

# **Frames and Ways of Knowing: Key Considerations for Policy Response to Climate Risk and Vulnerability**

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## **Abstract**

This paper argues that a resilience and adaptability in face of climate change is largely dependent upon the ways in which framing occurs and knowledge is produced and diffused in particular communities and contexts. Climate change problems are contextual, multifaceted and complex, engendering wide variation in social sense making and invoking different formulations of facts and relevant knowledge. Transferring and translating information among different ways of knowing and transforming ways of knowing so that they are more inclusive and accepted is critical to adaptability and resilience. Examples from the American West and Latin America illustrate that only when multiple frames and ways of knowing are incorporated and transformed can policy respond to climate risks related to water resources.

## **Introduction**

Multiple, overlapping and often conflicting framing and ways of knowing the issue of climate change are the major impediment to understanding climate risk and vulnerability and making science more relevant to decision making. The development of physical climate models, where science has expended most of its attention to producing knowledge, indicate that magnitude of effects of change vary depending on factors including, among many others, geography, regional meteorology, and ecology. Similar variation in the magnitude of impacts occurs in social, political and economic risk and vulnerabilities to climate change, but this knowledge is neither as well produced nor as widely utilized in decision making. People's vulnerabilities vary with their position within social and political geography/space. Accumulated consequences of poverty, poor health, dislocation, lack of education and the like exacerbate vulnerabilities. Even less well understood and more important for this paper, there are important variations in the way different people in the same or dissimilar contexts perceive issues and assess and act on risks. In assessing climate related risks, people draw upon such sources as identity, culture, social interactions, place-based practical experience, moral reasoning, intuition, and myth that lead them to adopt different frames and ways of knowing.

This paper will first consider the evolving ideas of physical and social vulnerability. The argument will then move to a consideration of framing and the existence of multiple and dynamic frames within a problem space (Dewulf et al, 2009). Frames invoke knowledge and privilege some facts, ideas and relationships over others. Multiple frames are accompanied by multiple ways of knowing. For climate change science information about risk and vulnerabilities to modify or transform existing frames and ways of knowing, collaborative interaction must take place. Communications about risks and vulnerability of climate change need to engage recursive and interactional relationships employing boundary spanning tools such as boundary organizations, objects and experiences.

### **Evolving Concepts of Vulnerability and Risk**

Up until the last decade, science related to risk and vulnerability to climate change usually engaged only one or a few ways of knowing dominated by experts that had comparable framing and engaged similar epistemologies. Scientists calculated risk on the basis of probabilities of certain physical events or phenomena taking place and communicated through ratios, scenarios, forecasts and reports. These kinds of risk assessments overlooked the inseparability and linkages of physical and social sides of risk and vulnerability (Berkes and Folke, 1998; Rolfe, 2008). Susceptibility to risk is only partly a function of characteristics of physical exposures (frequency, magnitude, duration, extent and the like). Equally important are characteristics of the community or sector such as resources, physical and social capital, and coping mechanisms (Rolfe, 2008).

Vulnerability to climate change is affected by politics and culture. Mike Hulme (2008) argues that contemporary discourse about climate change and climate science can not be separated from broader cultural settings including images of catastrophe, apocalypse and fear of the future. Climate change risks and vulnerabilities do not so much happen to societies, but instead are constructed and used to serve different purposes, values and meanings. How sectors and communities respond to the risks and vulnerabilities associated with climate change depends upon such concerns as how climate is exploited to commodify the atmosphere, inspire global social movements, or advance different ways of knowing (Hulme, 2008).

A large gap is frequently observed between expert assessment of risks and public perceptions of risk and vulnerability. Ordinary people do not perceive risks as do scientists. Social studies of science scholars like Brian Wynne (1996) cite cases in which failure to

incorporate local knowledge in deference to that of experts has led to mistaken policies inappropriate to particular contexts. Thatcher (2007) argues that experts systematically disvalue things because they do not share the experiences of ordinary people. Thatcher argues that ordinary people do not make “errors” of judgment when confronted with weighing benefits and costs and probabilities, but instead factor in different values that have an emotional component. Ackerman and Heinzerling (2004) similarly argue that expert conducted cost-benefit analyses differ significantly from moral, cultural, and emotional bases people use for assigning values to human life, health, nature and the future.

