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

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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 an expectation for collaboration, and should establish a task force for enforcement, because only a mix of obligations and collaboration provides accountability along with considerations for diverse situations, and a treaty approach would aspire to too much and not move forward.

This paper will begin by discussing what seawater desalination is, why it is harmful to the environment, and why the United Nations should take an active role in regulating the desalination processes of its member states. Next, this paper will discuss the current models that are used for regulating desalination, as well as a "cap-and-trade" model proposed by Kenneth Korosi, and discuss why these models are not the best way to regulate desalination. These models, as well as a binding treaty approach, are not the most effective ways to regulate desalination, as they do not address all the issues presented by the seawater desalination problem. Finally, this paper proposes that the United Nations should adopt model rules considering the minimum environmental requirements for desalination regulation. The United Nations also needs a mechanism for the enforcement of these model rules, so it should create a task force comprised of government and non-

1. Env't Assembly Res. 4/11 (Mar. 11, 2019).

2. *Towards Sustainable Desalination*, U.N. ENVIRONMENT PROGRAMME (May 2, 2019), https://www.unep.org/news-and-stories/story/towards-sustainable-desalination.

3. *Id.* at 2.

4. *Id*.

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 assessment of the research and practice around desalination, the objectives of this study are to: (1) share an insight into the historical development of desalination; (2) provide a state-of-the-art outlook on the status of desalination, considering the number of desalination facilities and their associated treatment capacity with regards to aspects such as geographical distribution, desalination technologies, feedwater types and water uses; and (3) assess brine production from desalination facilities and the management implications of the produced brine."). *Id*.

10. *Id.*

11. *Id.*

12. *Id.*

water to citizens.[13] Seawater desalination is increasingly important for providing fresh water for drinking, cooking, and washing to people in water-scarce countries.[14] Over time, desalination has come into greater and more prevalent use.[15] This is because "reductions in the economic cost of desalination associated with technological advances, coupled with rising costs and the diminishing supply and security of 'conventional' water resources, have made desalination a cost-competitive and attractive water resources management option around the globe."[16] Also, improvements in desalination technology, such as improved membrane technologies and improved energy provision and recovery systems make desalination more economically feasible for many nations than in the past.[17] Several countries, such as the Maldives, Malta and the Bahamas, meet all their water needs through desalination, and Saudi Arabia acquires 50% of its fresh water through desalination.[18] A United Nations study (UN Study) found that, as of 2018, almost 16,000 desalination plants operated in 177 countries, producing a volume of freshwater equivalent to almost half the average flow over the Niagara Falls.[19] But desalination is not a perfect solution.

The process of desalination can have dangerous environmental impacts. First, desalination is an energy-intensive process.[20] The energy needed to power desalination plants is typically acquired using fossil fuels, which contributes to global warming.[21] Second, desalination creates a toxic brine byproduct that pollutes coastal ecosystems.[22] With either boiling or reverse osmosis, about 1.5 liters of the liquid brine byproduct contaminated with chlorine and copper are produced.[23] This toxic brine is often pumped back into the ocean, where it depletes oxygen and impacts organisms along the food chain; creating massive die-offs of ocean life in the affected areas.[24] Approximately 80% of all desalinated water is produced within ten kilometers of a coastline, and "ocean disposal is assumed to be the dominant brine disposal worldwide."[25] This disposal method is very

13. *See Towards Sustainable Desalination, supra* note 2, at 2.
14. *Id.* at 1.
15. Jones et al., *supra* note 9, at 1344.
16. *Id.*
17. *Id.*
18. *Towards Sustainable Desalination*, *supra* note 2.
19. *Id.*; *see also* Jones, *supra* note 9, at 1344.
20. *Towards Sustainable Desalination*, *supra* note 2.
21. *Id*.
22. *Id*.
23. *Id.*
24. *Id.*
25. *See* Jones et al., *supra* note 9, at 1351.

