third section, we identify emerging opportunities arising from social and technical change that may facilitate escape from poverty and constrain descent. We end that section with a review of the emergence of “water justice” as a focus of social concern and public action.

In the concluding section, we briefly assess anti-poverty processes on each of the three pathways and the extent to which emerging opportunities may engage those processes. Overall, these deliberations highlight three processes: (i) the potential poverty-reducing value of participatory, grassroots action contesting water injustice; (ii) changing international discourse on “safe drinking water” to include household domestic-productive water; and (iii) preventing the poverty caused by construction of water infrastructure.

PATHWAYS AND CONTEXTS

This section examines pathways through which the control and use of water may facilitate escape from poverty. The term “pathways” is used to refer to causal scenarios connecting economic and technical change to changes in the opportunities and well-being of different social groups. Thus, for example, the adoption of irrigation may first influence output for a class of farmers for whom irrigation is accessible. Second, changes in agriculture brought by irrigation may lead to increased agricultural employment for a class of laborers and demand for goods that may facilitate the rise of merchants. Third, the increased demand for diverse goods and services from farmers and laborers may create the potential for new livelihoods and opportunities for the poor.

Pathways identify social processes connected to water that may facilitate low-income households’ attempts to extricate themselves from deprivation. These attempts, however, arise within a historical context best illuminated by the relational perspective on poverty: “people are poor because of others. . . . [They are] unable to control future events because others have more control over them” (Wood 2003, cited in Mosse 2010: 1158). This perspective brings to light ways in which durable or chronic poverty can be maintained by the “exclusionary and expropriating aspects of long term capitalist transformation” and the operation of boundary marking and excluding categories like caste, ethnicity, and gender (Mosse 2010: 1156–1157).

The wider focus of a relational perspective on poverty begins to explain the divergence between the optimism of mainstream economics and policy literatures on water

and poverty (e.g., Smith 2004) and the pessimism of the more contextualized historical and political economy literature on related questions (such as Cousins 2013; Mollinga 2014; Swyngedouw 2004). Mainstream writers see water utilization generating greater (short-term) opportunities for the poor to escape poverty. Writers situating water utilization in historical context, however, document dismal long-term tendencies of dispossession and inequality as water utilization allows the rich and influential to accumulate from increased output and buy the land and labor of the poor.

The relational perspective also alerts us to the importance of gender relations and male bias (see van Koppen, this volume). Water access and control over water play key roles in male bias and gender subordination. In an influential book, Elson (1991) argues that male bias is founded on the ways that getting a living and raising children are inter-related: “Lack of an independent and secure entitlement creates a bias operating against those people who have the task of child care and weakens their bargaining position in the cooperative conflicts of the family” (Elson 1991: 320). If, as is often the case, water collection forms a significant part of women’s household work, then that obligation adds to the constraints of childcare, constrains opportunity to gain independent income, and tends to intensify this underlying support for male bias. We note here some points where male bias shapes pathways.

Two additional analytical connections between mainstream and historical literatures—empirical patterns enabling escape from or furthering descent into poverty and unequal access to capital—have potential to illuminate interactions between water and poverty. Krishna’s (2010) participatory research on the reasons for escape from, and descent into, poverty documents the sequences of cause and effect through which illness, health costs, and deaths can drive poor households into acute deprivation and the sequences through which other households find new livelihoods and well-being improvement. Barrett and Swallow (2005) model dynamic poverty traps in rural livelihoods, in which unequal access to finance and other forms of capital enables some to establish remunerative rural livelihoods while excluding others. Both strands of research focus on households and income poverty, but their findings suggest connections to wider, relational poverty.

Irrigation and Poverty

Contemporary literature on irrigation and poverty (Hussain and Hanjra 2004; Namara et al. 2010; Smith 2004) describes several pathways through which more widespread use of irrigation water can reduce poverty. Both direct effects (as better water management raises agricultural output of farmers) and indirect effects (as new methods, increased output, and spending generate livelihood possibilities for other social groups and classes) are described. The pathways identified in these reviews are summarized in table 2.1.

These reviews suggest that irrigation initiates increased output of larger farmers and expanded opportunities for employment. Over several years, demand for goods and

Table 2.1 Pathways Arising from Irrigation

Direct: Effects for Adopting Farm Households	Indirect: Subsequent Effects with Possible Consequences for Other Groups
Increased yield (because irrigation water avoids water stress and transports new inputs) (Namara et al. 2010; Smith 2004)	Generating employment on and off farm (Smith 2004)
Crop intensification (multiple cropping seasons) (Hussain and Hanjra 2004; Namara et al. 2010; Smith 2004)	Increased demand for goods leading to diversification of economic activity (Hussain and Hanjra 2004)
Greater predictability of output (Namara 2010)	Lower food prices benefiting rural and urban purchasers of food (Hussain and Hanjra 2004)
Multiple uses of irrigation water (Smith 2004)	Growth of backward linkages to commercial and industrial production (Hussain and Hanjra 2004)
	Growth of non-farm rural output and employment (Namara 2004)

Source: Summarized from Hussain and Hanjra (2004), Namara et al. (2010), and Smith (2004).

services rises, bringing possibilities for livelihood diversification. They also show that irrigation has differential social consequences. Better-placed farmers increase their output early in the process. Small farmers, poor peasants, and landless people may gain as more work becomes available and as opportunities for livelihood diversification emerge with the expansion of trade and demand for agricultural tools and inputs and life necessities.

In what follows, we briefly describe three of these processes: increased output, increased farm employment, and increased non-farm employment. Farmers able to command irrigation may get increased yield, longer or additional growing seasons, predictability of output, and multiple uses of irrigation water. Hussain and Hanjra's (2004: 11) review of quantitative evidence from large- and medium-scale schemes suggests that irrigation leads on average to increased yield of one ton per hectare and the production of one additional crop each year.

Possibly the largest force for reducing poverty as irrigation use expands is the increase in employment, first in agriculture, then in non-farm activities. On-farm irrigation generates jobs because more labor per hectare is required to produce a crop with irrigation and because irrigation allows for additional seasons of crop production. A case study from the Philippines estimates that the demand for labor increased from 18 days per hectare before irrigation in 1995 to 54 days after irrigation in 2002 (Namara et al. 2010: 522). A comparison of labor used in the Pabna Irrigation and Rural Development Project in Bangladesh in 2003 to that used in adjacent rainfed agriculture suggests that irrigation increased labor demand by 80–116 days per hectare per year (Namara et al. 2010).

Increased demand for labor in irrigated areas can lead both to rising wages and to migration of labor from areas where there is less employment. Hussain and Hanjra (2004: 6) point, as an illustration of the latter process, to the growth of seasonal migration of landless labor from the Indian state of Bihar to farms in Punjab that gained irrigation as part of the Green Revolution. Such migration may lead to increased average household incomes in Bihar through remittances and changes in the Bihar labor market.

The papers discussed thus far in this section do not distinguish between large, government-backed irrigation schemes and small, private irrigation (large private schemes are rare). In South Asia, state-driven canal irrigation emerged in the mid-nineteenth century to meet the needs of colonial rule and was continued by postcolonial governments throughout the twentieth century. In the last decades of the twentieth century, individual groundwater pumping became a more common source of irrigation water in South Asia. In Africa, large canal irrigation schemes were few. Recently, there has been renewed interest in both public and private irrigation in Africa. One estimate (De Fraiture and Giordano 2014) suggests that there may be five million small farmers in sub-Saharan Africa with the potential to use tube well irrigation, and that it may be the fastest growing segment of irrigation in African countries as diverse as Niger, Nigeria, Ghana, and Burkina Faso. These authors suggest that the spread of smallholder irrigation could be facilitated by state policies and that this could lead to substantial increases in income for millions of smallholders. The Land Matrix database shows that most African countries have experienced significantly increased foreign investment in large-scale irrigation projects since 2007–2008 (<http://www.landmatrix.org/en/>).

