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WATER SCARCITY

Climate change is essentially a water problem. Whether it is drought, flood, changing hydrology or rising sea levels, the impacts of climate change all involve water to some extent. Even those who deny that human activities cause climate change must acknowledge that long-term drought cycles in the past (as evidenced by tree rings and other environmental indicators) and wide variations in hydrology can be expected to recur and may be recurring now. Based on the best evidence currently available, precipitation patterns in the near future are likely to be substantially different than in the recent past.

Because of these ongoing changes, the importance of adapting existing legal regimes to changing hydrology cannot be overstated. The competition for water resources is keener now than it has ever been and will only get worse. The list of civilizations that have fallen due to drought is a long one, and with more people, essentially no additional water supplies and different precipitation patterns from what occurred when most water laws were created, water users face significant challenges. This article discusses why conflict over water resources is inevitable; the significance of water as a different type of property and common resource; adapting existing laws and institutions to the changing environment; and the role of reasonableness and physical solution.

A Role for Reasonableness and Physical Solution in Water Law in an Era of Climate Change

By Eric L. Garner

The starting point for adapting laws and institutions to climate change should be an acceptance that there will be no end to conflict over water. The goal of laws and institutions, however, should be to make those ''water wars'' peaceful and not violent.

There are five reasons why there will be no end to water wars.

The first reason is simply the population growth. In 1900, there were 1.7 billion people in the world.[1] Currently, the world population is 7.2 billion, and by 2050 it's expected to grow to 9.6 billion.[2] With more people than ever on the planet and a nearly 20 percent growth in world population projected over the next 30 years, human demands for natural resources such as water will continue to increase; with increasing demand comes increased risk of conflict.

[1] United Nations Population Division, *The World at Six Billion*, Box 2, World Population Growth, available at http://www.un.org/esa/population/publications/sixbillion/sixbilpart1.pdf.

[2] United Nations World Population Prospects – The 2012 Revision, Key Findings and Advance Tables, Summary and Key Findings, available at http://esa.un.org/wpp/Documentation/pdf/WPP2012_%20KEY%20FINDINGS.pdf.

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The second reason is the worldwide phenomenon of people moving from rural areas to cities.[3] As of 2010, more than half of all people lived in urban areas.[4] By 2030, six out of 10 people will live in a city, and by 2050, this proportion will increase to seven out of 10 people, according to the World Health Organization. As more people move to urban areas—many of which were built on and have been served by rivers and other water bodies—these resources become increasingly stressed, prompting the need to find other water sources. Frequently, this involves moving water long distances to meet the needs of growing urban areas. These transfers increase the risk of losses in quantity and quality during transmission, reduce the amount available for ecosystem restoration and protection and also sometimes deprive access for people who live close to the water source. All of these create the risk of conflict.

The third reason is the increasing number of people in the middle class in countries such as China, Brazil and India.[5] Middle-class consumers use more water than lower-income people, and so per capita water consumption worldwide can be expected to rise along with an increased potential for conflict.

Ending the water wars also is unrealistic because of the recognition in recent decades of the importance of allocating water to in-stream, non-consumptive uses in order to protect the environment and rare and endangered species. With increasing consumptive uses of water, the direct competition between people and environmental uses will increase.

Finally, water allocations are never really final. Over time societal needs for water change. For example, mining economies can shift to agriculture; agricultural economies can become manufacturing economies; rural uses can decline and urban uses can increase. Because water resources are fully allocated in many places, creating a new use requiring water means shifting a portion from an existing use. Thus, there is an ongoing need to revisit prior allocations, which frequently creates conflict. Without appropriate institutions these conflicts risk becoming violent.

Water Must Be Managed Differently Than Other Types of Property. Water is different from other types of real property in at least three ways. First it is the only type of property essential for human life. Second, because of the hydrologic cycle, it is the only type of property that is used and reused by others over and over. Lastly, water is not stationary. As the old saying goes, you can't fence water.

Despite the fact that water is different than other real property, it is typically governed by rules of real property. Rights are frequently based on the date a use began. This is known as prior appropriation and sometimes called ''first in time, first in right.'' Rights can also be based on the ownership of land adjacent to a watercourse, known as the riparian system. Importantly, rights to water are typically ''use'' rights, and it is extremely rare to be able to own water as personal property, except when it is in a bottle.

The significance of a ''use'' right is that the one holding it cannot prohibit someone else from taking the allocated water if it is not being used. This is akin to going on vacation and not being able to prevent someone from living in your house while you are out of town. That scenario gives one an idea as to how water is a significantly different type of real property.