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

There are six principal organs of the UN: the General Assembly, the Security Council, the Economic and Social Council, the Trusteeship Council, the Secretariat, and the International Court of Justice.[29] However, only three of these organs adopt resolutions: the General Assembly, the Security Council and the Economic and Social Council.[30] The most common form in which a conference expresses itself is by way of resolutions, like the Resolution for the Protection of the Marine Environment from Land-Based Activities, concerned herein.[31]

The UN Charter is the basic text for the organization, comparable to a Constitution of the organization.[32] After the Charter, the resolutions adopted by the General Assembly essentially constitute the laws of the United Nations.[33] Unfortunately, the resolutions adopted by the General Assembly are not always entirely clear and may be obscure and even seem to be contradictory.[34] This is because, contrary to what happened in the early days when every draft resolution used to be put to a vote, in the

26. *Id.*
27. *Id.* at 1354.
28. *Id.*
29. MODEL UNITED NATIONS, DRAFTING RESOLUTIONS, https://www.un.org/en/model-united-nations/drafting-resolutions (last visited Oct. 27, 2022).
30. *Id.*
31. *Id.*
32. *Id.*
33. *Id.*
34. *Id.*

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.*

as the Resolution for the Protection of the Marine Environment from Land-Based Activities, essentially ineffective. [46]

B. THE RESOLUTION ON THE PROTECTION OF THE MARINE ENVIRONMENT FROM LAND-BASED ACTIVITIES

In March 2019, the United Nations Environment Assembly adopted a resolution on the protection of the marine environment from land-based activities.[47] Member States agreed to

> 1. 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 in support of the 2030 Agenda as a framework for sustainable development,
>
> 2. Enhance capacity-building, know-how, lessons learned, knowledge sharing through collaboration and partnerships involving governments, financial institutions, private sector, civil society and experts at the regional and global levels in the protection of coastal and marine ecosystems from land-based activities and sources of pollution…
>
> 4. Encourage the exchange of information, practical experience and scientific and technical expertise cooperative and collaborative action and partnership among governmental institutions and organization, communities, the private sectors and non-governmental organizations which have relevant responsibilities and/or experience.[48]

The Resolution recognizes the importance of cooperation between nations in order to effect actual and positive environmental change.[49] Seawater and the contaminants it contains as a result of desalination waste can naturally travel between jurisdictions, so the desalination activities of one nation may negatively impact the ecosystem of another.[50] Therefore, desalination regulation is a concern even for nations that do not rely on desalination themselves. The adoption of the Resolution is a significant achievement because it demonstrates the United Nations' and its member states' dedication to reducing the environmental harm to marine ecosystems from land-based pollution processes like seawater desalination.

While the Resolution is a significant achievement, it lacks important elements that would make it effective. The Resolution does not require any

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46. *Id.*
47. *See Towards Sustainable Desalination*, *supra* note 2.
48. *See* Environment Assembly Res., *supra* note 1.
49. *Id.*
50. *See Towards Sustainable Desalination*, *supra* note 2.

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.[61]

The third principle, the duty to cooperate, may also be called the obligation of "good neighborliness."[62] This duty compels cooperation with neighboring states when implementing national strategies that tend to have

51. *See* Environment Assembly Res., *supra* note 1.

52. *Id.*

53. *See* MODEL UNITED NATIONS, *supra* note 29.

54. Kenneth P. Korosi, *Without a Grain of Salt: Evaluating International Permitting Schemes in Light of Industrial-Grade Desalination*, 21 SW. J. Int'l L. 431, 431 (2015).

55. *Id.* at 444.

56. *Id.*; Rhett B. Larson*, Innovation and International Commons: The Case of Desalination under International Law*, 2012 Utah L. Rev. 759 (2012).

57. *See* Korosi, *supra* note 54, at 444.

58. *Id.*

59. *Id.*

60. *Id.* at 445.

61. *Id.*

62. *Id.*

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

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 the impact on each region's ecosystem, make it difficult to reach consensus on proposed regulations.[74]

A. WHY A BINDING TREATY WILL NOT WORK

In this case, a binding treaty is likely ineffective for many of the same reasons as why either the RAM or the CAM approaches would be ineffective on their own. As discussed, under RAM, 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.[75] "The CAM model [also] suffers an irreconcilable problem: Creating a collaborative government without the required unanimity for decisions would seldom occur, but creating a collaborative government requiring unanimity in decisions would consistently result in stalemates."[76] These problems that are present in the RAM and the CAM approaches are also present in the binding treaty approach.

