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## Projected Climate Change Impacts on our Water Resources

## WATER LAW REVIEW 2010 SYMPOSIUM: WATER LAW AND CLIMATE CHANGE, PLANNING IN AN UNCERTAIN FUTURE

Denver, Colorado      April 9, 2010

### PROJECTED CLIMATE CHANGE IMPACTS ON OUR WATER RESOURCES

Brad Udall is the director of Western Water Assessment at the University of Colorado – National Oceanic and Atmospheric Administration. Mr. Udall's work focuses on global climate change's impact on water supplies, particularly in the western part of the United States. He holds a Bachelor of Science from Stanford University and Masters of Business Administration from Colorado State University.

Mr. Udall's presentation focused on four main issues related to the connection between global climate change and the water supply system. First, Mr. Udall stated the science of climate change is unequivocal, and we have already experienced the effects of global warming. Second, climate change will seriously impact global and national water supplies. Third, hydrologic effects will stress water supply mechanisms and lead to conflicts. Fourth, climate change will seriously impact the Colorado River Basin and create unique challenges for water users. Altogether, global climate change has seriously affected water resources and will only continue to stress limited water supplies.

Currently, the debate regarding climate change still focuses on whether climate change will actually occur and what the effects will be. Although the debate rages on, it is clear that ninety percent of climate models agree that we will experience substantial warming before the end of the century. Scientists have studied global warming since the late nineteenth century and have detected warming trends over the last three decades. While there is some dispute regarding the range of effects, the evidence demonstrates that man-made greenhouse gasses have contributed to a one degree rise in the twentieth century, and we have already "locked in" a two to three degree rise by 2030. At current emissions levels, man-made carbon emissions will directly or indirectly heat the earth six to eleven degrees by the end of the century. While doubling the amount of carbon dioxide in the atmosphere accounts for two degrees of this change, the cumulative impacts, especially increased moisture in the atmosphere, exacerbates the problem. Uncertainty in the science does not excuse policy makers from making tough decisions regarding climate change that require delicate interest balancing.

As climate change continues to occur, water temperatures will rise, precipitation patterns will change, ocean heat content will increase, atmospheric moisture content will increase, and arctic sea ice levels will decrease. Higher overall air temperature increases water temperature, which affects aquatic wildlife habitat and increases evaporation. Increased water temperatures decrease dissolved oxygen content and increase pathogen concentration, thereby making water unable to support wildlife and unsuitable for human contact. Climate change will also extend the growing season. As air and water temperatures rise, storm patterns will shift north in the northern hemisphere and change the locus of precipitation. Storms will also tend to be downpours, substantially increasing erosion and accelerate runoff. Further, glaciers and arctic sea ice will melt and increase sea levels.

These changes will affect the water sector substantially. Overall, climate change will influence the water cycle by shifting the locus, timing, and duration of precipitation, beginning in lower elevations. In general, precipitation events will become more concentrated and severe. There will be less summer rainfall and runoff will begin sooner and occur more quickly. In arid areas, droughts will occur more frequently and persist longer. In moist areas, precipitation will increase and become more violent. Consequently, dry areas will experience more conflict over water supplies and wet areas will struggle to assimilate increased precipitation. These conflicts will be particularly apparent where large populations in arid places already stress water supply and control systems.

Climate change will substantially, if not ironically, impact energy production. Thermoelectric energy is the largest non-consumptive use of water in the West, where climate change will impair water supplies. Thermoelectric energy production is also a leading source of greenhouse gas emissions. Not only will climate change decrease water supplies for energy creation, but also higher water temperatures will reduce power generation in fossil-fuel fired and nuclear power plants.

The Colorado River Basin will experience the effects common to arid climates, including increased incidence of drought. The basin is already over-appropriated, and significant decreases in water quantity will intensify conflicts. Indeed, the basin has already experienced the primary adverse effects: drought, large fluctuations in storage, and decreased flow. Climatologists agree that if the current pattern persists, the basin will experience a five to forty-five percent decrease in water quantity, with lower elevations bearing the brunt of these impacts. Ultimately, the Colorado River Basin may see severe impacts such as persistent drought and reservoir drying.

In conclusion, the uncertainty regarding the potential impacts from climate change does not dismiss policy makers' obligations to address the certainty of climate change. Globally, the polarizing effects of climate change will be a calamity. Dry areas will become drier, wet areas will become wetter. Precipitation will move further north and become

more difficult to manage. Water short areas, such as the Colorado River Basin, will face conflict and uncertainty over water supplies. If Congress and the global community fail to address the issues, water systems will no longer function sufficiently to meet the demands of a growing population.

*Daniel Vedra*

#### THE DORMANT COMMERCE CLAUSE AND WATER EXPORT: OPEN FOR BUSINESS OR SUCKERS BEWARE?

Professor Christine A. Klein of the University of Florida Levine College of Law began by discussing the water regulation challenges currently facing states. States have a greater interest in importing water rather than in exporting water, particularly with the increasing stresses on water resources. Professor Klein noted that many people are sensitive to water exportation. As an example, she referenced a billboard depicting people from around the country with straws into the Great Lakes water supply. Professor Klein then addressed whether states should have the ability to restrict water export.

As background, Professor Klein discussed *Sporhase v. Nebraska*, 458 U.S. 941 (1982). In *Sporhase*, a landowner, who owned property in both Colorado and Nebraska, wanted to irrigate the Colorado property with Nebraska water. The state of Nebraska brought action under a Nebraska statute to enjoin the landowner from using the water in this manner. The United States Supreme Court struck down the Nebraska statute, finding it violated the Commerce Clause. Thus, the Court held that a ban on exporting water across state lines is unconstitutional.

Professor Klein thought the question the Court asked in *Sporhase* of whether water is an article of commerce was the wrong question. Instead, she said that the Court should have asked whether the export of water has an effect on interstate commerce. As a result of asking the incorrect question, *Sporhase* overrode state water law. Following *Sporhase*, courts struck down various state and federal regulations preserving the states' regulations of water law. However, the Court started recognizing congressional limits on the Commerce Clause in *United States v. Lopez*, 514 U.S. 549 (1995), thus slowly giving states more regulatory authority.

In terms of reform, Professor Klein suggested that states, the federal government, and individuals consider water along a continuum instead of a "one size fits all" article of commerce. She argued that courts need to evaluate whether the actions or regulations in a specific context or case interfere with interstate commerce. To show the complexity of water law issues, Professor Klein provided a categorical listing of different water classifications and possible applicable doctrines. As such, Professor Klein advocated for a more nuanced analysis of water export cases.

Professor Klein perceived that the courts are diminishing the