# DON'T BE SALTY: WHY THE UN SHOULD CREATE MODEL RULES AND A TASKFORCE FOR REGULATING DESALINATION

Jenna H. Whelan*



* Jenna Whelan is a J.D. Candidate 2023 at Southwestern Law School. She received her B.A. in Communication Studies at California State University, Northridge. She wishes to thank her family for all their love, support, and encouragement. She would also like to thank Professor Natalia Anthony for providing her with research and editing support, as well as the Southwestern Law Journal Board and Staff for their hard work in editing this article.

## I. INTRODUCTION

The United Nations Environment Assembly has recognized the environmental harm from desalination as a global concern and adopted a "resolution on the protection of the marine environment from land-based activities" (Resolution).[1] Member states agreed to "enhance the mainstreaming of the protection of coastal and marine ecosystems in policies, particularly those addressing environmental threats caused by increased nutrient, wastewater, marine litter and microplastics."[2] Despite this resolution, however, it has largely been left to individual countries to determine the means by which they regulate their own desalination facilities.[3] This approach gives deference to individual countries to determine the best way to regulate their own processes within their own capabilities but may lead to confusion about accepted practices and varying degrees of environmental protection between different member states.[4] The United Nations should adopt model rules establishing minimum environmental requirements for desalination that combine obligations with government agents who are experts in the desalination field; these agents would be required to visit desalination plants in all the applicable member states in order to ensure that they are complying with their environmental obligations. This paper concludes by examining some encouraging trends in making desalination a more environmentally friendly and sustainable practice.

## II. BACKGROUND

Seawater desalination[5] is the process of removing salt and impurities from seawater to create fresh, potable water.[6] This is done primarily by one of two methods: boiling the water and recondensing it (thermal technology), or through reverse osmosis.[7] Reverse osmosis is the process of pushing seawater under pressure through a semi-permeable membrane to filter out the salt and impurities.[8] At their inception, desalination plants predominantly used thermal technologies for desalinating water.[9] About 84% of all global desalinated water was produced using thermal technologies as late as into the 1980s.[10] However, the development and utilization of reverse osmosis technology "gradually shifted the dominance away from thermal technologies," so that, as of 2018, approximately 69% of the world's desalinated water was produced using reverse osmosis.[11] Together, thermal technologies and reverse osmosis produce about 93% of the world's desalinated water.[12]

In many countries where fresh water is an increasingly scarce resource, seawater desalination is a valuable tool for providing much needed potable

5. Desalination is also used on some other water sources, including river water, but this paper will focus on regulating seawater desalination, and the environmental consequences of seawater desalination processes.

6. *Desalination Overview*, POSEIDON WATER, https://www.poseidonwater.com/desalination.html (last visited Oct. 14, 2022).

7. *Id.*

8. *Id.*

9. Edward Jones et al., *The State of Desalination and Brine Production: A Global Outlook*, 657 SCI. OF THE TOTAL ENV'T 1343, 1346 (2019) ("With the aim of providing a global

water to citizens.[13]

economical, which is unfortunate because it also carries important environmental concerns.[26] Ocean disposal of brine byproduct introduces increased salinity, as well as toxic chemicals (used in pre-treatment of water to be desalinated) into the ocean's ecosystem.[27]

> The high salinity of brine causes elevated density in comparison to the salinity of the receiving waters, which can form "brine underflows" that deplete dissolved oxygen (DO) in the receiving waters. High salinity and reduced DO levels can have profound impacts on benthic organisms, which can translate into ecological effects observable throughout the food chain. A combination of these factors necessitates the development of new brine management strategies that are both economically feasible and environmentally sound.[28]

Although not all countries use or rely on desalination, ocean health is a global problem, so desalination regulation requires a global solution.