The mechanism whereby scholarly and scientific knowledge about risk can be engaged in decision making on complex problems being variously framed and engaging many ways of knowing is being critically reexamined. Recent research indicates that effective risk assessment must occur through a process and practice of engaging potential users who may have differing views (NRC 1989, 2007). Putting out prepackaged information is a kind of ‘loading dock’ model of providing support for policy that does not work (Cash et al, 2006). Communication means collaboration and involves effective multiparty, iterative, recursive discourse and focuses upon human relationships and networking. Characterization of risk is constantly evolving and shifting as different information users/generators learn from and adapt to one another (Feldman and Ingram, under review; US Climate Change Science Program, 2008).

### **Multiple Frames and Ways of Knowing Climate Change**

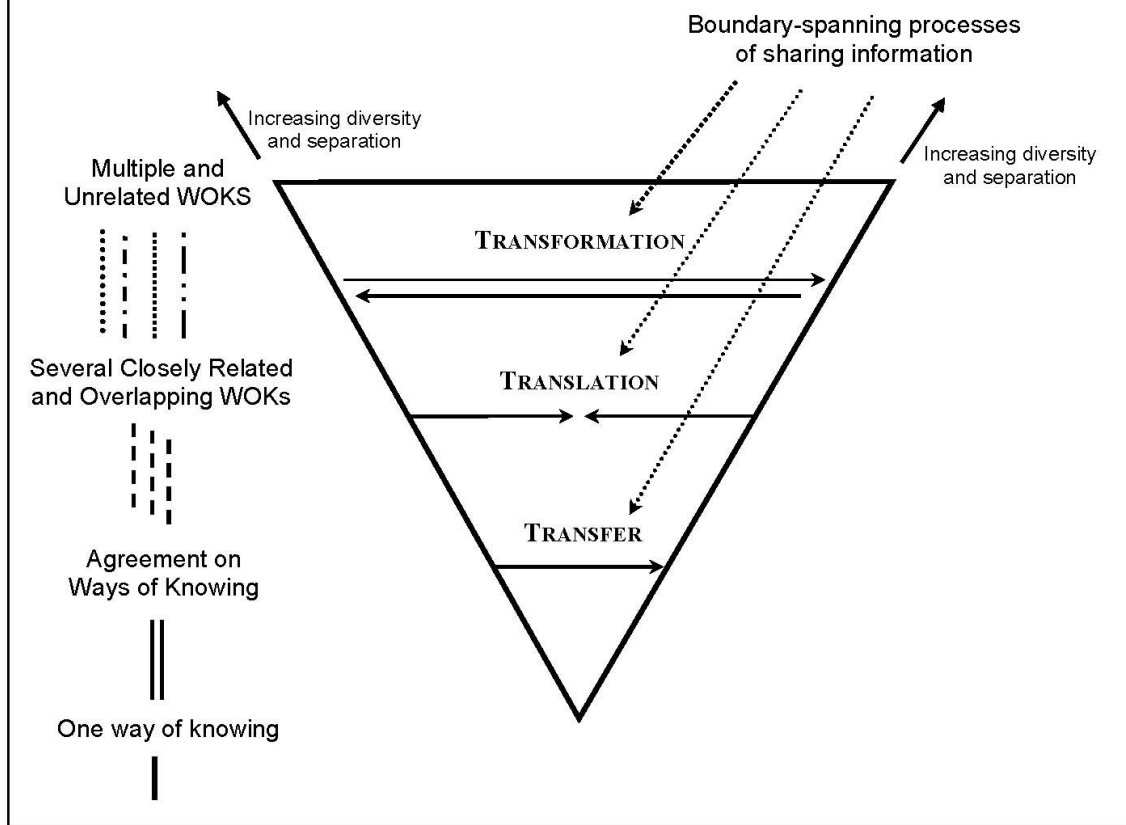
Framing is a social sense-making device that creates meaning by selecting certain issue elements and arranging them in a meaningful way. For instance, “nature” is framed in a number of different ways that are partially conflicting and in flux, including nature as a pristine Garden of Eden, as uncertain and risky, and as avenging angel for past sins (Cronon, 1996). Multiple frames on an issue like climate change creates great ambiguity as information critical to one framing is irrelevant to another. Framing of climate change risk as a problem that can be overcome by physical infrastructure and social preparation foregrounds knowledge from engineering and planning disciplines. Framing climate change as an equity problem of burden sharing between the developed world that has profited from greenhouse gas production and poor countries that have produced few problems but experience the most negative consequences

invokes normative philosophy and historical and political analysis of the consequences of colonialism and imbalances of power among nations.

