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WATER

Emma S. Norman
Michigan Technological University

INTRODUCTION

Water is intrinsically multifaceted and multidisciplinary. Within geography, it spans both human and physical dimensions and is present in almost every subdiscipline of geography (e.g., political geography, feminist geography, urban geography). This article focuses primarily on human geography approaches to water, which includes topics such as management, meaning, power, and social relations. The topics focus largely on cultural, political, social, and economic issues pertaining to water. These interests, in turn, share boundaries with historians and other scholars outside geography, such as political science, history, and sociology. Water is a tremendous example of the reflexive nature between humans and the natural environment—the ongoing interplay between adaptation and change. Access to reliable freshwater sources is a basic human need, the availability of which has great influence on shaping cultures and influencing settlement patterns. However, universal access to clean drinking water has proven to be a difficult goal to meet, with more than one billion people estimated to have inadequate access to clean drinking water. In some cases, lack of water inspires innovative technology for communities to meet human needs (for example, complex irrigation systems and more-recent processes of salt reduction and reverse osmosis). However, these innovations are often limited to access to capital wealth. Weather patterns also affect human settlement and influence many dimensions of the development of cultures, economies, and religions. Adaptive frameworks (such as integrated water resource management and water security) have been developed to help understand, mitigate, and prepare for changing conditions associated with changing weather patterns and global climate change. In addition, issues of scale are inherently linked to water—because water is simultaneously a local resource as well as part of a global system. Scalar framings directly influence decisions about who governs water and how. The creation of boundaries—and associated administrative units—affects the governance of this shared resource (e.g., watershed boundaries, state boundaries, municipal boundaries) through complex historical-social processes. Framing issues related to water as hybrid, hydro-social processes, or as part of a network, helps to understand the complex dynamics of power, economies, and social processes associated with human-environment relations.

INTRODUCTORY WORKS

Understanding the basics of water issues requires a comprehensive look at how people and the environment interact and influence each other. Black and King 2009 provides a good introduction to the broad range of issues related to the complex and dynamic interaction of humans and water. Reports such as the Pacific Institute's *The World's Water* (Gleick 2012) and *State of Freshwater Report* (United Nations World Water Assessment Programme 2009, linked with the World Water Forum) provide excellent, up-to-date, and comprehensive reports on the state of the world's water. Increasingly, scholars are committed to open-source resources, such as

****Water Alternatives**** (see ***Journals***). Understanding water and its related issues also requires historical and geographical lenses. Linton 2010 and Solomon 2010 highlight the historical framing of water discourse as separate from, rather than connected with, social meaning, suggesting a need for reframing where the two are viewed as intertwined.

Black, Maggie, and Jannet King. *The Atlas of Water: Mapping the World's Most Critical Resource*. 2d ed. London: Earthscan, 2009. [ISBN: 9781844071333]

The atlas provides a user-friendly, visual guide to the world's state of the water. It explores the complex and dynamic interaction of humans with water, spatially and temporally, using a mix of graphics, maps, charts, and narrative.

Gleick, Peter H. *The World's Water 2011–2012: The Biennial Report on Freshwater Resources*. Vol. 7. Washington, DC: Island Press, 2012. [ISBN: 9781597269995] [class:report]

This biennial report provides a current and up-to-date overview of current global water issues, as well as suggestions for new techniques to move to sustainable water management. Published through the Pacific Institute, the staff publishes widely on issues related to water governance and policy.

Linton, Jamie. *What Is Water? The History of a Modern Abstraction*. Nature, History, Society. Vancouver, BC: UBC Press, 2010. [ISBN: 9780774817011]

Explores how water has been constructed in modern discourse as a separate and scientific entity—as H₂O—rather than as something with social meaning. Linton argues that part of the solution to our current water crisis is to reconfigure the concept of water to include social meaning at its foundation.

Solomon, Steven. *Water: The Epic Struggle for Wealth, Power, and Civilization*. New York: Harper Collins, 2010. [ISBN: 9780060548308]

A general overview provided in narrative style to account how water has shaped human society from the ancient past to the present.

United Nations World Water Assessment Programme. *Water in a Changing World*. United Nations World Water Development Report 3. Paris: UNESCO, 2009. [ISBN: 9781849773355] [class:report]

The 2009 report is part a series of reports published every three years in conjunction with the World Water Forum. The reports provide an overall snapshot of the world's freshwater resources and are written with the aim of providing decision makers the tools necessary to implement sustainable water practices and policies. Available

online**[<http://www.unesco.org/new/en/natural-sciences/environment/water/wwap/wwdr/wwdr3-2009/>]** through the ***World Water Assessment Program**[<http://www.unesco.org/new/en/natural-sciences/environment/water/wwap/wwdr/>]*****.

GENERAL OVERVIEWS

Excellent overviews of water and water-related issues are available through a variety of sources. Barlow 2007 provides a well-written and accessible introduction to most pressing water-related issues, including water rights and privatization. Conca 2006 explores emerging trends of rescaling water governance, including the faltering role of interstate and supranational regimes compared to less formalized and more-regional institutions. Sabatier, et al. 2005 provides a comprehensive collection of articles engaging with adaptive management and collaborative planning at the watershed scale. Earle, et al. 2010 provides a comprehensive overview of the key

issues associated with transboundary water governance, and Molle and Wester 2009, an edited volume, looks at the reflexive relationship between societies and their environment.

Barlow, Maude. *Blue Covenant: The Global Water Crisis and the Coming Battle for the Right to Water*. New York: New Press, 2007. [ISBN: 9781595584533]

Barlow discusses the state of the world's water and documents the history of international movements to secure water sources for all. She documents the grassroots movement for global water justice and exposes how water companies are profiting from declining supplies.

Conca, Ken. *Governing Water: Contentious Transnational Politics and Global Institution Building*. Global Environmental Accords. Cambridge, MA: MIT Press, 2006. [ISBN: 9780262033398]

Conca explores the interface between political process and water governance. He argues that while interstate regimes (and formalized mechanisms to govern water) have faltered, less formalized institutions are emerging as viable alternative forms of effective water governance.

Earle, Anton, Anders Jägerskog, and Joakim Öjendal, eds. *Transboundary Water Management: Principles and Practice*. London and Washington, DC: Earthscan, 2010. [ISBN: 9781849776585]

Textbook style that provides overview of international water issues. Provides comprehensive coverage of transboundary water management and can serve as a good introductory text for undergraduate students.

Molle, François, and Philippus Wester, eds. *River Basin Trajectories: Societies, Environments and Development*. Comprehensive Assessment of Water Management in Agriculture 8. Cambridge, MA: CABI, 2009. [ISBN: 9781845935382]

This edited volume looks closely at the interaction between societies and their environment, with an emphasis on water management and resources. The authors draw on cases of river management from around the world. The scope and breadth make it a good resource both for students and water practitioners.

Sabatier, Paul A., Will Focht, Mark Lubell, Zev Trachtenberg, Arnold Vedlitz, and Marty Matlock, eds. *Swimming Upstream: Collaborative Approaches to Watershed Management*. American and Comparative Environmental Policy. Cambridge, MA: MIT Press, 2005. [ISBN: 9780262195201]

Swimming Upstream is a classic text that is referenced frequently within environmental geography and political science applications of water governance. It identifies current struggles with watershed governance and participatory management. Sabatier and colleagues' edited volume situates the literature on adaptive management and collaborative governance for freshwater resources.

JOURNALS

National Geographic's special edition on water (Johns 2010) is a visually rich and engaging entry point into some of the world's most pressing water-related issues. The recently launched ****Water Alternatives**** journal is an example of a free and open-access journal that is committed to bringing academic debaters and water practitioners into conversation with each other.

Johns, Chris, ed. ****Special Issue: Water Our Thirsty**

World[<http://ngm.nationalgeographic.com/2010/04/table-of-contents>]*." *National Geographic* (April 2010).

This special issue provides a visually rich snapshot of the world's contemporary water issues. It is a great entry point into the narratives and discourses of the impacts of water-related issues at a global level, through local stories.

Water Alternatives[<http://www.water-alternatives.org>]. Edited by Ruth Meinzen-Dick, François Molle, and Peter Molligna. [class:periodical]

This open-source resource publishes peer-reviewed articles related to the water-society nexus. The articles aim to provide cross-fertilization between disciplines and are designed to create dialogue between the water community (e.g., decision makers, practitioners, civil-society groups, students) and critical social sciences (cultural and political geography, political ecology, legal studies, etc.).

Water History[<http://www.springerlink.com/content/r01133671423/?MUD=MP>]. Edited by M. W. Ertsen and H. J. Hoag. [class:periodical]

This newly conceived journal explores the complex relationship between water and humanity, through a historical lens. The journal provides a forum for scholarship that explores the complexities of water management and the complexities of the power associated with controlling water resources. The journal links scholarship in humanities and social sciences with the natural and applied sciences.