## A. ENVIRONMENTAL PROGRAMS WITHIN THE UNITED NATIONS

present day, every draft resolution, is the result of informal consultations.[35] In the process, parties compromise and the final language of the text may sometimes be unclear.[36] This is indicative of the same type of trouble that would be caused by the collaborative and adaptive management model of regulation or trying to implement a binding treaty for the regulation of desalination, as discussed later in this paper.[37]

In 2013, the Governing Council of the United Nations Environmental Program (UNEP) was replaced by the United Nations Environment Assembly (Environment Assembly).[38] While the Governing Council was comprised of fifty-eight members of the U.N. General Assembly, the new Environment Assembly automatically incorporated all 193 member states of the United Nations.[39] Universal membership eliminated the need for the General Assembly to elect members of UNEP's governing body, and essentially gave UNEP greater political clout.[40] The United Nations Environment Assembly now has the "elevated status of a plenary body,"[41] similar to the plenary organs of other specialized agencies of the United Nations, thanks to the mandate by the UN General Assembly that, in addition to providing universal membership to the Environment Assembly, gave the Environment Assembly "a high-level ministerial segment to bolster decision making."[42] Despite this seemingly independent status, the Environment Assembly remains a subsidiary organ of UNEP that is itself "a subsidiary organ of the General Assembly."[43] In effect, this means that the Environment Assembly must report its decisions to the General Assembly, a requirement that the other plenary organs of specialized UN agencies are not subject to.[44] The Environment Assembly meets once annually "with a ministerial segment."[45] The Security Council remains the only body of the UN with the authority to take disciplinary action and to compel member states to act, which is problematic because it renders many resolutions, such

35. *Id.*

36. *Id.*

37. *Id.*

38. Bharat H. Desai, *The Advent of the United Nations Environment Assembly*, AM. SOC'Y OF INT'L L. (Jan 15, 2015), https://www.asil.org/insights/volume/19/issue/2/advent-united-nations-environment-assembly.

39. *Id.*

40. *Id.*

41. *Id.*

42. *Id.*

43. *Id.*

44. *Id.*

45. *Id.*

action from member states; it merely "encourages"[51] the exchange of information and "invites"[52] member states to take initiative. The only body of the UN that has the authority to compel member states to act is the Security Council, which is not involved with the Environment Assembly.[53]

## III. APPROACHES TO REGULATING DESALINATION

There are currently two main models for viewing desalination regulation: the "rights-based adversarial model" (RAM) and the "collaborative and adaptive management model" (CAM).[54] RAM operates on the primary principles of the reasonable use of water, the duty to avoid harm, and the duty to cooperate.[55] Under this model, liability attaches to a nation that uses irresponsible and harmful desalination practices, compelling it to internalize the cost of pollution.[56] All three RAM principles—reasonable use of water, the duty to avoid harm, and the duty to cooperate—form a part of the 1997 United Nations Convention on the Law of Non-Navigational Uses of International Watercourse.[57] The right of reasonable use of water and the duty to avoid harm both stem from the principle of territorial integrity.[58] The reasonable use of water principle grants states sovereignty over natural resources within their own territory,[59] while the duty to avoid harm principle prohibits a ratifying-nation from causing environmental harm to its neighbors.[60] These two principles conflict with one another because the duty to avoid harm compels nations to avoid significant harm while still acting with "due regard" to the right of reasonable use.

environmental impacts at the international level.[63] All three principles are now prevalent features in customary international law.[64] The interwoven nature between the right to reasonable use and the duty to avoid harm causes significant confusion amongst conflicting nations because, as each nation seeks to meet its local needs while minimizing impact on its local ecosystem, each nation will assert different goals, either favoring desalination implementation or environmental protection.[65] The need to alleviate this confusion is precisely why the United Nations needs to step in and create model rules so that there are international standards for desalination regulation.

By contrast, the CAM uses collaborative governance to create a special unitary commission to oversee resources, like water, that move between jurisdictions.[66] Rather than compelling cost internalization to individual nations like the RAM, the CAM uses collaborative governance to create a special district or commission to oversee spillover goods, like water and air, that move between jurisdictions.[67] "By focusing governance at the basin level, neighboring nations would establish a joint-governance institution to regulate and manage water development, protection, and conservation."[68] However, the success of these joint-governance institutions depends on their perceived legitimacy by neighboring states.[69] If nations do not see the institution as being legitimate or as having any efficacy, then they will be disinclined to cooperate and invest their own efforts and resources in the project.[70]

The United Nations' approach is somewhat an amalgam of both the RAM and the CAM. The Resolution calls for collaboration and cooperation between governments, as well as private institutions, for the development of sustainable desalination practices, which falls under the CAM.[71] However, collaboration is merely encouraged, not required, and member states are ultimately left to their own devices for deciding how to manage and regulate their desalination processes, which falls under the RAM model.[72] Neither the RAM nor the CAM approaches are perfect. One problem with

