# M. PAUL-EMILE BARBEAU

# BULK WATER EXPORT

# MATTERS OF CONCERN

*By Paul-E. Barbeau*

## A) PROBLEMS

The economics are not the only matter that may govern the import of water. Long-term national strategy may dictate any country to preserve its water resources and consequently suggest to import water. Such case may disrupt from an apparent rational approach and precipitate commercial operation. From the shortage of water around the world several signs show that will emerge a crisis for the management of this unique and vital resource.

Water export within North America is one fold. Exportation to the rest of the world is a second one. Who can do it and under which authority, according to which rules?

The export of water in any large quantity covers not only legal and political but also moral aspects which may respond to different and possibly conflicting objectives. So, various local and national interests shall be considered such as rights and ownership, environmental impact and social priorities.

## B) TRANSPORTATION IN BULK BY SHIP

Water transportation in bulk by ships is expensive but can be done with a tanker vessel on very short notice and almost unremarked. At a cost of about $30,000.00 CDN per day for a 15,000-metric ton capacity vessel, a delivery schedule of 10 days will bring the initial transportation cost at $300,000.00 for 15,000 tons or $20.00 per metric ton or $0.02 per liter. Other charges plus practical solutions for quality control and storage add to the cost by a margin of about 60%. Once this is easily established, it is adequate to just wait and see who will come first not knowing why, and how.

## C) PRACTICAL MEASURES

Before uncontrolled export operations start on a large scale, practical controls shall be addressed at an early stage as ample room is left for cheating.

Capturing water is easy. Simply a floating ship can pump what may be declared as water ballast. This is done daily on any coastal or ocean-going vessel or even more simple with any barge as there are already some on the Great Lakes.

The tools to export water afloat are already there, what is missing is the precise development in law to prevent an uncontrolled practice.

## D) DILIGENCE

Delivering water in bulk without controlling and protecting the reputation of origin shall be prevented. Stringent quality control shall apply to water export in bulk. There is much to lose otherwise.

There are already acquired rights. Although someone may pretend the law is a seamless web, there are already sinking holes which must be meticulously patched to avoid confusion in words if not conflict of opinions and regrettable precedents.

Matters become urgent when they are essential. That is where we are. It is an obligation to provide our societies with a decent humanitarian code of ethics for the consumption and exportation of fresh water. North America, with its abundance shall pave the way.

# MR. JAMES BRUCE

# SOME THOUGHTS AND DISCUSSION ON WATER EXPORTS FROM CANADA-U.S. BOUNDARY AND TRANSBOUNDARY WATERS*

J.P. Bruce, 22 March, 1999

## COMMENTS ON DIVERSIONS:

A number of engineering firms on both sides of the Canada-U.S.A. border have examined options for diverting water to the U.S.A. southwest and northern Mexico. In the Rio Grande, the Colorado, and the Great Plains basins, total consumption has already reached 40 percent of renewable supplies. Twenty-one percent of U.S.A. irrigation is now being achieved by over pumping groundwater. If climate change projections are correct in indicating increasing drought frequency and severity in mid-continent over the next century, reductions of flows of the Rio Grande by as much as 75 percent and of the Upper Colorado of 40 percent have been estimated. As one Mexican expert has put it, "The scope of this threat makes a merely bilateral (U.S.A.-Mexico approach unsatisfactory" (Szekely, 1991). Thus, it may well be that future pressures to divert waters southward as far as Mexico will increase markedly in future decades.

On the other hand, successive Canadian governments have stated that Canada's water is not for sale (except in very limited quantities in bottles or other containers) and the U.S.A. has never formally requested major diversions (other than at Chicago). Part of the rationale for the Canadian position has been the recognition that water export amounts to export of agricultural and other economic opportunities. The B4ritish Columbia government has recently passed legislation prohibiting any additional export or diversions of water except in bottles. Most U.S.A. experts believe that improved conservation and demand management could meet their needs. In addition, the engineering costs of major diversions make this a much more costly source of water than present prices would support.

In drought situations over the next few decades, especially with the projected effects of climate change, the main pressure may be for the increased diversion southward through the existing Chicago ship canal out of Lake Michigan. Analyses are needed of questions such as: if diverted waters are used to keep irrigation water prices for southern U.S.A. or Mexico crops artificially low, is this unfair competition to Great Lakes basin farmers?

The "Great Lakes Charter" of 1985, while not binding, does provide for the Great Lakes States and Ontario and Quebec to consult on major changes. In addition, Article III and IV of the Boundary Waters Treaty provides for an IJC approval of significant uses, obstructions, or diversion of boundary or transboundary waters.2

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* These are drawn mostly from two earlier publications: Broadening Perspectives on Water Issues: J. Bruce and B. Mitchell. Incidental Report # IR95-1 The Royal Society of Canada August 1995, and Environmental Challenges of the 21st Century: Implications for Canada-U.S.A Transboundary Issues and the International Join Commission – J.P. Bruce 1997: Report for IJC

## WATER DEMANDS AND SUPPLIES – THE CHANGE PICTURE

Three main factors will affect future water demands and supply on transboundary and boundary rivers and lakes. These are: population trends, changes in water demand per capita, and climate change.

Water withdrawals (1985) in U.S.A. were 13% for domestic use, 45% for industry and most of the balance for agriculture. In Canada (1995), domestic withdrawals were 18% of the total, 70% were for industry and most of the small balance for agriculture. These data reflect in part the fact that U.S.A. has about 21 mill hectares of irrigated land, while Canada has about 700,000 hectares (1993), mostly near the U.S. border. Increases in irrigation water demand in a stable climate depend greatly on food demand, prices, cropping practices and improvements in irrigation water management, but would likely be less than 1% per year. Without any changes in climate, however, U.S. water withdrawals in all sectors are projected to rise to 20-40% of available supplies by 2025.

Studies of climate change impacts on irrigation in the Great Plains of U.S.A. show much more rapid increases in demand. Indeed, climate models now project that the greatest drying, between bursts of heavy rain, would occur from 45-50°N near the western border and through the Great Lakes basin. (Wetherald and Manabe, 1995, Journal of Climate and IPCC 1996 Chapter 14). This strongly implies lower summer and autumn flows of the many transboundary rivers and streams crossing the border between the Great Lakes and the Rockies and lower Great Lakes levels. Thus, increasing competition for the available water will probably arise from both increased demand and a changing climate.

In many of the Boundary and Transboundary basins, greater public participation in administering apportionment agreements could assist in ensuring acceptance of some of the difficult decisions that may be required with these additional future stresses.

