

FUTURE FORECASTING

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It is a great pleasure to address the 25th anniversary of the Tarizmex Provincial Water Council. The good auspices of its founding, coincident with the Second Constitution in 2010, have been fulfilled by the quarter century of steady, if not unbroken, accomplishment.

In looking over our family diaries, I note that my father spoke at one of the pre-provincial water council meetings back in '85 -- to something called the Annual New Mexico Water Conference. Both that family connection and the importance of events over the last 50 years lead me to a brief review of the high points of national water resource development and management since 1985.

Canada's joining the Union in '02 provided substantial relief to many anxieties about water supply as well as electric energy. The Canadian union not only provided for more effective integration of water resources in the eastern and western regions of the old United States, but also allowed for major civil works to carry water all the way from the severe winter regions of northern Canada into the trans-Rockies.

Perhaps an historical note on the Second Constitution would help, since some of the younger members in the audience may be unfamiliar with what is to them ancient history. The pre-constitutional convention was conducted from 2005 to 2007. The new constitution was adopted in '09 and implemented in 2010. The primary administrative consequence was to eliminate the old 50 states, the several thousand counties, and literally tens of thousands of quasi-independent special authorities, elected units controlling everything from education to water allocation. The basic new units so familiar to us, of course, are the nine provinces and the 28 administrative districts. Not only water resources, but most of the other infrastructure systems, were given a new rationally integrated base under the present constitution. Another big change under the Second Constitution was the elimination, or as they preferred to call it, the

super-succession, of all prior laws, regulations, interstate compacts, dealing with the infrastructure. Super-succession wiped the slate clean and permitted a more integrated management of all infrastructure.

Of course, the Federal Mediation Act of '92 laid the groundwork for the broad base of stakeholder participation in public policy and decisionmaking. A mere 15 years of experience under that act was crucial to the transition from the old to the new constitution and laid in place the literally hundreds of infrastructure laws and regulations required to follow the transition.

The earthquake at New Madrid, outside St. Louis, in '98 was an event of unprecedented magnitude, an earthquake of 8.4 on the old Richter scale. It wiped out 32 dams, restructured substantial portions of the Ogallala aquifer, and did some \$143 billion worth of structural damage in the four states primarily affected. One of the sights I regret not having seen directly but one we all have seen on film, is the 36 hours during which the Mississippi River ran backward. In any case, the primary effect of the New Madrid quake was to stimulate more effective long-range infrastructure and land use planning than ever before.

By 2010, atmosphere management was routine. Snow enhancement was universal through the Rocky Mountain regions from the Arctic Circle to the Mexican border. Hail control was widely practiced throughout the Midwest. Unfortunately, the management of drought has on balance been unsuccessful. Recent developments suggest that the Department of Atmospheric Management's international division, in working with the government of Tunisia in the North African Republic, is expected to make headway within the next decade.

The Mexican trouble, of course, led to the Popsicle Project, which began in '94 and was completed in 2001. It is rather amusing how ice seems to be such a focus of humor in North American politics -- you may all recall Seward's Folly, the purchase of Alaska in the 19th century. Project Popsicle involved the towing of Antarctic icebergs to North America. And the first one was moored in 2001 in Baja, California. For the last 25 years we have routinely brought two of these bergs to the

California region, and we have managed to effectively deal with the microclimate changes, which you have read about. The technology has proven so successful that 12 icebergs are routinely delivered to arid zones throughout the Northern and Southern hemispheres. Keep in mind that one of these icebergs is equivalent in fresh water to half of irrigation water in the old southern California region.

By 2015, the Total Cost Recovery Act was fully implemented, which led to the abandonment or demolition of some \$4 billion in old hydrologic, irrigation and other water works. Under the act it was shown that these were either of no value or substantial sinks for money. Under the Total Cost Recovery Act, less than one and three-quarters percent of all provincial water services throughout the United States of North America enjoy subsidies originating more than 150 miles away. Subsidies, of course, continue on a quite extensive basis on a sub-district basis, where local participation has decided that subsidization is important for local micro development.

