



CONVERGING GLOBAL TRADE-OFFS – WATER, AGRICULTURE AND CITIES

By Bob Sandford

Our understanding of how water functions in natural and agricultural ecosystems is changing. Law makers and public policy scholars around the world are beginning to react to ground-breaking new scientific research that indicates that natural ecosystems may be far more important to our global economy than many of us may have appreciated. It has become increasingly clear that Canada's future economic success may well be defined by how well and productively it manages its water resources.

So much of what is important about where and how we live is defined by water. Research indicates that the world's remaining healthy, intact aquatic ecosystems very often function in seamless synergy with neighbouring terrestrial complexes to provide regulating services such as those that control rainwater capture, the storage of water in ecosystems, and the gradual release of the water that perpetuates stream flow throughout the year. New research also indicates that healthy aquatic ecosystems contribute far more than we ever understood to the production of water through the hydrological cycle and to the self-purifying power of healthy wetlands, lakes, and rivers. These functions are in turn the foundation of the primary production of the organisms that make life on Earth possible.

Nature Needs Water, Humanity Needs Nature

Together, primary production and soil formation are the basis of the biodiversity that is the foundation of the relative ecosystem stability that has defined our planet's atmospheric composition. Our atmospheric composition is in turn the foundation of the climate stability upon which our civilization has relied to sustain population growth and increasing economic prosperity. Natural ecosystem function is also the foundation of the

ecological diversity that makes both natural and agricultural food production for our growing populations possible. As we come to realize the importance of water's role in the stabilization of natural ecosystems, we begin to see the ways in which our numbers may be altering the very systems upon which we depend to sustain planetary conditions as we know them.

Currently, global human population growth is the highest in places where there is the least water. About 40 percent of the surface of the solid Earth receives so little precipitation that natural ecosystem function is limited by water availability. Thus we find that globally a third of humanity is now competing directly with nature for water. More water resource development, especially in semi-arid and arid regions of the globe, will lead to great damage to both freshwater and non-aquatic ecosystems, which will lead directly to the decline of our global life-support capacity and ultimately to diminishment of human well-being. That, however, is the direction in which we appear to be headed.

It is estimated that to meet the food demands that are projected to exist in the world in 2025, we will need to put an additional 2,000 km³ of water into irrigation. This amount is roughly equivalent to 24 times the average flow of the Nile. Given current water-use patterns, the population that is projected to exist on the planet in 2050 will require 3,800 km³ of water per year, which is close to all the freshwater that can presently be withdrawn on Earth. This would mean that the world would lose most of the important environmental services that aquatic ecosystems presently provide on our behalf. Clearly, that is just not going to happen. Something has to give.

We are also beginning to observe that rapidly expanding urban centres have begun to compete with agriculture for both land and water on a global basis. Agriculture has, in turn, begun to

compete with nature for land and water. We are increasingly concerned that we cannot meet both agricultural and urban needs while at the same time providing enough water to ensure the perpetuation of natural ecosystem function.

As a consequence of growing populations and increased competition for land and water, humanity is converging upon the need to make uncommonly difficult public policy trade-offs that have never had to be made on a global scale before. If we provide to nature the water it needs to perpetuate our planetary life-support system, then much of that water will have to come at the expense of agriculture, which means that many people will have to starve to meet ecosystem protection goals. If, on the other hand, we provide agriculture all the water it needs to have any hope of feeding the populations that are projected to exist even in 2025, then we must expect ongoing deterioration of the biodiversity-based ecosystem function that has generated Earth's conditions upon which our society depends both for its stability and sustainability. In any event, water in Canada will become more important to us and to the world.



"All the water that ever has been or ever will be is here now. It sits, it runs, it rises as mist. It evaporates and falls again as rain or snow. You cannot pollute a drop of water anywhere without eventually poisoning some distant place."
(Michael Furtman) PHOTO: J. HILDEBRAND

Canadians in Wonderland

To be useful to others, however, we have to get our own house in order. There are at least three major problem areas that need to be addressed in Canada if we are to achieve anything close to a level of sustainable water resource management that will allow us to help the world.

The first challenge we need to address relates to self-perception. We have to dispel the myth of limitless water abundance in Canada or we will continue to make public policy choices based on false assumptions that will have undesirable ecological, social, and political consequences in the future. Canada presently diverts more water per capita than any other nation in the world. We spend far too much time in this country worrying about water exports and not nearly enough time thinking about the damage caused by our own diversions. Before we even consider new approaches such as continental water markets, Canada should solve its own very serious problems associated with jurisdictional fragmentation, weak regulatory strictures, the absence of proper monitoring, and widespread aquatic ecosystem decline.

Then there is the matter of recognizing the actual extent of our water resources. We may have 20 percent of the world's freshwater resources, but much of that is water in the bank left after the last ice age. We have only 6.5 percent of the world's *renewable* water resources and most of that is found in the north. If the Americans want our water, or if we want more in the south, that is where we are going to have to go to get it, and that will be very, very expensive. The lesson here is that we have to be careful not to make ourselves vulnerable by making political decisions based on false assumptions about how much water we actually have. We have to solve our own problems first, before we satisfy the thirsts of others.