Consumptive uses without climate change of **Great Lakes waters** were estimated (IJC 1981) to reach a median projected amount of about 25,000 cfs (708 cms), 4,500 from Canada and 20,900 from U.S.A. by 2035**. Consumptive use is 5 to 10% of total withdrawals. The potential effects of increasing average temperatures, evapotranspiration and precipitation changes with a greenhouse gas forced climate, requires further study but will likely result in much increased consumption for irrigation, cooling and household uses. In the Great Lakes Basin, these increasing consumptive uses would further exacerbate lowered lake levels due to an estimated excess of increased evaporation over precipitation with climate change. Projections from early climate models suggest reduction of net basin supply by 37 to 50% and of levels by 0.2 to 0.5 metres for Lake Superior and 1 to 2.6 metres for the other Great lakes. More recent climate model runs with aerosol effects factored into the models may suggest a lesser reduction in levels, but these studies are just getting underway.

** Projections in 1985 report for year 2000 were 161 – 238 cms in total.

Nevertheless, while uncertainties exist in both consumptive use projections and climate change effects, both point to two main conclusions:

1) we are probably facing significant lowering of Great Lakes levels in the coming century with losses in hydropower and shipping, possible gains through reduced shore erosion, and major consequences for shoreline wetlands ecosystems.

2) consumptive uses upstream of major hydro-power production facilities at Niagara and the St. Lawrence, are and would continue to be 4 to 5 times greater in U.S.A. than in Canada.

Across Canada, one in five municipalities currently report problems with suitable water availability. In the U.S.A., 20% of citizens receive water from facilities that violate a national safety standard. To begin to address these issues there is a drive to increase water use efficiency being promoted, for example, by the Canadian Council on Ministers of Environment's national action plan to encourage municipal water use efficiency. Public information campaigns in both U.S.A. and Canada encourage less lavish use of water in irrigation and household uses. Working against such conservation efforts is the relatively very low price, and related high consumption of water, for residential use in North America, compared to other industrial countries. Canada's average price is $0.29 (US) per 1,000 litres with 370 litres/person per day used. For U.S.A. these figures are $0.30 (US) and 430 litres/person per day. Compared to the average of four European countries (France, Germany, Sweden, U.K.) North Americans pay one half as much and use twice as much.

Groundwater consumption from aquifers near the border is also likely to increase giving rise to potential transborder conflicts. At present most of the irrigation water used on the U.S. side near the border is from groundwater. Allocation of water from shared groundwater aquifers is a potential problem area. Consideration should be given to advancing the adoption of a more formal mechanism (e.g. the Bellagio Draft Treaty on Transboundary Groundwater) for protection and sharing of transboundary groundwater perhaps as an Agreement pursuant to the Boundary Waters Treaty.

# MR. RIC DAVIDGE

# ALASKA WATER EXPORTS

## The Market

Within three to five years the greater southwestern region of the United States and the most northern communities of Mexico, including Baja will be out of water, even if it rains. Some areas in this region have already experienced surface subsidence of over 8 feet for 300 sq miles due to ground water pumping. Recent drought studies by major universities have discovered that dry cycles of 20 to 150 years are the norm in this area. What is unusual is that over the past 100 years, droughts have only lasted 7 to 10 years.

California, between Sacramento and San Diego, is the second largest economy in the world, second only to the United States. Major Multi-national manufacturers and producers, directly dependent on clean water, are in this area. The price of water, on a dollar per unit basis, is already higher than refined gasoline. Significant manufacturing in northern Mexico is rapidly growing in response to international trade agreements and global economics. The Colorado River, the most important water source for this region, is being reallocated to upstream users who have not historically taken their full appropriation resulting in down stream users loosing vast quantities of water. Government desalinization of the Colorado River is the most expensive in the world, and still leaves over 700 TDS for down-stream users. Mexico is insisting on its full appropriation of "clean" water.

Population growth projections of 33% by 2005 for southern California alone continue to underestimate actual growth. Political realities such as the Endangered Species Act (ESA) are causing dramatic reallocations of water to fish and wildlife throughout this region. Conservation legislation adding additional protection to rivers and their ecosystems that will cause draconian reallocations of water to other than human consumption is before Congress. All major rivers in the United States flowing into the Pacific are effectively closed to appropriation for export by specific federal/state statutes or environmental regulations.

More and larger desalinization projects can not produce the quantities of water, nor the quality of water for this region that can be economically imported from Alaska. The top desal engineers in the world agree that desal technology is mature and no developments are anticipated that could drastically lower desal cost per gallon. Further, when all costs are considered for desal, including government subsidies, the real cost of desalinated water is above $2,000 per acre-foot and the environmental (energy consumption, land use, and toxic waste disposal) costs are significant, troublesome, and controversial.

According to the World Bank, the World Health Organization, and the United Nations there are more countries without sufficient potable water then with it. Foreign markets in Pacific Rim nations including, Japan, Taiwan, China, and the Philippines also offer pressing opportunities. Delivery contracts for bulk water shipments from Alaska are already in hand and projects are moving forward with projected shipments beginning in June of 1999 at per acre-foot prices that are very attractive. Population growth in these countries is exponential and their surface and ground water is fully appropriated or so polluted that the economic and environmental costs of cleaning it up is prohibitive. Bulk exports to bottling plants and industry in these markets offer the best potential for Alaskan water exports.

**The world is running out of water, even if it rains. Even if global warming is not a reality.**

Every major market and economy in the world will soon feel the impact. Not just the south-western region of the United States, but huge cities like New York, where its most important reservoir is more than 70% empty. In Florida, orange groves and resort towns alike struggle to recover from the desert-like conditions of a small drought in 1998.

Everything from soft drinks to French wine to micro-chips will get many times more expensive as area reserves of clean water are drawn down. Essentially every food source will begin to shrink that is except their price. The Archer Daniel Middlen Co. (ADM) professes in its TV commercial that the greatest

challenge in the next decade will be feeding the world. They are wrong. The greatest challenge is the demand for potable water.

Some experts predict full-blown economic disaster that may start in one region, but will spread across the planet. Y2K was fun, and fixable, compared to this challenge. Exponential population growth, ravenous production and manufacturing demands, and the need to protect critical fish, wildlife, and ecosystems combine to cause the kind of eco-political pressures that have caused wars. Wars being fought even today, with access to fresh water a critical if not fundamental factor in these conflicts.