The spread of irrigation is refracted by a larger set of social transformations of which it is part. Male bias and processes of accumulation and dispossession produce inequalities disrupting this positive picture.

Irrigation, Gender, and Social Transformation

Male bias is reflected, as irrigation is taken up, in a number of documented processes:

- (1) Increased returns from irrigated agriculture are generally controlled by men, diminishing women's relative standing in the household (Ramamurthy 1991).
- (2) Large irrigation systems are frequently designed with the assumption that agricultural work is done by men, and thus overlook women's use of irrigation water and systems.
- (3) As irrigation is adopted, the work assigned to women changes and often increases (Ramamurthy 1991).
- (4) Irrigation management policies that decentralize water management and treat water as only an economic good may further marginalize women. Women farmers may be less able than men to pay for water and may have less voice in local water institutions (Zwarteveen 1998; Zwartveen and Meinzen-Dick 2001).

- (5) Despite the results of many gender studies of irrigation schemes, the issues of women and gender often remain an afterthought in project design and management (Zwarteveen 2013).

These processes connect to a larger picture, the relational perspective, recognizing that almost all social relations and institutions are gendered in ways that shape vulnerabilities and poverty. Livelihoods, water management, collective action, and community-level resource management tend to have gendered outcomes (Cleaver 1998; Meinzen-Dick and Zwarteveen 1998; Ray 2007). Both women and men, however, have agency (Jackson 1998), and these outcomes may be contested at many levels including those of the household, community, and state (through, for example, collective action for greater equity). To be effective, such action also must challenge the consequences of uneven capitalist transformation.

The research recognizes that the adoption of irrigation is uneven and may increase inequality. Smith (2004: 250–251) notes that irrigation most often leads to a reduction in absolute poverty, but when the spread of irrigation fuels land consolidation and dispossession it may increase absolute poverty. Hussain and Hanjra (2004: 9–10) suggest that irrigation is notably inequitable in areas where there is uneven distribution of land, as in much of South Asia. Where land is more evenly allocated, as in cases in Sri Lanka and China, the advantages of irrigation are more equally available. Land consolidation, dispossession, and inequality exacerbated by uneven land holding are elements of social differentiation as capitalist forms of production intensify within peasant agriculture (Bernstein and Byres 2001).

Water and Health

We turn next to pathways arising from the use of safe water and from easier access to household water. In each of these pathways, the advantages of improved access accrue most immediately to women and children. In the pathway arising from safe water, analysis has generally been focused on health consequences for the whole household. While women are key agents in hygiene and safe water, we have fewer studies of the consequences of improved health for women's work and lives (Koolwal and Van De Walle 2013).

Water free of disease vectors reduces morbidity, mortality, and the substantial costs of both. Krishna (2010) reports that the costs of health care and the impacts of death are the foremost causes of descent into poverty for poor households in all of the eight countries he studied. The prolonged focus on water, sanitation, and hygiene by the United Nations Children's Fund (UNICEF), the World Health Organization (WHO), and the World Bank has contributed significantly to the prevention of poverty across the globe by reducing ill health and mortality. In 2014, the editors of *PLoS Medicine* (PLoS Med 2014) wrote in an editorial: "The importance of water, sanitation and hygiene have not changed over the millennia—all have, are, and always will be the foundations of human health." In the

history of now-industrialized countries, the effects of water provision on life expectancy and on poverty have been substantial. Cutler and Miller (2006) estimate that clean water was responsible for nearly half the total mortality reduction, and three-quarters of infant mortality reduction, in major cities of the United States in the early twentieth century.

Bad water, hygiene, and sanitation conditions account for a large part of the global burden of ill health. Diarrheal diseases are the second leading cause of ill health worldwide (Mathers et al. 2008: table 13). Bartram and Cairncross (2010) suggest that 2.4 million deaths could be prevented annually with improved provision of water, sanitation, and hygiene. Such change can reduce diarrheal disease by one-third, and with a higher level of water provision through household piped connections, it can be reduced by 63 percent (Bartram and Cairncross 2010: 2 and fig. 2). The interactions between mortality and morbidity and their many social consequences mean that, as with irrigation, domestic water influences multiple pathways out of poverty. Bosch et al. (2002) identify these linkages (figure 2.1) covering both health and productive uses of water.

A study of costs and benefits arising from improved water and sanitation (Hutton and Haller 2004: 23) identifies seven principal economic benefits of improved water and sanitation:

- (1) health sector benefit due to avoided illness;
- (2) reduced patient expenses due to avoided illness;
- (3) value of deaths avoided;
- (4) value of time savings due to access to water and sanitation;
- (5) value of productive days gained by those with avoided illness;
- (6) value of days of school attendance gained by those with avoided illness;
- (7) value of child days gained by those with avoided illness.

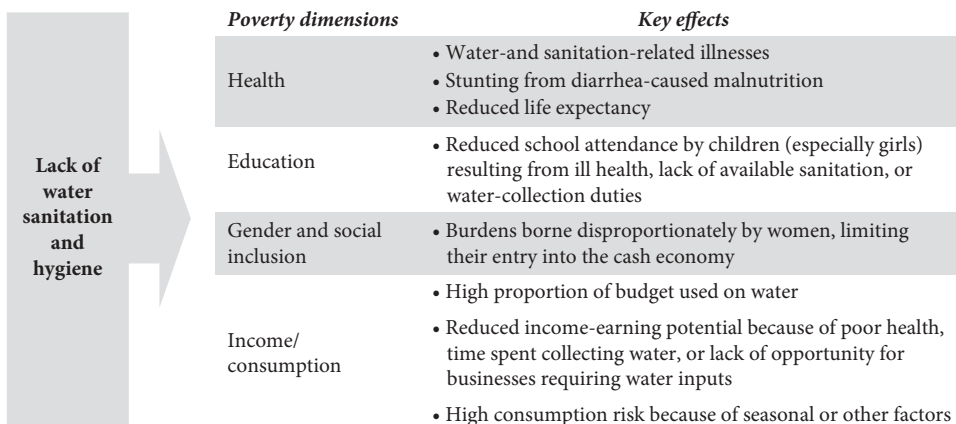


FIGURE 2.1 Linkages between poverty and water and sanitation

Source: Reprinted with permission from C. Bosch, K. Hommann, G. Rubio, C. Sadoff, and L. Travers (2002). "Water and Sanitation." In *A Sourcebook for Poverty Reduction Strategies*, vol. 2, *Macroeconomic and Sectoral Approaches*, edited by Jeni Klugman, 372–404. Washington, DC: World Bank. © International Bank for Reconstruction and Development/The World Bank.

While these are identified as economic benefits to society arising from improvements in water and sanitation, they also provide an indication of likely pathways arising for low-income people to escape from poverty. In that light, the list can be seen to incorporate both changes that reduce descent into poverty (items 1–3) and changes that offer opportunities for escape (4–7). Hutton and Haller (2004) seek to estimate the economic value of each of these benefits in different continents and epidemiological regions of the world.

For countries in Africa with high adult and high child mortality (the WHO epidemiological sub-region D, excluding countries with very high adult mortality), they suggest the relative importance of each of the economic benefits as shown in figure 2.2.

The largest benefit, amounting to more than 65 percent of the total, arises from time saved (convenience savings) as a result of closer access to water and sanitation (discussed further in the next section). This is followed in importance by school days made possible, health sector savings, the value of averted deaths, and the value of additional baby/child days without illness. Savings in patient costs and the value of adult working days are small in this estimate.