Attempting to draft a treaty that is both fair, and yet meets the needs and capabilities of all individual nations, would be nearly impossible. Saudi Arabia meets approximately 50% of its fresh water needs through desalination and the Bahamas derive most of their fresh water from desalination, but these two countries have very different populations and different economic and technological capabilities.[77] Attempting to hold each country to strict standards of regulation as defined in a binding treaty aspires to too much and runs into the same problems of the RAM and the CAM approaches.[78] A binding treaty would either be too lenient overall, in order to accommodate the capabilities of nations with fewer economic and technological resources, or too strict, trying to regulate wealthier countries.

In addition, international environmental conventions and treaties have historically been ineffective.[79] In January of 2019, the UN released a global

73. Korosi, *supra* note 54, at 448.

74. *Id.* at 448.

75. *Id.* at 445.

76. *Id.* at 448.

77. *Towards Sustainable Desalination*, *supra* note 2.

78. Korosi, *supra* note 54, at 455.

79. De Vann Sago, *The Difficulties of Enforcing Global Environmental Law*, GEO. ENV'T L. REV. (Feb. 1, 2019), https://www.law.georgetown.edu/environmental-law-

assessment on the environmental rule of law, the first ever report of this kind.[80] It found that, despite a substantial increase in the amount of environmental protection agencies and laws, widespread failure to adequately enforce regulations has impeded the international effort to combat numerous environmental threats.[81] In other words, countries across the globe recognize the need for environmental protection but have failed to implement effective policies to achieve this end.[82] "Lack of sufficient enforcement mechanisms is an issue that affects international bodies and agreements" across the globe and throughout the modern era.[83] This issue continues to complicate and undermine the international community's efforts to implement effective global environmental policy today.[84] The UN report goes so far as to suggest that, although environmental laws have substantially multiplied in number in recent years, they nonetheless "exist mostly on paper" due to insufficient, inconsistent, or faulty implementation and enforcement. [85]

This problem has two basic components that can be viewed as "layers."[86] The first layer consists of international bodies like the UN, and the difficulties such international organizations face in enforcing international rules on individual member states.[87] The second layer of this issue is the individual states themselves.[88] While the individual states may "arguably suffer less from lack of ability to enforce environmental regulations," they also suffer more from "a lack of motivation to implement potentially costly regulations with no guarantee that other states will follow suit."[89] This is an illustration of the free-rider phenomenon; nations may assume that because others are implementing environmental regulations, there is no need to do so themselves. The international community's lack of ability to enforce global environmental law partially comes from the

review/blog/214/#_ftnref2; School of International Service, *A Beginner's Guide to Environmental Agreements*, AM. U. SCH. INT'L SERV. (Dec. 13, 2018), https://ironline.american.edu/blog/beginners-guide-environmental-agreements/; Science Safety Security, *International Agreements*, U.S. DEP'T HEALTH AND HUM. SERV. (Feb. 15, 2018), https://www.phe.gov/s3/law/Pages/International.aspx.

80. *See* Sago, *supra* note 79.

81. U.N. Env't Programme [UNEP], *Environmental Rule of Law: First Global Report* (2019); Sago, *supra* note 79.

82. Sago, *supra* note 79.

83. *Id.*

84. *Id.*

85. *Id.*

86. *Id.*

87. *Id.*

88. *Id.*

89. *Id.*

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 for the effective regulation of seawater desalination.

Also, a binding treaty would be difficult to change and adapt as more technological advancements are made. Technological innovations and innovative financial mechanisms to support the sustainability of

90. Oona A. Hathaway, *International Delegation and State Sovereignty*, 71 LAW & CONTEMP. PROBS. 115, 116 (2008).

91. The Paris Agreement is an international treaty that was adopted in 2015 and targeted climate change. The treaty's goal is to limit global warming and reduce global emissions of greenhouse gasses. Paris Agreement to the United Nations Framework Convention on Climate Change, Dec. 12, 2015, T.I.A.S. No. 16-1104. *See* Sago, *supra* note 79.