## The Challenge

I believe our challenge here is not to be knowledgeable. Nor is it to be revisit philosophical dogmas. Our challenge is to be wise. Wise for the people and natural resources of this indigenous aquatic ecosystem. Wise in the face of certain events that will surely be of biblical proportion. This region is facing serious questions. Questions of survival. Not of human life, but of a way of life that must include the conservation of your magnificent and fragile biosphere. You are a very tempting target. The scale of the Great Lakes is recognized globally. It is known by any child who turns a globe or looks at a world map. You are the largest accessible reservoir of fresh water on the Atlantic Ocean. You are a target.

Is the bulk transfer of fresh water from this region to one that is in critical demand economical? It depends on the price of water in the consumptive market. It is really that simple. The lower the supply, the higher the demand - the higher the price. Once the price gets to a given point new supplies become economical. New technologies are applied. Human greed is a reliable factor. Our history as human beings dependent on water is clear. Not just in the United States but across the planet and throughout human time.

So what are we to do? But who are "we"? We, this beautiful environ, are an attractive supply source. What systems will we have in place to ensure our ecological survival as we watch the thirsty approach? Is there a silver bullet that can slow or tame this beast, or do we need a number of alternatives given the diversity of the bio-sphere we are tasked to protect?

We can not solve the problems of the world or this continent during this two-day workshop. Discussions that focus on market demand are not useful here. We must focus on supply management. We must define the problem on this end clearly, and we must start with the resource. What do we have and where is it? Two simple questions, that can take many lifetimes to answer given the scale of this resource. My limited research, however, revels that you have been busy. That's good because time is not on our side.

And who is to answer these questions? It appears that the IJC is a most appropriate vehicle for not only resource inventory coordination, but also policy development, articulation, and prioritization.

Setting priorities. Given limited time and resources, with pressing demand, that's the bottom line.

So what are the questions we need to address?

1. What do we have? (quality and quantity)
2. Who owns it?
3. Where is it?
4. From what hydrologic unit(s) will they want it first?
5. What in-stream uses/values do we think are important?
6. Which are the most important in-stream uses to the least important?
7. How much water do we need to meet in-stream uses that we have determined important?
8. What mechanism(s) do we use to ensure in-stream uses are protected?
9. Can any mechanism really protect in-stream uses in the face of pressing human demand?
10. What legal systems already exist (US/Canada) that provide a framework upon which to build?
11. What are the strengths and limitations of these systems?
12. How do we enforce our decisions?
13. Who has the ultimate authority to enforce or overturn our decisions?

Our experience in Alaska is that each of these questions can and must be answered. Our in-stream "appropriations" for fish, wildlife, recreation, and future needs works. Vesting property rights with other than human consumptive uses offers greater legal protection. It takes time and money to delineate species and/or use specific appropriations, but if you start with the water sources most likely to be under pressure, you can achieve real success right where you need it. It takes clear leadership and system coordination along with realistic strategic planning – it takes political vision and courage as well as commitment, but it can be done. What are the alternatives?

Our decision to regulate hydrologic system unit transfers of any significant amount of water, seems to make sense legally and scientifically. It allows manageable science in a holistic water dependent environment while not violating our federal "commerce clause" issues. Does it address the cumulative impacts of any and all water takes (diversions) from an area as vast as the Great Lakes? No. But it does provide a manageable place to start and to learn and build from.

Should surface and ground water legally be treated differently? Although I am not that knowledgeable of the hydrologic character of your ground/surface water resources in this area, my review of the materials you have sent causes me to say no. It would appear that both ground and surface waters in this region are generally interrelated resources. Although buyers prefer ground water, when it is available in sufficient quantity, because it is cheaper to process, it is out experience that appropriations of either should be addressed in the same manner. A significant draw from a groundwater source in close proximity to large surface water usually has an impact on the surface water.

In Alaska we have insisted that any significant export of water from a hydrologic unit requires full in-stream protections (fish, wildlife, recreation, future needs) and environmental assessment prior to licensing. Unnatural fresh water discharges, however, can be viewed differently as the environmental impact is different.

By establishing a regulatory framework that is hydrologic unit based, you can manage surface and groundwater appropriations with a much better sense of specific and cumulative impacts. In the case of the IJC and the Great Lakes ecosystems, this poses a significant challenge given the numbers of stakeholders or "owners" who have an interest in either conservation or exploitation. An agreement between all stakeholders or jurisdictions is essential to ensure the appropriate level of ecosystem management.

Let me again emphasize that our challenge here is not to try and manage demand. Those in the demand markets will address their own issues. Let's not get distracted from what we must do. We must provide the framework for solid science and effective management this potential source in the face of increasing demand.

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# MR. DEAN JACOBS

## MR. DEAN JACOBS

## NO PAPER AVAILABLE AT THIS TIME

# The Place Where the Waters Divide:
# Bkejwanong, Water and Aboriginal Concept of Sustainability

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March 26, 1999

Our present-day community is nestled between Ontario and Michigan at the mouth of the St. Clair River. The modern delta emerged only 6,000 years ago. We are timeless. Furthermore, we are here and we are not going away. Bkejwanong is a meeting ground and a place of sacred fire. So if you want to share with us, you must make an effort to understand us and our ways.

For the citizens of Bkejwanong, sustainability is an animate concept that translates each and every day into practical concerns for our Mother Earth and for our future as well as for the future of our children seven generations hence. This is our unique perspective on sustainability. It is animate, practical and ultimately spiritual.

We have been on our Territory for thousands of years. This fact is pre-eminent in understanding our approach to sustainability. The Bkejwanong (Walpole Island) First Nation have always lived by and from the waters of our Territory, known to them as Bkejwanong in the Great Lakes and connecting waterways. Bkejwanong means in your language-English-the place where the waters divide. It is our life-blood. Our Territory extends from Lake Erie in the south to Lake Huron northward. It also includes the watershed of Lake St. Clair and the Thames River as well as the St. Clair and Detroit Rivers. Bkejwanong is truly a place of water. Even many thousands of acres of our lands are covered with water and are known as wetlands. Our wetlands and our waters are world-renowned. Here the fish and muskrats have been bountiful and our sustainable harvests have been rich.

Our lands and waters are under siege. Walpole Island has been subjected to pollutants for decades. First, up-stream is Canada's major petrochemical and refining region called "Chemical Valley". Between 1974 and 1986, a total of 32 major spills, as well as hundreds of minor ones, involved 10 tonnes of pollutants. Since 1986, the Ontario Ministry of the Environment has recorded an average of 100 spills per year. A decade later, this number is now only beginning to decline. But the propheoy of the seventh fire is over and, as we quickly approach the new millennium, the balance has now shifted in our favour as has been foretold.

