

Increasing Institutional Resilience for Water Conservation

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In March 2010, Karl Wood organized a group to prepare a proposal for the NSF on connections between water and climate change. We debated mechanisms to promote institutional resilience in water institutions for encouraging water conservation; none of us really knew what institutional resilience meant, but we still sent the proposal off on April 15. We discovered a short time later that the proposal would not get funded for various technical reasons. Several of us thought it was a merciful end to a very ambitious program, and that surely no one would ever bother us again about institutional resilience in water conservation. However, about three days later Cathy Ortega Klett said, “Frank, how would you like to give a talk on institutional resilience for water conservation?” But that was back in April, and I thought that December 3 wouldn’t come for a long time. I would have plenty of time to learn something about institutional resilience. So I committed back in April, hoping that I could somehow get it finished. Well here it is, December 3rd, and institutional resilience still presents all the challenges that it did back then.

As I think about what it means to have institutional resilience for water conservation, I am reminded of a photograph of Dulles International Airport. Many of you may have flown into that airport recently, and you will notice that although it is a very beautiful place, it sits out there in an isolated way; it looks like a loaf of bread. If you study the history of that airport, you will discover that they built it to be able to expand to growing

demand if that demand happened, or to shrink in case demand disappeared. So the Dulles people built what you could call structural resilience. As we think about institutional resilience, that airport would be an analogy to sharpen our thinking. Institutional resilience is what we need to set up against a background of growing evidence of water shortages in many regions of the world, with the need to insure food and water security for growing populations.

If you are looking at ways for any river basin to adapt to climate variability and climate change, you need to know something about that basin’s resilience to unexpected changes in demand or supply. Yet, there is little knowledge of measures to improve water institutions that could in fact bring about the increased economic and ecological resilience to an unexpected future.

So with that in mind, my mission here today is to at least try to do three things. I would like to characterize what we mean by resilient water conserving institutions. I’d like to talk about some criteria for how we can identify resilient water institutions. Finally, I’d like to apply some of these principles to four or five well-known water institutions in New Mexico’s Rio Grande Basin.

So what do we mean by water institutions? We could talk about an institution as a rule that affects the development of water, the allocation of water, or the use of water. So we are looking at rules. What kind of rules or social/legal structures might we have to live with that are very important? Certainly international treaties would be a good

one, for example, the 1906 U.S.-Mexico treaty that promises and delivers 60,000 acre-feet of water per year to Mexico at the U.S.-Mexico border. It is a great example of an international treaty or institution that is important to our lives.

Certainly the Rio Grande Compact as well as the other compacts in other states like the Colorado River Compact and the Pecos River Compact are all important. There are 22 compacts in the western U.S., and we live in our immediate area with the Rio Grande Compact, a very important set of rules for allocating water and water shortages as the case may be.

Any kind of trading arrangement would be an important institution. These include things like water trading, water rights markets, water leasing, inter- or intra-basin transfers, renting of water, which is any sort of process to move water from where it is to where it needs to be based on economic ideas of need.

Legislation is a very important institution. The Endangered Species Act has an immense influence on water allocation. It is an important rule governing how water is used. When you look at things like the Rio Grande silvery minnow that requires a certain amount of flows for survival, the Endangered Species Act is a way that legislation has a lot of influence in setting rules on how water is used.

Plain old private water rights are a very important institution. We routinely talk about water rights in our part of the world, but when you look at other parts of the world such as Afghanistan and Iraq, there is no such thing as a water right. So when a drought occurs or other terrible shortage, there is a mad scramble for water; no one knows who has a senior right, no one knows who has a junior right and thus there is massive over-watering in the basin because there is no legal authority to enforce those rights in that part of the world. Water rights and their adjudication are a very important institution.

Adjudications, which state how much water you have a right to, and how that right to use water varies under various water supply conditions, its seniority, is very important. Shortage sharing agreements are important. We are finding in our work in Afghanistan that when supplies fall off in dry years, the question of who has to bear what part of that shortage and how that is enforced has a great influence on food security, water security, and farm income, all important to that part of the

world. For our own part of the world, the Rio Grande Compact is an important shortage sharing agreement. Project operation rules like the Rio Grande Project are another example. All of these are important institutions, and since these institutions are designed and influenced by people, they are certainly not acts of God. They are adjustable and controllable and can be used to deal with future climate change and climate variability.

What might a water conserving institution look like (whether or not it is resilient), as opposed to a water hogging institution? Water conservation is itself a very tricky idea to define, but I would think that any institution that promoted a reduction in use over time, not just less use physically, but less productive use economically, where the benefits exceed the costs of reduced use, could be considered a water conserving institution.

What do we mean by resilient? You might have 120 definitions if you counted up everyone's definition in this room; but I would view a resilient institution as something that has built-in flexibility, something that can adapt to changes in demand for water from things like population, changing values, and changing uses. So when demand changes, the institution would adjust to reduce the suffering caused by unexpected shortages. Of course maybe supply is the bigger force, so when the supply of water changes, we would like our laws or institutions to be able to adjust or adapt to it; supply because of climate change, supply because of drought or flood. Pakistan has much infrastructure, but very few institutions for adapting to recent floods.

Resilience has to do with flexibility and has to do with adaptation: How are we going to evaluate whether or not some particular institution really is resilient? I'm not sure if there are any well-accepted standards out there, but I for one would like to see it be economically efficient in the sense of having the benefits be larger than the cost. I'd also like it to be just and fair. It would be even better if our institutions could be sustainable, if they could last; and it would be nice if they could protect water security and food security, though that's a bigger problem in some developing countries of the world. Certainly protecting water from out of state or out of nation encroachers or demanders would be very important here in New Mexico as other states and other countries are certainly looking at our water.