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63. Id.
64. Id.
65. Id.
66. Id. at 446.
67. Id. at 447.
68. Id.
69. Id.
70. Id.
71. Environment Assembly Res., supra note 1; Korosi, supra note 54, at 447.
72. Towards Sustainable Desalination, supra note 2. See Environment Assembly Res., supra note 1.

the RAM model is that it is a hindsight approach in which liability attaches to nations only after desalination has caused environmental damage.[73] A problem with the CAM model is that nations' divergent interests, including the amount of other freshwater available, the population to be served, and

reluctance of individual states to surrender sovereignty to international organizations.[90] As a result of this reluctance, international environmental agreements, like the Paris Agreement,[91] are often voluntary in nature. This means that, even if the treaty or agreement purports to be legally binding, the UN does not actually have the power or authority to compel individual signatories to comply with the terms.[92]

Additionally, nations may sign the agreement, but it has no effect on the countries' laws until the countries' governments have ratified the agreement and incorporated it into their own codes of law.[93] Moreover, the governments of individual states who sign international environmental agreements may be reluctant to vigorously enforce their provisions knowing that there is no guarantee that all signatories will do the same.[94] This has essentially the same effect as the free-rider issue discussed above, but with a different rationale; nations feel that if other nation states will not uphold their end of the deals, then there is no need to do so themselves, either.[95] On top of this conundrum, "the cost of implementing rigorous environmental standards may be impracticable, or simply not worth it, to governments where noncompliance could save them substantial costs."[96] In other words, with the current state of environmental regulation enforcement, it is simply less costly for nations to be noncompliant than to bring themselves into compliance. "Lack of ability and, in some cases, motivation to effectively implement these policies on an individual state level, and lack of effective enforcement mechanisms on the international level both contribute to the global community's failure to enforce the environmental rule of law."[97] This is why an alternative solution is needed

desalination at the international level.[109] Cap-and-trade does address some modified annually to “respond to changing conditions.”[122] This feature would eliminate the inflexibility of the RAM approach and incorporate the collaborative and flexible nature of the CAM approach.[123]

Then, once cap-and-trade schemes have been established at the regional leve(l)-4.6 ( l)6.T4312 (e)11.3 t

The ability to purchase allowances from other schemes is central to the cap-and-trade system.[131] Allowances basically determine how much pollution a company is allowed to create/emit.[132] A company or scheme may continue to release large amounts of pollution, as long as they can purchase enough allowances from other companies/schemes to accommodate their emissions.[133] In the desalination context, this means that a desalination plant could continue to devastate its surrounding environment, as long as it has purchased allowances from another company that enable it to meet its compliance obligations. This potential for continued devastation is particularly true regarding the release of the toxic brine byproduct. The harm resulting from the release of carbon emissions and other greenhouse gasses from desalination plants may not be cttisk (i)-8.2 (n)10.9 t(on)10.9(i)-8.2 (r)-3.96 ( t)6.3 o(t)-4.6c(9-1.6 (s)-1.6 (s)8.5 n, o(t)-4.6 (i)-7.6 (he

## IV. THE UN SHOULDT

desalination.[137] A better approach is to adopt model rules as guidelines and establish a taskforce for enforcement. The Financial Action Taskforce can serve as a model for how the United Nations should structure its own task force.

For example, the Financial Action Task Force (FATF) is an unelected, inter-governmental body comprised of thirty-four countries and two regional organizations dedicated to ending money laundering around the world.[138] Each country adopts rules compatible with its economic circumstances and legal system, like the RAM approach.[139]

benefits of the FATF's approach are that it allows members to conserve their limited resources with regard to combatting money laundering and terrorist financing activities, and it allows members to focus their limited resources on where they are most needed to reduce the risk of money laundering and terrorist financing.[148] The FATF has set Recommendations that outline risk-based preventative measures for financial institutions and, on a more limited basis, other professions, such as realtors and lawyers, to combat money laundering.[149] The Recommendations also apply to preventing terrorist financing.[150]

