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Climate Change and Water Resources Law: A Looming Adaptation Crisis

it difficult for conservation groups to incentivize ranchers to preserve agricultural land rather than sell the land to developers. One suggestion posed by McCloy involved state funding for a more sustainable water project to match population growth and demand, diverting attention away from ecologically special high-country areas.

The panel concluded with a brief discussion on three relevant and timely topics: The Walton Family Foundation Report, agricultural water conservation, and leasing/fallowing under Colorado House Bill 1248.

The Walton Family Foundation funded a collaborative effort, working with interested stakeholders, to identify innovative ways to allow water transfers from agriculture to urban use while avoiding or mitigating damages to agricultural economies and environmental values. The report evaluated novel water sharing strategies, and developed actionable recommendations to improve water-sharing opportunities in the Colorado River Basin and throughout the West.

Discussion on agricultural water conservation centered first on the issue of how to define such conservation and, second, whether agricultural water conservation can contribute to instream flows or municipal supply. The panel had difficulty answering some of the hard questions on the topic but agreed the problem is still a work in progress.

This discussion led to the topic of House Bill 1248, which authorizes the Colorado Water Conservation Board to administer a pilot program consisting of up to 3 pilot projects, each up to 10 years in duration, in the lower Arkansas River basin. The projects intend to experiment with fallowing agricultural irrigation land and leasing the associated water rights to municipal users in years of shortage.

Overall, the panel spoke positively about the Walton Family Foundation Report, agricultural water conservation, and HB 1248, and viewed each as progressive support for building a creative new approach to Western water management.

Heidi Ruckriegle

CLIMATE CHANGE AND WATER RESOURCES LAW: A LOOMING ADAPTATION CRISIS

Denver, Colorado August 29, 2013

On August 29, 2013, the University of Denver Sturm College of Law was honored to welcome Associate Professor Alex Gardner of the University of Western Australia (UWA). Professor Gardner began his legal career as a solicitor in Melbourne, Australia, before receiving his Master of Laws in natural resources law at the University of British Columbia. Professor Gardner has been on the UWA Faculty of Law since 1988. During this time, he has worked with numerous research centers including the UWA Centre for Mining, Energy and Natural Resources Law, the National Center for Groundwater Research and Training, and the Cooperative Research Center for Water Sensitive Cities. Professor Gardner also holds an Adjunct Professorship at the Australian National University College of Law.

Following a warm welcome, Professor Gardner introduced his presentation, entitled *Climate Change and Water Resources Law: A Looming Adaptation Crisis*, with a brief overview of the impacts of climate change on southwest Western Australia, especially declining precipitation and rising temperatures. These impacts will have serious ramifications for water resources management in the state and adaptation will be necessary in order to secure enough water for both human consumption and environmental preservation. According to Professor Gardner, an important part of that adaptation for Western Australia will ineludibly require reformation of its water law, especially the right to take and use water.

Professor Gardner then gave a brief overview of the foundations of Australian water law. Australia is a federation of six states. Its constitution is a marriage of English parliamentary democracy and American federal democracy. The Australian Constitution distributes legislative power and sovereignty over natural resources between the states and the Commonwealth (national) Parliament. The Commonwealth Parliament, like the United States Congress, has limited, enumerated legislative powers. Importantly, those powers do not include the power to legislate with respect to natural resources, while the states retain the "residual" power to make laws regarding anything, including natural resources and water. The Australian Constitution also gives states sovereignty over natural resources, giving them the power to grant rights to take and use water.

Professor Gardner explained that current Australian water rights laws are based on a mixture of the English common law riparian tradition and more modern licensing regimes encompassed by state statutes. Under this system, landowners have the right to take and use water for domestic purposes, including livestock watering, while water use for commercial purposes requires procurement of a state license. According to Professor Gardner, the general goal of water management laws in Australia is ecologically sustainable development, with heavy emphasis on setting aside sufficient water to maintain the environment *before* determining the amount available for consumptive use.

Professor Gardner next described the current scientific understanding of climate change impacts on southwest Western Australia. Specifically, a recent report by the Australian Climate Commission shows that declining rainfall and increasing average temperatures are beginning to have serious negative impacts on agriculture and urban water supplies in southwest Australia. Even during the recent La Nina event, which caused much of the rest of the country to experience heavy rainfall, the southwest remained dry. Additionally, recent projections for annual rainfall over the next twenty years almost unanimously predict continued drying in southwestern Australia. Professor Gardner pointed out that recent studies by the Indian Ocean Climate Initiative all but confirm that rainfall reductions in southwestern Australia are consistent with human-induced climate change.

Professor Gardner then described the water infrastructure and water needs of the southwest. Southwest Western Australia has a rapidly growing population of roughly two million with an economy historically rooted in agriculture and mining. Traditionally, the southwest relied on surface water but is

now heavily reliant on groundwater in order to make up for declining precipitation.