WATERSHEDS AND RIVER BASINS

The concept of watersheds as “natural units” for management has become increasingly popular since the early 1990s, as documented in Michaels 2001. Definitions of watersheds range considerably but are generally linked to a drainage basin—an area where surface water flows toward a common body of water. The size of a watershed can also range considerably, because sub-watersheds (and sub-sub) are nested within larger watersheds. Advocates for governing at a watershed scale suggest this approach is more ecologically sensitive than managing at jurisdictional units (such as municipalities, counties, or states). However, recent articles such as Cohen and Davidson 2011 and Warner, et al. 2008 challenge the assumptions that watersheds are a “natural” unit of governance that provide a more “appropriate” method of water governance, and the authors call for a closer examination of watersheds and their purported benefits. The recent critiques identify the concern that watersheds are often collapsed with public participation and integrative governance practices rather than as stand-alone physical features, as seen by articles such as Koehler and Koontz 2008 and Wester, et al. 2003. The failures of the governance practices, then, are linked with the failures of watersheds writ large. Cohen and Davidson 2011 suggests that watersheds and governance need to be disentangled for more-accurate analysis. Furthermore, recent scholarship suggests looking more closely at how the practice of watershed governance distributes benefits (and costs) between users and systems, as seen in Vogel 2012. Other scholars are concerned that the use of watersheds, over time, has been co-opted by certain groups to influence decision making and buy-in, as seen in Molle 2009. See also *Integrated Water Resource Management*.

Cohen, Alice, and Seanna Davidson. “The Watershed Approach: Challenges, Antecedents, and the Transition from Technical Tool to Governance Unit.” *Water Alternatives* 4.1 (February 2011): 1–14.

Advocates for a critical analysis of watersheds—particularly disentangling roles of public participation at a watershed scale, with watersheds as a concept. Available

online[http://www.water-alternatives.org/index.php?option=com_content&task=view&id=144&Itemid=1].

Koehler, Brandi, and Tomas M. Koontz. "Citizen Participation in Collaborative Watershed Partnerships." *Environmental Management* 41.2 (2008): 143–154. [doi:10.1007/s00267-007-9040-z]

This study describes and explains membership and participation in collaborative watershed groups. Available *online[<http://www.springerlink.com/content/k02524377225k307/>]* by subscription or purchase.

Michaels, Sarah. "Making Collaborative Watershed Management Work: The Confluence of State and Regional Initiatives." *Environmental Management* 27.1 (2001): 27–35. [doi:10.1007/s002670010131]

Through case studies, this article highlights the interaction between state and regional watershed initiatives. The author shows how issues are shaped by utilizing external support and generating management results. Available *online[<http://www.springerlink.com/content/aet3bern89ngmbgp/>]* by subscription or purchase.

Molle, François. "River-Basin Planning and Management: The Social Life of a Concept." *Geoforum* 40.3 (May 2009): 484–494. [doi:10.1016/j.geoforum.2009.03.004]

Molle recounts the evolution of the concept of a river basin and how it has been linked to various strands of thinking and sometimes co-opted or mobilized by social groups or organizations to influence agendas and promote legitimacy. Available *online[<http://www.sciencedirect.com/science/article/pii/S0016718509000311>]* by subscription or purchase.

Vogel, Eve. "Parcelling Out the Watershed: The Recurring Consequences of Organising Columbia River Management within a Basin-Based Territory." *Water Alternatives* 5.1 (2012): 161–190.

Vogel examines how the practice of watershed governance distributes benefits (and costs) between users and systems. Vogel calls for a more historical-geographic analysis of watershed governance as a way to understand how the watershed is "parceled out" and its political costs.

Warner, Jeroen, Philippus Wester, and Alex Bolding. "Going with the Flow: River Basins as the Natural Units for Water Management?" *Water Policy* 10.S2 (2008): 121–138. [doi:10.2166/wp.2008.210]

This article argues that choices to manage at a watershed scale are political, and that river basins are as much political units as they are natural units. These choices, the authors argue, require democratic debate—something that is largely missing in the current conceptualization of watersheds. Available *online[<http://www.iwaponline.com/wp/010S2/wp010S20121.htm>]* by subscription or purchase.

Wester, Philippus, Douglas J. Merrey, and Marna de Lange. "Boundaries of Consent: Stakeholder Representation in River Basin Management in Mexico and South Africa." *World Development* 31.5 (May 2003): 797–812. [doi: 10.1016/s0305-750x(03)00017-2]

This article promotes the idea that stakeholder participation cannot be collapsed with substantive stakeholder representation in river basin management—the later needs to be promoted to achieve water sustainability. Available *online[http://www.iwmi.cgiar.org/Assessment/files_new/research_projects/River_Basin_Development_and_Management/Boundaries.pdf]*.

GROUNDWATER

Groundwater represents about 97 percent of available freshwater resources (excluding water locked in polar ice). More than one-half of the world's population relies on groundwater to meet basic needs. Increased technologies in pumping (and access to cheap oil to run the pumps) have led to an overextraction of this resource since the early 1960s, and to an unsustainable reliance on groundwater for agricultural purposes, as documented in Emel and Roberts 1995. Despite its social, economic, and political importance, international law has paid little attention to this importance resource. Burchi and Mechlem 2005 attempts to remedy this by documenting the binding and nonbinding instruments related to groundwater in international law, in a single comprehensive document. The characteristics of groundwater as hidden, or elusive, contribute to public misperceptions and underestimates of the resource. Furthermore, groundwater is a difficult resource to manage because it flows under different jurisdictional units with different managing practices, as described in Scott, et al. 2010. Political scientists (such as the author of Mumme 2005) and geographers (such as the authors of Milman and Scott 2010) have made progress in understanding the complexities of binational cooperation in transboundary aquifer management; for example, between the United States and Mexico. The increased understanding of aquifers (and realization of its vulnerability) has led to recent international attention on its protection through legal regimes and frameworks, as documented in Burchi and Mechlem 2005 and Mukherji and Shah 2005. In addition, the impacts of global climate change on groundwater is also a considerable concern, as Loáiciga 2003 discusses.

Burchi, Stefano, and Kerstin Mechlem. *Groundwater in International Law: Compilation of Treaties and Other Legal Instruments*. FAO Legislative Study 86. Rome: Food and Agriculture Organization of the United Nations, 2005. [ISBN: 9789251052310]

[Provides an overview of binding and nonbinding legal instruments that are currently in place for international groundwater. \[class:report\]](#)

Emel, Jacque, and Rebecca Roberts. "Institutional Form and Its Effect on Environmental Change: The Case of Groundwater in the Southern High Plains." *Annals of the Association of American Geographers* 85.4 (1995): 664–683. [doi:10.1111/j.1467-8306.1995.tb01819.x]

[Emel and Roberts question the effectiveness of various forms of regulatory institutions in furthering environmental goals. Drawing on empirical study of the southwestern United States, they compare the effects of three institutional forms—a community-organized regime, a centralized state regime, and an unrestricted private-property regime—on groundwater for agriculture. Available *online\[<http://www.tandfonline.com/doi/abs/10.1111/j.1467-8306.1995.tb01819.x>\]* by subscription or purchase.](#)

Loáiciga, Hugo A. "Climate Change and Ground Water." *Annals of the Association of American Geographers* 93.1 (2003): 30–41. [doi:10.1111/1467-8306.93103]

[Provides a summary of the key research that links climate change to changing hydrologic and aquifer processes. Available *online\[<http://client-ross.com/crwuug/Water%20Sector%20-%20Climate%20Change%20Impacts/Climate%20Change%20and%20Ground%20Water/9815665.pdf>\]*.](#)

Milman, Anita, and Christopher A. Scott. "Beneath the Surface: International Institutions and Management of the United States–Mexico Transboundary Santa Cruz Aquifer." *Environment and Planning C: Government and Policy* 28.3 (2010): 528–551.

[Determines the relationship between state-centered politics and binational cooperation and looks at how binational agenda setting and data sharing aid in the alignment of priorities for](#)

transboundary aquifers. Available *online[<http://www.envplan.com/abstract.cgi?id=c0991>]* by subscription or purchase.

Mukherji, Aditi, and Tushaar Shah. "Groundwater Socio-ecology and Governance: A Review of Institutions and Policies in Selected Countries." *Hydrogeology Journal* 13.1 (2005): 328–345. [doi:10.1007/s10040-005-0434-9]

This paper draws on examples from India, Pakistan, Bangladesh, China, Spain, and Mexico to show the implications of using groundwater for intensive agricultural purposes. It also shows how institutions and policies influence groundwater. The authors conclude by suggesting a deliberate move from managing groundwater to governing groundwater. Available *online[<http://www.springerlink.com/content/d4u42quy9yp7pe4k/>]* by subscription or purchase.

Mumme, Stephen. "Advancing Binational Cooperation in Transboundary Aquifer Management on the U.S.-Mexico Border." *Colorado Journal of International Environmental Law and Policy* 16.1 (2005): 77–111.