Although the FATF purports not to use a rules-based approach, the Recommendations' preventative measures do become "de facto mandatory obligations"[151] for FATF members who do not want to be labeled noncompliant. While being "obligations," the Recommendations are also generally flexible enough that a country can adopt and enact rules that are in line with its own governecoion rulitulrotecoionh sh ana 24 Tw 0o[(t)- (eco)-1.6 3 0 Tdc.6

approach.[157] Unlike a binding treaty, adopting a system of self and peer review of compliance with the model rules will allow flexibility for regulations that are within a country's capabilities and make it easier to adapt regulations in the event of future technological advances. The FATF's "Mutual Evaluation process" operates effectively because it "incentivizes member countries to become more proacti

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2009, in all twenty-three cases where the FATF blacklisted or threatened to blacklist countries, "the actual or anticipated negative consequences of blacklisting have been sufficient to induce compliance with international organizations' demands."[167]

Blacklisting works essentially by tarnishing a country's reputation.[168] When the country's name is placed on a blacklist, then other nations may be discouraged from doing business with or investing in that country.[169] Countries who suffer these consequences will enact reforms to bring themselves into compliance with the FATF's regulations, or in this case, into compliance with the UN model rules for desalination regulation.[170] However, this approach does not only work in hindsight…it can also be proactive.[171] Countries who are warned about the possibility that they will be blacklisted may enact anticipatory reforms to bring themselves into compliance and avoid being blacklisted in the first place.[172]

## V. HOPE FOR THE FUTURE

There is hope for the future of desalination technology. Today, most desalination plants use reverse osmosis technology.[173] Recent advancements in reverse osmosis technology may significantly reduce the amount of energy required to pressurize salt water and force it through membranes.[174] The development of nanostructured reverse osmosis membranes can provide more efficient water transport than the conventional membranes used by desalination plants.[175] The new nanostructured membranes

> reportedly have much higher specific permeability than conventional [reverse osmosis] membranes at practically the same high salt rejection. In

167. *Id.*
168. *Id.* at 577, 588.

> addition, nanostructured membranes have comparable or lower fouling rate than conventional thin-film composite [reverse osmosis] membranes operating at the same conditions, and they can be designed for enhanced rejection selectivity of specific ions.[176]

Membrane fouling occurs when substances accumulate on the membrane's surface or in its pores, thus diminishing the membrane's filtering performance.[177] As the membranes become clogged, more energy is expended to force the water through.[178] Essentially, the new nanostructured membranes are tailored to filter out specific substances, and

The plant's goal is to be carbon-neutral, and the Solar Dome technology can make this possible.[186]

In addition to the recent progress in reducing energy consumption and carbon emissions in desalination, there has been progress regarding the production and disposal of the toxic brine byproduct.[187] For one thing, the new nanostructured membranes' improved filtering leads to less of the byproduct overall.[188] Also, it is now possible to manufacture "commercially valuable products" from the brine byproduct. Minerals, such as magnesium, lithium, and pure sodium chloride, can be extracted from the brine.[189] These minerals are highly valuable for production of other products, and extracting them from seawater is more environmentally friendly than traditional terrestrial mining.[190] There is also a recent trend in the desalination industry toward chemical-free desalination.[191] Chemicals are typically used to treat the wastewater and clean the reverse osmosis membranes.[192] These chemicals are used to "remove solids or other contaminants prior to being added to the desalination concentrate for discharge."[193] However, with the new nanostructured membranes, there are fewer solids and contaminants that need to be removed in the first place, so fewer chemicals will be needed to remove them.[194]

These innovations are the type that a United Nations task force would keep in mind when determining how desalination plants across the globe can become more environmentally friendly. At this point in time, all countries may not have the resources to implement these technologies and practices. This is precisely why a task force comprised of experts in the field, as discussed in Part IV of this paper, is necessary and why it will be successful. It can help countries devise ways they can eventually employ and utilize these technologies. By working together with the various United Nations' member states to find ways to implement greener technologies, the harm from desalination practices can be greatly reduced.

186. Flanagan, *supra* note 182; *Concentrated Solar Heat to Desalinate Seawater at Saudi Neom City*, *supra* note 183.

187. *See* Amoudi & Voutchkov, *supra* note 173, at 27-28.

188. *Id.* at 27.

189. *Id.* at 27-28.

190. *Id.*

191. *Id.* at 28.

192. *Id.*

193. *Id.*

194. *Id.* at 27-28; *See* Sanders, *supra* note 174; *Breakthrough in Reverse Osmosis May Lead to Most Energy-Efficient Seawater Desalination Ever*, *supra* note 174.