The Far Reaching Effect of Ground Water Reductions

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ABSTRACT

As our greatest natural resource, water is a variable in future economic growth and the public health of our nation and the world. Policy making, related to global health and food production is influenced by changes in water quality and availability. The United States must understand the limitations of our own water resources. An increased awareness of the problems created by ground water reduction around the world can increase our diligence and attention to conservation policy.

INTRODUCTION

Natural disasters affecting billions of people around the world have to a large extent been related to floods and droughts and in developing countries this carries a death toll. Populations without adequate water supplies cannot sustain or recover from these natural disasters. There are 1.1 billion people, or 18% of the world's population, who lack access to safe drinking water; 2.6 billion or 42%, who lack access to basic sanitation. Water related diseases, diarrhea and malaria, rank 3rd and 4th in cause of death among children under 5 years old. At any given time, half of the world's hospital beds are occupied by patients suffering from a water-related disease (Water 2002, Water 2006). The water resources in many areas of the world are only marginal at best to maintain normal health even without added natural disasters.

There are many examples of ground water reduction and increased usage throughout the world. The health issues related to lack of fresh drinking water and water needed for agriculture will become a determining factor in survival of numerous populations which are currently teetering on the edge. As a world producer of technology, we must support world health. We must evaluate our own policy on many fronts to be available for programs which will help maintain and develop water supplies and support world health. One disturbing relation is the lack of grain production as a food source as we squander this in the quest for more fuel sources. Ethanol production utilizes a key food supply with very inefficient use of water and energy resources.

As a professor in the Health Care Management program at the State University of New York at Canton I have been teaching students the need for attacking health issues with insight into the future. We must bring world attention to the economic stress related to this growing problem, creating an understanding of how our water resources, even in the United States are relevant to world health. New initiative and organizations could include education within the United States along with programs that address the problem in countries with urgent need. The Royal Bank of Canada has acted by creating the

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RBC Blue Water Project, a 10 year commitment to provide $50 million toward global fresh water initiatives to foster a culture of water stewardship.

The value of ground water will be determined by how industry, agriculture and domestic use control ownership. The domestic use of water has an impact on public health. The availability of water for agriculture and industry will also affect public health by stabilizing food supply and maintaining adequate energy supplies in a viable economy. The issues of maintaining industry and all of its far reaching effects on the economy and energy must now be addressed from the view point of public health.

On a global level the effects of ground water reduction on public health results in political strife and impacts the growth of nations. National leaders with policy planning toward water sustainability can fit into a world economy more favorably. One does not need to look to global conflict or natural disasters to find examples of political discord related to reduction in ground water. However it seems the public health issues in countries which are already struggling with inadequate water supply feel the most pain. In a prosperous industrialized nation the water infrastructure can buffer the effects of growing industry and energy needs on the availability of ground water.

As the reduction in ground water coincides with the exponential growth to our world population, the need to value our water supply with the hope of directing action to maintain sustainability of the resource becomes evident. The growth of industrial energy use and water requirements will continue to be exponential as is population growth. In a developing country, water requirements correspond to agriculture and domestic need. The growth of industry will force a reduction in water available for agriculture. The natural progression of domestic use will increase with the population. Thus, clean drinking water and adequate water for sanitation are two serious public health issues that need to remain in balance with population rise, industrial development and increase need for agriculture efficiency.

VALUE OF WATER

The United Nations report on industrial development estimates the rise in water use by industry from 1995-2025 will be 35%. An expected world population growth of 6 billion to 9 billion will clearly stress water availability for industry. The high income countries now using 59% of their resources for industry will also need to be leaders in water management. The United States will need to evaluate where population growth is stressing water supply and how industry is using and polluting water (UNSummit 2002).

A discussion of world energy policy and the quest for energy independence in the United States is an extension of water as a sustainable resource. The correlation between hydropower and electricity, water and energy will also control ground water depletion and overall public health. As we link public health with industry, agriculture and energy, with an understanding of water availability, the value of water becomes more evident.

Urban areas across the United States, those in areas of minimal rainfall and those in the Great Lakes region have been studied along with the 20 largest cities to evaluate residential water use and cost. It is interesting to note, in Boston, Massachusetts, the average daily use per person is 41 gallons at a cost of

$67/100 gallons and in Fresno, California, where the cost is $34/ 100 gallons the use is over 200 gallons per person per day. In another example, Milwaukee, with an abundant supply of lake water and easy access for its population; prices are on the rise as usage drops. Breweries and tanneries have left town causing a 41% drop in water revenue from 1976 to 2008 (Walton,B 2010).

Buying water on the open market and desalination are costly alternatives for many southwestern US cities. This has promoted many conservation minded activities with good results. Since 1995, Santa Fe, New Mexico, water use has dropped 42% and Phoenix has not increased domestic use over 10 years even though they have an additional 400,000 residents.

What is the most important determining factor to value water correctly? Is it availability, cost or even more important do we drive the price up if we conserve?

In many arid western cities federal investment to water infrastructure has reduced the capitol cost to cities and states. These subsidies create an artificial price. Considering the California Central Valley Project, Central Arizona Project, Hoover Dam, Colorado's Big Thompson Project, federal funding of 3.6 billion with only 45 percent funded by residents has off set the real cost of water. In Santa Fe, New Mexico where ground water use is unsustainable, the city is building a $217 million water diversion project without federal money. City and county taxes will fund 75% and 25% will be grant funded (Gleick 2010).