Ways of knowing are linked to frames and provide the underlying logic or rationale (Dewulf et al, 2009). Ways of knowing are a relatively new concept in inclusive management and policy analysis (Feldman et al, 2006; Schneider and Ingram, 2007; Weber and Khadamian, 2008; Ingram and Lejano, forthcoming; Schneider and Ingram, 2007). A way of knowing is an assemblage of heterogeneous elements that relate to a particular framing or understanding of a specific situation, problem or policy. Ways of knowing are created through communication, discourse, and relationships. Ways of knowing an issue, policy or problem are most often multiple even for a single individual. Rational self interest is only one way of knowing about a problem, and this way of knowing may or may not be relevant in particular issue situations. People have a large repertoire of cognitive and emotional tools beyond self interested rationality such as authority, intuition, moral reasoning, direct experience, logic, belief or faith, mysticism, etc. that contribute to their capacity for comprehending a problem situation in multiple ways, rather than just as one stable, established way. Any one of these perceptual lenses may become more or less relevant through reframing, continuous discourse, and engagement and learning. Knowing is a social process, and it is formed and molded by interacting with others in specific, grounded, situations.

Carlisle (2004) is helpful in understanding how some differences between ways of knowing can be understood and overcome by working with the commonalities, those things that are shared and familiar, and recognizing and transforming the differences among things that are unfamiliar and not shared. Figure 1, adapted from Carlisle, portrays three levels of differences among different ways of knowing as well as the boundary spanning kinds of communicative relationships that must be engaged to overcome impediments and to foster collaboration.

**Figure 1: An Integrated/3-T Framework for Information Sharing Processes Across Boundaries of Increasingly Diverse Ways of Knowing (adapted from Carlisle 2004)**



At the lowest level of potential collaboration only one way or a few very similar ways of knowing are involved and most elements are shared between different adherents, perhaps organizations like electric or water utilities that have much in common. Policy approaches and strategies in this situation often move information in one direction from the better resourced, more advanced, technologically sophisticated, more popular entities to other groups with lesser developed capacities but the same basic perspectives. The barriers to information transfer are fairly low. This level of boundary spanning is best characterized as training or capacity building.

The second level of collaboration among several closely related and overlapping ways of knowing is translation. In this case related ways of knowing must incorporate new elements as a common language, or shared meaning. Different ways of knowing contribute to the creation of common terminology and definitions that are essential to exchange. Knowledge transfer may be facilitated by mechanisms to encourage working teams that cross different ways of knowing, co-location of participants in the same geographical areas, the creation of a jointly produced project

(boundary object) that engages two or more parties, and legitimizing the position of brokers or translators (Carlisle, 2004).

The third level of collaboration, or transformation, involves bridging unrelated ways of knowing and requires innovation in new framing and ways of knowing, adding innovative perspectives, and elements not previously present. Boundaries become more inclusive and all ways of knowing undergo alteration as new ways are jointly created. This level of collaboration is most challenging, and most relevant to complex climate change governance. Collaboration at the third level of transformation presupposes that the conditions of the other two levels have already been satisfied. That is, different ways of knowing have already shared skill-based know how and have a common vocabulary. The third level involves the development of more inclusive conceptions of issues and problems and more complex and multifaceted logics of social and physical interactions. Risk and vulnerability related to climate change, for an instance, encompasses multiple physical and social systems at different scales and numerous underlying logics. Ways of knowing climate change problems diverge in terms of the kinds of physical manifestations fore-grounded such as energy, air, water, agriculture, and the like. There are also differences in the values stressed that range from economic efficiency to equity to the survival of particular ecosystems and species.