Argues that the current institutions and policies in place are not sufficient to address the growing importance of, and demand for, groundwater in the border region. The laws and policies are based on outdated frameworks of use, and they need to be updated to address current usage patterns. Available

online[http://www.colorado.edu/Law/centers/nrlc/publications/Groundwater_Conference/papers/Session4/mumme.pdf].

Rodrigues, Francisco de Assis, and Sueli Yoshinaga Pereira. "Problems of Groundwater Management and the Need for Its Inclusion in the Brazilian National Model of Integrated Water Resources Management." *Water Policy* 10.2 (February 2008): 165–171. [doi: 10.2166/wp.2008.038]

This paper provides an example of the current disconnect between groundwater management and the development of national strategy for securing water supplies. In the case of Brazil, the lack of integration is problematic. Available

*online[<http://www.emeraldinsight.com/journals.htm?issn=&volume=&issue=&articleid=1767128>] by subscription or purchase.

Scott, Christopher A., Sandy Dall'erba, and Rolando Díaz Caravantes. "Groundwater Rights in Mexican Agriculture: Spatial Distribution and Demographic Determinants." *Professional Geographer* 62.1 (2010): 1–15.

This paper examines the spatial distribution of groundwater use for irrigation. The authors analyze irrigation permits, availability of surface water, and population and find all three directly affect aquifer consumption. The research aim is to strengthen policy response to aquifer depletion. Available

online[<http://udallcenter.arizona.edu/publications/sites/default/files/Scott%20and%20Dallerba%202010.pdf>].

OCEANS AND FISHERIES

The study of oceans and fisheries has many entry points for inquiry. Geographers such as the authors of Church, et al. 2010 explore the interrelationship among global climate change, salinity, and sea-level rise. Heyman and Wright 2011 considers the role of marine reserve networks to mitigate threats to marine ecosystems. Steinberg 1999 and Steinberg 2001 laid the foundation for critical ocean studies with the author's work on the social construction of the oceans. His more recent work, as seen in Steinberg, et al. 2012, examines the phenomenon of

“floating islands” with the concept of sovereignty in the open ocean. Further, Mansfield 2004 explores how neoliberalism and the associated governance practices associated with privatization affect the fishing industry. St. Martin and Hall-Arber 2008 fills a gap in the marine literature by providing a method to include the human element in spatial analysis of fisheries, through a participatory method to map the presence of fishing communities at sea. Similarly, Prigent, et al. 2008 shows how cognitive mapping helps identify fishers’ ecosystem knowledge. Hau’ofa 2008 provides a rare opportunity to see, in one place, the many entry points into the interrelationship between oceans and human culture.

Church, John A., Dean Roemmich, Catia M. Domingues, et al. “Ocean Temperature and Salinity Contributions to Global and Regional Sea-Level Change.” In *Understanding Sea-Level Rise and Variability*. Edited by John A. Church, Philip L. Woodworth, Thorkild Aarup, and W. Stanley Wilson, 143–176. Oxford and Hoboken, NJ: Wiley-Blackwell, 2010. [ISBN: 9781444334517]

This chapter (and the book, in general) provides an accessible overview of current understanding of the link among ocean temperatures, salinity, and sea-level change. Understanding the changes is an important component of managing and assessing risk and of adapting to changing conditions.

Hau’ofa, Epeli. *We Are the Ocean: Selected Works*. Honolulu: University of Hawai‘i Press, 2008. [ISBN: 9780824831738]

This collection of essays, short stories, academic articles, and poems represents an eclectic and grounded look at the ocean. It intersects traditional stories laden with cultural meaning and analytical commentary on the state of the marine environment. This work is lauded as an important contribution to postcolonial Oceania.

Heyman, William D., and Dawn J. Wright. “Marine Geomorphology in the Design of Marine Reserve Networks.” *Professional Geographer* 63.4 (2011): 429–442.

Recognizing that marine environments are under considerable threat, the authors consider the role of marine reserve networks to help mitigate the negative impacts of human-induced change on the marine ecosystems. They show the importance of integrating ecological habitat studies with improved planning practices that include local fisher knowledge. Available *online[<http://www.tandfonline.com/doi/abs/10.1080/00330124.2011.585074>] by subscription or purchase.

Mansfield, Becky. “Rules of Privatization: Contradictions in Neoliberal Regulation of North Pacific Fisheries.” *Annals of the Association of American Geographers* 94.3 (2004): 565–584.

This paper explores the rationales for neoliberalism in fisheries and the governance practices associated with privatization of the fishing industry (using the Alaska pollock industry as an example). The paper helps to analyze the impacts of neoliberal principles on environmental management and ecological principles. Available *online[<http://utopia.sbs.ohio-state.edu/faculty/bmansfield/paper-pdfs/Annals-2004.pdf>] by subscription or purchase.

Prigent, Magali, Guy Fontenelle, Marie-Joëlle Rochet, and Verena M. Trenkel. “Using Cognitive Maps to Investigate Fishers’ Ecosystem Objectives and Knowledge.” *Ocean & Coastal Management* 51.6 (June 2008): 450–462.

This paper presents a survey of French Eastern English Channel fishers’ observations of current and past marine ecosystem conditions. Cognitive maps were used to formalize observations and document trends. The indicators used by the fishers to determine healthy ecosystems were similar to those employed by marine scientists (e.g., average fish length and biomass). Available *online[<http://archimer.ifremer.fr/doc/2008/publication-6134.pdf>] by subscription or purchase.

Steinberg, Philip E. "Navigating to Multiple Horizons: Toward a Geography of Ocean-Space." *Professional Geographer* 51.3 (August 1999): 366–375.

This article introduces the idea that the ocean, an arena typically ignored by geographers, is a viable (and important) arena for geographic research. Available [*online\[http://www.tandfonline.com/doi/abs/10.1111/0033-0124.00172\]](http://www.tandfonline.com/doi/abs/10.1111/0033-0124.00172)* by subscription or purchase.

Steinberg, Philip E. *The Social Construction of the Ocean*. Cambridge Studies in International Relations 78. Cambridge, UK: Cambridge University Press, 2001. [ISBN: 9780521804431]

This book provides an analysis of five hundred years of application, regulation, and representation of the ocean. Steinberg brings to life the parallels between the changing construction of the sea and the networks of global capitalism.

Steinberg, Philip E., Elizabeth Nyman, and Mauro J. Caraccioli. "Atlas Swam: Freedom, Capital, and Floating Sovereignities in the Seasteading Vision." *Antipode* 44.4 (September 2012): 1532–1550. [doi:10.1111/j.1467-8330.2011.00963.x]

Explores the concept of "seasteading" as the new frontier. The article unpacks the inherent ideals regarding the nature of the open sea, the limits of sovereignty, and the underpinning role of technology and capitalism in manipulating social frameworks.

St. Martin, Kevin, and Madeleine Hall-Arber. "The Missing Layer: Geo-Technologies, Communities, and Implications for Marine Spatial Planning." *Marine Policy* 32.5 (September 2008): 779–786.

The authors fold the social landscape into geospatial technologies, which have been dominated by biophysical processes. This new layer will help with the decision making and policy efforts to better manage fisheries and to understand social and physical trends related to humans' relationship to the fisheries. Available

[*online\[http://www.sciencedirect.com/science/article/pii/S0308597X08000663\]](http://www.sciencedirect.com/science/article/pii/S0308597X08000663)* by subscription or purchase.

WATER AS A HUMAN RIGHT/WATER AND DEVELOPMENT

Articulating water as a human right was conceived by geographers such as Gilbert White as early as the 1970s (White 1976). More recently, the UN Millennium Development Goals identified the concept of "water as a human right" as a top global priority. However, years after the goals were set, they remain largely unmet. There has been considerable debate about the root causes for the inability to meet these basic needs. For example, Anand 2007 and Bakker 2007 suggest that framing the issue as a "right" is an unproductive means to influence change because of the vague wording, while Miroso and Harris 2012 suggests that framing "water as human right" remains useful as a vehicle to incite change. Many suggest that neoliberal agendas including water privatization have stymied the goals of universal access to adequate quantities for drinking water and sanitation purposes (see **Water Privatization**). The consensus remains, however, that this is an important unmet need that requires ongoing attention (see **Introductory Works**).

Anand, P. B. "Right to Water and Access to Water: An Assessment." *Journal of International Development* 19.4 (May 2007): 511–526.

Anand argues that the Right to Water under the UN Millennium Development Goals is difficult to operationalize on the ground. Drawing from case studies of four counties in Africa, Anand suggests that governance mechanisms may be more important than a formal articulation of a "right to water." Available

[*online\[http://onlinelibrary.wiley.com/doi/10.1002/jid.1386/abstract\]*](http://onlinelibrary.wiley.com/doi/10.1002/jid.1386/abstract) by subscription or purchase.

Bakker, Karen. "The 'Commons' versus the 'Commodity': Alter-globalization, Anti-privatization and the Human Right to Water in the Global South." *Antipode* 39.3 (June 2007): 30–455.