Domestic-productive Household Water and Poverty

The water and health pathway has brought transformative changes in health with wide consequences. The focus on “safe drinking water” has, however, overshadowed the significance of domestic-productive household water. Domestic-productive household water gets lost in the conceptual gap between the idea of irrigation water and that of safe

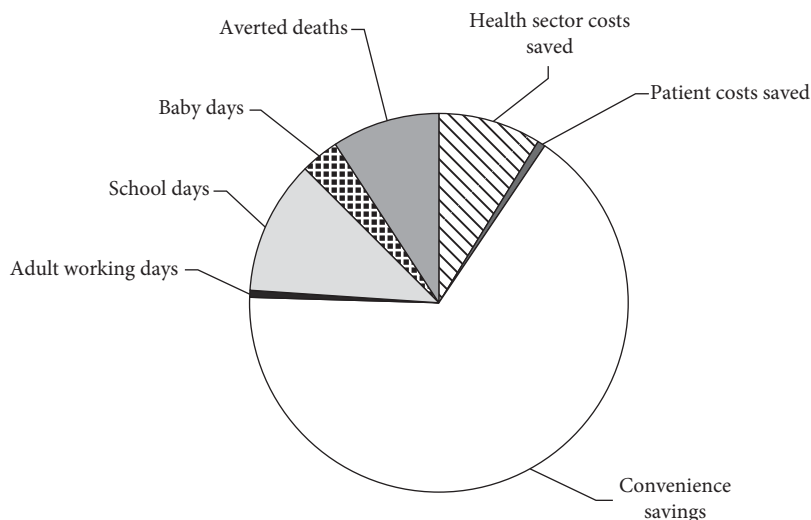


FIGURE 2.2 Economic benefits of improvements to water and sanitation

Source: Reprinted from Guy Hutton and Laurence Haller (2004). *Evaluation of the Costs and Benefits of Water and Sanitation Improvements at the Global Level*. Water, Sanitation, and Health, Protection of the Human Environment. Geneva: World Health Organization. © 2004. http://www.who.int/water_sanitation_health/wsho404.pdf.

drinking water (Cleaver 1998; Moriarty et al. 2004; Zwarteven 1997). Popular discourse and institutional policy and practice focus on singular, sectoral understandings of those two forms or uses of water (Mollinga 2008). The category of domestic-productive water, however, recognizes a wider set of activities and concerns beyond drinking and cooking water. Domestic-productive water can be imagined as household water requirements beyond health concerns (water free of disease vectors)—that is, sufficient and easily accessible water to support and allow time for domestic work (cleaning, laundry, bathing), productive work (livelihoods), education, and leisure.

Governments have ministries and departments, and international agencies have specialist institutions, that focus on singular uses of water. Ministries of irrigation tend to focus on agricultural uses. Health ministries deal predominantly with safe drinking water. The WHO and UNICEF assess safe drinking water access through their Joint Monitoring Project which has decided to exclude domestic water from its concerns (Goff and Crow 2014). (The UN's Millennium Development Goals and their successor, the Sustainable Development Goals of 2015, supported more encompassing ideas about water as parts of anti-poverty agendas.) The UN Food and Agriculture Organization and other international agencies may overlook the multiple uses of irrigation water (Bakker 1999; Moriarty et al. 2004). These institutions may lack awareness and a mandate to consider domestic-productive water. Perhaps more likely, they may be unwilling to deal with multiple waters because it would disrupt institutional borders and practices. The institutional gaze—what Scott (1998) calls “seeing like a state”—favors simple processes and singular waters, and has not been turned to this third, and possibly more complex, type of water.

This omission matters because inadequate access to household water is a significant constraint on freedoms and capabilities, in Amartya Sen's (1999) depiction of poverty; easy access to water may open pathways to escape from (income) poverty. The poorest households escape poverty frequently by finding new livelihoods and diversifying their income sources (Krishna 2010). In both rural and urban areas, with few opportunities for employment, a range of household enterprises—from services such as hairdressing, childcare, and laundry to making things in tailoring, pottery, and snacks for sale—can generate new sources of income. These livelihood opportunities require both available time and adequate, accessible water. Beyond income-generating activities, enhanced access to water has wide social consequences with ramifications for wider conceptions of poverty, including new capabilities and freedoms and profound changes in household and social life.

Little attention has been paid to these wider social consequences of water provision. Enhanced water access may have implications on five interrelated terrains: the time allocation of individuals (with fewer time conflicts); the character and scope of domestic and reproductive household work (increased quality of childcare and home maintenance and time for education); the initiation of new livelihoods and small business; choices about leisure and freedom (several studies report women routinely sleep less than men); and gender divisions of labor (which may be unsettled as women have new opportunities, and gain voice and civic involvement).

Wide-ranging improvements in well-being are suggested by a study reporting that enhanced water access in Tangiers brought increased happiness. Piped water connections reduced conflict over water, increased leisure time, and generated higher levels of happiness (Devoto et al. 2012; see also Andujar 2005).

The breadth and diversity of changes brought by piped water means that a search for single outcomes may be elusive. Nonetheless, we summarize evidence on changes in livelihoods and timesavings.

Small business and livelihoods. The combination of access to more water and time saved from collecting water can enable households to initiate a wide range of enterprises and livelihood strategies. In Vietnam, households in villages with better access to water initiated more enterprises than those in a control group without improved access (Noel et al. 2010). This study suggests that childcare and domestic tasks can be combined with one or more enterprise, such as food production and pig rearing. In rural Senegal, piped water systems “provided women with time savings and greater quantities of water which they used to expand their productive use activities and initiate new activities” including livestock-raising, gardening, selling water or ice, fabric-dyeing, selling fruit juice, soap-making, pottery, and henna tattooing (van Houweling et al. 2012). In Western Kenya, piped water led to increased household incomes, mostly through sales of vegetables and milk (Crow et al. 2012). In rural Gujarat, time saved through water provision was transformed into increased income (James et al. 2002). In a study of small enterprises in two towns in Uganda (Davis et al. 2001: 1765) found that enterprise owners say that water access is a binding constraint on their business. Even though savings from improved water infrastructure may be small they are not negligible for struggling businesses.

Time spent collecting water. Time saved from access to closer water sources may be the largest economic benefit from improvements in water access over the last several decades (figure 2.2). Those timesavings, however, have not reached all households. Between 1972 and 1997, in both rural and urban sites in Kenya, Tanzania, and Uganda, the time devoted by households lacking piped water access to one trip collecting water increased from 15.8 minutes on average to 25.3 minutes (Thompson et al. 2001: appendix). Households make many water collection trips on some days each week (particularly, for example, when doing laundry). Thus, total collection time is often a multiple of the time for one trip.

Time scarcity has particular impact on women’s lives. Gendered roles leave women’s labor time more constrained than that of men (Blackden and Wodon 2006; see also Sorenson et al. 2011). And while men are free to take on tasks sequentially, women tend to juggle multiple roles simultaneously, including childcare, household provisioning, and income-generating work. Time poverty and income poverty, these authors argue, reinforce one another. Jackson (1998) argues that time allocation studies fail to account for women’s preference for less arduous work. The collection of water in containers often weighing 44 pounds or more is particularly heavy, demanding work. This may be part of the explanation for the high priority to closer water provision seen in survey responses (e.g., Swallow 2005).

Reducing the time devoted to water collection generates a freedom, particularly for women and children, that can be used in many ways including increased leisure, increased income, better childcare, improvements in domestic work, and greater opportunity for children to attend school. Nauges and Strand (2013), for example, suggest that in Ghana a 15-minute reduction in water collection time increases the proportion of girls attending school by 8–12 percent.

Reducing water collection times also leads to improvements in robust measures of child health (diarrhea prevalence, nutritional status, under-five mortality). Pickering and Davis (2012: 2394–2395) suggest that the relationship between reduced water collection time and health can be explained as follows: walk times restrict the volume of water available in the household and reduce the efficacy of hygiene behavior; water stored for longer periods is more likely to be contaminated; mothers spending time collecting water have less time for childcare and seeking health care; nutrition may be reduced because less water is available for cultivating family plots; and time collecting water may constrain income-generating activities.