Secondly, passing ocean-going freighters are a constant reminder that a "valdez-type" disaster is possible. As it is, these ships are to blame for introducing the menacing and resilient zebra mussels to Lake St. Clair and our wetlands.

Thirdly, significant agricultural runoff of pesticides and fertilizers is a major non-point pollution source. Our once popular beaches are closed for weeks on end because of high levels of bacteria. And lastly, dredging of contamination sediments in the surrounding waters poses yet another serious environmental problem.

Environmental degradation has significant implications for our wildlife and its habitat, our human health and well-being. It determines our water quality and whether we can safely drink the waters of Bkejwanong. It affects our economic development. This effect is cumulative and complex. For example, our economic activities depend to a large degree on the viability of our

natural resource base. This, in turn, affects our recreational tourism.

Our Aboriginal rights to the Great Lakes include both our Aboriginal title, sovereignty over our Territory and governance of it. Our Aboriginal rights have never been addressed by non-Aboriginal governments. They have not been covered by any Treaty or any other similar arrangement. Our Territory is pure unceded Lands and Waters.

So you can readily see that any changes in the quality or the quantity of water directly affects our Territory-both our lands and wetlands and our waters in profound and varied ways. It affects our livelihood and our bountiful and diverse economy. It affects the day to day life of our citizens. None of these things need to happen if sustainability is practiced wisely by governments and their agencies. To do so, our neighbours in non-Aboriginal communities will also benefit from these practices.

**RESPONSES TO THE WORKSHOP QUESTIONS**

**A. Laws and Policies that bear on the sustainability of the water resources in boundary and transboundary basins including shared ground water aquifers.**

Our First Nation practises sustainability on a daily basis as part of spiritual heritage and responsibility to Mother Earth. One does not need "laws and policies", or their enforcement, when one's citizens practice sustainability on a regular basis. It appears to us that, since non-Aboriginal governments do not practice sustainability on a regular basis, much less enforce their own legal and policy instruments, this is the reason why they stress the need for a legislative and a legal approach to their citizens. This way of thinking is to our minds somewhat perverse, putting the daily practice of sustainability, so to speak, in the wagon after the horse rather than being the horse pulling the wagon. Our experience with the enforcement of daily legal spills (loadings) by private industry along the St. Clair River is witness to this fact. The spills continue when there should be no spills. The same, to my way of thinking is also applicable to international legal principles. The "medicine line" cuts through the Great Lakes making the possibility of sustainable development much more difficult. It also cuts our "Reserve" in two, making it even more difficult for us to practice our ways.

Aboriginal people have much to teach the wider population of

Canada and North America about our living in harmony with nature and in community with other people. Our Elders know our Lands and our Waters. They will continue to share that knowledge with the European-based scientists. But the later have to be ready, and well-prepared to listen to our ideas and our voices. Through knowledge, comes first understanding and then wisdom. A strong feature of our cultures is an emphasis on community, on sharing resources through good and bad times, and on group decision-making through consensus. The preservation of the unique cultures of Aboriginal people and the sharing of their knowledge are therefore an important part of our sustainable life strategy. For this reason, one of the indicators of overall sustainability should be the well-being of Aboriginal communities.

Recently, there have been a few signs that the balance may be shifting in our favour from exploitation to sustainability. For example, in 1995, our community was the recipient of a major international award, the "We the Peoples: 50 Communities Award".[1] We have now been recognized by the United Nations, in its fiftieth anniversary, as one of fifty communities around the world demonstrating, among other achievements, our commitment to environmental issues. This international recognition comes from our exemplary record in Environmental Research and Sustainable Development Advocacy. In particular, the award is for the leadership role which our community has taken in combining traditional and non-traditional environmental knowledge as the basis for "interacting effectively with the non-indigenous

population and western environmental scientists to everyone's mutual benefit." This is a sign of a true meeting ground of ideas.

Needless to say, if law and policy(ies) are not working, neither are the management principles and conservation measures. One idea would be to promote a greater understanding of Aboriginal Science in these issues. The concept of sustainability is founded on Aboriginal Science and notions of ecology. The problem has been that European-based knowledge systems are not based on sound science and at the same time reject Aboriginal Science, thus fail utterly to become a true and reliable source for non-Aboriginal governments to base their approach to sustainability. This is analogous to my seeing a frustrated Indian dog continually chasing its tail and coming up only with air time after time. It simply got the wrong prey. I fear that until that is recognized non-Aboriginal governments are not going to get every far with their policy and legal approaches to sustainability in our generation. This seems to me to be the heart of the matter. It would be a good subject for an international conference on "Aboriginal Science and the Concepts and Practice of Sustainability". We need more sharing and understanding and mutual respect to work together. Only then we will begin to get some better idea of both the questions that are to be asked or what the answers are.

**B. Existing diversions, past proposals, and reasonably foreseeable proposals for diversions of water in and out of boundary and transboundary basins, including bulk removals of water for export.**

Our experience with diversions has been multitudinous since the early twentieth century. Our wetlands have been drained for commercial agricultural use making them almost unusable for other diverse purposes. In the 1930's our waters have been diverted and dredged through the St. Clair River and adjoining waterways. The effect has been disastrous in almost every case.

The 1950's saw prosperity and massive industrial expansion in Canada's heartland. It also witnessed large-scale environmental degradation-pollution without mitigation or compensation. However, this expansion, of which the St. Lawrence Seaway was the spine or the backbone, exacted an inordinately heavy toll on our people who had always lived by and from these waters. The environmental damage at Akwesasne and at Walpole Island has been, and still is, massive and wide-spread. Today our main source of our potable water supply is contaminated. Likewise the animal and plant life have suffered dreadfully with only minimal compensation and without mitigation. In 1955, when the St. Lawrence Seaway was under construction these matters again became a concern. To facilitate construction of the St. Lawrence Seaway, our First Nation was forced to conditionally enter into a Treaty, in 1958, the land under water of the Southeast Bend Cut-off Channel to the Crown. We had no choice. We were forced to relinquish rights in part of their territory. This Treaty raised two other issues of continuing concern: the heavy St. Lawrence Seaway traffic through their territorial waters and the community and environmental

concerns created by the dumping of toxic wastes on Seaway Island. In the Fall of 1989, for example, the First Nation has raised the issue of dredging in the Channel with the federal government and has negotiated an agreement on these matters. In September, 1997 it was agreed that Seaway Island was to be re-affirmed as part of the Bkejwanong Reserve according to the Seaway Island Treaty of 1977.[2]

Enough is enough. There should be no more tampering with the waters of the Great Lakes for either purposes of diversion, the export of water or its use for more economic development at the inordinate price exacted on our waters and on the practice of sustainability. International agreements, such as GATT and NAFTA) to which First Nations have not been a party to, much less consulted, should not diminish our land rights or our lands or our sustainable practices.