This paper calls for greater understanding of the discourses created around privatization. Bakker argues that alter-globalization strategies based on concepts of the commons are more cogent than strategies based on the narrative of water as a human right. The paper calls for greater precision in the conceptualization of neoliberal analytics. Available

[*online\[http://aguabolivia.org/wp-content/uploads/2010/07/1er_04_documento_-Bakker2007.pdf\]*](http://aguabolivia.org/wp-content/uploads/2010/07/1er_04_documento_-Bakker2007.pdf).

Mirosa, Oriol, and Leila M. Harris. "Human Right to Water: Contemporary Challenges and Contours of a Global Debate." *Antipode* 44.3 (June 2012): 932–949. [doi: 10.1111/j.1467-8330.2011.00929.x]

Oriol and Harris respond to the "human right to water" critiques. They argue that the concept remains important, relevant, and timely as a discourse and strategy to help address unmet water-related needs (including water access and provisions, attention to vulnerable populations, and equity concerns). Available

[*online\[http://www.gpia.info/files/u1392/MirosaHarrisHumanRighttoWater.pdf\]*](http://www.gpia.info/files/u1392/MirosaHarrisHumanRighttoWater.pdf).

White, Gilbert F. "Water for All: Statement of the International Institute for Environment and Development." In *Earthscan, Symposium on Water in Preparation for the United Nations Water Conference, Mar del Plata, Argentina, 14–25 March 1977*. Washington, DC: Earthscan, 1976. [class:conference-paper]

White argues for the concept of water for all as a basic human need and one that should be a priority in the international community.

ENVIRONMENTAL HISTORY OF WATER

Environmental historians and historical geographers engage with topics related to water, particularly in relation to how the utilization of water sources influences the development of civilizations. Much of the literature is linked closely with hydropower, as seen with Worster 1992 in the context of the American West and Evenden 2004 in the context of the Canadian West. Irrigation and urban development also play centrally in the discussions of the environmental history of water, as seen in Fiege 1999 and Kahrl 1983. Teisch 2011 shows how water engineering in California was a product of transnational influence and had great impacts on the shaping of the nation-state. Steinberg 1991 provides an important account of the Industrial Revolution, from an environmental perspective. Historical geographies about water and human development are found throughout the world. For example, Blackbourn 2006 concerns the history of hydroscares in Germany, and Hillel 1994 is about the relationship between water and peace in the Middle East. However, as of the early 21st century the genre focuses largely on the American West.

Blackbourn, David. *The Conquest of Nature: Water, Landscape, and the Making of Modern Germany*. New York: Norton, 2006. [ISBN: 9780393062120]

This book explores how over the course of 250 years, modern Germany transformed its landscape by draining marshes, straightening rivers, and building dams. Through the lens of a hydroscape, Blackbourn shows how the proclaimed "war on taming nature" was used to transform a landscape and to build an empire.

Evenden, Matthew D. *Fish versus Power: An Environmental History of the Fraser River*. Studies in Environment and History. New York: Cambridge University Press, 2004. [ISBN: 9780521830997]

Evenden's book is a unique look into the decision not to dam the Fraser River in British Columbia, Canada. The book provides insights into how experiences of the Columbia River influenced the decision to choose "fish" over hydroelectric power.

Fiege, Mark. *Irrigated Eden: The Making of an Agricultural Landscape in the American West*. Weyerhaeuser Environmental Books. Seattle: University of Washington Press, 1999. [ISBN: 9780295977577]

This book weaves the story of settlers and irrigation in the American West. Fiege highlights the choices made to transform the landscape and the contentious nature of upstream and downstream neighbors—particularly in relation to agricultural development.

Hillel, Daniel. *Rivers of Eden: The Struggle for Water and the Quest for Peace in the Middle East*. New York: Oxford University Press, 1994. [ISBN: 9780195080681]

This book provides an in-depth analysis of the delicate balance of peace and water in the Middle East.

Kahrl, William L. *Water and Power: The Conflict over Los Angeles Water Supply in the Owens Valley*. Berkeley: University of California Press, 1983. [ISBN: 9780520907416]

Analyzing the Los Angeles River provides insights into the full costs of providing water supply to a metropolis, and the political decisions that occur as the infrastructure is made.

Steinberg, Theodore. *Nature Incorporated: Industrialization and the Waters of New England*. Studies in Environment and History. Cambridge, UK: Cambridge University Press, 1991. [ISBN: 9780521392150]

Steinberg explores the Industrial Revolution in New England from an environmental perspective, particularly in relation to the textile industry.

Teisch, Jessica B. *Engineering Nature: Water, Development, and the Global Spread of American Environmental Expertise*. Chapel Hill: University of North Carolina Press, 2011. [ISBN: 9780807878019]

Examines the ways that California engineers attempted to shape the hydrological landscape in the 19th century through irrigation and settlement patterns. Teisch traces how California water experts were influenced by practices in Australia, South Africa, and Palestine.

Worster, Donald. *Rivers of Empire: Water, Aridity, and the Growth of the American West*. New York: Oxford University Press, 1992. [ISBN: 9780195078060]

This is a classic text, originally published in 1985, that shows the complex relationship between growth, power, and development in the American West.

HYDROLOGY AND POLICY INTERFACE

The need for greater interface between scientific inquiry and policy remains an ongoing issue for the management of water and environmental planning. As Gober, et al. 2010 contends, this need becomes accentuated with the increased vulnerabilities associated with global climate change. To adequately address the changing environment, Gober, et al. 2010 suggests that new risk management approaches that take into account uncertainty and that advocate for resilience in communities are necessary, while Wagener, et al. 2010 advocates for addressing water issues as holistic and integrated. Furthermore, Falkenmark and Rockström 2004 advocates for using an ecological approach to understand and manage water resources. Complicating the science-policy interface is the concept of "virtual water"—where water is exported in various forms (through

agriculture, industry, etc.), as described in Warner and Johnson 2007. Lave 2012 brings studies in political ecology and science technology together to analyze the debates surrounding riparian restoration, which has important implications for understanding the construction of science and the link to policy, politics, and education. Similarly, Agnew 2011 contends that practical politics is often missing in discussions related to water management.

Agnew, John. "Waterpower: Politics and the Geography of Water Provision." *Annals of the Association of American Geographers* 101.3 (2011): 463–476.

Agnew argues that although geographers have grappled with issues of water and power in understanding the "water crisis" of the 21st century, few people look specifically at the practical politics behind the issues. Inserting politics, as negotiation and compromise, helps to understand practical means of avoiding crisis and finding solutions. Available [*online\[http://www.tandfonline.com/doi/abs/10.1080/00045608.2011.560053\]](http://www.tandfonline.com/doi/abs/10.1080/00045608.2011.560053)* by subscription or purchase.

Falkenmark, Malin, and Johan Rockström. *Balancing Water for Humans and Nature: The New Approach in Ecohydrology*. London and Sterling, VA: Earthscan, 2004. [ISBN: 9781853839276]

These authors advocate for an ecohydrological approach to land/water/environmental problems. The authors, leading experts in water management, examine water flows as a "blood stream" both of nature and society. They make a cogent argument for applying an ecological approach to understanding and managing water resources.

Gober, Patricia, Craig W. Kirkwood, Robert C. Balling Jr., Andrew W. Ellis, and Stephanie Deitrick. "Water Planning under Climatic Uncertainty in Phoenix: Why We Need a New Paradigm." *Annals of the Association of American Geographers* 100.2 (March 2010): 356–372. [doi:10.1080/00045601003595420]

The authors present (and provide rationale for) a new paradigm for climate change and environmental planning that is founded on the assumption of uncertainty. They contend that water and environmental planning necessitates understanding (and being prepared for) multiple risks. Available [*online\[http://www.tandfonline.com/doi/abs/10.1080/00045601003595420\]](http://www.tandfonline.com/doi/abs/10.1080/00045601003595420)* by subscription or purchase.

Lave, Rebecca. "Bridging Political Ecology and STS: A Field Analysis of the Rosgen Wars." *Annals of the Association of American Geographers* 102.2 (2012): 366–382.

Lave responds to the calls to bring critical geography into conversation with studies in science and technology. Through an examination of the Rosgen Wars, a debate surrounding the American stream restoration movement, Lave shows how political-economic relations are central to the production of scientific knowledge. Available [*online\[http://www.tandfonline.com/doi/abs/10.1080/00045608.2011.641884\]](http://www.tandfonline.com/doi/abs/10.1080/00045608.2011.641884)* by subscription or purchase.

Wagener, Thorsten, Murugesu Sivapalan, Peter A. Troch, et al. "The Future of Hydrology: An Evolving Science for a Changing World." *Water Resources Research* 46.5 (2010): W05301. [doi:10.1029/2009wr008906]

This article calls for new way of thinking about climate change and water planning. The authors suggest that a paradigm that synthesizes observation and analysis as a holistic entity is needed. Available [*online\[http://www.agu.org/pubs/crossref/2010/2009WR008906.shtml\]](http://www.agu.org/pubs/crossref/2010/2009WR008906.shtml)* by subscription or purchase.