In sum, there are multiple paths to reduced poverty arising from enhanced water access beyond the goal of “safe drinking water.” Domestic-productive water deserves more research and public action.

DESCENT INTO POVERTY

While water scarcity clearly can impoverish, the development of water access, use, and control can also contribute to descent into poverty through two sets of processes: deprivation initiated by infrastructure construction and long-term processes of dispossession triggered by irrigation development.

Deprivation Initiated by Infrastructure Construction

The most well-known example of this process comes from displacement of people by the filling of reservoirs after dam construction. Arundhati Roy (1999) estimates that large dams in India have displaced at least 33 million people. The estimate of the World Commission on Dams (WCD 2000) is that 40–80 million people have been displaced worldwide. The Commission put the onus for successful mitigation, resettlement, and development on the state and the developers of dams. This responsibility, however, has not been accepted by the governments of many countries where dam building is proceeding apace (Briscoe 2010). Ten years after the WCD, studies suggest that the displacement of people by dams has not been satisfactorily addressed in the current phase of dam building (Moore et al. 2010).

A study of displacement as a result of dams in Brazil, Indonesia, and Kenya (Cernea 1990) concludes that the risk of impoverishment as a result of displacement is high and results from a combination of landlessness, joblessness, homelessness, marginalization,

food insecurity, morbidity, and social disarticulation. In the case of India, Roy (1999: 7) argues, “The great majority [of people displaced by dams] is eventually absorbed into slums on the periphery of our great cities, where it coalesces into an immense pool of cheap construction labor (that builds more projects that displace more people).” In addition to the displacement associated with reservoir storage, there are also downstream consequences for both livelihood and environment resulting from changes to the flow of a river (Richter et al. 2010). The government of Ethiopia has been constructing a series of large dams since 1986, with tens of thousands of people displaced by the reservoirs and possibly millions of people affected by reductions in water and other downstream effects (Eguavoen and Tesfai 2012).

Irrigation and Dispossession

The introduction of irrigation, as noted, may reduce income poverty while contributing to longer-term processes of accumulation and dispossession. These consequences of capitalist transformation may happen even when government policies seek to support marginal farmers. On the Tungabhadra Canal in India, for example, Peter Mollinga (2014: 12) found that “protective irrigation” designed to maximize access to irrigation led to a “pattern of water distribution that is equal in principle but unequal in practice.” A class of farmers with large holdings was able, using government policies intended to increase food production, policies to generate votes, and collusion with the Irrigation Department, to appropriate land and water to support intensive farming (Mollinga 2014). Such processes of social differentiation led small farmers to rely more on wage labor and, over time, to sell land and sometimes to migrate to cities. These longer-term processes of dispossession and change may not be picked up in quantitative studies with a shorter time horizon.

EMERGING OPPORTUNITIES TO ESCAPE POVERTY

Is it possible to reduce poverty with more equitable water systems? Many think so. We look in this section at innovations in household water treatment, new modes of delivery of water to households, water pricing in agriculture, action to prevent descent into poverty, and contestation of water injustice.

Household Purification

Innovation in filtration and treatment technologies is a common focus of industrialized-world research and investment intended to improve health in the non-industrialized

world. The US Agency for International Development and other international agencies have promoted household purification with, for example, the subsidized distribution of chlorine tablets (Burch 2013). The efficacy of this form of intervention, however, is in question.

There is a significant literature (reviewed in Zaman et al. 2014) on the advantages and disadvantages of a wide range of low-cost filtration and treatment systems. There are also studies showing that these methods can be effective (Sobsey et al. 2008: 4265). The editors of *PLoS Medicine* (PLoS Med 2014), however, note that carefully controlled trials of household treatment, including chlorine tablets and solar disinfection, suggest that such methods are ineffective at limiting disease vectors. Wolf-Peter Schmidt and Sandy Cairncross (2009) say that evidence from household treatment trials of diarrhea prevention is questionable and that non-health benefits are negligible. It is possible that household treatment is undermined by intermittent use and recontamination during storage.

New Arrangements for Household Water Delivery

As noted earlier, many people who lack access to piped water, particularly in low-income urban areas, buy water from the tanker trucks and taps of private suppliers, often at substantially higher prices than paid by those with access to public water supplies. New metering technologies facilitated by real-time delivery of digital data and new social arrangements could make water more accessible and at lower prices.

In some low-income urban areas in Africa, “pre-paid” meters are being installed delivering a quantity of water to those with a card or drive indicating that water units have been purchased. For consumers, they are intended to reduce the unit price of water, extend service, increase flexibility, and reduce corruption. For utilities, the meters offer reduced water losses (to illegal trade) and better cost recovery. However, their introduction in Soweto, South Africa, has been strongly opposed because they increased costs for the poor and raised risks of water supply disconnection (redesigned meters are now being installed to provide emergency water). In East Africa, the small-scale introduction of pre-paid meters has generated at least some of the intended benefits for consumers and utilities (Were and Crow 2013).

Innovative modes of household water delivery may also be emerging from regularizing informal (illicit) enterprises and forging new relationships among small enterprises, community organizations, utilities, and government agencies (Ahlers et al. 2014: 14; McKenzie and Ray 2004: 24). Measures to recognize and regularize informal enterprises and their undercover relationships with utilities could enable new livelihoods, deliver water more cheaply and reliably, and begin to give citizen’s rights to the residents of low-income areas. Utilities might, for example, seek to build relations with existing water traders and regularize illicit links between utility plumbers and officials and traders.

Such action, however, will not be simple. Larger water traders may be powerful figures with political connections who are unwilling to relinquish their trade and position.

In Nairobi, for example, a tentative and failing initiative to build relations between the water utility and traders was finally terminated by police action. A violent sweep through informal settlements to repress an ethnic mafia, the Mungiki, used water company officials to sever both legal and illegal connections to utility water mains. It was believed that water revenues and water control sustained the Mungiki, along with taxes on minibuses. Failure to exempt water connections where bills were being paid undermined such trust as had been built between the water company and water traders (Crow and Odaba 2010).

The global spread of bottled drinking water has in many low-income urban areas provided potable water for the slightly more affluent (cost estimates are not available). In low-income areas of Accra, Ghana, there has been a large-scale shift to packaged (500 ml heat-sealed plastic bags), ready-to-drink water. One study suggests that the supply of water “sachets” by small-scale private vendors has positive health effects (Stoler et al. 2012). In the capital of Guinea Bissau, however, Adriano Bordalo and Ana Machado (2015) found that packaged water was contaminated.

Water Pricing Policies in Agriculture

New modes of household delivery may improve water access by the urban poor. In agriculture, the pricing of irrigation water can encourage more effective use of water and generate finance for increasing water access—but without wider governance reforms, such changes may intensify rural poverty.

Most large-scale irrigation systems around the world have been, and continue to be, installed and maintained by government organizations. While there are convincing arguments for publicly administered irrigation, such systems have often encountered problems. Scarce water supplies are used inefficiently, there is underinvestment in operations and maintenance, coverage is incomplete (especially for the poor), and it is difficult to reallocate water from agriculture to cities and other sectors of the economy (Easter and Liu 2007). Water pricing can be part of the solution to these problems. Pricing can generate funds for investment and cost recovery, facilitate transfer of water between uses, and facilitate extension of water services to new areas and client groups. Despite these potential advantages, it is now generally recognized that water pricing alone can cause as many problems as it solves. The poor tend to be most negatively affected by all of these problems and have the least options for response.