The proposals to sell water from Canada to the United States is, in our view, utterly reprehensible. The waters of the Great Lakes, including our waters within our Territory, remain unceded to this day. It is a legal principle, even of English common and property law that one cannot give, or grant, that which one does not own. There are no Treaties or other similar agreements covering any of the lands and the waters of the Great Lakes. How can the non-Aboriginal governments contemplate the export of the selling, or even drawing up a "business case" to give, grant or sell, that which it doe snot own by even its own laws? It cannot, and will not, be done. The assumptions made in this part of the

paper are frankly not only inappropriate but erroneous being based on the view that we do not exist or are invisible. But we do exist as human beings. We have remained here for thousands of years and we are not going away. You will have to eventually address this fact as well as our concerns about Aboriginal title and land rights as well as our approach to sustainability.

The integrity of Bkejwanong must be respected and maintained for future generations. This is sustainability in our view. It involves management and control through Aboriginal governance, including protection for the land and its uses wherever they may be within our Territory. To this end, there must be protection and conservation of the flora and fauna, of village sites and former village sites, natural heritage sites, of traditional historical sites, of sacred burial places as well as protection of the environment.

Today our lands and waters still remain intact and unceded. To us they are sacred. They are our spiritual Mother. They remain a place of Fire. We are spiritual beings. As such, our sources of life are all alive and around us--the four elements of Earth, Water, Air and Fire.

# DR. RONALD LOUCKS

# Preliminary Response to Workshop Questions

**Ron Loucks**
**March 24, 1999**

Re: Text on sustainability/sustainable use:

This definition appears to include far-field effects. The particular far-field effect with which I have experience is a downstream effect of upstream diversion - the effect of lack of freshwater runoff on productivity and biodiversity in estuaries and coastal waters. Oceanographers have tended to keep to themselves the knowledge that freshwater and tides interact to create a pressure distribution in the water column which drives an estuary current which is as much as thirty times greater in volume transport than the freshwater discharge. The estuary downstream from the Great Lakes is the Saint Lawrence Estuary. The signature of the spring freshet is detectable over eight months and more than 1000 kilometres, as far as Browns Bank off southern Nova Scotia. Decision-makers and the public are generally not aware that freshwater flowing into the sea is not wasted, that it's part of the pattern.

Re: Law and policy:

In terms of scientific needs, it can be useful to assess the level or degree of resolution of available scientific information supporting alternative policies; the vulnerability to errors of "complacency" or of "false alarm" implicit in this level of information; and the relative costs of such errors. For example the case of the far-field oceanographic effect, above, is made only at the level of a prediction (Bruce, 1990)[1]*. It is vulnerable to a Type I error - it could be a false alarm. However if this concern is dismissed without investigation, we are vulnerable to the complacency error (Type II). And which error is associated the higher costs? Usually the latter.

I am interested in the potential usefulness of the comments made by Francis and Regier[2] on Great Lakes management. They have applied Holling's ecodynamics "model" involving exploitation, conservation, release and reorganization. I am interested in discussion on the characteristics of, and ways to avoid, the over-connectedness that Holling describes as being a precursor to crisis.

Re: Experience and impacts/effects on diversions and the legal mechanisms used:

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[1]Bruce, J. 1990. *Eco-Decision*, vol 1.

[2]Francis, G. and H. A. Regier, 1995. Barriers and bridges to the restoration of the Great Lakes Ecosystem. in *Barriers and Bridges to the Renewal of Ecosystems and Institutions*. L.H. Gunderson, C.S. Holling and S.S. Light (eds), Columbia University Press.

The question of cumulative effects interests me. I find that assessment of cumulative effects tends to lead to a choice being faced between two approaches: 1) environmental impact assessment, case-by-case, or 2) a policy approach invoking principles.

On the question, "Is a prohibition of inter-basin transfers or other bulk removals a sound policy for management of Great Lakes water?", the context for the discussion is different depending on which approach (above) is adopted.

## DR. PETER PEARSE

## NO PAPER AVAILABLE AT THIS TIME

# FAX COVER SHEET

To: Mr. Murray Clemen, Secretary
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***Message:***

Mr. Clemen

One of the things you requested in your letter of March 16 about our forthcoming workshop was a biographical note. I'm sending one with this.

I've noted your request for responses to the "Questions", also. I'm travelling most of the time between now and our meeting, but I'll try to get something to you later.

Peter Pearse

# PROF. JOSEPH SAX

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March 23, 1999

Murray Clamen, Secretary
Canadian Section
International Joint Commission
via fax (613) 993-5583

## Preliminary Response To Workshop Questions

**1. Can you suggest ideas on how the waters of the Great Lakes can be protected for the long term to ensure sustainable use...? How does one place a value on the many uses to which water are or could be put, including instream uses....?**

The combined interests of the Great Lakes jurisdictions and of modern environmental concerns converge to suggest some version of the following three-point management system:

1. A reinvigorated version of riparianism. That is, minimizing disturbance to water quality and aquatic ecosystem values, plus protection of basin state/province values such as navigation, hydropower, irrigation, etc., by disfavoring out of basin-jurisdiction uses. There are various ways to do this; perhaps a permit system with a unanimity requirement (à la WRDA), a presumption against (though not a flat prohibition of ) export uses, etc. This is the most plausible device for confining demand, though it need not be rigidly prohibitory of export.

2. Establishing (i) instream-flow requirements (seasonal, etc.) for tributary waters; (ii) safe-yield limitations for groundwater extraction; and (iii) water quality discharge requirements (which are already generally in place under water pollution legislation) plus non-point-source controls).

3. Controlling demand for uses within the basin jurisdictions through water-use charges. "Metering" in some form has proven highly effective, whereas regulatory rules about reasonable use and waste have not.

The combination of these 3 steps will bring you about as close as you can get in practice to what most people mean by "sustainability". I suggest these devices are also the most "realistic alternatives for promoting water conservation, reducing demand and... stretching available water supplies." As to valuing water uses, the most practical approach is to build the system around priorities--the values that must first be satisfied before other uses can go forward. I would suggest the 4 priorities above: (1) Inbasin-jurisdiction uses; (2) instream values to protect fish, riparian areas, etc. (3) water quality (4) charge-based efficiency of use for economic users. Within these categories, one can have other priorities (e.g., hydropower and navigation over irrigation), but I have no views about them.