Different collaborative policy tools can create networks across boundaries depending upon the number of ways of knowing that are relevant, the degree of overlap among ways of knowing, and whether the collaborative challenge is simple information transfer or requires more demanding translation or transformation. Scholars identifying policy strategies and tools for collaboration have reached virtual consensus on two points (Dryzek, 1990; Hajer and Wagenaar, 2003; Innes and Booher, 2003). One is that people from a variety of points of view must be brought together to engage in discussions that lead to more tractable problem definitions and policy solutions. How this occurs, whether through focus groups, boundary organizations, citizens' conferences or other means, matters less than the opportunity for learning. A second point of agreement is that this type of face-to-face engagement has the potential for bringing about trust, shared experiences, empathic understanding, positive relationships, and other community oriented consequences that will enable people to work toward new ways of knowing that are more amenable to collective solutions (Innes and Booher, 2003; Ostrom, 1990). Boundary objects (Star and Griesemer, 1989) provide an artifact such as a model, scenario,

template, prototype, compact and the like that draws upon necessary but different ways of knowing and enhances mutual understanding among different ways of knowing. Boundary organizations, like advisory committees or task forces drawing upon science and lay members, may perform similar services across organizational boundaries (Jasanoff, 1990; Guston, 2001). Shared or boundary experiences, where not only do people experience the same thing but also talk about it, also facilitate collaborative action (Feldman et al, 2006).

### **Water Management, Risk and Vulnerability**

Water resources are an especially appropriate sector in which to examine how resilience in face of increasing climate change related risk can come about. Water supplies have always varied according to changing weather patterns, and climate change promises to exacerbate this variability and increase the frequency of extreme events. Water managers have developed their own mechanisms for hedging against such things as droughts and floods through physical structures like dams and storage reservoirs and various strategies of demand management and emergency planning. There is hardly a consensus about water management, and water has been identified as being highly contentious (Conca, 2006). Expert water management is regularly contested by environmentalists, developers and human rights advocates each focusing on different aspects of multifaceted water and relying on divergent knowledge drawn from disciplines like ecology, economics, politics, anthropology, history, and normative philosophy (Blatter and Ingram, 2001; Whiteley et al, 2008). Examining some cases where climate related water risks are high and multiple frames and ways of knowing present governance challenges is instructive.

**Urban Water Rate Increases.** Water professionals have long argued that water rates, especially in urban areas, are too low almost everywhere. The true costs of providing urban water service are rising rapidly. Increasing price to reflect these rising costs can be a signal of both the growing risks of scarcity of the resource, and the increasing costs of water quality and flood protection. Logically, water rate increases in face of an uncertain water future would seem to be part of urban water governance. Yet problems encountered in raising water rates in the cities of Tucson, Arizona and Cochabamba, Bolivia explain why relatively low water rates persist. In both cases, rate increases attached to framing and ways of knowing that were too narrow and ignored other widely resonating frames. While temporarily transferred into policy, the necessary translation

and transformation needed for sustained implementation did not occur. Instead of bringing people together, rate increases widened differences.

Tucson Arizona is especially vulnerable to climate related drought. Urban water supply depends upon groundwater aquifers that are being rapidly depleted and flow diverted from the over allocated and unreliable Colorado River. The legacy of extreme political backlash from an attempt in the 1970s to increase water rates continues to inhibit the aggressive use of higher rates to signal increasing water risk (Martin et al, 1984). A cadre of environmentalists elected to the city council framed the city's increasing water problems as part of the cost of excessive growth and insensitivity to the natural aridity in a desert city. In this frame, water was viewed as a sensitive and vulnerable element in nature. Excessive outdoor watering reflected in great differences between customers' summer and winter water use were subjected to punitive rate increases sometimes double or triple previous water bills. Further, new houses associated with urban sprawl that spread to the foothills of the Catalina Mountains were subjected to increased water connection fees and a lift charge associated with increased cost of pumping water to higher elevations. A public outcry ensued that led to the recall and replacement of environmentalists on the city council and a roll-back of water rates.

Opposition political forces drew upon powerful opposing frames. Water and economic development have long been associated in the Southwest, and public utilities are expected to insure access to plentiful water supplies. Los Angeles set the example of an economic miracle when imperialistic city fathers laid claim to not only the resources of rural neighbors like the Owens Valley but also to a lion's share of the Colorado River. In their zeal to pursue their own vision of environmental stewardship, Tucson city council members failed to reach out with arguments and policies that might have been attractive to the economic development frame. Such an argument might have portrayed more economically rational water pricing as part of economic security, assuring both water and financial resources into the future. In the end, replacement council members were forced to make modest water rate increases for just such security reasons. Tucson public and utility officials have since avoided any connection between risk and vulnerability of water supplies and growth management.