A review of the history of water pricing in irrigation is provided by Molle and Berkoff (2007). During the colonial era, the British government had lively debates about the need to balance the benefits of expanding irrigation services with the need to generate revenue to cover the costs of those services. World War II (1939–1945) prompted greater concern for food security and in the 1950s and 1960s newly independent governments tended to view public provision of irrigation water as a strategic

national investment. As a result, irrigation water was often provided at little or no monetary cost to users.

Greater attention to water pricing occurred again in the 1980s, particularly in the World Bank, which had financed large-scale irrigation projects in many countries. Some World Bank loans were made conditional on the public agencies levying service fees on water users. Reviews conducted in 1981 and 1986 showed that most countries ignored irrigation-service fee covenants and that irrigation performance was unrelated to the level of fees.

Molle and Berkoff (2007) describe a shift during the 1990s from cost recovery to demand management, efficiency, and inter-sector allocation as the main foci of water pricing. In 1992, this was articulated in both the Dublin Principles on Water Management and the Rio Declaration on Environment and Development. This emphasis on water pricing for demand management emerged in part due to international concerns about the environmental and social impacts of large-scale dams, as well as studies that documented inefficient use of water in agriculture and predicted future water shortages. These concerns were reflected in national policy. For example, the Republic of South Africa's National Water Act 36 of 1998 specified that "water use charges are to be used to fund the direct and related costs of water resource management, development and use, and may also be used to achieve an equitable and efficient allocation of water." At the same time as it implemented irrigation water pricing, the South African government enacted many radical changes in water law, shifting from riparian rights to nationalization of all water resources. Many other countries implemented similar reforms to their water-allocation and water-rights policies.

Studies conducted since these reforms were implemented suggest the need for caution in drawing conclusions about the positive impacts of water pricing. Charges for water have been difficult to implement, with Mexico and China as possible exceptions. There is little evidence that user fees have caused major improvements in water-use efficiency. For example, a large increase in irrigation costs had no appreciable impact on water demand in rural China (Yang et al. 2003). Water metering, quotas, enforceable property rights, and more efficient irrigation technologies and practices (e.g., Jensen et al. 2014) have tended to have greater impact than pricing. The overall consensus in the development community appears to be that pricing should be an important element of financing of irrigation services, and used in special cases to improve the efficiency of water use, with special care taken to minimize negative impacts on the poor. Escalating block-rate pricing may strike the best balance, in which zero or low volumetric charges are applied for the small volumes used by poorer farmers (the first block) and higher volumetric prices applied for larger volumes (second and third blocks) (Easter and Liu 2007). Block-rate pricing for irrigation water has been applied on a limited scale in Côte d'Ivoire, India, Kenya, Malawi, Nicaragua, South Africa, and Zimbabwe (Wichelns 2013). To be most effective, water pricing should be combined with other reforms and technologies to have the desired improvements in efficiency, equity, and sustainability of irrigation systems.

Descent-Preventing Governance

Dams, canals, and irrigation systems can cause poverty, as described earlier. This does not have to happen. Evidence shows that protocols around infrastructure and efforts to mitigate inequality in the social and technical design of irrigation systems could reduce the toll.

Poverty-preventing infrastructure protocols. Following the example of the WCD and the International Organization for Standardization (ISO) 14000 standards for environmental management, a set of protocols and enforcement could be developed to limit the most egregious poverty-making elements of infrastructure design and construction. While Briscoe (2010) outlines the tensions between national development and growth policies, on the one hand, and poverty-reducing standards, on the other, it is likely that legal, political, and social pressures will move governments of even the most active dam-building countries, including China, Ethiopia, and India, to gradually recognize the merit of following accepted standards. A set of articles reviewing progress ten years after the WCD show that many of the commission's recommendations have been used in successful multi-stakeholder negotiations in Guatemala, the Klamath basin in the United States, and the Pangani river in Tanzania (Moore et al. 2010). So, too, could potential protocols with a compelling rationale on a broader range of water infrastructure gain acceptance. Appropriate standards could include rules and practices (with third-party oversight) to avoid deprivation following displacement, as well as institutional practices and civil-society counterweights to ensure more equitable consideration of displacement, dispossession, environmental change, and consequences for growth and development. There are, of course, also environmental and sustainability standards that may be intertwined with poverty-preventing protocols.

Inequality-mitigation in irrigation. The spread of irrigation may accelerate class, gender, and ethnic inequalities. Improved access for small and poor farmers might slow descent into poverty. And it might be achieved, it is suggested, through low-cost, labor-intensive irrigation technology, shared access to water, low-cost finance, and a shift to high-value crops (Hussain and Hanjra 2004; Namara et al. 2010; Smith 2004).

Irrigation systems could also be designed and managed in ways that recognize women as legitimate irrigators (Zwarteveen 2013). The establishment of water rights for women through legal and administrative change could also enable women-headed households, for example, to avoid poverty. Effective inclusion of both women and men in decision-making is also a step toward recognition of women's goals (Zwarteveen and Meinzen Dick 2001). A broader conception of irrigation design to include, for example, household water use could also support the freedoms and capabilities of women.

The efficacy of these responses to inequities arising from irrigation remains to be established because few of them have been tried on a significant scale. Also, the ineluctable tendency for the emergence of capitalist agriculture to encourage inequalities of class and gender suggests that piecemeal responses may be inadequate. Nonetheless,

the question of gender and class equity must be confronted by engineers, planners, and managers working on irrigation.

Contestation of Water Injustice

A new set of opportunities for innovation in the waterscape is emerging from discussions, protests, and organized action around water inequality and injustice. The most prominent example of such action is dialogue and protest at the global level around the human right to water. Of equal importance are actions by, and discussions involving, community-based organizations.

In a thoughtful consideration of water questions in South Asia, Joy et al. (2014: 954) propose that water questions should be analyzed as problems of justice and injustice because

Conflicts over water distribution, water-derived benefits, and risks often play out along axes of social differentiation like caste, wealth, and gender. Those with least power, rights, and voice suffer lack of access, exclusion, dispossession, and further marginalization, resulting in livelihood insecurity or increased vulnerability to risks.

In contrast to the apolitical approach of governments, international agencies, and much academic research on water, these authors propose that water questions are inherently political and are thus appropriate subjects for consideration of inequality and injustice (see also Mollinga 2008). Joy et al. (2014: 968) suggest that such consideration should focus upon the ways “socio-environmental inequality actually matters for specific groups and how injustice is produced.”

Building on their experience collaborating with a water justice network in Latin America, *Justicia Hídrica*, Zwartveen and Boelens (2014: 155) suggest a framework for identifying and understanding water injustice: “Taking seriously, and developing awareness of, the many manifestations of injustice, from brutal water grabs to much more subtle politics of disciplining and normalization.” They challenge a mainstream consensus that focuses on water scarcity and the water needed to grow food for rising populations. This consensus, they argue, supports apolitical approaches such as Integrated Water Resource Management (IWRM) and market-based solutions. As an alternative, they suggest that injustice must be confronted in everyday situations, recognizing the specific political, material, and natural circumstances of injustice, in ways that build alliances and bridge differences between social groups.

Zwartveen and Boelens are also two of the authors of the Santa Cruz Declaration on the Global Water Crisis (Crow et al. 2014). This declaration describes some of the range of water injustices arising in irrigation, urbanization, mining, and land and water grabs. The Declaration summarizes three ways in which groups are beginning to contest them: (1) through policy dialogue; (2) in local actions, multi-scalar mobilizations, and democratic assessment; and (3) through academic and reportorial investigations.

The authors and signatories of the declaration suggest that such actions can generate space for building coalitions across classes, influence governments to create institutions that recognize and address the breadth and consequences of water injustice, and situate and assess technological innovation in the sphere of water. In rural Maharashtra, in the Andean highlands, and in urban India, examples of successful water contestation can be found.