**2. What has been the experience in the United States...regarding inter-basin diversions and bulk shipments of water?**

We do a great deal of it. Many of the major cities (and agricultural areas) in the arid west depend upon inter-basin diversions, for example, Denver, Phoenix, San Francisco, Los Angeles, San Diego. The same is true for agriculture, as California's massive inter-basin 'plumbing' system demonstrates. Whether one thinks the experience has been good or bad depends on how one evaluates the existence of the metropolitan areas mentioned above, such as the San Francisco bay area, which depends upon imported water. San Francisco's import (from Yosemite National Park) was the subject of a famous environmental controversy in the first years of the 20th Century. The Los Angeles import from the Owens Valley generated a bitter, protracted controversy over the destruction of a promising agricultural community. Of course in both cases (as in the trans-mountain diversion from western to eastern Colorado) the water was exported from remote, rural or

largely-unpopulated areas to places of burgeoning growth. That is not the situation with the Great Lakes basin.

The very strong feeling within the Great Lakes basin jurisdictions that the water belongs to the people there is shared by people in every export area of which I am aware, and various devices now exist that seek to protect those in the areas of origin. California has area-of-origin protection laws by which water can be called back if needed, but they have never been tested. Other places have built compensating reservoirs to reassure local interests and protect their possibilities for future growth. It is also possible to compensate people in areas-of-origin, which is perhaps the way to view what New York City did in building its facilities on the Delaware River. Perhaps the best example of successful resistance to export was shown by the Columbia River basin interests in the 1960's when ideas were being floated about diverting Snake River water into the Southwest, or sending water from the Columbia (by undersea pipeline) to the California coastal cities.

**3. Is prohibition of inter-basin diversions or bulk removals a sound policy for management of Great Lakes water? Is it feasible in law and practice?**

I would strongly counsel against flat prohibitions. A viable policy needs some flexibility. There are a variety of ways to diminish prospects of significant exports without a flat prohibition, such as a bi-national version of WRDA (a unanimity rule), or some sort of permitting system that imposed presumptions against export.

At the basic policy level, the question is whether water is to be treated as a commodity, or as a more-or-less inalienable community resource. As I noted above, the contemporary feelings of the basin jurisdictions that Great Lakes water should be reserved for their benefit, joined with modern environmental values, suggest strongly that some version of a non-commodity view of the water is the only policy that would be acceptable.

Is it sound policy? From an environmental perspective there are good reasons to disturb natural systems as little as possible, which is consistent with limiting uses to those in-basin (and limiting in-basin consumption). Of course much of the territory of some of the basin states is itself out-of-basin (only Michigan is wholly within-basin, and Illinois and Indiana are almost entirely

out-of-basin as I recall). So the policies under consideration (in-basin-state uses, vs. export out of state) are not either environmentally or hydrologically consistent anyway. But, in any event, limiting uses to those within basin-states at least reduces the chance of a huge shock to the system, as by a vast diversion to the Northern Great Plains or to the high plains of Texas, assuming such uses became economically feasible (it is unlikely that tanker shipments, or bag-towing-ships would themselves be of quantitative or qualitative significance). With those reservations, a basically-no-export policy can be defended as sound policy.

Is it feasible in law and practice? Yes, though any anti-export policy needs to be made as federal law (either as statute or compact) in the U.S. to avoid dormant commerce clause problems, and would probably have to be done through the treaty power or through a congressionally-approved compact with Canada to be binding on both the U.S. States and the Canadian Provinces. It will be recalled that Congress, in consenting to the Great Lakes Compact, did not consent to the invitation to Ontario and Quebec to become parties, and did not consent to allowing the compact commission to have more than a consultative function. Whether Congress would today consent to any increased form of international authority over the Great Lakes is uncertain. I do not know what the views of the Canadian government would be.

-end-

# MR. A. DAN TARLOCK

TO: INTERNATIONAL JOINT COMMISSION

FROM: A. DAN TARLOCK

RE: GREAT LAKES LEGAL REGIME TO RESOLVE DIVERSION AND BULK WATER EXPORT CONFLICTS

DATE: MARCH 22, 1999

The latest perceived threat of the export of Great Lakes waters outside the basin is the export of bulk water for human consumption by tanker from Canada to the United States and other water-short countries of the world. This perceived threat is not confined to the Great Lakes Basin; export plans have been formulated for sources of Canadian water from Newfoundland to British Columbia. Anthony DePalma, *Free Trade in Fresh Water? Canada Says No*, The New York Times International, Sunday, March 7, 1999, p. 10. Bulk water exports are less of threat to either Canada or the Great Lakes ecosystem compared to the large-scale trans-basin diversion schemes that were proposed in the 1960s - 1980s, but these earlier, economically questionable diversion proposals form the political context in which this current Canada-United States water conflict arises.

The export of water from the Great Lakes must be done in a manner consistent with the legal regimes that control the use of the lakes. As the 1999 Reference indicates, there is a growing consensus that any use of the lakes, including bulk water exports, should be consistent with the emerging international legal norm of environmentally sustainable resource use and development. This idea is reflected in some but not all Great Lakes legal regimes. In a nutshell, the problems are that there are multiple Great Lakes legal regimes, no institutional mechanism to assess, monitor and management relatively small-scale Great Lakes consumptive uses in a manner that allays the fear of future damage to Canadian national interests, and the issue at the intersection between trade and resource management law.

There are at least four separate and unintegrated international legal regimes that control the use of Great Lakes water, in addition to the two federal regimes of Canada and the United States and the separate provincial and state allocation regimes. These international regimes reflect that the water law reality that the less the actual risk of shortages that cause demonstrable damage, the less concrete the legal regime. The root problem is that the most valuable aspect of the lakes is their maintenance at as close to natural but fluctuating levels as possible, but this value is only partially reflected in the existing allocation regimes and totally unreflected in NAFTA. The number of the regimes and their generality have, to date, precluded the development of a coherent Great Lakes baseline against which future uses can be measured. See Julia R. Wilder, *Questions of Ownership and Control*, in PERSPECTIVES ON ECOSYSTEM MANAGEMENT FOR THE GREAT LAKES 243 (L.K. Caldwell ed. 1988). However, the regimes do reflect

a wide-spread if general, consensus that he baseline standard for the Great Lakes is the maintenance of the ecological integrity of the system as whole. The natural- fluctuating levels- are presumed to be the norm. This baseline does not preclude consumptive, out of basin uses, but the burden is on the proponent of the use to demonstrate that there will be no long risk of environmental damage to the system.

