Massive water diversion from Canada to the United States. An old idea born again?

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Water is increasingly a major political issue as scarcity of the resource grips several societies, especially in developing countries where agriculture is responsible for about 80% of water consumptive use. However, western nations are not immune to water tensions, for instance in Greece, Spain, Italy, or the western United States, where the available water is being exploited to the limit: the Colorado no longer reaches the sea, and growing debates are emerging as to whether water should be allocated to thirsty cities or to agriculture; as to whether public funds should be invested again to increase the resource, or if demand management should be implemented; as to whether water could be imported from far away.

These questions are all the more relevant as the consumption patterns of water in the West are clearly not sustainable. Given the technology available today, massive water transfers could only come from Canada. There have been several projects in this vein, mostly in the 1960s and 1970s. Should Canadians worry about water exports to the United States, especially in the frame of NAFTA? Or is climate change going to be the decisive factor in the debate?

1. The advent of water addiction in the Western United States

Water is a key ingredient in the fabric of the Western American society, as well studied by Donald Worster. The West is not completely water-scarce, for several mighty rivers flow in the region, mainly fed by snow and glaciers from the Rockies; but it definitely is semi-arid, compelling all societies living there before the industrial revolution to adapt to water scarcity. The early 20th century American society, empowered by the industrial age, decided to harness rivers and aquifers. Technology enabled the American society to eliminate the water scarcity burden and developed the illusion that technology would always bring about a solution to growing water needs. « What nature does not yield freely, humanity should refashion to better suits human needs. [...] Nature has no greater purpose than to serve Man, and Man has no greater purpose than to work the land and take his place in the productive cycle »2. Wendy Nelson Espeland also clearly depicted the representation that developed at the time that all water flowing unused to the ocean was a wasted resource, and that rivers needed to be “tamed” and “harnessed” to be put to use. President F. Roosevelt declared in 1935, when

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inaugurating Boulder Dam, that “the mighty waters of the Colorado were running unused to the sea. Today we translate them into a great national possession”\(^3\).

This idea is still very much alive today. « Much of the contemporary culture of the American Southwest is based on denying its desertness... In a subdivision being built to the south [of Las Vegas], Paseo Verde Parkway and Val Verde Road intersect in Green Valley Ranch. The concept of green, like sod lawns, was an imported fantasy »\(^4\). Technology can make up for water scarcity and water must be used so as to develop Western resources : « The rural Western ethic is that all wealth comes out of the ground, either as grass growing or as minerals being mined. [...] So the fact that today’s reclamation projects – such as Garrison, CUP, Animas-La Plata – cost a few million dollars for each farmer they put on the land, doesn’t cause their proponents to blink. That, they say, is the price society pays for creating the stuff of wealth. Without it and the other industries based on earth, there is nothing »\(^5\).

2. **Massive water transfer projects were once considered**

Massive water transfers were first built in the Eastern United States, in 1847 with the Croton Aqueduct for New York City, or the 1900 Chicago Diversion. As early as 1906, water transfers began being built in the West, with a 46 km long canal from the St Mary River in Montana to the Milk River, triggering a severe dispute with Canada that forced the United States to negotiate the 1909 Boundary Waters Treaty. Other projects soon followed : the Los Angeles Aqueduct in 1913, the Hetch Hetchy Water Supply (1934), the Colorado River Aqueduct (1941), the All American Canal (1942), the California Central Valley Project (1951). Diversion were initially designed for municipal water supply, but irrigation soon became their main rationale, as the sector benefited from generous subsidies from the federal government through the Bureau of Reclamation (created in 1902), its agency dedicated to the development of agriculture in the West.

When exploited resources began to show signs of exhaustion, engineering firms started to design huge transfer projects from Canada. But the main trigger of the idea that water resources were exhaustible and not adequate to sustain limitless development in the Western United States struck in 1963 when the Supreme Court compelled California to stop excessive Colorado water pumping. The Colorado River water had been apportioned between upper-basin and lower-basin States with the Colorado Compact of 1922, but Arizona felt California tried to prevent its own use of the water. With the 1963 ruling, California’s share was established at 4,4 million acre-feet (af), by far the largest share in the 15 million af available, but a figure that set a limit to what California could bank on. The very idea that the water resource, all of a sudden was set at a strict limit, sent

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shockwaves throughout California that triggered a frenzy of plans designed to increase supply\(^6\) through continental water diversion projects from Canada.