Maharashtra. Over the last two decades, tens of thousands of people have been mobilized in a “water struggle movement” led by a Landless Laborers and Toiling Peasants’ Organization (SKSS) in southern Maharashtra, India. Among several achievements, the movement has persuaded the state government to redesign and re-assign water distribution from the large Tembhuri lift irrigation scheme so that a much larger number of poor households in three *Talukas* can receive water for both irrigation and household use (Joy 2014 pers. comm.; Joy and Kulkarni 2010; Phadke and Patankar 2006).

Andes. In the Andean regions of Peru, Ecuador, and Bolivia, social movements have arisen to contest injustices resulting from mining and in response to inequitable distribution of irrigation and household water. Across all three countries, there have been organized responses to the effects of extractive industry on water. Changes in the quality and quantity of water available and the encroachment on rights to water and land have been contested by a diverse range of alliances, including peasant federations, citizen-based defense fronts, and coalitions led by large, internationally connected conservation organizations (Bebbington et al. 2010). In Ecuador, an alliance of peasant and indigenous organizations successfully fought to change discriminatory practices in household and irrigation water. The leadership and practices of the Chimborazo Water Agency were changed (Hoogesteger 2012: 82).

Urban India. In urban areas, contestation of water injustice may take hidden or unrecognized forms. Studies of the Indian cities of Bangalore (Ranganathan 2014) and Mumbai (Anand 2011, 2012) suggest that payment for pipes and constant pressure on engineers and counselors may have given somewhat improved water access and the beginnings of citizenship rights for residents of informal settlements. Not all communities are able to gain political legitimacy to undertake such actions (Anand 2012).

Thus, water-justice contestations have the potential to raise new actors and facilitate new foci for collective action. In addition, such contestations may gain traction from connections to engineers, government officials, and others holding concerns about poverty and inequality, at national and global levels.

CONCLUSIONS: RETHINKING WATER-POVERTY INTERACTIONS

In sum: there are opportunities for rethinking water-poverty interactions. Water-justice contestations can help transform the actors, principles, and practice of water

governance. The major international water initiative of the WHO, UNICEF, and the World Bank could be persuaded to tackle poverty through domestic water provision as well as its current focus on waterborne disease through provision of safe drinking water. The tendencies of irrigation and infrastructure to cause poverty and dispossession may be partially constrained if engineers, planners, and policymakers recognize that political choices are embedded in their designs and decisions. These are the main action items emerging from this chapter.

Perspectives on poverty influence how we see water-poverty interactions and, in turn, what possibilities for public action we can grasp. In this chapter, we have concentrated on household pathways of escape from, and descent into, poverty that are connected to interactions with water. This focus illuminates possibilities for which there is significant evidence. The perspective of relational poverty, in contrast, presents a bleaker picture of social change. In what follows, we review the pathways and opportunities discussed, and then briefly sketch a possible reconciliation of the gap between the policy-oriented and historical literatures.

Irrigation Pathways

The spread of irrigated agriculture can lead directly to increased and more predictable agricultural output and then indirectly generate new and improved livelihoods and economic diversification. This can reduce income poverty. At the same time, women may be further marginalized, and the differentiation of peasant households into farmers and farm laborers is likely to accelerate.

Inclusive governance recognizing male bias and the needs of poor households might mitigate these tendencies, but significant examples of such inclusion have yet to be documented. The example of protective irrigation in India, described earlier, provides a case where inclusive design did not have inclusive consequences.

Infrastructure construction for irrigation (and for hydropower) also leads frequently to descent into poverty. On this, poverty-preventing infrastructure protocols may emerge. The pricing of irrigation water at present shows little benefit for the poor. Struggles for water justice, though not yet widely recognized, may be an effective way of making the irrigation pathway more inclusive.

Water-Health Pathways

UN agency funding and government action has constructed this pathway over at least the last twenty-five years. Much has been achieved to reduce mortality and morbidity caused by water-borne diseases, which are the leading causes of descent into poverty. Time saved as a result of closer water sources has also been a major advance. Further support of this pathway may continue such progress. But the questions raised about the efficacy of household purification may indicate the need for more careful research

on the outcomes associated with everyday water practices before the promotion of this pathway is renewed.

It is also possible that refocusing international support to include the domestic-productive water pathway will bring greater advantages than the continued pursuit of “safe drinking water.” Instead of water taps within (distant) reach, as is currently being promoted to reduce water-borne disease, a more ambitious goal combining both pathways could be rallied around the slogan of “a tap in every house.”

Domestic-Productive Water Pathways

Larger quantities of more accessible water can not only liberate water collectors, frequently women and girls, from unproductive labor collecting water, but also allow the time saved to be turned to a range of activities contributing to poverty reduction, the building of capabilities, and greater well-being. Of the emerging opportunities considered, household purification of water may be least valuable. Its ability to provide disease-free water is in question and it does not improve provision of domestic-productive water. New forms of household water delivery hold potential for reducing poverty. In urban areas, the regularizing of informal water trade and Internet provision of real-time data is likely to give rise to a wider range of delivery options. At the same time, new forms of contestation may be emerging in urban areas with the potential to extend citizenship rights as well as water supply.

Reconciling the Gap between Policy-Oriented and Historical Political Economy Literatures

The gap between the optimism of the policy and economics research in the countryside, focused largely on income poverty, and the pessimism of historical political economy analysis, which illuminates relational poverty, is striking. The policy and economics analysis of irrigation shows that water control can generate employment. The historical political economy shows that accumulation and dispossession are frequently accelerated by irrigation. The two bodies of research and writing look at changes with spatially and temporally dissimilar scales. The policy literature focuses on changes occurring within a defined area over a period of one or a few years and resulting from directed development. Historical political economy, by contrast, may survey change in a broader context, over decades, and on regional, national, and sometimes international scales.

Both types of studies may suffer from the way they address factors other than water that confound or condition the effect. Short-term economic studies may fail to account for important confounding factors and thus overestimate the benefits of water interventions (Hobbes 2014). Randomized control trials, such as Kremer et al. (2009) on the health benefits of spring protection, may adequately control for household-level confounding factors, but understate the importance of local contextual factors that affect

outcomes (see Barrett and Carter 2010). On the other hand, historical political economy studies may presume overly simple relationships between water control and power relations.

The two bodies of research document overlapping but distinct processes. Historical political economy may illuminate complex variants of what Marx called primitive accumulation: the uneven, slow, and often incomplete social transformation making the pivotal classes of capitalist society: wage labor free of means of production and the accumulation of private property in the hands of capitalist entrepreneurs able to hire labor. Policy studies illuminate shorter term, but nonetheless complex, economic changes from an irrigation project. There is need for a unified theory to describe spatially and socially uneven processes in which primitive accumulation, dispossession, and altered gender relations occur simultaneously, though often at other locations, with the creation of (some) diverse livelihood opportunities, particularly for wage labor.

What research would shed light on the interaction of relational and income poverty? Larger-scale and longer-term studies encompassing elements that are sometimes missing from policy research, such as migration and seasonal labor, vulnerability, gender relations, and exclusion could be integrated with the concerns of policy research in everyday material phenomena such as wages, prices, and employment.