## II. THE FOUR PRIMARY REGIMES

### *A. International Customary Water Law*

The Great Lakes are shared water resources and thus are subject to the customary rules of international water law. There are several competing "restatements" of customary international water law. The most recent is the 1997 United Nations Convention on the Law of Non-Navigational Uses of International Watercourses, 36 I.L.M. 700 (1997). The regimes all rest on two principles: (1) all countries that share a common watercourse have a right to an equitable share of the resource and (2) one country's use should not seriously prejudice another country's equal right of use. This regime is designed to set the ground rules for multiple-purpose basin development. It is therefore less applicable to the bulk water controversy since the amount of water involved is a statistically insignificant portion of the total resource. The basic problem is that the this regime contemplates a conflict between a use by one state that causes substantial, immediate injury to another. The injury that bulk exports is both a long term future one, and the injury, if any, is to the ecosystem of the lakes not to any specific country, province or state.

### *B. The Great Lakes Treaty and Great Lakes Charter Regimes*

The 1909 Boundary Waters Treaty is an early example of the limited recognition that countries that share a common water resource must cooperate with each in the use of the resource. Articles II and III both incorporate the principle that each state has the sovereign right to control the use of waters within its boundaries and the limitations that use by one state can injure another and that both states have a right to evaluate future diversions. The Boundary Waters regime is too gross a screen for most bulk export proposals. The Treaty contemplates major movements of water from one basin to another that now require extensive environmental and social analysis. There are many models to do this. However, it is not clear that bulk tanker exports would violate either Article II or trigger IJC approval. Article III applies only to diversions that affect the natural level or flow of a boundary water. The Boundary Waters Treaty has been supplemented by the 1985 Great Lakes Charter. The Charter includes Lake Michigan, the only non-boundary water lake. Again, it is not clear that bulk exporters will trigger Charter review. Article IV requires that no new *major* diversion will be undertaken without

prior notice to and the consent of all Great Lakes provinces and states. The United States Congress has waived the Dormant Commerce Clause for this agreement so the requirement of unanimous consent does not violate the United States constitution.

*C. The Pollution Control Regimes*

Toxic water pollution has been a much greater threat to the lakes compared to diversions. The Great Lakes Water Quality Agreement of 1972 and 1978 does not directly regulate bulk exports. But, the agreement is the most important recognition that the Great Lakes is an ecosystem and the ecological services produced by the system are extremely valuable and should be protected. The ecosystem perspective and the necessity to maintain the natural system are directly incorporated into the 1985 Great Lakes Charter.

*D. The NAFTA*

The North American Free Trade Agreement (NAFTA) promotes trade in goods and services among the Canada, Mexico and the United States. Trade law rests on the assumption that trade in commodities should only be restrained when there is a clear and demonstrated national interest such as health and safety. It further assumes that states have control over their natural resources prior to the time that they are transformed into commodities. Article 102. Article 301 requires that each party shall accord national treatment to the goods of another party, and Article 309 prohibits export and import restrictions unless permitted by the NAFTA or Article XI of GATT. In Annex 301.3 Canada has exempted certain goods from Article 309. These include logs and fish from five eastern Canadian provinces. The application of NAFTA to waters depends on its classification as a good. No, or minimal, processing is required to turn water into a good so bulk water could be a commodity or a natural resource. Article 201 defines a good as "domestic products as understood in the GATT as the parties may agree. Bottled water is a good but the two countries have not decided how to treat bulk water exports under NAFTA. The issue is whether bulk exports are simply another form of exporting a NAFTA commodity or an exercise in natural resources management. See generally Little, *Canada's Capacity to Control the Flow: Water Export and the North American Free Trade Agreement*, 9 Pace Int'l L. Rev. 127 (1996).

The relationship between natural resource conservation and NAFTA is barely addressed in either the NAFTA or the 1993 Side agreement on Environmental Protection, North American Agreement on Environmental Cooperation. NGOs expressed concerns that NAFTA would increase the demand for water use. However, the prevailing assumption is that NAFTA and the NAAEC maintain a distinction between environmental protection, which is subject to NAFTA, and natural resources management, which is not. Pierre Marc Johnson and

Andre Beaulieu, THE ENVIRONMENT AND NAFTA: UNDERSTANDING AND IMPLEMENTING NEW CONTINENTAL LAW 389- 390 (1996). Thus, each nation retains its power to conserve its natural resources. e.g. The NAFTA: Report on Environmental Issues, November 4, 1993, reprinted in NAFTA and the Environment: Substance and Process 393, 402- 403 (Daniel Mcgraw ed.. 1995)(NAFTA only facilitates cooperation between Mexico and United States over shared ground water resources along border). Treating bulk tanker exports under NAFTA would place the burden on Canada to articulate a clear, demonstrable national interest to ban exports. The advantage of this approach is it would allow this relatively minor use of water but would preserve Canada's discretion to ban future exports if the cumulative impacts of bulk tanker exports posed environmental and resource conservation issues.

# Mr. Richard Wahl

Richard W. Wahl
March 21, 1999

## WORKSHOP ON WATER USES

My perspective on the workshop questions is that of natural resources economist having worked on water issues in the western United States, both while in the U.S. Department of the Interior in Washington, D.C., and now living and working in the western U.S. While at Interior, in addition to reviewing the economics of water resources projects (benefit-cost analysis, federal subsidies, and water pricing) and related water use issues, a group of us focussed on promoting the development of markets in federally supplied water (water supplied by the U.S. Bureau of Reclamation), particularly since the bulk of this water was supplied for irrigation in the 17 western states at low, subsidized rates and was therefore subject to being used inefficiently.

Economists generally believe that markets, properly structured, can provide the most efficient means for allocation, conservation, and sustainability of a resource. There is little really meaning to the phrase "free market," since all markets have evolved within some institutional framework - to prevent theft, to regulate currency, to establish weights and measures, to enforce trading rules, etc. In the case of water, the degree of institutional involvement in establishing the framework for ownership, transfers, and markets is probably greater than for many other resources due mostly to the physical characteristics of water: water resources are fugitive, interconnected, not easily "tagged" with the owner's name, reusable, and subject to contamination. In the western United States, where water is more scarce, the **appropriation doctrine** for water rights was established in early mining camps and is now regulated by each state. Water rights are established by first use (appropriation) and maintained by continuing to put the quantity appropriated to beneficial use on an annual basis. Rights are not gained by proximity to a stream, per se, but normally by diversion - diversions, which in some cases, extend hundreds of miles from the source.

