The Ebbs and Flows of Water Diplomacy

Grace Rosenberg | July 26, 2019

Water diplomacy. To let the rather ironic term sink in, let's dive into its etymology. *Water* is derived from—what did you say? Wells? Hydrogen and oxygen? Oh please, let me intellectualize for a minute! Let's start over.

Water is derived from the Old English *wæter,* which itself comes from the Proto-Germanic root *watr*, in turn a tributary of the Proto-Indo-European *wed*.[1] *Diplomacy*, on the other hand, is a hand-me-down from the French *diplomatie*, whose grandfather is the Latin *diploma, diplomatis, n.*[2] Just in uttering the (somewhat wishy-washy, I'll admit) words, we conduct diplomacy; we are marrying the Germanic tradition to the Roman, as we English speakers tend to do. We can thus glide past centuries of war between the civilizations. Like the language that describes it, water can be a peaceful means of resolving conflict. To see how, let's examine some cases of water diplomacy, both actual and potential, and the methods employed in these cases.

Water diplomacy practiced in the Great Lakes region of North America highlights the difficulties and successes of joint federal, state, and international efforts to achieve a set of goals. As a crucial boundary between the United States and Canada, as well as a place of environmental concern, local use, and transnational importance, the Great Lakes region makes for interesting study. With the desire to protect the environment growing at the beginning of the twentieth century, improving water quality in the Great Lakes came onto the agenda for both the US and Canada. The Boundaries Water Treaty, crafted in 1909, marked the first major instance of federal commitment to water quality in the Great Lakes.[3] The issue was revisited notably in 1987, with the Great Lakes Water Quality Agreement (GLWQA) and the multi-state Great Lakes Water Protection Fund formed to see the agreement enacted.[4] Tension emerged on both nations' sides, however, leading to inaction throughout the '90s; lack of funding from the federal

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[1] --,"Water (n.1)," *Online Etymology Dictionary*, (--) https://www.etymonline.com/word/water#etymonline_v_4854. Accessed July 11, 2019.
[2] --, "Diplomacy (n.)." *Online Etymology Dictionary,* Douglas Harper, --, https://www.etymonline.com/word/diplomacy#etymonline_v_8611. Accessed July 11, 2019.
[3] Johns, Carolyn M. and Adam Thorn, "Subnational diplomacy in the Great Lakes region: toward explaining variation between water quality and quantity regimes" *Canadian Foreign Policy Journal* (2015): page 200, https://www.tandfonline.com/doi/full/10.1080/11926422.2015.1035296
[4] Johns, Carolyn M. and Adam Thorn, "Subnational diplomacy in the Great Lakes region: toward explaining variation between water quality and quantity regimes" *Canadian Foreign Policy Journal* (2015): page 201, https://www.tandfonline.com/doi/full/10.1080/11926422.2015.1035296

Canadian government troubled federal-provincial relations and hindered the effort to keep the lakes clean. To top it off, American involvement dwindled. In the Obama era, the United States took a more active stance, and the 2014 Canada-Ontario Agreement promised cooperation on the Canadian end.[5] Given the immediacy of environmental issues, we can hope that the Canadian and American federal governments will build on these foundations; it appears vital that federal support underscore state and provincial action in the realm of water quality. The incentive for federal governments to do so is clear, as worsening water quality has major effects on human and wildlife health.

In certain cases, however, such as that of water quantity in the Great Lakes, states and provinces, recognizing their stake in the issue, have taken more action. In particular, there is a push from the riparian states and provinces to limit others' access to their water. State and province interaction eventually resulted in the Great Lakes Compact and the 1985 Great Lakes Charter. The latter lacks some effectivity due to the United States Constitution's prohibition on state interactions with foreign powers.[6] In this case as well, then, it may be helpful to gain federal approval. In collaborating on issues such as these, state, federal, and provincial governments can realize their mutual goals and better serve their people.

To bolster these negotiations, governments would do well to employ the seemingly unrelated umbrella of game theory. They, as theoretical players, could use game theory to smooth negotiations and help everyone reach mutual benefits and alliances. Numerous papers concern the potential connection between water diplomacy and game theory, and one in particular—written by theorists Mahdi Zarghami, Nasim Safari, Ferenc Szidarovszky, and Shafiqul Islam—cites the relevance of game theory to the Water Diplomacy Framework (WDF). WDF emphasizes the importance of contextual effects, uncertainty, and knowledge about water in proposing solutions to conflicts about water. To quote the paper, it 'diagnoses water problems, identifies intervention points, and proposes sustainable resolutions that are sensitive to

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[5] Johns, Carolyn M. and Adam Thorn, "Subnational diplomacy in the Great Lakes region: toward explaining variation between water quality and quantity regimes" *Canadian Foreign Policy Journal* (2015): page 203, https://www.tandfonline.com/doi/full/10.1080/11926422.2015.1035296

[6] Johns, Carolyn M. and Adam Thorn, "Subnational diplomacy in the Great Lakes region: toward explaining variation between water quality and quantity regimes" *Canadian Foreign Policy Journal* (2015): page 204, https://www.tandfonline.com/doi/full/10.1080/11926422.2015.1035296

diverse viewpoints and uncertainty as well as changing and competing demands."[7]A nonlinear system can accommodate these particularities in imagining solutions for water use. The authors choose to work with what they consider a suitable nonlinear system: the interval parameter method.[8] This method involves various stages, lending to flexibility of variables. Moreover, several techniques can be used: the Nash bargaining solution, which allows for partial coalitions (that is, alliances among players); Shapley values, which permit the "total surplus. . . [from] the grand coalition" to be divided among players "based on each players average contribution"[9]; and the Nucleolus concept, which 'minimizes the "unhappiness" of the most unhappy player." [10] This diversity of potential strategies might perhaps translate to adaptability in applying game theory to the issue of water use.