92. Sago, *supra* note 79.

93. *A Beginner's Guide to International Agreements, supra* note 79; *International Agreements, supra* note 79.

94. *A Beginner's Guide to International Agreements, supra* note 79*;* Sago, *supra* note 79.

95. Sago, *supra* note 79.

96. *Id.*

97. *Id.*

desalination schemes are necessary for affordable and environmentally friendly systems to be rolled out in low-income and lower middle-income countries.[98] For this reason, the United Nations needs a more flexible approach that can match varying nations' capabilities.

B. CAP-AND-TRADE

One scholar, Kenneth Korosi has proposed a fourth option for regulating desalination: cap-and-trade.[99] Cap-and-trade has traditionally been used as a regulatory scheme for carbon dioxide emissions, and other greenhouse gasses.[100] Essentially, in a cap-and-trade system, governments issue a limited number of annual permits, called "allowances," which allow companies to emit set amounts of carbon dioxide or other pollutive agent.[101] The "cap" is the total amount of pollution allowed by the permit.[102] If the company releases a greater amount of pollution than their cap, then the company is taxed at a higher level.[103] However, if the company creates less pollution than their cap, then the company can sell its unused permits to other companies.[104] This is the "trade" function of cap-and-trade. Companies are thus incentivized to reduce their emissions because they can profit from selling their unused permits.[105]

In theory, each year, the issuing government reduces the number of permits available and consequently lowers the total emissions cap.[106] The scarcity of the allowances makes them more expensive, which in turn, gives companies an even greater incentive to invest in greener or cleaner technology because the green technology eventually becomes cheaper than buying the allowances.[107]

In his paper, *Without A Grain Of Salt: Evaluating International Permitting Schemes In Light Of Industrial-Grade Desalination*,[108] Kenneth Korosi argues that a cap-and-trade system solves the problem of the RAM and the CAM approaches, and is the perfect vehicle for regulating

98. *Id.*
99. Korosi, *supra* note 54, at 449.
100. Will Kenton, *Cap and Trade*, INVESTOPEDIA, https://www.investopedia.com/terms/c/cap-and-trade.asp (last updated Dec. 5, 2020).
101. *Id.*
102. *Id.*
103. *Id.*
104. *Id.*
105. *Id.*
106. *Id.*
107. *Id.*
108. Korosi, *supra* note 54, at 444.

desalination at the international level.[109] Cap-and-trade does address some of the key issues with RAM and CAM, as well as some of the problems associated with a treaty approach. Korosi acknowledges that the RAM approach is too reactive and not proactive enough and also acknowledges that it is nearly impossible for governing bodies to reach consensus under the CAM approach.[110] In addition, he also recognizes that "treaties will not be enough"[111] because "forcing any standardized compliance on such a delicate market will smother its implementation and consequent innovation."[112] Korosi, therefore, argues that cap-and-trade is the perfect solution to all of these issues because, by encouraging companies to reduce emissions at the cheapest price, cap-and-trade schemes "increase flexibility to local conditions."[113] Since the desalination needs of different nations and regions are diverse, establishing a system of allowances for the varying levels of desalination pollution produced by these nations is logical, at least on the surface.[114] Korosi does acknowledge that "a seawater desalination plant's isolated location would negate environmental concern from a neighboring country, making it unfair to limit its pollution under any cap-and-trade."[115] More broadly, a system of cap-and-trade may seem unfair when the environmental impacts of a desalination plant are not felt by other nations.[116] Korosi's solution is to establish cap-and-trades schemes regionally.[117] This way, the scheme only includes desalination plants that pollute shared ecosystems.[118] Negotiating nations would share the cost of the environmental impact studies needed to determine the particular geographic area to be protected.[119] However, desalination plants outside this geographic and outside of the particular cap-and-trade scheme would not be subject to regulation.[120]