Total water consumption in the southwest increased steadily during the last decades of the 20th century. However, Professor Gardner highlighted the fact that recent data show total consumption in the region is stabilizing, population increase notwithstanding. This trend reflects the growing recognition of water scarcity and the success of reductions in per-capita consumption. In spite of this, per-capita consumption remains relatively high by both Australian and international standards. In fact, without further adaptation, growing demand coupled with shrinking supply due to climate change will produce a water shortage of 365 gigaliters by 2060.

Professor Gardner then focused specifically on the effects of climate change on the water supply serving Perth, Western Australia's largest city. Traditionally, Perth relied primarily on surface water, especially for its public water supply. As surface water supplies began to dry up in the late 1970s, Perth began to increase its reliance on groundwater resources and finally resorted to desalination in the early 2000s. However, according to Professor Gardner, even with increased use of desalination, these combined sources are proving insufficient in the face of a rapidly drying climate. In the future, water resource managers will need to find other water sources to meet the demands of a rapidly growing population.

Professor Gardner, with input solicited from the audience, then proffered several possible supplementary supplies that Perth could look to in the future. For example, Professor Gardner suggested wastewater recycling, increased conservation, and inter-basin transfers. However, using these supplies presents various obstacles, including ecological concerns and political opposition. Professor Gardner therefore identified "managed aquifer recharge" as one of the more promising solutions.

Professor Gardner next discussed each of Perth's current main water supplies, beginning with the Perth Hills Dams, the major source of surface water for the city. Distressingly, over the past century, average run-off into these dams has fallen by more than fifty percent to an all-time low of thirteen gigaliters in 2010, representing a paltry three percent of the historic average.

Groundwater is another major water source for Perth. Originally seen as a backup to the Perth Hills Dams, use of the major aquifers underlying Perth, called the Gnamptara Groundwater System, has steadily increased over the past decade. Now, the Gnamptara supplies roughly sixty percent of Perth's water supply. Increased pumping has led to a steady drop in the aquifer's level to such a degree that the upper, or superficial, aquifer is now at its lowest level on record. This drop has led to increased drilling into the lower aquifers of the system, the Leederville and Yarragadee aquifers. Though these lower aquifers contain relatively large amounts of water, increased use of the Leederville and Yarragadee has precipitated a drop in the level of the superficial aquifer due to the hydrologic connection between the superficial and Leederville/Yarragadee aquifers.

Professor Gardner highlighted the fact that users are over exploiting Perth's groundwater resources with a newspaper article featuring Loch McNess, a lake in Perth's northern suburbs. As a boy growing up in Perth,

Professor Gardner remembered rowing boats on Loch McNess with his family, an activity that would be impossible now that the lake is essentially dry. Professor Gardner then explained how the state water utility has consistently failed to abide by the legal limits on groundwater drawdown already in place, which is exacerbating the situation. Unfortunately, it is difficult to tell whether climate change or overuse is the primary factor leading to such low aquifer levels. Further complicating matters are the large number of other, non-municipal water rights holders, including agricultural and industrial users, and well as a significant number of unlicensed users.

In the face of this water shortage, Perth has increasingly turned to desalination. Though approximately half of the city's water now comes from desalination, according to Professor Gardner, the climate is drying faster than the city can build desalination capabilities, requiring increased reliance on other sources such as wastewater recycling.

Professor Gardner then discussed the current state of Western Australia's water law. The current licensing scheme in Western Australia includes a landholder eligibility requirement, a fixed term generally ten years in length, as well as the right to renew the license after the term has expired. Each license specifies the land upon which the user can apply the water, up to an annual maximum. However, the licensed maximum is subject to scarcity reductions at the direction of the state water minister. Though there are limits in place to protect the environment, according to Professor Gardner, limited metering and poor enforcement have severely limited their efficacy.

Though climate change has hit Western Australia particularly hard, the other states of the Commonwealth have experienced similar problems. This led the Commonwealth government to develop a National Water Policy to help deal with the adaptation crisis. As Professor Gardner explained, the key principles of the National Water Policy include transitioning to tradable water rights removed from landholder requirements, improving metering and reporting, national oversight of state water markets, proportional sharing of scarcity, and a comprehensive water planning system. Though Western Australia initially resisted, it has recently accepted the National Water Policy and is moving toward implementation of a planned water property rights regime based on a system of proportional sharing of scarcity among licensees.

In closing, Professor Gardner compared the changing nature of Australian water law with Colorado water law. Western Australia is moving towards a property rights regime like that in Colorado. However, unlike in Colorado, the new Australian scheme will incorporate a system of central planning that is bound to first provide adequate water for environmental flows. Another major difference between the Colorado system and the emerging Western Australian system is the formula for sharing scarcity. Instead of a hierarchy founded on historical priority, the new system in Western Australia will require proportional sharing of scarcity.

Nathanial Brown