The second challenge we face relates to our own agricultural practices. Agricultural water use is becoming an issue globally because contemporary industrial-scale food production practices inevitably result in reduced return flows to nature, and much of the returned water is of poor quality, which diminished and often water-starved natural systems no longer have the capacity to purify. Without improving our agricultural practices, we will not be able to supply



PHOTO: R.V. RASMUSSEN – RAYSWEB.NET

water-scarce areas in the world with virtual water in the form of food.

The hard lesson we should learn from this is that modern agriculture is not sustainable on the scale or in the manner in which it is currently practiced. Until agriculture becomes sustainable and we find ways to release enough water to ensure the maintenance of the other important processes of ecosystem productivity upon which our survival equally depends, our civilization will not be sustainable either.

But it is not just the fact that agriculture takes water away from nature that should concern us. We cannot ignore the impact of our cities. Water resources management in the twenty-first century must consider what it takes to feed the millions crowded into urban centres like Toronto, Montreal, Calgary, and Vancouver.

Despite record cereal production globally, there is less food available and it costs more because a greater percentage of our annual cereal crop goes to feed livestock so that more people in the world can enjoy meat in their diet. There is also less food available because a disproportionate amount of some food crops such as corn are utilized not for food, but to make ethanol to power obscenely inefficient North American cars.

Whenever we look at the amount of water cities actually must have to perpetuate their overall function rather

than just what they use for drinking, cooking, bathing, sanitation, and lawn and garden needs, then the city assumes a completely different character in terms of real water use. To generate the concentrated wealth necessary for urban prosperity, cities often tear the guts out of surrounding natural environments.

Think of how we have been disciplined in our thinking to exempt cities from serious consideration in water management and matters of sustainability because they use only 8 or 10 or 12 percent of their total water allocations because so much of the water people use in cities is returned to the natural cycle after use. Clearly this is a very narrow way in which to view the profound influence cities have on regional, national, and continental water supply systems and on the ecosystems that ensure the reliable function of those systems.

It is impossible to think of what is happening to this country without thinking of the huge areas that have been converted to agriculture to feed our cities. But it is not just food that we take from rural areas. When I think of the city of Calgary, I cannot separate my image of it from what I have witnessed in central and northern B.C. and in the Fort McMurray area of Alberta, the areas where the energy, minerals, wood, and water come from that make spectacular urban consumption possible. What I am saying is that cities utilize and degrade



“Sunwapta Falls” 30x40 inches, acrylic ©B. ZHENG

a hell of a lot of water long before the rivers, lakes, or aquifers that supply them are squeezed out into the little streams that flow out of our taps. About the impacts of cities on their surroundings, contemporary public policy has little to say.

One of the reasons we do not connect the needs and appetites of our cities with larger environmental decline is that we think that because we can afford to engineer our way out of short-term water availability and quality issues, we are creating a sustainable water management future. There is no guarantee that this is so. We are not the world leaders in water resource management that we tell ourselves we are. We are not world leaders because we widely fail to accept the role that aquatic ecosystem health must ultimately play in sustainability. We have, over the last century, destroyed a great deal of our country’s natural aquatic ecosystem function and replaced it wherever possible or necessary with technology. Artificial technological replacements for natural and passively managed ecosystem function, however, invariably turn out to be expensive and inferior to ecosystem-provided goods and services.

We are in the process, nationally, of turning a Taj Mahal of diverse and highly productive natural ecosystem function into a tool shed of singular engineering purpose and function. We have yet to learn that there are things nature does

on our behalf that we don’t know how and can’t afford to do for ourselves. By destroying the Taj Mahal that is nature and moving our society into the tool shed of engineering solutions to water quality concerns, we fail to see that in the end there won’t be clean water anywhere except where we commit to water treatment. What we are effectively doing is putting nature and all of humanity on dialysis. This is something to which the next generation ought to strenuously object.

The third big challenge we face relates to governance. Every time I return to Canada from abroad I feel as though I have fallen back through a rabbit hole into a land of such utter market and money obsession as to make the people who live in it seem mad as hatters. In trying to confront well-identified future challenges such as sectoral and regional conflicts over shrinking water supplies, increased demand related to growth and development, climate change, and demands for water from new energy

“Water is a more important resource to the people of Alberta than oil or gas, and it’s becoming more crucial all the time.”

(Former Alberta Premier Peter Lougheed, July 21, 2004)

developments such as biofuels, we need to aim for far more than just market efficiency.

The Road Ahead

Before we embark on any significant water policy reform, we must ask ourselves some fundamental questions. What is our water policy really about? Is it about market efficiency? Is it about decentralization and local participation in water resource decision-making? Or is it about sustainability? Or should it be about all of these things together?

Global example warns us that achieving part of the goal is not enough. Creating markets and efficiency without achieving equity and sustainability changes the circumstances of water governance but does not solve the whole problem. It only creates new problems that are even more complicated to address.

What we need is a new Canadian water ethic that harmonizes federal and provincial water resource management aspirations. Under the aegis of that ethic we need to change our economic system to make true long-term sustainability possible.

Unlike so many other places in the world, we still have room to move in Canada in terms of how we manage our water resources. If we can balance the global water availability and quality needs of nature, agriculture, and our cities, everything else we need to do, including addressing climate change, may very well fall into line. Only then will we have something new and useful to share with the rest of the world. 🍷

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