Warner, Jeroen F., and Clare L. Johnson. "'Virtual Water'—Real People: Useful Concept or Prescriptive Tool?" *Water International* 32.1 (March 2007): 63–77.

This article provides critical analysis and genealogy of the concept of “virtual water”—from the argument of its Malthusian origin (water scarcity leads to water wars) to its role as a prescriptive tool. The authors argue that employing the analytical concept as a policy instrument should be carefully considered. Available [*online\[http://www.thirdworldcentre.org/warner.pdf\]*](http://www.thirdworldcentre.org/warner.pdf).

WATER SECURITY AND RISK ASSESSMENT

In recent years, there has been an increased use of the concept “water security” in the water governance literature. Historically, the term has been applied differently, with focus largely on water scarcity. Cook and Bakker 2012 provides a useful overview of the changing meaning of the concept of water security. Falkenmark and Lundqvist 1998 is an early champion of the terms, advocating that it is a likely avenue to help frame (and analyze) complex water issues.

Vörösmarty, et al. 2010 highlights the utility of water security in global water assessment. Similarly, tools such as the Water Poverty Index, designed by Caroline Sullivan in Sullivan 2002, have been developed to help quantify (and bring attention to) the integrated assessment of water stress and scarcity. Inextricably linked to water security is risk assessment. Wheeler and Evans 2009 advances the idea that the management of land and water is inextricably linked, particularly in relation to flood management and risk.

Cook, Christina, and Karen Bakker. “Water Security: Debating an Emerging Paradigm.” *Global Environmental Change* 22.1 (February 2012): 94–102. [doi: 10.1016/j.gloenvcha.2011.10.011] This article provides a comprehensive review of the concept of water security. It documents the increased use of the term and compares its interpretations. The authors conclude that an integrated approach to framing water security holds promise as a new approach to sustainable water management. Available [*online\[http://www.sciencedirect.com/science/article/pii/S0959378011001804\]*](http://www.sciencedirect.com/science/article/pii/S0959378011001804) by subscription or purchase.

Falkenmark, Malin, and Jan Lundqvist. “Towards Water Security: Political Determination and Human Adaptation Crucial.” *Natural Resources Forum* 22.1 (February 1998): 37–51. [doi:10.1111/j.1477-8947.1998.tb00708.x]

This article advocates for a more critical look at the complexity of water management issues. The authors argue that politicians tend to oversimplify issues and that environmentally oriented communities tend to focus on a narrow set of issues, while the general public takes water for granted. They stress the need for a global ethic regarding upstream-downstream water sharing. Available [*online\[http://onlinelibrary.wiley.com/doi/10.1111/j.1477-8947.1998.tb00708.x/abstract\]*](http://onlinelibrary.wiley.com/doi/10.1111/j.1477-8947.1998.tb00708.x/abstract) by subscription or purchase.

Sullivan, Caroline. “Calculating a Water Poverty Index.” *World Development* 30.7 (July 2002): 1195–1210.

This paper presents an interdisciplinary approach to produce an integrated assessment of water stress and scarcity. The index links physical estimates of water availability with socioeconomic variables that reflect poverty. Available [*online\[http://www.sciencedirect.com/science/article/pii/S0305750X02000359\]*](http://www.sciencedirect.com/science/article/pii/S0305750X02000359) by subscription or purchase.

Vörösmarty, Charles J., P. B. McIntyre, Mark O. Gessner, et al. “Global Threats to Human Water Security and River Biodiversity.” *Nature* 467.7315 (30 September 2010): 555–561. [doi: 10.1038/nature09440]

This high-profile article aims to diagnose threats of freshwater resources from global to local scales. The authors find that 80 percent of the world's population is exposed to high levels of threat to water security, with much disparity between rich and poor countries. The authors present a cumulative-threat framework. Available

online[http://limnology.wisc.edu/personnel/mcintyre/publications/vorosmarty_etal_2010_nature_global_threats.pdf].

Wheater, Howard, and Edward Evans. "Land Use, Water Management and Future Flood Risk." *Land Use Policy* 26.S1 (December 2009): S251–S264. [doi:10.1016/j.landusepol.2009.08.019]

This paper advances the idea that the management of land and water is inextricably linked. The authors provide a detailed analysis for flood risk and water quality and discuss scientific needs to manage water, and its associated risks, more effectively. Available

online[http://www.bis.gov.uk/assets/foresight/docs/land-use/jlup/29_land_use_water_management_and_future_flood_risk.pdf].

WATER CONFLICT AND COOPERATION

Considerable debates have ensued in the environmental literature concerning the concept of water conflict and cooperation. These vary from the provocative "water wars," presented in Shiva 2002, to the premise that shared resources facilitate cooperation rather than conflict, presented in Grey and Sadoff 2003. The cases find that scale of governance and individual hydro-political circumstance have great influence over the tendency for the level of cooperation, as noted in Sneddon 2002 and Turton 2006. Wolf, et al. 2003 is a useful online database for conflict and cooperation of international river basins. Giordano, et al. 2002 provides a useful analytical framework to assess the potential for conflict and cooperation over freshwater resources as it pertains to broader international affairs.

Giordano, Meredith, Mark Giordano, and Aaron Wolf. "The Geography of Water Conflict and Cooperation: Internal Pressures and International Manifestations." *Geographical Journal* 168.4 (December 2002): 293–312. [doi: 10.1111/j.0016-7398.2002.00057.x]

This paper investigates the dynamics of water interactions across geographic scale and their relationship to broader international affairs. The authors provide an analytical framework for assessing freshwater resources management across scales, and they apply the framework to three case studies—the Middle East, South Asia, and southern Africa. Available

online[<http://onlinelibrary.wiley.com/doi/10.1111/j.0016-7398.2002.00057.x/abstract>] by subscription or purchase.

Grey, David, and Claudia W. Sadoff. "Beyond the River: The Benefits of Cooperation on International Rivers." *Water Science & Technology* 47.6 (2003): 91–96.

The authors show the benefits to cooperation in terms of ecology, economics, and politics. They suggest that trade-offs between states encourage cooperation over conflict. Available

online[<http://www.ncbi.nlm.nih.gov/pubmed/12731775>] by subscription or purchase, and, with the authors' names reversed,

online[http://www.worldwaterweek.org/documents/WWW_PDF/Resources/2009_19wed/0211_Beyond_the_River_Published.pdf] in *Water Policy* 4.5 (2002): 389–403.

Shiva, Vandana. *Water Wars: Privatization, Pollution, and Profit*. Cambridge, MA: South End, 2002. [ISBN: 9780896086500]

Environmental activist and scientist Shiva outlines the impacts of corporate culture on the erosion of historical communal water rights. Drawing on examples of industrial activities such

as damming, mining, and the international water trade, Shiva highlights the human costs (and hidden costs) to industrial use of water.

Sneddon, Chris. "Water Conflicts and River Basins: The Contradictions of Comanagement and Scale in Northeast Thailand." *Society & Natural Resources: An International Journal* 15.8 (2002): 725–741.

This paper explores questions of geographic scale, social conflicts, and shifting socioecological contexts as obstacles to comanagement of river basins. Available

online[<http://www.tandfonline.com/doi/abs/10.1080/08941920290069317>] by subscription or purchase.

Sneddon, Chris, Leila Harris, Radoslav Dimitrov, and Uygur Özesmi. "Contested Waters: Conflict, Scale, and Sustainability in Aquatic Socioecological Systems." *Society & Natural Resources: An International Journal* 15.8 (2002): 663–675. [doi: 10.1080/08941920290069272]

This introduction to the special issue provides an overview of how complex social processes contribute to the transformation of aquatic ecosystems and, thereby, contribute to conflicts over water demand. It is an informative overview of the beginning of a conversation linking socioecological systems. Available

online[<http://www.tandfonline.com/doi/abs/10.1080/08941920290069272>] by subscription or purchase.

Turton, Anthony R., Marian J. Patrick, and Frédéric Julien. "Transboundary Water Resources in Southern Africa: Conflict or Cooperation?" *Development* 49.3 (2006): 22–31.

Turton and colleagues use a hydropolitical context to choose cooperation over conflict when a critical shared resource is at stake. They examine transboundary water management of southern Africa to elucidate this point. Available

online[http://researchspace.csir.co.za/dspace/retrieve/1714/Patrick_2006_d.pdf].

Wolf, Aaron T., Shira B. Yoffe, and Mark Giordano. "International Waters: Identifying Basins at Risk." *Water Policy* 5.1 (2003): 29–60.

Using their comprehensive database of international water basins, the authors assess all reported events of conflict or cooperation over water resources between nations during the fifty years prior to publication. The authors find that most of the parameters employed to indicate water conflict are only weakly limited to disputes. Available

online[<http://www.environmental-expert.com/Files%5C5302%5Carticles%5C5877%5C2.pdf>].