The inability to fence water makes it a common resource and contributes to its overuse. This problem was discussed in Garrett Hardin's classic 1968 article, ''The Tragedy of the Commons.'' Hardin, discussing the overuse of common resources in the context of world population growth, described the problem with joint use of a pasture:

''Picture a pasture that is open to all. Each herdsman will try to keep as many cattle as possible on the commons. . . . Therein is the tragedy. Each man is locked into a system that compels him to increase his herd without limit—in a world that is limited. Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all.''[6]

Lest one think this is just a modern-day issue that might go away, more than 2,000 years ago Aristotle reached the same conclusion: ''What is common to the greatest number gets the least amount of care. Men pay most attention to what is their own; they care less for what is common; or at any rate they care for it only to the extent to which each is individually concerned.''[7]

Unfortunately, the logic of the tragedy of the commons applies to water resources, particularly to groundwater. Access to water is not readily limited. Therefore, it is in an individual's best interest to extract additional water instead of trying to conserve the resource because other users will simply withdraw that conserved water for their own use, defeating the original user's purpose.

The Need for Reasonableness and Physical Solution in Water Law. Instead of creating new legal regimes, it is essential to focus on adapting current laws to changing hydrology. Adapting current laws is essential because a great deal of the world's water is already allocated, and it would be futile, as well as disruptive, to attempt to overturn those legal regimes. Rather, they should be the starting point, and the concept of equity and reasonableness should be incorporated into them.

It is clear from prior experience is that strict priority systems without reasonableness are not well suited to adapting to changing conditions. A pure priority system in a fully allocated watercourse leaves little room for new uses or changed conditions. Thus, although priority and the recognition of investment-backed expectations must be the starting point for incorporating reasonableness, when there have been substantial hydrologic or demographic changes, they frequently cannot be the ending point.

The importance of equity and reasonableness in water law can be seen not only in its existence in the law of most states in the U.S. but also in the Convention on

[3] Abby Joseph Cohen, CFA and Rachel Siu, *Sustainable Growth: Taking a Deep Dive into Water*, Goldman Sachs (May 8, 2013), at http://www.goldmansachs.com/our-thinking/focus-on/clean-technology-and-renewables/cohen/report.pdf.

[4] World Health Organization, Global Health Observatory (GHO), Urban Population Growth, available at http://www.who.int/gho/urban_health/situation_trends/urban_population_growth_text/en/.

[5] *Id*.

[6] Garrett Hardin, *The Tragedy of the Commons*, 162 Sci. 1243-1248 (1968).

[7] Aristotle, Politics (Oxford: Clarendon Press, 1946).

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the Law of Non-navigational Uses of International Watercourses adopted by the United Nations in 1997 and ratified by 33 nations.[8]

Article 5 of the Convention provides that nations should use international watercourses in an equitable and reasonable manner. Specifically, these watercourses should be used and developed for optimal and sustainable use while considering the interests of the countries involved and consistent with the adequate protection of the watercourse, according to the Convention. The factors relevant to equitable and reasonable use include geography, hydrology, ecology, social and economic needs, the people dependent on the watercourse, the impacts of the water use on others and the availability of alternative uses.

Similarly, Article 4 of the Draft Articles on the Law of Transboundary Aquifers[9] provides that nations using transboundary aquifers or aquifer systems do so according to the principle of equitable and reasonable use. Countries should maximize the long-term benefits of water use, develop a comprehensive use plan considering present and future needs and alternative water sources and use the aquifer at a level that will not deplete it to a point that it is no longer a reliable water source. The factors relevant to equitable and reasonable use include the people dependent on the aquifer, present and future uses, social, economic and other needs, the natural characteristics of the aquifer, the impact of the aquifer use on others and the protection and conservation of the aquifer.

There are two major challenges to incorporating equity and reasonable use in water law. One is that it lacks the certainty of riparianism or prior appropriation. While there is no uncertainty of right with riparianism and prior appropriation, there is still uncertainty of supply. However, since implementing reasonableness should begin with current priorities, it will not substantially increase uncertainty of right.

The second issue is implementation. As is evident from the list of considerations above, a quick, easy, inexpensive one-time process cannot effectively implement reasonableness. Instead, users on a watercourse must create institutions that will continue on an ongoing basis. This is also true because water allocations including reasonableness are very watercourse-specific and can only be implemented over time.