As we pursue this quest for these institutions, we are looking for measures that adapt, not just

to changes, but to unexpected changes, that is, unexpected demand changes or supply changes or quality changes. The emphasis here is not just adapting, because you'll always adapt, but it would be nice to adapt with minimum economic loss. We are looking for flexibility so that people don't suffer as part of these changes.

My wife, Erin, found this nice photo last night of an efficient structure (Fig. 1), a classic picture of Hoover Dam. The dam is presumably efficient, it only cost \$44 million to build the thing back in the 1930s; it has certainly produced 100 times that much in benefits. So that passes the test of an economically efficient structure. The benefits far exceeded the costs. But what might an economically efficient institution look like? I've looked at my old photo files, and I've driven around the state of New Mexico in this quest after Cathy put me on the hook here six months ago. I went looking for some economically efficient institutions. I found no signs saying that this was an economically efficient or resilient or any other kind of institution. So it's not easy to see an economically efficient institution. Even though you cannot see them, we can define them as a set of rules that produces high economic benefits from the supplies we have. Maybe benefits for irrigation, maybe benefits for urban use, benefits for environmental use, energy use, whatever kind of use we have for water.



Figure 1. Hoover Dam, an economically efficient structure

And, of course, in economics we always love the idea of avoiding using high-cost water for low-valued uses. So a good institution should discourage scarce water from being thrown on non-productive uses. Better yet, it would encourage ways to get scarce water moved from low-valued

uses to high-valued uses. We would like to promote orderly development. When you think about the Colorado River Compact, the Rio Grande Compact and other compacts, those were developed many years ago so each state would know how much water they had coming to them. This helped each state with orderly development of farms and factories and apartments.

As for an equitable institution, Figure 2 is a photo that my wife and I took in Valencia, Spain last June; this is the water court of Valencia. This court convenes at noon every Thursday, at which time it tries to resolve local irrigation disputes. This is a fine and distinguished group of men who normally hang around in jeans, but at the appointed hour, they toss on those hoods to give them a look of distinction so they can debate and deliberate. It is a pretty impressive body and we thought that would be a good example of an equitable institution because it promotes social justice and it promotes fairness. I don't know that they promoted equal opportunity for access to water, but it would be nice if they did. So if our institutions are truly resilient, we want our institutions to be equitable and just.



Figure 2. The Water Court of Valencia, Spain, ranks as one of the oldest democratic institutions in Europe. The Court convenes at noon each Thursday in the center of the city, where farmer-elected judges hear and resolve local irrigation disputes.

For sustainable institutions, Figure 3 is a photo of a gentleman standing by his canal and one would think that he is going to sustain his water right. I'm not sure if that is a shotgun or a shovel that he has in his hand, certainly if that were in the Rio Grande Basin, there would be a



Figure 3. Gentleman protecting his water supplies

shotgun. He is forcing his sustainable institution with a shovel in this picture. What do we want sustainable institutions to do if resilience is going to mean sustainability? We certainly would want to keep our aquifers from being depleted; we would probably want to encourage institutions to use only renewable supplies of surface or groundwater but certainly we think of surface water as a more common renewable resource, although some aquifers are rechargeable. We would like our institutions to last for many generations. Eleanor Ostrom who won a Nobel Prize a year ago in economics, did lots of writing on institutions. Her work is relevant to our part of the world. If you like an institution and it is truly resilient, it will probably be lasting for a long time. I like the looks of the Rio Grande Compact; it has been around since 1936, it has a pretty good chance of being sustainable, and we'd want our water supplies to be sustainable and we would want the human right to water.

How would we score water institutional resilience? I have three or four rather interesting examples of great local importance. I looked at some important local institutions: the Rio Grande Compact; the U.S.-Mexico treaty of 1906; the U.S.-Mexico Groundwater treaty, which as you know doesn't exist yet; domestic well development that's being debated in the courts right now; and stream and aquifer adjudication.

The emphasis of table (Table 1) is on how all these institutions, existing or proposed, would be altered if you allowed water trading; without trading versus with trading. Generally, the message of this table is that with trading, it certainly gives rise to greater efficiency; water has a greater chance

of moving from where it is to a higher valued use. Water trading can promote equity, although it is less likely to than without trading in some cases. And aquifer sustainability is another piece of the criteria. This table emphasizes lots of things, but probably any institution with trading has a greater probability or likelihood of passing the test of resilience.

Table 1. Impact on efficiency with and without trading

	<u>Efficiency</u>	<u>Equity</u>	<u>Sustainability</u>
Rio Grande Compact			
without trading	medium	high	low
with trading	high	medium	low
U.S. Mexico Treaty 1906			
without trading	low	low	low
with trading	medium	medium	low
U.S. Mexico Groundwater Treaty			
without trading	medium	high	high
with trading	high	medium	high
Domestic Well Development			
no offsets required	medium	high	low
offsets required	high	medium	high
Steam/Aquifer Adjudication			
without trading	medium	high	high
with trading	high	medium	high

What are my concluding points? Identifying resilient and water conserving institutions is complex. It is very important that even if you can't see them, they are pervasive, affect our lives, and they are mired in controversy. Good institutions will complement good infrastructure. Afghanistan has no institutions and no infrastructure for sharing shortages. So building great institutions with no structures won't help much. Any search for resilience should be open and debated and transparent. I like watershed policy models, so I would say the discovery of good institutions could be informed by hydrologic and economic models. Models force you to confront your assumptions.

Thank you.