SCIENCE IN DECISION-MAKING

Integrating Land Use and Water Planning in New Mexico
UNM Utton Center
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INTRODUCTION

S.E. Reynolds, New Mexico's legendary State Engineer and a powerful figure in the State during his 35-year tenure, often said that he didn't speak for or against any particular piece of legislation, but simply described for legislators the likely consequences of their actions. I believe that is the proper role of science and engineering in public-policy decisions.

Land-use issues usually include water supply and water quality components. My central point is that the public's elected representatives, not scientists, should make these decisions that affect the public, but in doing that, they ought to take the scientists' predictions of the consequences into account.

WATER AVAILABILITY IN NEW MEXICO

The Statewide Water Balance

The average precipitation over the state as a whole is about 14 inches per year. This would lead to a prodigious amount of water available to us, some 90 million acre-feet per year, were it not for the fact that the average rate of potential evaporation is dramatically greater, generally in the range 40 to 80 inches per year, many times as much as the rate of precipitation. That we have any water supply at all is because of the inflow from upstream states, and the fact that rain and snow do not occur uniformly but are concentrated in time, and in space, and are either used immediately or protected from evaporation by natural or man-made mechanisms like storage in the ground water system, or in lakes and constructed reservoirs. The amount of water we do manage to capture is highly variable from year to year, and from place to place.

The average supply for the state is around 4 million acre-feet per year, about 78 percent for agriculture and 13 percent for combined municipal and industrial uses. Of the total supply, about 53 percent comes from surface water and most of it is used in agriculture. About 47 percent of the total is from groundwater, again mostly for agriculture, but almost all municipal and industrial supplies are from groundwater.

We store surface water in reservoirs, but at a large cost. Evaporation loss from reservoirs was about 7 percent of our total water use in 2005, and it has been considerably higher. The loss from Elephant Butte is roughly twice as much as the consumption of water in Albuquerque.

Groundwater is a separate resource only to the extent that we can pump water from storage in the aquifers without affecting the flow of any surface stream. This is only possible in an area without a river—the Estancia Basin, the High Plains, and the like—and of course in these cases, pumping the groundwater is equivalent to mining. The water will eventually be depleted, the land use depending on it must end, and the

land-use decision has to do with the advisability of establishing a particular use under those circumstances.

Where an aquifer is in connection with a stream, water pumped from a well is all from groundwater in storage at the very beginning, but it soon begins to be partly at the expense of flow in the stream. The proportion of it derived from the stream rises over time until all of the water pumped from the well is coming at the cost of flow in the stream. The timing of the transition depends on a number of factors, but it can be calculated, and varies enormously from case to case.

THE STATE ENGINEER ADMINISTRATIVE PROCESS

Water Rights Administration

The waters of New Mexico belong to the people, collectively. Although an individual or a legal entity may own the right to use water (and may cause it to disappear by evaporation in the process of using it), persons or corporations do not own a water resource in itself. The State Engineer acts as the people's agent in the allocation of water. Until fairly recently, the role of the State Engineer was entirely limited to that of a referee, protecting the rights of those that already have them against impairment of those rights by others, in the same way that the referee in a football game protects the players and the interests of the game by enforcing the rules. The Engineer administered water rights, but did not "manage" water in the sense that he prohibited any use that would not otherwise impair an existing water right. The Engineer does not choose among competing legitimate uses at all; a gambling hall has the same status as a charity hospital. There is no hierarchy of more- and less-desirable uses, except that all must be "beneficial uses," and waste is forbidden. The system established by the Territorial Legislature in 1907 strongly reflects the "growth accommodation paradigm," not the "planned growth paradigm" that Lora Lucero will be discussing a little later.

Lately, in view of impending shortages as rapid growth has continued, the State Engineer has been inclined toward what the current Engineer has called Active Water Resource Management. This might move a little way toward a "planned growth" paradigm, but it has been slowed by a State District Court decision—the TriState case.

Science is at the center of the State Engineer's consideration of a new application, in that he requires the applicant to present calculations based on physical measurements, and these calculations are often very detailed and exhaustive, but the strong emphasis is on protection of existing water rights. One major category of applications, those for individual domestic wells, is exempt. Although the Engineer has reduced the amount of water that can be appropriated from 3 acre-feet per year to 1 (which is still two to four times the average single-family water use), permits are generally available for the asking.

The Engineer deals with applications in the order of their filing. Formerly, the incremental effect of a new appropriation or water-right transfer was examined, and if the incremental effect would not impair an existing right, the permit would be granted. Recent guidelines, in contrast, set standards for the cumulative effect that would constitute the threshold of impairment.

"Prior appropriation" is our fundamental water law. As each new appropriation is made from the same water source (a particular river or ground-water basin), it becomes

the most junior right. There is no limit to the appropriations that could be made, on paper, from a single source. The "wet water" available would be parceled out to fully satisfy the most senior right, then the next and the next, until it is all allocated, and the most junior rights would simply not be supplied.

As it has happened, however, allocation during shortage according to priority has almost never been used here, for several reasons. Real shortage has been relatively rare. When we do have a serious and sustained shortfall in supplying all of the existing rights, plus obligations to downstream states, as in the Pecos River basin, the pain of priority administration is too horrible to contemplate and we find another way. We also have moved very slowly to adjudicate rights so that priority administration could be carried out routinely, without endless due-process impediments. In the 104 years since the Territorial water code was promulgated, the rights appurtenant to about 67 percent of the irrigated acreage have been adjudicated, the process has represented decades of costly and acrimonious litigation, and we haven't even started on the Rio Grande basin north of Elephant Butte.