Environmental oriented city officials also failed to recognize the appealing frame that related water to human rights and fairness. Affordable water is widely regarded in the American West and elsewhere is practically a birthright. While it might have been possible to brand

residents with huge lawns and swimming pools as water hogs, the steep rate increases faced by middle and lower income water users were perceived as unfair. It was clearly insensitive to initiate rate increases in June when big increases in water use always accompany highly elevated desert heat. After the recall election that replaced offending city officials, the water utility has slavishly adhered to small, incremental rate increases. Water rates are justified only on the basis of cost of service, not as a stimulus to conservation. Further, utility managers have learned that too much water conservation without base rate increases depletes their coffers and leaves them with inadequate resources.

In Cochabamba, Bolivia, steep water rate increases were an element in a broader neoliberal framing that looked to private enterprise and economic principles like full cost recovery pricing to reform the poorly performing water sector (Schouten and Schwartz, 2006; Baer, 2008). Coverage of urban water service reached only 57 percent meaning that 43 percent had to rely on other sources such as community service providers, private wells and private vendors. Matters were made worse by water scarcity caused by drought and excessive water use. Even those with service experienced frequent outages. To cover the cost of system upgrades, the private concession contracted by the government to run the utility for 40 years required all water users to switch to their company for service and sharply increased rates even though this increase was not accompanied by an improvement in service. Resistance to neoliberal policies was already on the upsurge, and water rates increases turned out to be the tinderbox that ignited widespread and ultimately successful protests. Opposition depended on framing of human rights and equity, and branded as unjust not only rate increases but also the process by which contracts were let and decisions were made (Baer, 2008). No public participation had occurred during very hurried procedures that did not engage dislocated and angry community systems and vendors. While ultimately the private contract was cancelled, no substantive improvement has resulted in water service. Professional water providers have lost all confidence and legitimacy in the eyes of water users, and there is neither the expertise nor the agreement among the dominant ways of knowing water as a human rights and equity issue to actually administer the water utility effectively. Unless water rate increases can become integral to framing and ways of knowing beyond the narrow environmental, privatization and market perspectives, they cannot be successfully adopted.

**Transboundary, Collaborative Water Management.** The Bear River Basin in the Rocky Mountain region of the United States is characterized by a highly variable, snow-driven montane ecosystem subject to recurring drought. Climate change science predicts this region will become increasingly vulnerable to hydrologic variability and overall scarcity of water supplies in the future. Looking at the history of how people have adapted to the region's variable climate and hydrology offers important insights for understanding how boundaries among multiple frames and ways of knowing can be bridged and transformed.

Drought adaptations in the Bear River Basin can best be “characterized as a historically contextualized process where ways of knowing the particular interdependencies of human hydrology in a place are brought to bear on solving problems of water scarcity” (Endter-Wada et al, under review). Over time, people in the Bear River Basin have come to better understand the dual physical risks of droughts and floods posed by the region's hydrologic variability and their own management of its rivers, lakes, and reservoirs. Equally important, they have come to know various risks associated with their interdependent use of water and ways in which their own decisions and choices exacerbate or ease vulnerabilities at particular times, in particular locations, and under particular circumstances. New ways of knowing the intersections between physical and social risks and vulnerabilities emerged through a long, historical process of human interaction and discourse whereby people sought to understand the basin's particular hydrologic complexities, struggled to make sense of their own changing political-economic circumstances, learned the meanings of specific impacts, and negotiated agreements and adjusted practices in light of these evolving understandings.

Since European settlement, various boundary-spanning processes of information sharing have been used in the Bear River Basin to deal with human-hydrologic risks. Settlers were united in their framing of water as the key to survival, and its beneficial use as a practical way to fulfill the nation's vision of manifest destiny and the Latter-Day Saints' goal of creating Zion and making the desert bloom. In that context, risks and vulnerabilities mainly related to potential conflicts in times of scarcity between different beneficial uses that diverted water. Information sharing was aimed at recording and publicizing people's claims and rights to water in order to protect them and to notify others as to the legal security of their own access to water.