In addition to establishing particularized geographic area and specific ecosystems for protection, the cap-and-trade scheme would allow nations to create yearly caps for "future environmental compliance"[121] that could be

109. *Id.* at 449-54.
110. *Id.* at 444-48.
111. *Id.* at 455.
112. *Id.*
113. *Id.* at 448.
114. *Id.*
115. *Id.* at 450.
116. *Id.*
117. *Id.* at 451.
118. *Id.*
119. *Id.*
120. *Id.*
121. *Id.*

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 level, desalination regulation may be brought to the international level through linkages.[124] A linkage is essentially when one cap-and-trade scheme combines with another.[125] A linkage occurs when one government allows its "regulated entities," in this case desalination plants, to use allowances from other schemes to meet their compliance obligations.[126] This linking can occur either directly, or indirectly.[127] With a direct linkage, one government's scheme directly accepts another scheme's allowances, whereas with an indirect linkage, two schemes are connected through a third, commonly shared scheme.[128]

This series of linkages of schemes between nations is an interesting concept because it theoretically allows for desalination regulation at the regional level, where the harm from desalination is immediately felt, and at the international (and presumably global) level, where the harm from desalination is more abstract, and felt in the long-term.[129] As Korosi explains, with regard to the short-term and long-term benefits of linkages,

> [s]hort-term results include opening the market and creating greater liquidity without harmonizing emerging and existing schemes, and long-term results might include a singular global scheme that regulates desalination or climate change as a whole or a large set of direct links that joins each regional scheme. Opening a regional scheme's market for trading creates greater liquidity, efficient trading, and innovative compliance. These linkages, however, serve a greater purpose. They provide an international structure for overall pollution reduction. This may come from establishing multilateral links or from an international agreement regulating desalination.[130]

Despite seeming like the best of all worlds, however, a series of cap-and-trade schemes and linkages ignores an obvious problem.

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122. *Id.*
123. *Id.* at 444-55.
124. *Id.* at 449, 453.
125. *Id.*
126. *Id.*
127. *Id.* at 453.
128. *Id.*
129. *Id.* at 449, 453-54.
130. *Id*. at 453-54.

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 immediately apparent but undeniably contributes to global warming.[134] A cap-and-trade system may make sense for regulating desalination in regard to greenhouse gas emissions, because pollution reduction of one scheme may make up for the continued emissions of another scheme, resulting in an overall, global decrease in greenhouse gas emission.[135]

The release of toxic brine byproduct back into the ocean, on the other hand, has a direct and easily identifiable impact on the area's ocean health.[136] One desalination plant's reduction in the amount of toxic brine release cannot possibly make up for another plant's continued toxic brine release, because the marine ecosystem surrounding the second plant will just continue to be devastated. For this reason, I propose a fifth approach to desalination regulation: a system of UN model rules with a task force for their enforcement.

131. *See* Kenton, *supra* note 100.

132. *Id*.

133. *Id*.

134. *Towards Sustainable Desalination*, *supra* note 2. *See also* Atef Badr, *Desalination Sustainability: The Need to Think Again*, *in* TOWARDS A SUSTAINABLE WATER FUTURE: PROCEEDINGS OF OMAN'S INTERNATIONAL CONFERENCE ON WATER ENGINEERING AND MANAGEMENT OF WATER RESOURCES 171, 176-77 (Atef Badr & Jean Venables eds., 2021).

135. *See* Kenton, *supra* note 100.

136. *See Toward Sustainable Desalination*, *supra* note 2; *see also* Jones et al., *supra* note 9, at 1344.

IV. THE UN SHOULD ADOPT MODEL RULES THAT COMBINE THE RIGHTS-BASED ADVERSARIAL MODEL WITH THE COLLABORATIVE AND ADAPTIVE MANAGEMENT MODEL, AND CREATE A TASKFORCE FOR THE ENFORCEMENT OF THE MODEL RULES

Neither the RAM nor the CAM approaches are perfect on their own, and the cap-and-trade approach has its own drawbacks, as discussed. For this reason, a new approach is needed; one that will combine the best elements of other proposed approaches while eliminating the weaknesses of said approaches. To this end, Subsection A argues that the UN should adopt model rules that combine the RAM and the CAM approaches. In order to ensure that the model rules are effective, the UN needs a system of enforcement. Subsection B argues that the UN should establish a taskforce comprised of experts in the desalination field, who will visit nations' desalination facilities and ensure compliance with the model rules.