In numerous cases around the country infrastructure was developed 50 years ago. In 2009 the EPA has estimated $335 billion will be needed to fix the countries aging water supply. Will these funds be generated by tax or tariff? Will water supply infrastructure to areas of ground water reduction even be realistic? Ground water sustainability seems to be a more important question than infrastructure cost.

In other countries the ground water reduction is so severe that bulk water transport is planned. Tankers holding 80 million gallons will take water from the Blue Lake Reservoir of Sitka, Alaska to India in 2010. Additional plans to transport to East China and the Caribbean will follow. Water from Sitka can unload at $0.07 per gallon. Australia is a penny per a gallon for desalination (10). Keep in mind that shipments can be turned on and off avoiding the capitol burden as multimillion dollar desalination plant remains dormant during a wet season. Every year the allocation water rights of farmers and cities in Australia can be resold. In 2000 one million liters traded for AU$2. In 2010 the same volume sold for AU$1,300 to 2,400. Even with market value drops of 40% in 2009, AU$3 billion in water rights was traded (Walton,Brett 2010).

It has been estimated that Quebec, Canada could see $6.5 billion annually through water export. If the resource is used with sustainability in mind it could enhance the economy and encourage conservation at the same time (Katz 2010,Olson 2010). Does the government or private interest have a right to privatize a public resource?

Since the 1800's through a US Supreme Court decision the Great Lakes and all navigable waters are subject to public ownership in a public trust. It demands water remain available for all citizens. However, a

recent Michigan law is permitting private use to deplete up to 25% of lakes and streams, ultimately means ground water depletion (Olson 2010).

COLLISION BETWEEN ENERGY DEMAND AND WATER SUPPLY

The next valuation of water occurs with a relationship of ground water conservation and energy production. In 1973 the government began talks of energy independence and over more than 40 years has neglected the significance of a water energy link. Each process has an environmental impact along with inequitable water use.

- *Hydro fracturing for Natural Gas:* The Pennsylvania – New York Marcellus Shale formation is 95,000 square miles of dense shale, which could provide enough natural gas to supply the entire east coast for half a century; a $2 trillion per year business. The projection for 2011 is 109 million gallons of waste water per day. Seventeen million people from Pennsylvania and New York acquire their drinking water from here, including a 2,000 square mile water shed supplying pure unfiltered water to New York City. There are 400,000 hydro fractured gas wells in the United States; each has created 4 million gallons of polluted waste water (over 1.5 billion gallons of polluted water) (AP Report 2010, Fox 2010, Rousseau 2010).
- *Ethanol production:* It takes more energy to produce ethanol than we obtain from the same unit of ethanol. It takes 1000 gallons of water to produce 1 gallon of ethanol. Annually 40 million bushels of corn are processed into 115 million gallons of ethanol in each plant (8). There are hundreds of these plants in the United States which waste water and energy, not to mention depletion of an exportable food supply.
- *Oil producers:* Oil producers injected 1.3 billion barrels of water into the ground to obtain 162 million barrels of oil. In August 2010 amidst severe drought the oil industry received 8.4 billion gallons of water (Schneider 2010).
- *Chip manufacturing:* A 2 gram, 32 megabyte memory chip needs 10 gallons of water and 80 pounds of chemicals to etch the chip. Intel employs 10,000 people in Chandler, Arizona investing 9 billion dollars into the economy. Chip manufacturing uses 2 million gallons of water per day, in a region of water scarcity.
- *Thermo electric power:* Coal fired and nuclear powered plants turn 3 billion gallons of water per day into steam. Thermo electric power generation accounts for half of the 400 billion gallons of water withdrawn daily from our nation’s rivers and lakes. The Energy Information Administration of the Department of Energy forecast a nearly 50% increase in electricity demand from 2005 to 2030.

CONCLUSION

The value of water must be measured against securing world food supply, protecting the environment, balancing withdrawal with recharge, while meeting energy needs with future growth in mind.

> "Water sits at the nexus of so many global challenges, including health, hunger and economic growth. And sadly, water scarcity takes its greatest toll on society's least fortunate. I am absolutely convinced that the only way to measurably and sustainably improve this dire situation is through broad-scale collaborative efforts between governments, industry, academia, and other stakeholders around the world" Indra Nooyi Chairman & CEO, PepsiCo, Inc.

The water debate has been about utilizing water in different ways. The debate now needs to consider risks related to water usage. Forward thinking countries are now importing water intense products rather than developing domestic production. The purchase of water rich farm land in Africa is becoming common place for countries to improve their food supply. It seems the most water intensive crops have been produced in countries with water scarcity.

Continued political achievements to promote ground water sustainability could (Katz 2010):

- improve public understanding of water issues
- conduct ground water and fresh water inventories
- determine sustainable water levels; determining use and recharge rates
- reform public subsidies for water use, artificially low residential and industrial water rates should be phased out and agricultural use must adopt conserving technologies
- repeal bulk water export prohibitions
- build future thermo electric plants in areas where cooling water can utilize waste water, sea water, and mining/ drilling water

At the same time we need to make critically needed observations and plan to deal with sanitation systems and their costly infrastructure upgrades.

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