The prior-appropriation system would be compatible with real-time allocation of the flow of a stream as it is going by, to many different owners of rights, but it doesn't work very well where there is much storage in the system, where one large irrigation district supplies most of the water under the same priority, or where groundwater is a significant part of the supply. Shutting off a junior-priority well has only a delayed effect to restore the flow of a stream, and little or no meaning in short-term priority administration.

Almost all of New Mexico's streams are considered fully appropriated, and no new surface-water appropriations have been permitted for a long time. New ground-water appropriations are permitted, but carry the requirement to acquire existing surface-water rights of offset any depletion of streams attributable to the pumping.

Some years ago, the legislature added consideration of "the public welfare of the state" (and evaluation of the applicant's plans for water conservation) to the State Engineer's jurisdiction over water allocation, and the Engineer has taken that role seriously and tried his best. But there are no guidelines for deciding what's best for the public, and the public-welfare implications of applications are not examined in any consistent way. The State Engineer has no staff with expertise in that area. The current Engineer, John D'Antonio, may agree with me that the public welfare considerations would more properly belong with elected governing bodies, assisted by their planning staffs.

Regional and Municipal Water Planning

The Interstate Stream Commission has provided for water plans in each of 16 planning regions, prepared usually by engineering firms but with extensive public participation. This may sound like a fruitful marriage of science and land-use planning. The original purpose of these plans, and the statewide plan formed from them, was about something else altogether, however. In 1980, the El Paso Public Service Board, having filed two large applications to appropriate water in New Mexico, to which we responded by invoking a state law forbidding export, sued New Mexico. In a federal-court challenge, our law was found unconstitutional, but the precedent of a contemporaneous

U.S. Supreme Court decision offered us a clever way to keep the water here. That stratagem required a showing that the water would be needed here for future uses, and thus was born our water-planning statute. The real function of the water plans was to show that the all our water will be needed in New Mexico within 40 years, and therefore that none can be sent out of the state.

The regional water plans may give the Engineer some insight as to the public's views on the public welfare, but the plans are rarely (if ever) specific enough to inform a decision about any particular project. Even where a plan adopted by a planning entity would prohibit some project, the Engineer is not likely to enforce that prohibition if the project is otherwise legal. A plan may forbid transfer of water out of its region, but that is not likely to stop the Engineer from issuing a permit if there is no other impediment.

Municipalities are required to prepare 40-year water plans, but the purposes of those plans are generally to provide for effective water-conservation, to justify the acquisition of water rights, and to justify the holding of rights without exercising them for as long as 40 years, rather than the statutory 4 years for other users.

Much of the criticism of land-use decisions that seem to ignore science is related to subdivisions that have been approved in spite of water problems. The State Engineer reviews the water-supply studies in subdivision applications to county government, compares them with subdivision regulations, and very frequently reports deficiencies, but his office does not make decisions about the appropriateness of the land use in other ways, and in any case he cannot prevent the county from approving the plans.

SOME DECISIONS THAT MAY NOT HAVE BEEN BASED ENTIRELY ON SCIENCE

The information about the water-related consequences of land-use decisions often does exist, but may not match decision-makers' concepts, or conflicts with policy. You will notice that the State Engineer, in effect, made the land-use decisions described below by not acting, even though the results that we now may consider highly undesirable were scientifically predictable, and were predicted.

The rapid loss of capacity of wells due to heavy pumping for agriculture in the High Plains of eastern New Mexico was clearly recognized by the 1930s, but even though serious pumping began and expanded greatly after that, the Engineer did not take some of the areas into his jurisdiction for a long time. The last large area to be put under his administration was the Curry County Basin (around Clovis), in 1989, a half-century later. I think the Engineer, Mr. Reynolds at the time, believed that the farmers should be left in charge of their own destinies, and that unregulated pumping across the state line in Texas would capture the water anyway if he prevented New Mexico farmers from pumping it. I do not know what a "science-based" decision about that land use would have been, if it had been made before the water levels began to plummet.

The Pecos River was seriously over-appropriated by 1948. Certainly the science of the day would have told land-use authorities even earlier that further expansion of agriculture would lead to big trouble, and Texas had already been trying for several decades to get our attention about our failure to share the river. But no land-use authorities took an interest, other than the State Engineer, again Mr. Reynolds. He took

the position that it was better to let another generation or two of New Mexico farmers prosper, and fight a protracted rear-guard action in Texas's lawsuit in the Supreme Court. Eventually, we were forced to reduce our use of water, pay for the under-deliveries, and promise to be good, but Mr. Reynolds' decision not to act had been very beneficial indeed to the Pecos Valley. What would a "science-based" decision have been?

Albuquerque's water came entirely from wells until a little over a year ago when the Drinking Water Project, to divert San Juan-Chama Project water and native Rio Grande rights directly from the river, came into service. Drawdown of water levels in wells had become great enough to cause significant problems, and the source was not sustainable over the long term. Even though pumping has been dramatically reduced now, the full effect on the river due to former pumping is far from being realized, and eventually all of the senior agricultural rights will be required to offset those effects. Presumably a "science-based" decision would have limited us to surface water to start with, but it would have been very difficult to explain to the people when high-capacity wells were so cheap and easy.

There are many sciences involved in land-use decisions, but the only one I know anything about is hydrology. I would submit that planners and governing bodies should not expect the State Engineer to make decisions for them, but he stands ready with very extensive and competent water science to inform their considerations, and so do the Bureau of Geology and Mineral Resources, and other agencies. Sometimes a translator is useful, and for that I suggest your accommodating local hydrological consultant.