These projects, like water diversion schemes built before, involved diverting large volumes of water over long distances; but their sheer size placed them on a very different scale, both regarding their length (often greater than several thousand km) and their cost (several dozens of billions $). They were designed as of 1959 until 1985 in the United States and sometimes in Canada, on a magnitude no project ever reached before. These projects involved the transfers of the Mackenzie River, for instance, all the way through the flooding of the Rockies Valley to the Mississippi and Colorado Rivers; or the derivation of the Great Lakes, or even the damming of James Bay so as to convert it into a freshwater lake and its subsequent transfer to the American West. Costs involved reached hundreds of billion dollars and environmental impacts were not studied at the time.\(^7\)

3. These continental water diversion projects were never close to being implemented

Although these continental water diversion projects received considerable media and State government attention in the West in the 1960s, none went beyond the feasibility study level and none managed to get an official approval.

3.1. Continental Water Diversions were very costly projects

Water is heavy. When transported by aqueducts over long distances, it requires a lot of energy merely to be moved and pumped over obstacles. The Grand Canal, designed in 1959 by Canadian engineer Tom Kieras, required at least 6 nuclear plants merely to pump the water from James Bay to Georgian Bay (Huron Lake)\(^8\). It is therefore expensive to operate these infrastructures. Moreover, the capital requirement is huge, as attested by their construction costs, at the time of the project design. Governments were more than reluctant to invest so huge amounts of money just for the sake of water exports, especially when the profitability of such projects was far from ascertained.

Estimation of cost of water transported or produced by different means do show that desalination is becoming much cheaper than it used to be: about 0,6 to 1,2 $ per m\(^3\), as compared to 0,55 to 1,35 $ for plastic bag transportation; 1,25 to 1,5 $ with water-carrying ships; 0,6 to 0,85 $ with iceberg transportation; 0,07 to 1,8 $ for water recycling and 0,8 to 3 $ for transfer canals of about 500 km. It is true all these means do not serve the same purposes, as desalination plants are usually located by the sea and serve urban


\(^{8}\) Lasserre 2005, op. cit, p.3.
demand. Sea water desalting technology, in particular, improved so fast between 1985 and now, that operation costs were dramatically reduced and divided by 5, from 2.5 $ to 0.55 $ per cubic meter. Desalting is now a very affordable water-producing technology for urban and industrial consumers, enabling them to tap into an inexhaustible source. However, the water it produces cannot be considered for irrigation purposes, given its cost, its distance from the interior, and the large volumes irrigation demands. But these figures are useful inasmuch as they show water transfers by canals are not as inexpensive as many advocates insist they are: it is not sure farmers could afford their expensive water volumes without massive subsidies.9

3.2. A stabilizing demand in the United States

The main reason why such giant diversion schemes never came to reality is that demand was not really present in the United States for Canadian water. Several factors explain why these projects lost their allure to both governments and society. The budget crisis that began in the early 1970s in the United States precluded public money for such large endeavors, at a time when public opinion turned gradually against large scale engineering projects tampering with the environment: 1977 what the “hit list” year when President Carter discarded several water development projects in the West because of their incredibly low benefit/cost ratio. The economics of continental diversion projects have so far worked against them and will do so for several more years.

It was all the more difficult to argue for these continental diversion schemes as water use, contrary to what had been expected in the 1960s, showed a definite trend toward stabilization. In Florida, or in the Western part of the United States, water conflicts that emerged because of the large share of available water that agriculture consumes (about 80%) are usually evolving towards water being transferred from the latter to cities, without it being necessary to develop new resources. A more cost-recovery oriented water pricing; competition from other regions, mainly Asia; cost incentives that lure American producers to Mexico, are among the factors that explain why water use in agriculture remain roughly stable between 1975 and 2000 throughout the country. If the federal government does agree, during the Doha Round of trade negotiations, to reduce agricultural subsidies, water prices for farmers could increase markedly, thus giving financial incentives to consume less, or water demand for irrigation could decrease because of several farmers getting out of business. As a whole, water withdrawals in the US increased slowly, much more slowly now than population, and could even begin a downward trend should competition from foreign fruits and vegetables producers increase against local farmers.

Besides, although there still is room for improvement, water use per person is showing signs of stabilization, probably thanks to the both tariff and education policies. The evolution of water use in the United States, from 1970 to 2000, shows that although the population grew by 38.6%, water withdrawals increased by only 10.7%. Urban consumers began to value water conservation with the development of urban water use


reduction programs in most large cities. Industrial use actually decreased by 55%, whereas irrigation grew by only 6.1%\(^\text{10}\).

Therefore, although water is still used at an unsustainable rate in the Western United States, importing water from Canada is not as urgent as it could appear to be to some politicians a few years ago, such as former senator Paul Simon. A stabilizing trend in water withdrawals and the availability of cheaper sources with desalting plants led the public planners to forget about massive water transfers from Canada. When asked, even the Western States Governors Association estimated continental diversion projects were unlikely to be ever built\(^\text{11}\).