A. COMBINING THE RAM AND THE CAM TO CREATE MODEL RULES

To help solve these problems with both the rights-based adversarial model (RAM) and the collaborative and adaptive management model (CAM), the United Nations should adopt model rules regarding the minimum environmental considerations and requirements for desalination. These should include rules regarding the energy consumption of desalination plants, geographic placement of desalination plants, and disposal of the brine byproduct. Adopting such rules would alleviate the hindsight problem of the RAM model by informing nations of the practices they must follow to avoid liability in the first place. It would also ease the potential tensions caused by the CAM model because countries would have more uniform guidelines to follow, thus making it easier to reach consensus.

B. USING A TASKFORCE FOR THE ENFORCEMENT OF MODEL RULES

In this case, a binding treaty is out of reach. With desalination plants in 177 countries around the globe, it would be nearly impossible to reach consensus on terms for ratification because different countries have very different interests and economic capabilities when it comes to regulating

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] The FATF uses a "soft" law approach to international law, as opposed to a "hard" law approach.[140] An international law instrument is hard when it "provides concrete prescriptions," is "accompanied by a strong expectation of enforcement," and is otherwise "highly authoritative."[141] Treaties are a classic example of a hard law approach.[142] By contrast, an international law instrument that does not have these traits is considered "soft."[143] The FATF uses soft law to address three challenges of international law: "(1) the demands for rapid responses to global financial crises; (2) the unwillingness of domestic legislatures, especially economically powerful ones, to cede control or sovereignty; and (3) the difficulty in reaching a consensus on technical issues, particularly when the outcomes may be subject to political tinkering as a condition of ratification."[144] A soft law approach is more "flexible" and can be rolled out and employed more quickly than a hard law approach.[145] In addition, a soft law approach may better convince nations to uphold their agreements and fulfill their promises because it uses enforcement mechanisms that are more likely than traditional hard law approaches to incentivize nations to comply.[146]

The FATF takes a risk-based approach to preventing money laundering, as opposed to a rules-based approach.[147] The two primary

137. *See Towards Sustainable Desalination*, *supra* note 2.

138. Jack P. Sahl, *Combatting Threats to the International Financial System: The Financial Action Task Force: Lawyer Ethics and the Financial Action Task Force: A Call to Action*, 59 N.Y.L. SCH. L. REV. 457, 467 (2015).

139. *Id.* at 468; Korosi, *supra* note 54, at 444.

140. Nicholas W. Turner, *The Financial Action Task Force: International Regulatory Convergence Through Soft Law*, 59 N.Y. L. REV. 547, 548 (2014).

141. *Id.*

142. *Id.*

143. *Id.*

144. *Id.* at 549.

145. *Id.* at 558.

146. *Id.* at 558-59.

147. *See* Sahl, *supra* note 138, at 468.

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 governing systems, legal system, and economic circumstances.[152] For example, one Recommendation provides that lawyers and other designated non-financial businesses and professions "should be required to report suspicious transactions when, on behalf of or for a client, they engage in financial transactions in relation to the activities" and provides a list covering a broad range of legal services including: "[the] buying and selling of real estate; managing of client money, securities or other assets; management of bank, savings or securities accounts; organisation of contributions for the creation, operation or management of companies; creation, operation or management of legal persons or arrangements, and buying and selling of business entities."[153]

The United Nations should also incorporate a system of self and peer review, like the FATF does.[154] For the self-review portion, FATF members are required to complete an annual self-assessment questionnaire that covers the county's implementation of FATF policies.[155] The FATF then reviews country's answers to the questionnaire to check that the country is actually in compliance with the FATF's standards.[156] Next, FATF members also review each other through a peer-review process, like the CAM

148. *Id.* at 468-69.
149. *Id*. at 469.
150. *Id.*
151. *Id.*
152. *Id.*
153. *Id.*
154. *Id.* at 470.
155. *Id.*
156. *Id*.