WATER SCARCITY

Drought is an exceedingly complex phenomenon that affects natural resources and human development. It has far-reaching impacts in terms of food and health security and habitat loss. Mechanisms exist to predict and prepare for drought. Smakhtin and Schipper 2008 shows that preventive action is rarely in place or mobilized in a way that staves off the serious impacts of this phenomenon. Rather, research has found that the discourses surrounding drought and water scarcity are often used as a tool to incite fear and to mobilize action to push forward political agendas, as seen in Mehta 2001 in the context of India, Kaika 2003 in the context of Greece, and Nevarez 1996 in the context of North America. To understand the role of discourse in water scarcity, Alatout 2008 usefully describes the history of scarcity and abundance of the hydrogeography of Israel.

Alatout, Samer. “States’ of Scarcity: Water, Space, and Identity Politics in Israel, 1948–59.” *Environment and Planning D: Society and Space* 26.6 (2008): 959–982.

Alatout traces the history of discourses of scarcity and abundance of Israeli hydrogeography. Available *online[<http://www.envplan.com/abstract.cgi?id=d1106>]* by subscription or purchase.

Kaika, Maria. “Constructing Scarcity and Sensationalising Water Politics: 170 Days That Shook Athens.” *Antipode* 35.5 (November 2003): 919–954. [doi:10.1111/j.1467-8330.2003.00365.x]

This paper examines how the Athens drought (1989–1991) was constructed as a “natural” crisis and then, consequently, linked to the rhetoric of market-led development and privatization. This discursive production, ultimately, facilitated significant social, political, and economic productions of nature. Available

online[<http://onlinelibrary.wiley.com/doi/10.1111/j.1467-8330.2003.00365.x/abstract>] by subscription or purchase.

Mehta, Lyla. “The Manufacture of Popular Perceptions of Scarcity: Dams and Water-Related Narratives in Gujarat, India.” *World Development* 29.12 (December 2001): 2025–2041.

[doi:10.1016/s0305-750x(01)00087-0]

This examines narratives of water scarcity in western India and links the discursive politics of scarcity to the politics of legitimizing a controversial dam. The paper contributes to arguments that scarcity is both a biophysical phenomenon as well as a powerful discursive construct.

Available *online[http://www.ids.ac.uk/files/World_Development_Scarcity.pdf]*.

Nevarez, Leonard. “Just Wait until There’s Drought: Mediating Environmental Crises for Urban Growth.” *Antipode* 28.3 (July 1996): 246–272. [doi:10.1111/j.1467-8330.1996.tb00462.x]

This article shows how discourse of drought and “natural” emergency influenced a community decision to overturn a historical resistance to importing water. This article is one of the first to link discursive politics to hazards and water planning. Available

online[<http://onlinelibrary.wiley.com/doi/10.1111/j.1467-8330.1996.tb00462.x/abstract>] by subscription or purchase.

Smakhtin, Vladimir U., and E. Lisa F. Schipper. “Droughts: The Impact of Semantics and Perceptions.” *Water Policy* 10.2 (2008): 131–143. [doi:10.2166/wp.2008.036]

The authors examine the multiple definitions of drought and the associated links to the concepts of hazard and disaster. They conclude that a common conceptual understanding of drought is imperative for effective policy and action to address the growing need for agricultural productivity and poverty alleviation. Available

online[<http://cat.inist.fr/?aModele=afficheN&cpsid=20219451>] by subscription or purchase.

WATER AS HAZARD

Water as hazard is an important category that captures the imagination of policymakers and general citizens alike. Dubbed the “father of floodplain management,” Gilbert White was one of the first scholars to link the issues of flooding and land use planning. White 1945 convincingly argued that flooding is not a “disaster” per se, but rather an issue of poor water management and planning and an overreliance on infrastructure. White’s student, Robert Kates, became a leading scholar in the mitigation of natural hazards, employing a human ecology approach (Kates 1962). However, scholars such as the authors of Watts 1983 and Wisner, et al. 2008 have critiqued White and Kate’s approach for not adequately including the political and economic forces that make hazards a “social justice issue” rather than “natural phenomena.” The discussion of water as hazard has shifted during the early 21st century, as a result of impacts of global climate

change. Sea-level rise and increased storm events due to rising temperatures also affect coastal populations and have created a new form of refugees (environmental refugees) who are displaced after massive storm events (see *Introduction*). The impacts of these events are often felt unevenly because economically disadvantaged communities have less access to support (as seen by the highly publicized Hurricane Katrina and the consequent situation in New Orleans, Louisiana)—and as geographers, the storylines created around these events (and the changing environments) are critical to understand, as seen in Bakker 2005.

Bakker, Karen. “*Katrina: The Public Transcript of ‘Disaster’; The ‘Big One’; Diss(ass)embling the Storyline of ‘Natural Disaster’[<http://www.envplan.com/epd/editorials/d2306ed.pdf>]*.” *Environment and Planning D: Society and Space* 23.6 (2005): 795–802.

[An insightful commentary that analyzes the discourse created around Hurricane Katrina as a natural disaster.](#)

Kates, Robert W. *Hazard and Choice Perception in Flood Plain Management*. Department of Geography Research Paper 78. Chicago: University of Chicago Press, 1962.

[A student of Gilbert White’s, Kates continues the work of understanding the link between hazards, risk, floodplain management, and planning. This is one of his seminal papers that outlines the trajectory for further inquiry.](#)

Watts, Michael J. *Silent Violence: Food, Famine, & Peasantry in Northern Nigeria*. Berkeley: University of California Press, 1983. [ISBN: 9780520043237]

[Explores the social and political underpinnings of famine and poverty, using a political ecology approach. Watts argues against framing environmental issues as “natural disasters,” making a case instead for a close geopolitical framing to understand famine and food supplies in Nigeria.](#)

White, Gilbert F. “Human Adjustment to Floods: A Geographical Approach to the Flood Problem in the United States.” Department of Geography Research Paper 29. PhD diss., University of Chicago, 1945. [class:thesis-phd]”

[This influential paper highlights the costs associated with building in a floodplain and argues that an overconfidence in and overreliance on infrastructure comes at a huge cost. He argues for a better understanding of ecological systems and better coordination of planning.](#)

Wisner, Benjamin, Piers Blaikie, Terry Cannon, and Ian Davis. *At Risk: Natural Hazards, People’s Vulnerability, and Disasters*. 2d ed. London: Routledge, 2008. [ISBN: 9780415252157]

[Wisner, also a student of Gilbert White’s, considers the political, economic, and social issues related to natural disasters. Together with his colleagues, this book examines the risks and vulnerabilities of marginalized populations in relation to environmental hazards. They draw on the concept of access and livelihood to discuss why some populations are more vulnerable than others. Originally published in 2004.](#)

INTEGRATED WATER RESOURCE MANAGEMENT

There has been considerable debate over the scope, aim, and effectiveness of integrated water resource management (IWRM) practices in recent years. Although the concept has been around since before the 1950s, it was rediscovered by many water managers in the early 1990s. IWRM was designed to be integrative and holistic in scope; however, it has been both criticized for its lack of consistency and championed for its flexibility. White 1998 provides a good overview of the events leading toward the contemporary IWRM movement, and van der Zaag 2005 links the history of IWRM with new issues of water security. Blomquist and Schlager 2005 suggests that boundary definition, decision-making arrangements, and issues of accountability are central

components of influencing political choices and special interests. Biswas 2004 argues that the amorphous definition makes it difficult to become operationalized on the ground. Furthermore, Blomquist and Schlager 2005 and Fischhendler and Heikkila 2010 highlight the potential political pitfalls associated with employing IWRM methods. McDonnell 2008 argues for greater attention to access of knowledge and transfer of knowledge in order to better govern the environment.

Biswas, Asit K. "Integrated Water Resources Management: A Reassessment—a Water Forum Contribution." *Water International* 29.2 (June 2004): 248–256.

Biswas makes the case that IWRM is not operational on the ground because there is no general agreement on fundamental issues, such as what aspects should be integrated, how, and by whom. Available

online[[http://galileu.iph.ufrgs.br/mendes/HIP_64/aula_2/Demandas/IWRM%20\(%20Water%20International\).pdf](http://galileu.iph.ufrgs.br/mendes/HIP_64/aula_2/Demandas/IWRM%20(%20Water%20International).pdf)].

Blomquist, William, and Edella Schlager. "Political Pitfalls of Integrated Watershed Management." *Society & Natural Resources: An International Journal* 18.2 (2005): 101–117. [doi: 10.1080/08941920590894435]

This article employs the example of a small Southern California watershed to highlight the political issues inherent in attempts at watershed management. The authors show how boundary definition, decision-making arrangements, and issues of accountability explain and influence political choices and special interests. Available

online[<http://www.tandfonline.com/doi/abs/10.1080/08941920590894435>] by subscription or purchase.

Fischhendler, Itay, and Tanya Heikkila. "Does Integrated Water Resources Management Support Institutional Change? The Case of Water Policy Reform in Israel[<http://www.ecologyandsociety.org/vol15/iss1/art4/>]*." *Ecology and Society* 15.1 (2010): 4.

This paper assesses fifty years of integrated water management in Israel. The authors' research reveals that integration often comes at the expense of much-needed reform and implementation of new policies and strategies of water management. This provides a good overview of cost-benefit analysis of IWRM.