3.3. Opposition from within the United States

Moreover, there also was opposition from within. Governmental archives from the early 1980s attest to the Western United States lobbying for the diversion of Great Lakes water to quench their lack of water. The International Joint Commission, created to prevent and resolve disputes between the United States and Canada under the 1909 Boundary Waters Treaty, explicitly warned against water diversions from the Great Lakes basin in its Final Report on Protection of the Waters of the Great Lakes (2000).

Great Lakes States wanted to resist these projects, both for environmental and political reasons: why would the Great Lakes States give to California an added value at a time when so many firms were leaving the area and moved away to the West Coast?\(^\text{12}\). The Council of Great Lakes Governors (CGLG), created in 1983, is a partnership of the Governors of the eight Great Lakes states and the two Canadian provinces of Ontario and Québec. The Great Lakes Charter stemmed from this growing concern that Great Lakes water could be diverted to water-scarce regions of the United States. The Great Lakes Charter, signed in 1985 by the CGLG members, created a notice and consultation process for Great Lakes diversions. The signatories agreed that no Great Lakes State or Province would proceed with any new or increased diversion or consumptive use of Great Lakes water over five million gallons per day without notifying, consulting and seeking the consent of all affected Great Lakes States and Provinces.

After an Ontario firm, Nova Group, tried to tap water in 1998 from the Great Lakes for export purposes, triggering an uproar of protests from both the Canadian and the American sides of the Great Lakes, the CGLG decided to further strengthen the water export ban. This led to the Great Lakes Charter Annex, signed in June 2001. The Annex outlines a series of principles for reviewing water withdrawals from the Great Lakes Basin that is grounded in protecting, conserving, restoring, and improving the Great Lakes ecosystem. In December 2005, the Annex 2001 Implementing Agreement was signed that give specific guidelines as to how the principles must be enforced, and provides a legal basis for the ban when the Great Lakes – St. Lawrence River Basin


\(^\text{12}\) Lasserre, 2005, op. cit., p.479.

Water Resources Compact is ratified by the US Congress, making it legally binding for American Great Lakes States. Water diversions are now only permitted over short distances from the Great Lakes, must ensure water must be returned to the Great Lakes basin, and only if there is no other solution to satisfy the water demand.

4. Massive transfers already exist... in Canada!

The late 1990s saw a great fear develop among the Canadian public about potential American water transfer schemes, leading to calls for the federal government to enact a ban on water export. Wisely, Ottawa refused to prepare a law that would implicitly recognize water as a good, but rather prepared Bill C-6, voted in December 2002, that forbids interbasin transfers, which, under NAFTA, is a clever move inasmuch as it leaves water outside the realm of commerce and applies to both Canada and the United States. But Canadians largely forgot that large-scale water transfers already exist throughout the world, and especially in Canada! Several massive transfer schemes are already operated in British Columbia (Kemano Transfer, 1954), in Manitoba (Churchill Derivation, 1976), in Ontario (Long Lake, Okogi River transfers, 1939 and 1943), in Labrador (Churchill Falls transfers, 1971) and in Quebec (Caniapiscau and Eastmain transfers, 1985).

Major differences exist with American water diversion projects: Canadian transfer schemes were built for hydroelectric development purposes, and none for urban consumption or irrigation. They are usually massive and over short distances, less than 200 km, whereas American water diversions often run for more than 500 km. There are projects to divert the Peace River in northern Alberta to meet growing agricultural and urban water needs, but the project is far from being accepted; Hydro-Québec is currently developing other water diversion projects for the Betsiamites, Eastmain and Manouane rivers development.

There is controversy as regards the extent of negative impacts of these diversions on the environment, since the concept of minimum ecological flow remains controversial among biologists. Water does remain in Canada for each of these diversions, but this is not the point: Canadians collectively forget that their very daily comfort and economic activity rest, to a certain extent, on major river diversions. It is therefore difficult to defend the argument that water transfers to the United States would weaken the environment, if one refuses to consider that transfers within Canada should be phased out.


15 J.C. Day and Frank Quinn, Water diversion and export : learning from Canadian experience; University of Waterloo, Dept. of Geography, 1992; Frédéric Lasserre, 2005, op. cit., p.490-491.

At the end of 2005, with the signing of the Annex 2001 Implementing Agreement, it was safe to say continental water diversions were definitely outdated as a water management concept. Demand was stabilizing in the Western United States; the public opinion had developed a strong distaste for the idea; governments were more than reluctant to invest the billions of dollars each scheme implied; diversion were by far not the most cost-effective to provide for additional water volumes, and conservation and recycling were promising alternatives to the long-used supply management approach\(^{16}\).