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CHAPTER 3

KNOWING EQUITY WHEN WE SEE IT

Water Equity in Contemporary Global Contexts

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INTRODUCTION

WATER is the quintessential equity issue because it is absolutely necessary to sustain life, livelihoods, and environmental quality. The provision of secure, safe, ample, and affordable water and sanitation are fundamental functions, and performing these tasks fairly is a hallmark of just and democratic governance. Equitable solutions to water problems build public support and avoid debilitating conflicts that erode capacity for collective action (Gerlak et al. 2011; Zeitoun and Mirumachi 2008; Wolf 2007; Weinthal 2002). However, despite decades of worldwide efforts at local, regional, national, and international scales, equity-related water problems persist and in many cases worsen. Thus poorly maintained water systems worldwide deliver less secure water supplies of uncertain quality to some economically disadvantaged city dwellers. Rural areas lose livelihoods and lifestyle, as they become targets of water transfers to urban areas. The water needs of indigenous peoples are slighted in favor of mainstream, nonindigenous cultures. These and other problems are amplified by climate change (Intergovernmental Panel on Climate Change 2014). By 2010, the water-related Millennium Development Goal (no. 7) for improving access to water supply by 2015 had been met, yet the sanitation goal lagged far behind. Worldwide, 783 million people lacked access to a safe and secure water source and 2.5 billion people lacked adequate sanitation (World Health Organization and UNICEF 2012, 3). Globally, water appears to be in a crisis, but it is a crisis primarily of governance failure, such as inequity, not of natural scarcity (Bakker 2010; Conca 2006). A transformation of governance is needed, and a greater commitment to water equity is at the heart of the required change. Yet a call for greater equity

creates a conundrum—what are the principles of water equity? That is, how do we know water equity when we see it?

There is widespread agreement that water equity must be prioritized in contemporary water governance and that equity has been shortchanged (Maas and Anderson 1978; Roa-Garcia 2014; Perreault 2014). To be seen as legitimate, the hegemonic neoliberal views of water must be counterpoised by elevating equity to a higher level rather than subsuming it as a value of lower priority. This chapter argues that water equity is not a set of universally prescribed principles but rather is embodied in governance processes and results that are viewed as legitimate, representative, accountable, and just. Like democracy, water equity is aspirational—it is about constructing a kind of process in order to achieve a better outcome. Water equity is also contextual—it is achieved in particular places and contexts and is broadly participatory and inclusive. And water equity is relational—it turns on the relationships among different governance actors and those of humans with the environment (Lemos and Morehouse 2005; Pelling et al. 2008). Water equity can be achieved in governance processes designed to embody multiple meanings, values, and knowledges of water (Blatter and Ingram 2001; Ingram and Lejano 2009) and to involve a diverse “community” of human, nonhuman, and biophysical actors (Schmidt 2012; Strang this volume). Efficiency not leavened by equity ignores the needs of the many to serve the few.

In this chapter, we develop this argument in the following way. The first section provides a brief overview of the current challenges of global water supply and provision and details the failures and shortcomings of the current global water governance paradigm. The second section presents the principles that frame the concept of water equity, and the third analyzes how the rich concept of equity has been eclipsed by discourses of security and scarcity, the legacy of past inequitable policies, and other emerging contemporary concerns. The fourth section presents case studies that illustrate the dimensions of equity and inequity and the promise of an alternative paradigm despite challenging conditions, and the final section presents conclusions.

OVERVIEW OF THE DOMINANT GOVERNANCE PARADIGM

Water equity tends to be shortchanged due to a dominant paradigm that treats water as an economic good and portrays that economic view of the resource as entirely compatible with integrated water resources management (IWRM), markets, decentralization, public participation, privatization, and depoliticization. This paradigm emerged in the early 1990s with the United Nations (UN) Earth Summit in Rio de Janeiro (1992), which promulgated the principles of sustainable development (Conca 2006). The formulation of the Dublin Principles on water that same year was also pivotal, by advocating that water should be treated as an economic good and championing the principles that

became associated with sustainability, including decentralization and local participation (Gleick et al. 2002; Conca 2006). European countries such as England and Spain adopted marketization reforms in their water sectors during this period (Bakker 2005, 2002). The World Bank's 1993 water resources policy implemented the new principles broadly through its lending programs across the Global South. Preceded by Chile's early reforms (Bauer 2004), in the last twenty-five years Mexico, Peru, Bolivia, and South Africa have all adopted neoliberal water legislation and/or policy reforms (Wilder 2010; Boelens and Zwarteveen 2005; Bustamante, Crespo, and Walnycki 2012; Perreault 2005; Goldman 2007). The paradigm called for marketization, privatization, decentralization, and local participation in water governance (Groenfeldt 2013). In addition, IWRM became a central feature of policy prescriptions for water management and acquired "normative force" within the global water governance paradigm (Conca 2006, 125; Vandever 1997). IWRM promotes a holistic, river-basin approach to water governance that recognizes the social, economic, and ecological uses of water; emphasizes cross-sectoral planning (e.g., agricultural, urban, ecosystemic); and promotes the coordination of governance at multiple scales (Conca 2006).

Yet the governance paradigm has not yielded the desired results such as substantive local control in water policy, the removal of politics from decision-making around water, or improved use and conservation of water. Overall it has failed to deliver on promises to be more equitable as well. Marrying contradictory principles perhaps flawed its essential architecture; treating water as an economic good is fundamentally inconsistent with the other principles of sustainability such as decentralization, participation, and local stewardship. Attempts at decentralization foundered in many contexts on the shoals of elite capture of "participatory" practices or lack of financial resources for decentralized management agencies (e.g., Ribot and Larson 2013), and privatization schemes led to such disastrous outcomes and disenfranchisement of marginalized populations in Latin America that they triggered a widespread antiprivatization movement (e.g., Bustamante et al. 2012; Loftus and McDonald 2001; Wilder and Romero Lankao 2006). Neoliberal laws and institutions intended to promote efficient use of water resources have not improved water services in cities or extended them to marginalized areas (e.g., Bakker 2010) and have caused disproportionate negative effects on small-scale farmers that dispossessed them of their water supply (Bauer 2004; Wilder and Whiteford 2006; Swyngedouw 2005). IWRM has been explicitly linked to equity by the Global Water Partnership, which stated that IWRM "maximize[s] the . . . economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems" (Conca 2006, 125). Yet recent scholarship illustrates IWRM's mostly unsatisfactory results (Huitema and Meijerink 2014; Conca 2006; Ingram 2011). Conca (2006, 157–158) points out that the "malleable" language of IWRM provided a broad umbrella for rival water users to legitimate their claims to water, without any way to sort priorities, and that participation in water management by local water users is often "rhetorical" and tends to privilege expert, technocratic knowledge over other forms of knowledge. Huitema and Meijerink (2009) provide several international case studies of IWRM approaches that have fallen short or failed altogether due to lack of implementation and

effective citizen engagement. Tanzania appeared on paper to adopt IWRM reforms but did so only to gain contributions from the World Bank and the International Monetary Fund and involved only local elites by promising rewards gained through privatization rather than engaging broad public participation (Goldin and Kibassa 2009). Reform faltered in Thailand because IWRM concepts were too ambitious and vague (Lubell et al. 2009).

Another shortcoming of the current governance paradigm is its inability to grapple meaningfully with the politics of water. Although politics is at the root of many water management decisions, the paradigm strives to be objective and technocratic and is not adept at accounting for political considerations (Ingram 2011). Water scholarship has frequently treated politics as an afterthought or, even worse, as an unmentionable best kept out of policy discussions. This began to change with the emergence of scholarship on the political ecology of water, gathering force beginning in the early 2000s. Swyngedouw (2004), Bakker (2003), and others (Linton 2010; Castro 2006) advanced a concept of water as a “socio-nature” that represents both material flows of water and social flows of capital and power. Political ecology has become a compelling analytical approach to understanding how political power and neoliberal values become literally embodied in the water channels and networks that course across the landscape. By and large, the governance and political ecology bodies of scholarship speak past one another in terms of equity, with the governance research seeking a prescriptive space (e.g., the terrain of best practices, model institutions, and processes) while the political ecology literature occupies a critical space (e.g., issues of inequality and lack of power). Bakker’s work constitutes an influential exception. Her writing has been an important bridge between the policy-oriented governance literature and the politics-infused political ecology of water literature (Bakker 2003, 2010), yet in general the reigning governance paradigm and scholarship on water governance disregards the workings of politics in water decision-making, to its detriment.