To demonstrate one possible application, the authors focused on the basin of the Zarrinehrud river in Northwestern Iran. This river crosses into the West Azerbaijan, East Azerbaijan, Kurdistan, and Zanjan provinces of Iran and is a major water supplier to Urmia lake. [11] Moreover, the Zarrinehrud is a crucial water source for the city of Tabriz, as it accounts for more than 40 percent of Tabriz's domestic water.[12] The river, as we see, is politically, economically, and socially relevant. The authors set player 1 as the agricultural section, player 2

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[7] Zarghami, M., Safari, N., Szidarovszky, F., and Shafiqul Islam, "Nonlinear Interval Parameter Programming Combined with Cooperative Games: a Tool for Addressing Uncertainty in Water Allocation Using Water Diplomacy Framework" *Springer Science* (2015): page 4286, https://link.springer.com/article/10.1007%2Fs11269-015-1060-5

[8] Zarghami, M., Safari, N., Szidarovszky, F., and Shafiqul Islam, "Nonlinear Interval Parameter Programming Combined with Cooperative Games: a Tool for Addressing Uncertainty in Water Allocation Using Water Diplomacy Framework" *Springer Science* (2015): page 4287, https://link.springer.com/article/10.1007%2Fs11269-015-1060-5

[9] Zarghami, M., Safari, N., Szidarovszky, F., and Shafiqul Islam, "Nonlinear Interval Parameter Programming Combined with Cooperative Games: a Tool for Addressing Uncertainty in Water Allocation Using Water Diplomacy Framework" *Springer Science* (2015): page 4293, https://link.springer.com/article/10.1007%2Fs11269-015-1060-5

[10] Leng, Mingming and Mahmut Parlar, "Analytic Solution for the Nucleolus of a Three-Player Cooperative Game" *Naval Research Logistics* (2010): page 1, https://cptra.ln.edu.hk/~mmleng/mmleng_files/NRL/Nucleolus-100715-Final.pdf

[11] Zarghami, M., Safari, N., Szidarovszky, F., and Shafiqul Islam, "Nonlinear Interval Parameter Programming Combined with Cooperative Games: a Tool for Addressing Uncertainty in Water Allocation Using Water Diplomacy Framework" *Springer Science* (2015): page 4295, https://link.springer.com/article/10.1007%2Fs11269-015-1060-5

[12] Zarghami, M., Safari, N., Szidarovszky, F., and Shafiqul Islam, "Nonlinear Interval Parameter Programming Combined with Cooperative Games: a Tool for Addressing Uncertainty in Water Allocation Using Water Diplomacy Framework" *Springer Science* (2015): page 4295, https://link.springer.com/article/10.1007%2Fs11269-015-1060-5

as the domestic section, player 3 as the industrial stakeholder, and the constraint as the environment.[13] They reach a supposed solution for the water's use in these various sections. There are problems with their work, however, and with their theory at large. To begin, the authors choose lambda, the amount by which benefit to a section would increase if environmental limitations were relaxed by one unit (for example, added financial benefit with more water up for grabs). They claim that their choice for lambda is reasonable, but without a vast reservoir of experience applying game theory to water conflict, we shouldn't be assigning a value to lambda, which is vital to solving the mathematics of the game. However, without assigning a value to lambda, there are too many unsolved-for variables for us to find a solution. We thus reach a numerical dam. Additionally, the authors emphasize uncertainty in the environmental situation due to weather and a score of other things that simply can't be accurately predicted. In that vein, it is plain irresponsible to use the environment as a system of constraints, since we don't really know their mathematical behavior. As we see, there are problems with the paper, but at least it primes the pump in the imperative crossover between environment, math, and policy.

To better predict the circumstances of water conflicts, we should implement tools like game theory in relatively low-stake water conflicts and thus collect data to improve our mathematical models. Eventually, these models may become helpful enough to solve water conflicts that are seemingly intractable. In the postmodern world, diplomacy must incorporate novel technologies like these. Take a sip of the twenty-first century (assuming it's clean!).

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[13] Zarghami, M., Safari, N., Szidarovszky, F., and Shafiqul Islam, "Nonlinear Interval Parameter Programming Combined with Cooperative Games: a Tool for Addressing Uncertainty in Water Allocation Using Water Diplomacy Framework" *Springer Science* (2015): page 4295, https://link.springer.com/article/10.1007%2Fs11269-015-1060-5

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Zarghami, M., Safari, N., Szidarovszky, F., and Shafiqul Islam. "Nonlinear Interval Parameter Programming Combined with Cooperative Games: a Tool for Addressing Uncertainty in Water Allocation Using Water Diplomacy Framework" *Springer Science*, (2015). https://link.springer.com/article/10.1007%2Fs11269-015-1060-5 (accessed July 11, 2019).

Johns, Carolyn M. and Adam Thorn. "Subnational diplomacy in the Great Lakes region: toward explaining variation between water quality and quantity regimes" *Canadian Foreign Policy Journal,* (2015). https://www.tandfonline.com/doi/full/10.1080/11926422.2015.1035296 (accessed July 11, 2019).