Nobel Prize-winning economist Elinor Ostrom performed a comprehensive analysis of institutions that had successfully governed common pool resources and found a number of key principles that are adapted here for the water resource context:

- Clear definition of the boundaries of the water resource;
- Clear definition of the individuals who may take water from the water resource;
- Congruence of the rules for taking water with local conditions and customs (one size does not fit all);
- A collective choice arrangement so that most individuals impacted by the operational rules can participate in modifying the operational rules;
- Monitoring of the condition of the water resource;
- Monitoring, at an individual level, of the withdrawal of water from the water resource;
- Some type of sanctions so that users who violate operational rules will be assessed some type of penalty by other appropriators or some type of governance official or both;
- Conflict resolution mechanisms so that water users have rapid access to low-cost local arenas to resolve conflicts among users or with a governance official;
- A recognition by external governance authorities of the rights of water users to develop an institution to govern the water resource; and
- If the water resource is part of a larger system, then all of the activities must be organized to fit within that larger system.[10]

Institutions with these elements currently exist and are managing groundwater resources in California. They have been implemented through what is called a ''physical solution.''

California groundwater has very limited statutory regulation, and thus the institutions that work here have applicability throughout the U.S. and the world. Because there is little statutory or non-judicial limitation of groundwater pumping in most of California, absent the institutions discussed herein, California groundwater law is essentially pump until a judge tells you not to.

''Over extraction has been the logical outcome of California's groundwater laws because it is an open access common pool resource without clear limits,'' Ostram wrote.[11]

She also noted that the ''uncertainty of the competing water doctrines was compounded by the uncertainty shared by all water producers about the actual supply of water to a basin and the quantity of water withdrawn by all of the parties.''[12]

The Physical Solution. Californians have been able to implement successful groundwater basin governance in certain basins through the physical solution. Sometimes called a ''common sense'' solution to water disputes, a physical solution allows parties to access the water they need by developing a legal and institutional structure to support existing and future uses.

A physical solution operates at three levels: political, legal and technical. It typically involves all stakeholders, provides for local governance, develops technical data, recognizes subareas or subbasins of the watershed, monitors uses and sets annual use amounts. The goal of a physical solution is to allow all reasonable and beneficial uses to continue either through more efficient uses or by developing additional sources of water. Critically, it is an ongoing process that continues year after year. In California, it is generally court-supervised.

[8] International Water Law Project, Status of the Watercourses Convention, December 20, 2013, available at http://www.internationalwaterlaw.org/documents/intldocs/watercourse_status.html.

[9] Draft articles on the Law of Transboundary Aquifers, Supplement No. 10 (A/63/10) United Nations General Assembly, Sixty-third Session, 2008, available at http://legal.un.org/ilc/texts/instruments/english/draft%20articles/8_5_2008.pdf.

[10] Ostrom, E., Governing the Commons: The Evolution of Institutions for Collection Action 90 Cambridge, UK: Cambridge University Press (1990).

[11] *Id*. at 106-108.

[12] *Id*. at 109.

A critical early step in the physical solution process is direct dialogue between all (or as many as will participate) of the technical representatives of stakeholders. This can often lead to at least some areas of general hydrological agreement upon which lawyers and policymakers can structure sustainable legal and management institutions. Of course, this process takes substantial time and is expensive, but it has led to a number of sustainable institutions in basins that were the subject of bitter and contentious disputes.

What is notable about successful groundwater basin governance through physical solutions in California is that it has occurred without state or federal government participation, except where a state government agency, such as the California Department of Water Resources, has been designated by the water users as the monitoring agency or where the state or federal government has been a water user. This is at least in part because a key element of a successful physical solution is that it serves the water basin users' needs and fits with the local conditions. This is much more likely to be accomplished if it is governed at the local level with oversight.

Because local governance is crucial to successful basin management, it is possible that the private sector can play a bigger role in physical solutions than it has in the past. Privatization has received a great deal of attention in the water world over the past several years. While many public-private partnerships in water have been implemented around the world, the private sector's role in water allocation has been more limited in the U.S.

Implementing physical solutions typically costs money, sometimes substantial money, and there would seem to be a role for private non-water user entities to play. For example, great advances are being made in desalination and water-use efficiency technology, and these will be key elements in future physical solutions.[13] There also may be a role for other types of private investments in physical solutions.

Adapting existing water laws to a changing climate is a great challenge. It will be time-consuming, expensive and at times very contentious, with no single formula that will work for all watersheds. The concepts of reasonableness and physical solution are not panaceas, but they provide the needed flexibility for institutions to adapt to conditions that may be unlike those ever seen before.

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[13] Cohen and Siu, *supra* note 3.

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