5. Climate change: toward the return of massive continental water diversion projects?

Climate change could shake this status quo. As years go by and as scientist as well as local governments accumulate impressive data attesting to a definite trend toward climate change, the developing weather shift could prove more challenging than the long-advocated water exports to the United States of the 1960s and 1970s. The possibility that climate change could affect Canada’s water quality and quantity is serious enough that Environment Canada decided to spend several million dollars on scientific studies to try and assess the risk\(^{17}\). Competing uses in regions where water could become scarcer, like agricultural, urban and oil mining in Alberta, could lead to conflicts between these various groups that would have authorities intervene with either water pricing or regulation that would prove very unpopular.

Present forecast, so far proven by observed data, show increased global precipitation, but an extra amount of water more than offset by increased evapotranspiration (Et) because of higher temperatures. In the already dry Okanagan Valley in British Columbia, water demand for orchards could therefore be multiplied by 12 in the summertime because of increased Et. Besides, a change in the pattern of how it falls throughout the year, coupled with changes in temperature, could very much alter its availability, resulting in seasonal but dramatic supply reduction, as happened in Quebec in August 2002. In the Prairies, less snow falls in the winter and it melts earlier in spring, allowing for less water in rivers in late spring and summer. Besides, along the eastern slopes of the Canadian Rocky Mountains, glacier cover has decreased rapidly in recent years, and total cover is now approaching the lowest experienced in the past 10 000 years. But rivers in the Prairies are mainly fed in the summer by melting glaciers. As the glacial cover has decreased, so have the downstream flow volumes. This finding appears to contradict projections of the Intergovernmental Panel on Climate Change (IPCC) that warmer temperatures will cause glacial contributions to downstream flow regimes to increase in the short term. However, historical stream flow data indicate that this increased flow phase has already passed, and that the basins have entered a potentially long-term trend of declining flows. The continuation of this trend would

\(^{16}\) Lasserre, 2005, op. cit., 522.
exacerbate water shortages that are already apparent across many areas of Alberta and Saskatchewan owing to drought\textsuperscript{18}.

However, climate change is not merely affecting Canada, but the United States as well. Similar conclusions have already been taken as regards the potential impact of disappearing snow and glacial cover in the Rockies in a warmer Western United States\textsuperscript{19}. Planning the impacts of climate change remains difficult, because building of accurate models, at the regional scale, of both precipitation and temperature that could give a true picture of available runoff in the future, remains a daunting task for programmers. What we now have are educated guesses sustained by general models and data trends. But these trends do show several regions in the United States, especially in the dry West, could be faced with critical water shortages given the present demand. This could prove to be a scenario in which the United States could become interested again in Canadian water: the goal would be to prevent a social crisis triggered by conflicts between agriculture and cities for dwindling water resources. The equation for the American federal government would be the perceived financial, social and political costs of finding new water resources as against arbitrating, very likely, against agricultural water needs. No one can predict what choice officials would then make if this scenario came true. A few parameters can be reminded:

- Agriculture is responsible of 80% water consumption in the US West.
- A 15\% reduction in irrigation use would satisfy the forecast needs for cities and industries\textsuperscript{20}.
- Agriculture does not pay the real price of its water (strong federal subsidies): tariff increases would bring a more disciplined behavior and encourage conservation
- Western farmers have begun selling or transferring their water rights to cities, for example the October 2003 water deal between the Imperial Irrigation District and the Metropolitan Water District.

**Conclusion**

Massive water diversion are not new in North America: they were extensively used in both Canada and the United States, in the latter mainly to develop the West, bring water to cities and fields so as to sustain an imported way of life; in the former, so as to develop hydropower projects. Beginning in the 1960s, American Western States and engineering firms began developing continental water diversion projects, because of fears continued development would bring about severe water scarcity and social disruption. These doomsday scenarios did not materialize, because of both reduced economic

\textsuperscript{20} Lasserre, 2005, op. cit., p.517.
growth, especially in agriculture, because of more efficient water use technology and the advent of water conservation, and because of the huge environmental and financial costs of these projects, that largely failed to attract public support.

However, the very idea of massive water diversions is not completely dead. Tom Kierans, the designer of the GRAND Canal, is still lobbying Ottawa and Washington. More challenging is the idea that ongoing climate change could dramatically question agriculture in the American and Canadian West. If these scenarios keep materializing, what answer would governments be prepared to offer? Wither agriculture? Select the more profitable and more water-efficient farmers? Or bring back to the forefront the idea of transferring large amounts of water from humid parts of the continent to drier zones? The answer probably lies in the severity of the developing weather pattern change and in the adaptation capability of the agriculture sector.