Especially in recent decades, as new water sources have become more scarce and the potential for finding suitable locations for additional storage facilities more difficult, existing water rights have become more valuable and state laws have evolved rules for trading, transferring, and selling water rights. Some of the issues confronted by these state institutional frameworks are (a) the interconnectedness of surface and ground water (if you appropriate or transfer a surface water right to another location, are you depleting someone else's groundwater rights, or vice versa), (b) the interconnectedness of surface water generally (you are generally only allowed to sell or transfer the quantity of water consumptively used (e.g. evapotranspiration), not the entire amount diverted, since your return flow becomes someone else's water right), and (c) maintaining a sufficient water quality that the basic uses of those using your return flows are not foreclosed (if the runoff from your fields is laden with excessive amounts

pesticides, trace elements, or, more commonly, increased salinity, then practices to assure appropriate water quality may be imposed). Water transfers or sales may be either short-term (seasonal or during a drought) or long-term (a permanent sale of a water right used in one location for use in another location, either close by or distant).

Still more recently, states have come to realize that the appropriation doctrine, as it had evolved, did not adequately protect instream uses of water (other than hydropower). A variety of measures to protect fisheries and other natural instream uses is still evolving. Primary among them is the establishment of instream flow rights, characterized by a registered flow rate between two points. Such flow rights are normally held by state agencies (such as a State Department of Fish and Game) and can be augmented in the market by purchasing rights from diverters and returning such rights to the stream. Such rights continue to be controversial because, once established, they can prevent a downstream appropriator from selling his or her water right to a user for diversion upstream of the instream flow right. This is one area of the law which is still evolving. For example, while instream flow rights have been used to protect particular instream uses, they are generally not recognized as a method to protect riparian uses (e.g., for wetlands).

Economists believe that markets, appropriately structured, can provide for **conservation** of a resource and for **sustainability**. In particular, as water rights in the west have become more valuable, growing cities have not only purchased water rights away from farmers (decreasing agricultural production), but also have paid for water conservation measures within irrigation districts (canal lining, tailwater recycling, better scheduling, etc.) in order to obtain the rights to the conserved water and leaving existing agricultural production in place. Economists also believe that these incentives can provide for sustainability of the resource (as water becomes more valuable, higher levels of capital and labor are devoted to water conservation measures).

As regards the natural resources dependent upon stream flows, their sustainability depends upon (a) first, human and institutional recognition of the importance of such dependent aquatic and riparian ecosystems and (b) then, institutional protection either through appropriate regulation of diversions or the establishment of sufficient instream flow rights. While such rights have been established in some locations (commercial fisheries, prize recreational fisheries), they have certainly not been established everywhere. In addition to resistance by traditional water diverters (individual farmers, irrigation districts, and cities), establishing the proper level of instream flows is complicated by (a) the lack of complete (or sometimes even good) scientific knowledge of exactly what flows, water temperatures, and timing of flows are needed by different species of fish, and (b) the complexity and variability of the natural resources dependent upon

streams (different species need different flows and water temperatures at different times, and the times at which species migrate upstream or downstream can vary somewhat from one year to the next).

In some stressed systems (e.g., Central Valley of California), this has led to extraordinary attempts to "fine tune" the system (e.g., monitoring upstream fish migrations and curtailing diversions for limited periods, using "pulse flows" to "flush" particular migrating species downstream at appropriate times of the year, and setting diversion standards at major lift stations based on counting fish mortalities due to entrainment in the pumps). In California, these schemes involve a high degree of species monitoring, water measurement, and flow regulation, supplemented by the establishment of markets to purchase water for instream use - either on a long-term basis or to meet emergency needs. Some of the funds for water purchase are obtained through a unit tax on diversions (tax per acre-foot).

In the eastern U.S. where rainfall and streamflows are more plentiful, the appropriation doctrine was not employed. However, some states are evolving similar concepts in response to increasing demands for water - creating systems of water permits and allowing transferability. For water quality, some areas have experimented with tradeable discharge permits.

Those concerned about **transboundary transfers or sales** of surface water rights or **bulk sales** (by tanker) should examine whether existing institutions are sufficient to assure that an appropriate institutional framework exists - one that recognizes various aspects of the water resource (rights to existing uses; quantity, quality, and timing of flows; and the natural uses of water).

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# DR. GILBERT F. WHITE

# PRELIMINARY RESPONSE TO QUESTIONS FOR EXPERTS POLICY WORKSHOP

March 30-31, 1999

A. Laws and policies that bear on sustainability of water resources

1. Undertake a careful review of the merits and demerits of several recent proposals of criteria of sustainable management of surface and ground water management.
   a. Policies suggested in the report, now under review, by the Board on Sustainable Development of the National Research Council on *Our Common Journey: Toward a Sustainability Transition.*
   b. The criteria of sustainability recommended in the report on *Water for the Future: The West Bank and Gaza Strip, Israel, and Jordan*, published by the National Academy Press on 2 March, 1999. Sustainable development is defined as the development that meets the needs of the present without compromising the ability of future generations to meet their own needs, and requires a variety of social and technological assumptions: comparable options, comparable quality, and nondiscriminatory access. This includes the capacity of ecosystems to provide basic services, including water, biota, and instream benefits. Criteria used in selecting among water use management options should include; 1) magnitude of impact on available supplies; 2) technical feasibility; 3) environmental impact; 4) economic feasibility; and 5) intergenerational equity.

2. In examining past, existing, and reasonably foreseeable proposals for water management, the public would apply methods having the following characteristics:
   a. Avoid using a framework aimed at computing the likely gaps between supplies and uses on the basis of generally existing methods of calculating those quantities.
   b. As an alternative, give major attention to each of the possible options for: managing demand; augmenting available supplies, including maintaining quality, watershed management, water harvesting; regulating ground-water draft; coast water reclamation; reuse; and desalination.
   c. Consider possible effects of proposed new research.
   d. Consider any measures relating to the use of coastal areas or other boundary waters in the light of recommendations in the Heinz Center publication on *The Hidden Costs of Coastal Hazards*, in publication by the Island Press. That document points out the implications for land and water planning of improved methods of: computing the social and environmental costs of extreme natural events; estimating risk and vulnerability for such events, and planning mitigation efforts.