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 proactive in enforcement through a higher level of participation and involvement."[158] Members of the FATF work to bring themselves into compliance with the Recommendations because, if they are found to be noncompliant, they will be identified on a publicly available list as a "noncooperative countr[y] and territor[y]," which would "jeopardize their governments' political standing both at home and abroad."[159] In addition, a noncooperative country risks having their FATF membership suspended, which encourages the country to work quickly to remedy its "deficiencies."[160] This threat gets its effectiveness mainly through the fear of shaming or sanctions.[161] "Noncompliance adversely reflects on nations' reputations to honor their international obligations and potentially exposes them to a system of sanctions, such as 'blacklisting . . . accompanied by countermeasures.'"[162] Often, even the mere threat of being blacklisted will encourage noncompliant countries to resolve the problems keeping them from adhering to the Recommendations, and incentivize them to "bring themselves into compliance."[163]

The United Nations should take an approach that mirrors the Financial Action Task Force. The main problem with international environmental treaties is that they lack an enforcement mechanism, and therefore carry little weight. A task force like the FATF would help keep countries accountable for their desalination regulation processes.

The task force should be comprised of experts in the field, including those from both the public and private sectors. This directly aligns with the Resolution's stated goal of encouraging the exchange of information, practical experience, and scientific and technical expertise among governmental institutions and private sectors that have relevant responsibilities and experience. Gathering a group of people across multiple organizations will help create a task force that is the most representative of

157. *Id*.
158. *Id.* at 471.
159. *Id.*
160. *Id.*
161. *Id.*
162. *Id.* at 471-72.
163. *Id.* at 472.

all the companies, organizations, and people it monitors and regulates. It makes the most sense to have the people who understand the science of desalination and the workings of the industry regulate the desalination industry because they are in the best position to understand the capabilities of nations to regulate desalination within their own particular circumstances. They are also the best suited to know what regulations are physically possible, and what regulations will be possible in light of technological advancements in the field.

The UN model rules regarding desalination would serve as the guidelines or standards by which to judge a nation's regulatory efforts, similar to how the FATF's Recommendations function. The FATF purports not to use a rules-based approach, but their Recommendations essentially function as model rules, guiding countries' efforts in complying with industry and international standards or regulatory norms. Similarly, the UN's model rules should be flexible enough to allow members to conserve their resources for combatting harmful ecological effects from desalination and to allow members to focus their limited resources on situations and persons that pose the greatest risk to the environment.

In concurrence with these model rules, the UN should have a system of self- and peer-review like the FATF. First, member states will evaluate their own regulations and assess how well they conform to the model rules and how they compare with other members' desalination regulation efforts. Next, the task force will visit the various members' desalination facilities and review their implementation of regulatory schemes. Like with the FATF, member states wish to avoid being judged as noncompliant with the model rules to avoid being identified on a publicly available list as a noncooperative country or territory because it would "jeopardiz[e] their governments' political standing both at home and abroad."[164] Countries who are found not to be in compliance with the rules will be encouraged to make rapid progress to remedy their deficiencies, because noncompliant countries and territories would risk negative reflections on their reputations to honor their international obligations and be exposed to a system of sanctions, such as blacklisting accompanied by countermeasures.

Blacklisting is a soft law measure because it does not include official sanctions or binding legal decisions.[165] Some may argue that the lack of such hard law measures make blacklisting toothless because nations will have no incentive to comply.[166] However, this is not the case because, as of

164. *Id.* at 471.

165. J. C. Sharman, *The Bark is the Bite: International Organizations and Blacklisting*, 16 REV. OF INT'L AND POL. ECON. 573, 574 (2009).

166. *Id.*

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.

169. *Id.* at 577-79.

170. *Id.* at 574, 582.

171. *Id.*

172. *Id.* at 582, 584.