McDonnell, Rachael A. "Challenges for Integrated Water Resources Management: How Do We Provide the Knowledge to Support Truly Integrated Thinking?" In *Special Issue: Integrated Water Resources Management in Latin America. International Journal of Water Resources Development* 24.1 (March 2008): 131–143. [doi:10.1080/07900620701723240]

McDonnell suggests the provision of knowledge and information is an important part of any enabling environment. Available

online[<http://www.tandfonline.com/doi/abs/10.1080/07900620701723240>] by subscription or purchase.

van der Zaag, Pieter. "Integrated Water Resources Management: Relevant Concept or Irrelevant Buzzword? A Capacity Building and Research Agenda for Southern Africa." In *Integrated Water Resource Management (IWRM) and the Millennium Development Goals: Managing Water for Peace and Prosperity. Physics and Chemistry of the Earth* 30.11–16 (2005): 867–871.

This article describes the historical developments that led to the development of IWRM, and links it to concepts of water security and conflict. It situates the discussions within the case study of water resource management in southern Africa. Available

[*online\[http://www.sciencedirect.com/science/article/pii/S1474706505001038\]](http://www.sciencedirect.com/science/article/pii/S1474706505001038)* by subscription or purchase.

White, Gilbert F. "Reflections on the 50-Year International Search for Integrated Water Management." *Water Policy* 1.1 (February 1998): 21–27.

White provides a useful historical overview the IWRM movement. Available [*online\[http://www.sciencedirect.com/science/article/pii/S1366701798000038\]](http://www.sciencedirect.com/science/article/pii/S1366701798000038)* by subscription or purchase.

WATER PRIVATIZATION

Water privatization and neoliberal approaches to water management have become highly scrutinized by geographers and the wider public in the early 21st century. Barlow and Clarke 2002, a provocative book, brought questions about the perils of industry and the privatization of water resources to the wider public's attention. Bakker 2003 analyzes the social and political costs of water privatization, through the case of privatizing water in England and Wales, and Wilder and Lankao 2006 examines the decentralized water management regime of Mexico. Both Ahlers 2010 and Perreault 2006 provide insights into the political mobilizations of communities affected by privatized water, while Rose 1994, a classic text in critical legal studies, provides useful insights through essays on the rhetoric of ownership. Harris 2009 further calls for greater attention to issues of gender in the discussion of privatization and neoliberalization of nature, with particular attention to water.

Ahlers, Rhodante. "Fixing and Nixing: The Politics of Water Privatization." *Review of Radical Political Economics* 42.2 (June 2010): 213–230. [doi: 10.1177/0486613410368497]

Ahler examines the social and ecological impact of neoliberal water policies. She takes the discussion in a new direction—which previously has focused largely on the urban and domestic water sector—by examining how the notions of nation and citizenship take on new meanings that allow for the commodification and privatization of public goods and assets. Available [*online\[http://rrp.sagepub.com/content/42/2/213.short\]](http://rrp.sagepub.com/content/42/2/213.short)* by subscription or purchase.

Bakker, Karen J. *An Uncooperative Commodity: Privatizing Water in England and Wales*. Oxford Geographical and Environmental Studies. Oxford and New York: Oxford University Press, 2003. [ISBN: 9780199253654]

Bakker shows, in this classic study of water governance, the full social and political costs (and unexpected outcomes) of water privatization.

Barlow, Maude, and Tony Clarke. *Blue Gold: The Fight to Stop the Corporate Theft of the World's Water*. New York: New Press, 2002. [ISBN: 9781565847316]

This book highlights many concerns related to water privatization and neoliberal agendas. The authors expose the political agendas linked to pricing water and utilities, providing the solution that water should be viewed as a fundamental human right not linked to ability to pay.

Harris, Leila M. "Gender and Emergent Water Governance: Comparative Overview of Neoliberalized Natures and Gender Dimensions of Privatization, Devolution and Marketization." *Gender, Place & Culture: A Journal of Feminist Geography* 16.4 (July 2009): 387–408. [doi:10.1080/09663690903003918].

This article explores the gendered dimension of changing governance regimes, particularly as it relates to water privatization and devolution. Harris calls for greater engagement from gender theorists on issues related to water resources and argues that discussion regarding neoliberalized natures requires more attention to gender and feminist theory. Available

online[<http://www.tandfonline.com/doi/abs/10.1080/09663690903003918>] by subscription or purchase.

Perreault, Thomas. "From the *Guerra Del Agua* to the *Guerra Del Gas*: Resource Governance, Neoliberalism and Popular Protest in Bolivia." *Antipode* 38.1 (January 2006): 150–172.

Perreault highlights the resource protests in Bolivia ("Water War" and "Gas War") to highlight the uneven geographies of neoliberal reform. In both cases, the public responded to the restructuring of the resource governance to highlight the concerns for lack of public participation and inequitable distribution of economic benefit. Available

*online[<http://onlinelibrary.wiley.com/doi/10.1111/j.0066-4812.2006.00569.x/abstract>] by subscription or purchase.

Rose, Carol M. *Property and Persuasion: Essays on the History, Theory, and Rhetoric of Ownership*. New Perspectives on Law, Culture, and Society. Boulder, CO: Westview, 1994. [ISBN: 9780813385549]

Rose's examination of property law and the narrative of property is an important contribution to legal theory and political and social philosophy, which are highly germane for the privatization of water.

Wilder, Margaret, and Patricia Romero Lankao. "Paradoxes of Decentralization: Water Reform and Social Implications in Mexico." *World Development* 34.11 (November 2006): 1977–1995. [doi:10.1016/j.worlddev.2005.11.026]

This paper analyzes Mexico's decentralized water governance, resulting from current neoliberal reform strategies. They found that decentralization did not result in greater equity, efficiency, or sustainability of water use; rather, it was a method for capital accumulation and a way to legitimize the transfer of the state responsibility. Available

online[http://www.udallcenter.arizona.edu/publications/epp/2006_WILDER.et.al_world.development.pdf].

WATER, POWER, AND THE POLITICS OF SCALE

The governance of water is deeply connected to the politics of scale, as well as sociopolitical and economic circumstance. Analyzing how the governance of water, and its associated mechanics, is framed both geopolitically and socially contributes to a more nuanced understanding of contemporary hydropolitics. Norman, et al. 2012 provides a pithy summary of how the politics-of-scale literature (and relative debates) comes to bear on water governance. The article introduces a special issue dedicated to this topic, through several case studies from around the world. Harris and Alatout 2010 also provides a useful analysis of how hydro-scales are negotiated through power and politics. Using the case of post-apartheid South Africa, Loftus and Lumsden 2008 explores how socio-natural relations (and associated hegemony) are established through everyday activities and affect the waterscape. Using the case of Ecuador, Swyngedouw 2004 is about social power in the context of urbanized water. Similarly, Feitelson and Fischhendler 2009 uses the complex intra-Israeli and Israeli-Arab case to examine the interrelationships between production of scale and hydropolitics. Liverman 2004 explores the link between the politics of scale and water governance, particularly the changing trends of privatization of water and commodification of nature. Norman 2012 links the literature on politics of scale with postcolonial studies to show that indigenous leaders are rearticulating the Salish Sea (Pacific Northwest of North America) as a tool to reclaim space and to reconstitute postcolonial constructions of spaces.

Feitelson, Eran, and Itay Fischhendler. "Spaces of Water Governance: The Case of Israel and Its Neighbors." *Annals of the Association of American Geographers* 99.4 (September 2009): 728–745. [doi:10.1080/00045600903066524]

This paper explores the dynamics of scale in governing water. Using the intra-Israeli and Israeli-Arab case as an example, the authors show discourse and storylines are used to rationalize and legitimize negotiating positions. They also show the difference in power dynamics between international and international levels. Available

online[<http://www.tandfonline.com/doi/abs/10.1080/00045600903066524>] by subscription or purchase.

Harris, Leila M., and Samer Alatout. "Negotiating Hydro-Scales, Forging States: Comparison of the Upper Tigris/Euphrates and Jordan River Basins." *Political Geography* 29.3 (March 2010): 148–156. [doi:10.1016/j.polgeo.2010.02.012]

This paper provides a comparison of hydro-scalar politics and performativities in relation to state and nation building, using the Jordan River basin as an example. Available

online[<http://www.dces.wisc.edu/documents/articles/alatout/Harris%20and%20Alatout-Political%20Geography-2010.pdf>].

Liverman, Diana. "Who Governs, at What Scale and at What Price? Geography, Environmental Governance, and the Commodification of Nature." *Annals of the Association of American Geographers* 94.4 (2004): 734–738. [doi:10.1111/j.1467-8306.2004.00428.x]

Suggests that two of the most important emerging themes in geography are the commodification of nature and the reframing of governance mechanisms to include stakeholders, consumers, corporations, and environmental and transnational groups. Available

online[<http://www.aimes.ucar.edu/docs/ssc/2005/04.liverman.pdf>].