Over four decades after Europeans created permanent Bear River Basin communities, the states of Idaho, Wyoming and Utah were established. Each of these framed water as essential to

development, made water the property of its public and adopted prior appropriation water laws. While these states agreed on ways of knowing water, information transfers became more complicated as each state independently allocated the shared waters of the Bear River to private use within their borders and the need for coordination increased. Beneficial uses of water become more diversified over time as the regional economy matured, requiring translation between different ways of knowing how to meet and coordinate the needs of different types of users, such as agricultural diversions and in stream flows for hydropower production.

A severe drought in the 1930s served as a boundary experience leading people in the Bear River Basin to engage in a long period of negotiations and struggles to establish an interstate water compact. Promoting beneficial use of water for economic development was still the overriding frame, but diversity emerged related to people's geographic locations on the river and the varying effects of proposals for developing storage and integrating management of the river. The common development frame was informed by the different publics within the borders of the three states and included needs outside the Bear River Basin's boundaries. Interactions and discourse over forming a compact had to span differences related to administering priorities across state lines, integrating principles of equitable apportionment between states with existing private rights to use water, providing for natural flow and storage rights, and balancing various site-specific concerns. Negotiations finally resulted in a boundary object, the Bear River Compact of 1958, and a boundary-spanning organization, the Bear River Commission. These two tools were transformative, instituting a new way of knowing the Bear River through interstate coordination and comity. These tools facilitated information transfers and translation processes, brought interests back into closely aligned ways of knowing the river, and become an accepted and embedded part of the river's administrative context.

The regional political-economy of the Bear River Basin has continued to change. New frames informed by amenity, aesthetic, recreational and ecosystem perspectives contend with the still relevant economic development frame. Water management increasingly involves working across the boundaries of multiple governmental agencies and numerous stakeholder groups. Challenges include managing the river's highly variable resource in a predictable manner for people who are linked to and understand it in very different ways, and having this management occur in separate but loosely connected forums for discussion, debate and decision-making.

In 2004, the Bear River Basin experienced the worst drought year since the 1930s. Despite fears about conflict, the season resulted in an extraordinary level of cooperation. Three connected boundary objects and experiences were responsible for this particular outcome. First, in response to a drought in the early 1990s, a precedent-setting voluntary settlement agreement was reached in 1995 (and restated in 2004). It provided for a scaled reduction in irrigation and hydropower deliveries tied to declining levels of Bear Lake. This agreement bridged very different ways of knowing held by lake recreational property owners and downstream irrigation and hydroelectric power users dependent on storage water from the lake. Second, in the period between the drought of the early 1990s and 2004, much technical work was done in instrumentation and hydrological modeling of the river which provided basin-specific, real-time flow-accounting information on water deliveries and diversions. Use of this information alleviated suspicions and conflict through creating transparency, accountability, and better delivery coordination and efficiency. Third, open conference calls hosted by the power company twice a week throughout the irrigation season allowed for extraordinary communication and coordination of water delivery schedules between anyone who chose to join the calls. Embedded in a history of ongoing dialogue, the informational and relational working and reworking paid off in reducing conflict that often emerges in drought situations.

## **Conclusion**

Policy response to climate risk must be informed by science, but science needs to change to become more inclusive and engaged. It is not sufficient for climate science to simply add consideration of social aspects to the physical vulnerabilities that have been primary concerns. Science must also focus on risks not revealed through rational reasoning. Perceptions of climate risks spring from identity, culture, moral reasoning, intuition, social interaction and other sources. Vulnerability to climate change is not so much shaped by objective assessments of the likelihood of physical and social exposure that have been the focus of science. Rather, how climate issues are framed and what are regarded as facts and knowledge determine what public and policy attention the issues get. Framing and ways of knowing are social sense-making devices through which people filter what is salient and important, and identify what facts and knowledge are relevant. As such, they are legitimate subjects of climate science.

As the cases from the water sector cited in this paper illustrate, narrow framing relying on only one way of knowing often defeats what could be appropriate policy for scarcity. In contrast, boundary work that engages in recursive and interactive communication across differences and encourages transformations toward more inclusive understanding is more helpful. Climate scientists must be active participants in such work.

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