There are some continuing, and even recurrent, sticky points in water management. Ground water pollution or contamination continues to be the nation's major environmental problem. New contamination of ground water had all but stopped by 2005, with the bulk of it already at end by '95. However, as was recognized at the time, the difficulties were only beginning, since most of the toxic, polluting or undesirable materials already in the ground had barely begun to move into the aquifers. Programs for subterranean dams, reverse flushing, chemical neutralization and numerous other underground civil hydrologic works have proven to be of little value. Today, and more precisely in the last report as of 2033, 25 percent of all potable water in the United States must go through stage 6, 7, or 8 purification processes. This, of course, has been a boon to the beverage and prepared food industries. As you all know, 19 percent of the land area of the old United States is now triple piped for direct potable, domestic use, and general use water. The plan to carry that triple piping through 26 percent of the land area should be completed over the next decade.

As early as '95, ground water contamination had begun to alter the national internal migration and resettlement patterns, both in the older northeastern and north central regions and in what was then the emerging, rapidly developing Sunbelt regions.

The global collapse of the soybean market and the total migration of cotton production and cotton textile manufacturing outside the United States have, of course, had their own effects on agricultural demands for water. I certainly urge all of you to tour the Department of History's nine restored cotton farms in the four southern provinces. They have, of course, been a smashing success, as now maintained and operated by Disney Enterprises. I particularly enjoyed the visit to the early 19th century farm called Old Alabama, which recalls the slavery days. Audio Animatronics (class A-6 robots) plant, harvest, pick, sort, gin and bale cotton in a restored pre-Civil War (1861-65) plantation.

One of the major innovations in water quality control seems in retrospect so simple it is incredible that it took a quarter of a century from its conception to its implementation. Closed loop water supply required that all industrial facilities with 25 or more workers must draw their water supply from within 50 feet downstream of their own waste-water effluent.

In summary, let me say that in looking back over the past 50 years, we must also acknowledge the previous 100 years. It has taken 150 years for water to be fully controlled and effectively managed. Water management cost per capita as revealed under the Tax Assignment Act of 2012 is \$140 per capita per year. This sharply contrasts with the experience of some 75 years ago when individual per capita subsidies in some regions ran as high as \$4,000 and direct costs in others as high as \$500 per capita.

What you have just read is one scenario of future water developments in the United States. It is only one picture, albeit a complex picture,

of how that infrastructure might evolve the next 50 years.

There is nothing in the scenario which is scientifically, technically, or public administratively bizarre. And yet it does represent in the aggregate developments which together create a future extremely different from the present.

The point of all this is to help shape our present action. By understanding the wide range of ways in which the future can evolve and seeing some hints of the significance of direct and indirect human intervention in the management of our world, we may be stimulated to create more desirable futures and act systematically to encourage the desirable and discourage the undesirable outcomes.

Let us turn briefly to the way in which the scenario was constructed, so that the reader may pick up the interest or the challenge of creating his or her own scenarios.

The scenarios were constructed by first defining a list of variables which seem critical to the evolution of the long-term future of water. These variables include quantity and stability of supply; source and reliability; qualitative factors such as health effects, salinity, and microorganisms; cost, both direct and indirect; administrative mechanisms; equity considerations in the short and long term; institutional frameworks; technological developments; social trends; political values; the users of water such as the general population; industry; the location of its users, and their special requirements; environmental factors in general; and a number of other variables. The scenario was then created by setting a value for each of those variables in a way that is coherent, that is, hangs together and is not self-contradictory. And then, with those elements in mind, one then embellishes a framework or story around them -- in this case, a presentation to a water conference in 2035. That is the scenario.

The importance of scenarios is that they permit us to deal in an intellectually satisfying way with a complex of material normally too difficult to conceptualize as a whole by concentrating merely on the individual components. As a tool for managing complexity, the scenario

has the advantage of presenting alternative images of the world, giving some interrelationship among them, and, in turn, stimulating an interest in either how to get to or how to avoid those outcomes.

Scenarios are tools of planning.

In the very sketchy scenario developed above, we did not give due weight and attention to the important role of telecommunications and computer technology, which will affect the collection of information, the modeling of patterns and the management of water facilities.

Telecommunications and computers will also open up the public policy process to more effective participation and decision-making. There are scores of sub-themes that were not used in the scenarios, such as scientific developments in water purification, in our understanding of health effects, or in biotechnology as a tool for cleanup or disposal.