Loftus, Alex, and Fiona Lumsden. "Reworking Hegemony in the Urban Waterscape." *Transactions of the Institute of British Geographers* 33.1 (January 2008): 109–126. [doi:10.1111/j.1475-5661.2007.00280.x]

Loftus and Lumsden employ Gramsci's writings on hegemony to explore how socio-natural relations established through everyday activities are critical to the creation and resistance of worldviews. This is applied in the post-apartheid urban waterscape of South Africa. Available *online[<http://onlinelibrary.wiley.com/doi/10.1111/j.1475-5661.2007.00280.x/abstract>]* by subscription or purchase.

Norman, Emma S. "*Cultural Politics and Transboundary Resource Governance in the Salish Sea[http://www.water-alternatives.org/index.php?option=com_content&task=view&id=186&Itemid=1]*." *Water Alternatives* 5.1 (February 2012): 138–160.

Norman argues that the inclusion of cultural politics of scale will, arguably, provide a more nuanced approach to the study of transboundary environmental governance, particularly water resources. This has been particularly relevant for indigenous communities, whose traditional homelands are often bifurcated by contemporary border constructions.

Norman, Emma S., Karen Bakker, and Christina Cook. "*Introduction to the Themed Section: Water Governance and the Politics of Scale[http://www.water-alternatives.org/index.php?option=com_content&task=view&id=181&Itemid=1]*." *Water Alternatives* 5.1 (February 2012): 52–61.

Provides an overview of how the literature on politics of scale interfaces with the literature on water governance, and introduces a set of papers that engage in this cross-pollination of topics.

Swyngedouw, Erik. *Social Power and the Urbanization of Water: Flows of Power*. Oxford Geographical and Environmental Studies. New York: Oxford University Press, 2004. [ISBN: 9780198233916]

This book examines the social-economic aspects of municipal water supplies in Ecuador, with a particular emphasis on social power and equity.

WATERSCAPES AND HYBRID NETWORKS

The concept of waterscapes and hybrid hydro-social networks is increasingly common in critical environmental and political geography and political ecology. Framing the social-water interaction as a “waterscape” or a “hybrid network,” as seen in Budds and Hinojosa-Valencia 2012, Loftus 2009, Swyngedouw 1999, and Swyngedouw 2004, rather than a “watershed” highlights the role of political actors, economic and social forces, and decision makers that influence (but are outside of) the watershed. As Swyngedouw 1999 and Swyngedouw 2004 show, reconceptualizing water as coproduced (rather than as a separate entity) opens up space to explore the reflexive nature between water and social processes, as seen in Loftus 2009. So, as Budds and Hinojosa-Valencia 2012 notes (p. 120), the use of waterscapes “allows us to think about not only the social processes that shape water, but also the ways in which water also shapes social relations.”

Budds, Jessica, and Leonith Hinojosa-Valencia. “Restructuring and Rescaling Water Governance in Mining Contexts: The Co-production of Waterscapes in Peru.” *Water Alternatives* 5.1 (February 2012): 119–137.

The authors consider how the growing mining industry in Peru and the simultaneous increase in demand for water reconfigure and rescale water governance. This study contributes to the growing work within political ecology that considers the politicized nature of water governance. Available *online[http://oro.open.ac.uk/32484/1/Art5-1-8_Budds-Hinojosa_Published.pdf]*.

Loftus, Alex. “Rethinking Political Ecologies of Water.” In *Special Issue: Remapping Development Studies; Contemporary Critical Perspectives. Third World Quarterly* 30.5 (2009): 953–968. [doi:10.1080/01436590902959198]

Using a political ecology lens, Loftus examines the world’s failure to provide a safe supply of clean drinking water. This paper queries who is to blame for the failure and how the operation of power directly affects the water user. Available *online[<http://www.tandfonline.com/doi/abs/10.1080/01436590902959198>]* by subscription or purchase.

Swyngedouw, Erik. “Modernity and Hybridity: Nature, *Regeneracionismo*, and the Production of the Spanish Waterscape, 1890–1930.” *Annals of the Association of American Geographers* 89.3 (1999): 443–465.

Through a historical examination of the development of the Spanish waterscape, Swyngedouw insists that nature and society are deeply intertwined. Available *online[<http://www.tandfonline.com/doi/abs/10.1111/0004-5608.00157>]* by subscription or purchase.

Swyngedouw, Erik. *Social Power and the Urbanization of Water: Flows of Power*. Oxford Geographical and Environmental Studies. New York: Oxford University Press, 2004. [ISBN: 9780198233916]

Swyngedouw conceptualizes the flow of water as a “production of nature” that is constituted through ongoing socio-nature reordering.

TRANSBOUNDARY WATER GOVERNANCE

Studying water governance at the site of the border affords many insights into the interface among political systems, cultures, and resource issues. The governance of shared (transboundary) waters has traditionally been relocated to federal-federal negotiations and formal mechanisms such as treaties and accords, as described in Fischhendler 2008 and Wolf 1999. Increasingly, however, subnational actors are involved in environmental governance, including transboundary water governance. Recent scholarship has found, however, that the increased participation should not be conflated with empowerment of decision-making capacity at the local level, as seen in Norman and Bakker 2009. Blatter and Ingram 2001 explores the link among governance, government, and politics of scale for the governance of shared resources. Furlong 2006 suggests the need to rethink the international-relations framing of transboundary water governance, while Sneddon and Fox 2006 looks critically at the hydropolitics of transboundary basins. Using the Canada–US borderland as an example, Norman, et al. 2012 shows how conflict at the site of the border can lead to innovative solutions for water governance. See also *Water Conflict and Cooperation*.

Blatter, Joachim, and Helen M. Ingram, eds. *Reflections on Water: New Approaches to Transboundary Conflicts and Cooperation*. American and Comparative Environmental Policy. Cambridge, MA: MIT Press, 2001. [ISBN: 9780262024877]

This volume supports the idea that humans' conceptual understanding of water must transcend rationalist definitions of water as a commodity. The contributors to this edited volume draw on cases from around the world to show the diversity of interpretations of water—which is accentuated at the site of the border.

Fischhendler, Itay. "When Ambiguity in Treaty Design Becomes Destructive: A Study of Transboundary Water." *Global Environmental Politics* 8.1 (February 2008): 111–136.

This paper argues that ambiguous or vague language in treaty design holds many long-term political and social costs. Fischhendler's study explores when ambiguity has the potential to become destructive in the course of agreement implementation. Available *online[http://www.bupedu.com/lms/admin/uploaded_article/eA.718.pdf]*.

Furlong, Kathryn. "Hidden Theories, Troubled Waters: International Relations, the 'Territorial Trap,' and the Southern African Development Community's Transboundary Waters." *Political Geography* 25.4 (May 2006): 438–458. [doi:10.1016/j.polgeo.2005.12.008]

This piece calls for a reassessment of the framings of transboundary waters, moving away from an international-relations framing of the primacy of the nation-state. Available *online[http://www.groupe-sage.ca/articles_membres/Furlong-HiddenTheories-2006.pdf]*.

Norman, Emma S., and Karen Bakker. "Transgressing Scales: Water Governance across the Canada–U.S. Borderland." *Annals of the Association of American Geographers* 99.1 (2009): 99–117.

This paper explores trends of rescaling water governance. The authors query two assumptions prevalent in the literature on water governance—that a shift in scale downward to the local implies greater empowerment to local actors and that rescaling implies higher orders of government are less important. Available *online[<http://www.cpsa-acsp.ca/papers-2008/Norman-Bakker.pdf>]*.

Norman, Emma S., Alice Cohen, and Karen Bakker, eds. "Flashpoints and Collaboration: How Problems Can Inspire Innovative Solutions for Canada, the US, and the Governance of Shared Waters[

briefs]*.” *Water without Borders? Policy Briefs*. Vancouver, BC: Program on Water Governance, 2012.

The editors have a series of policy briefs that highlight how “hotspots” and “flashpoints” along the Canada-US border have led to innovative solutions in the governance of shared waters. These briefs are part of the edited volume *Water without Borders*, to be released in 2013 through the University of Toronto Press.

Sneddon, Chris, and Coleen Fox. “Rethinking Transboundary Waters: A Critical Hydropolitics of the Mekong Basin.” *Political Geography* 25.2 (February 2006): 181–202.

[doi:10.1016/j.polgeo.2005.11.002]

This article advances the notion of critical hydropolitics as a way to understand the complex political and geographical nuances of transboundary river basins, using the Mekong Basin as an example. Available

online[<http://www.sciencedirect.com/science/article/pii/S0962629805001125>] by subscription or purchase.

Wolf, Aaron T. “The Transboundary Freshwater Dispute Database Project.” *Water International* 24.2 (1999): 160–163. [doi:10.1080/02508069908692153]

Provides an overview of a database documenting transboundary water disputes throughout the world—this is an ongoing project through Oregon State University. Available

online[<http://www.tandfonline.com/doi/abs/10.1080/02508069908692153>] by subscription or purchase.