Twenty-five years of mobilization around the global water management paradigm have not yielded solutions broadly viewed as more equitable nor led to fewer or more malleable conflicts. While equity is often stated as a priority even in the global water paradigm, markets, decentralization, privatization, and depoliticization take precedence in practice. The melding together of water as an economic good and water equity as if the two were compatible has led to the practice of the first and symbolic endorsement of the second. Subordinating a multifaceted understanding of the character of water with a narrowly economic view has skewed the management of water to serve those who have the ability and means to use water to produce the greatest economic returns (Roa-Garcia 2014). The international water agenda that blends concepts of efficiency, equity, and sustainability has been assumed to equally benefit all members of society when, in practice, these concepts are neither applied co-equally nor is their impact neutral toward different economic and social classes, geographical areas, or water values and uses.

The Andean region is a particularly appropriate illustration of the shortcomings of the global water management paradigm because it is a region where human appropriation of water has reached unsustainable levels. As a result, demands come from a wide

range of needs and uses with different levels of political power, including indigenous peoples. A close examination of water laws in Colombia, Ecuador, and Peru indicate that while efficiency has been elevated as a key component of neoliberalism, equity and sustainability principles are either neglected or become subsidiary. Equity has remained ill-defined and vague and does not promote the interest of the disadvantaged. After examining the evidence, Maria Cecilia Roa-Garcia (2014) concludes that achieving a balance between equity, efficiency, and sustainability appears unrealistic, suggesting the need to remove efficiency as a principle of water allocation and affording it only subsidiary status.

Overall, the current water governance paradigm has failed to yield equitable solutions to water conflicts (Ingram 2011). Citing an unprecedented “intellectual ferment” in water scholarship today, Ingram (2011, 241) nevertheless concludes “everyday water governance falls further and further behind mounting problems.” Water as an economic commodity fails to incorporate the many public-good aspects of the resource. The necessary convergence of factors for successful collaborative approaches or watershed-based cooperation, such as is envisioned in IWRM, is rare, and although markets perform many tasks well, they do not make up for government in pursuing more equitable and fair distribution of water resources. Science-based approaches like adaptive water management, and participatory approaches like IWRM, have failed to realize their goals because they are divorced from the politics that shape real change. Ingram (2011) concludes that the problem with all of the water management concepts envisioned as panaceas is not what they propose but what they leave out. Ingram looks to inspiring leadership, environmental networks, and context-based approaches rather than universal prescriptions to engender a distinct new paradigm (Ingram 2011; Lejano, Ingram, and Ingram 2013). Others point to hybrid modes of governance (e.g., *comanagement* by public authorities and community groups) as a locus of needed innovation (Bakker 2010; Lemos and Agrawal 2006). A transformational governance approach that raises equity to an equal or greater level with efficiency is needed for making the required changes.

FRAMING THE ASPIRATIONS OF EQUITY

Like a compass, equity principles point in the direction in which water policies must move to serve fairness as contexts and circumstances change. Researchers have been at work documenting the historic and continuing meaning of and aspirations for equity in water for many decades. Like most scholarship, the hopes and expectations related to equity have evolved to reflect events and the dominant concerns of the times. It is a testimony to progress in value-based thinking that contemporary concerns are more robust and inclusive than they were forty-odd years ago. At the same time, not all the normative rules emerging from this work are compatible in specific circumstances, and it is difficult to set priorities and make trade-offs among principles in the abstract, absent real-world situations.

Writing in the 1970s, Arthur Maass and Raymond Anderson (1978) took on the issue of whether large-scale water development such as had been occurring in the postwar United States necessarily led to strong centralization of political power and what Wittfogel (1957) termed “oriental despotism.” On the basis of in-depth historical study of irrigation projects in Spain, California, Colorado, and Utah, Maass and Anderson found success in avoiding domination by expert bureaucracies and the yolk of federal rules accompanying grants of federal money. The genius for such success was in popular participation and local control of operating systems and institutions. Preserving the autonomy of communities from outside power was essential to serving social justice and avoiding unequal treatment of individuals. Evidence in every case suggested that people were willing to forgo some economic development, the supposed goal of much water development, and efficiency in water use and delivery in order to preserve their local autonomy and serve fairness and equality.

The massive lawsuits over water allocation and the increasing use of water transfers to move water from rural areas to thirsty cities spawned an outpouring of research related to water equity in the 1980s. The role of social and cultural equity in water allocation to Hispanic and Native American communities attracted the attention of a number of legal and historical scholars (Dumars, O’Leary, and Utton 1984; Meyer 1984). Tracing the roots of water law and practice into Spanish water law, extending all the way back to 1265 and applied in Northern New Spain in North America, Meyer (1984, 159–159) found a consistent preference in favor of community concerns or the common good over individual rights and interests. Water rights in these specific historical settings were not fixed and quantifiable but instead were flexible as population changes occurred and needs changed. Spanish colonial judges had broad powers to consider fairness to litigants, other individuals, and the community and relied heavily on these equity concerns in their judgments (Meyer 1984, 159–164). Clearly, preserving access to water for the most vulnerable populations such as native peoples was part of an historic legacy of serving the common good, but it remained unclear whether moving water to its highest economic value served general welfare in a community. Brown and Ingram (1987) tackled this question and concluded that water had a community value that transcended the economic values associated with its use. These authors found that water had an emotional and symbolic value that was as or more important to communities than its economic value. Especially in arid lands, to have control of water is to have security and opportunity, and communities that lose the chance to participate in decision-making related to water are not perceived as having much of a future. Along with participation in community water decisions comes the obligation of caring for the resource, stewardship, and prevention of waste.

The collective accountability for water by the community is the center of one of the first attempts to articulate a set of principles on water and equity. Ingram, Scaff, and Silko (1986) set out five distributive rules—reciprocity, value pluralism, participation, promises, and responsibility—that they claim are the “necessary and sufficient”

condition to recognize equity when one sees it. They regard these principles as collectively representing an equity perspective. The principles are potentially in tension and should be considered together and weighed against each other. The definition of each principle is as follows:

1. *Reciprocity* means that all members of the community should share advantages and costs related to water.
2. *Value pluralism* means that community water users have rights to employ water to pursue whatever they consider legitimate, provided that the user does not degrade the resource or harm others.
3. *Participation* dictates that there be no infringement on the right of members of the community to participate in water decisions.
4. *Promises* signify the need to stand by previous decisions and that, when changes are imperative, consent is obtained from all the parties.
5. *Responsibility* to future generations means avoiding risks that would irreversibly diminish the quantity and quality of the resource for the community.

The impact of water resources development on nonhumans is neglected in early scholarship on water and equity. Environmental “ethics” replaces equity as the keyword in much of the writing after 1990, marked by the publication of an important book on water ethics by David L. Feldman (1990). While much of this ethics writing retains the concern with procedural and distributive fairness that is the heart of equity, it tends to focus more on physical consequences of water management including such things as species and habitat protection. Writing under this rubric, Adrian Armstrong (2009, 143–146) provides some “rules of thumb” about water equity and the environment that supplement social principles:

1. Water is a common good that should be made available to all human beings and to all landscape units and creatures if at all possible.
2. Where there is competition between users of water, natural proportionalities should be maintained so far as possible, allowing for positive action to preserve endangered species and habitats.
3. Uniqueness should be protected. Extinction is bad.
4. Wetlands are good, providing valuable processes, unique habitats and water-flow regulation.
5. Water bodies should be kept as close to natural conditions as possible, and protected from over-exploitation and contamination.
6. Prudent storage of water is generally a good thing.
7. We should plan to prevent extreme events—floods and droughts—from having bad impacts on both human and non-human systems.
8. Rivers and river systems should be left to function as closely as possible to their original state, so maintaining material flux through the hydrosystem.