173. Ahmad Al Amoudi & Nikolay Voutchkov, *Innovation in Desalination—The Path Forward*, IDA GLOBAL CONNECTIONS 26, 27 (Fall 2021).

174. *Id*.; Robert Sanders, *Improved Desalination Process Also Removes Toxic Metals to Produce Clean Water,* BERKELEY NEWS (Apr. 15, 2021), https://news.berkeley.edu/2021/04/15/improved-desalination-process-also-removes-toxic-metals-to-produce-clean-water/; *Breakthrough In Reverse Osmosis May Lead to Most Energy-Efficient Seawater Desalination Ever*, PURDUE UNIV. NEWS (May 12, 2021), https://www.purdue.edu/newsroom/releases/2021/Q2/breakthrough-in-reverse-osmosis-may-lead-to-most-energy-efficient-seawater-desalination-ever.html.

175. Amoudi & Voutchkov, *supra* note 173.

> 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 since they filter out only the specified substances, they clog less quickly and less easily.[179] This means that less energy will be required overall.

Another encouraging trend is the use of renewable energy sources for powering desalination plants.[180] Solar energy offers a green alternative to the traditional fossil fuels used to power desalination plants.[181] Saudi Arabia is a global leader in desalination technology and has recently invested in developing greener, solar-based technologies for seawater desalination.[182] Saudi Arabian teams have united with Solar Water, a United Kingdom company, to design and build a new, planned city called Neom.[183] Neom is intended to be a "futuristic desert metropolis" that will meet all of its fresh water need from a desalination plant using "Solar Dome" technology.[184] The Solar Dome "uses concentrated solar power—technology which already exists—to evaporate seawater inside a giant dome, separating fresh, drinkable water from extremely saline brine."[185]

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176. *Id.*

177. Norhan Nady et al., *Modification Methods for Poly(arylsulfone) Membranes: A Mini-Review Focusing on Surface Modification*, 275 DESALINATION 1, 1 (2011).

178. *Id.* at 2.

179. Amoudi & Voutchkov, *supra* note 173.

180. *See Towards Sustainable Desalination*, *supra* note 2.

181. *Id.*

182. Ben Flanagan, *What's Inside This Giant 'Solar Dome' Coming to Saudi Arabia*, WIRED (July 17, 2021), https://wired.me/science/environment/desalination-solar-dome-saudi-arabia-neom/; *Al Khafji Solar Saline Water Reverse Osmosis (Solar SWRO) Desalination Plant*, WATER TECH., https://www.water-technology.net/projects/al-khafji-solar-saline-water-reverse-osmosis-solar-swro-desalination-plant/ (last visited Oct. 27, 2022).

183. *Concentrated Solar Heat to Desalinate Seawater at Saudi Neom City*, SOLARPACES (Feb. 16, 2020), https://www.solarpaces.org/concentrated-solar-heat-to-desalinate-seawater-at-saudi-neom-city/.

184. *Id.*

185. *From Desert to Oasis: Saudi Arabia and the Global Revolution in Water Treatment*, GULF MORNING NEWS (Apr. 4, 2021), https://gulfmorningnews.com/from-desert-to-oasis-saudi-arabia-and-the-global-revolution-in-water-treatment/?utm_source=ReviveOldPost&utm_medium=social&utm_campaign=ReviveOldPost .

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.

VI. CONCLUSION

As freshwater becomes scarcer across the globe, and sea levels continue to rise due to climate change, seawater desalination is a more viable solution for providing fresh water. As nations employ seawater desalination more, the importance of regulating its environmental impacts increases. The United Nations has taken an important first step with its Resolution on the Protection of the Marine Environment from Land-Based Activities, but now it is time to take the next step and implement rules and establish a task force for their enforcement.

Model rules will provide much needed clarity by serving as standards by which nations can measure their own desalination regulations and against which the task force can evaluate their effectiveness. This avoids the problems with the rights-based adversarial model (RAM) and collaborative and adaptive management model (CAM) approaches. The implementation of the task force solves the problem posed by a treaty approach by providing enforcement mechanisms and enough flexibility to modify desalination regulations with technological advancements.