

CLIMATE-DRIVEN FISHERY SHIFTS: FRAMING THE PROBLEM & PROPOSING SOLUTIONS FOR SHIFTS ACROSS SHARED BORDERS

*Cayla Calderwood**

As oceans warm, fish around the globe are shifting to cooler waters. This will present significant challenges for global fisheries management, most of which is organized within set jurisdictional boundaries.

Climate-driven fishery shifts will challenge sustainable fisheries management at local, regional, and international levels. However, one of the most vexing problems will be cross-border shifts: when a fishery shifts from one country's waters into another's. Cross-border shifts will exacerbate international tensions and undermine environmental sustainability. They will also add new dimensions to the problem of climate justice. While regional patterns vary, global trends indicate that marine organisms are generally moving towards the poles. Therefore, these shifts are predicted to fall the hardest on developing nations in the tropics.

In theory, creative and flexible bilateral agreements could address cross-border shifts. However, negotiations may be impeded by a wide range of challenges, including bargaining inequity.

This Note argues that the problems posed by cross-border fishery shifts are analogous to those presented by international hazardous waste disposal in the 1980s. In both situations, there is a global trend that puts developing countries at a disadvantage. In both cases, this global trend may systematically undermine hundreds of discrete bilateral negotiations. Thus, this Note proposes a new international treaty modeled on the Basel Convention on Transboundary Movement of Hazardous Wastes. This treaty would establish a procedural checklist for any countries that experience a cross-border fishery shift. Proactively setting the stage for negotiations can help countries develop creative and flexible bilateral agreements that are tailored to their unique situation.

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* J.D. Candidate, Harvard Law School, Class of 2020. M.P.P. Candidate, Harvard Kennedy School of Government, Class of 2020. The author would like to thank the *Harvard Environmental Law Review* editorial staff for their excellent editing and helpful advice. Any mistakes are the author's own.

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INTRODUCTION

As oceans warm, marine organisms around the globe are shifting towards cooler waters.¹ The world's oceans have already absorbed “ninety-three percent of the heat from anthropogenic climate change,” causing marine organisms to shift “at a rate averaging 70 km per decade.”² Climate-driven fishery shifts will undermine sustainable fisheries management, which was designed to manage fisheries in their historic range. Furthermore, these shifts are not neutral in cause or effect. Climate change is primarily driven by affluent northern coun-

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1. See Food and Agric. Org. of the U.N. [FAO], *Impacts of Climate Change on Fisheries and Aquaculture*, at iv, Technical Paper 627 (2018) [hereinafter *Impacts of Climate Change*]; Keith Brander et al., *Changes in Fish Distribution in the Eastern North Atlantic: Are We Seeing a Coherent Response to Changing Temperature?*, 219 ICES MARINE SCI. SYMP. 261, 261 (2003); James W. Morley et al., *Projecting Shifts in Thermal Habitat for 686 Species on the North American Continental Shelf*, 13 PLOS ONE, e0196127, at 1 (2018). Warming water is also affecting freshwater fish. See, e.g., *How Climate Change Affects Fishing*, CLIMATE CENT. (Aug. 22, 2018), <https://perma.cc/K7A4-YSR2>. However, this is beyond the scope of this Note.
 2. Malin Pinsky et al., *Preparing Ocean Governance for Species on the Move*, 360 SCIENCE 1189, 1189 (2018).

tries, but the burden is predicted to fall hardest on less-developed nations in the tropics.

Climate-driven fishery shifts implicate a broad range of marine policy issues; however, this Note will focus on the implications for commercially fished marine organisms. Fishing is an economically valuable industry and fish are critical to global food security.³ The global fishing industry “supports the livelihoods of between 660 and 820 million people, directly or indirectly,” accounting for “ten to twelve percent of the world’s population.”⁴ Fishery landings are estimated around \$145,553,000,000 annually,⁵ and fish provide “more than 2.9 billion people with 20 percent of their animal protein needs.”⁶

The impacts of climate-driven fishery shifts manifest at multiple levels. Locally, fishermen are being forced to travel many miles to catch fish that were once right offshore, while others are beginning to catch species they have never seen before.⁷ Meanwhile, at the regional level, fisheries management is struggling to coordinate allowable catch limits for fish stocks shifting across regions.⁸ Globally, climate-driven fishery shifts will create winners and losers as valuable fisheries migrate to new waters.⁹ These shifts are anticipated to exacerbate historic tensions over fishing rights.¹⁰

Studying these shifts is complicated by different regional warming patterns. Because the ocean is not warming at a uniform rate, commercial fisheries

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3. See INT’L CTR. FOR TRADE & SUSTAINABLE DEV., CLIMATE CHANGE AND FISHERIES: POLICY, TRADE AND SUSTAINABLE DEVELOPMENT ISSUES 1 (2009).
 4. Vicky W.Y. Lam et al., *Projected Changes in Global Fisheries Revenues Under Climate Change*, 6 SCI. REP. 1, 1 (2016), <https://perma.cc/HJR9-AMC4> (citing Food and Agric. Org. of the U.N. [FAO], *The State of World Fisheries and Aquaculture*, at 223 (2014) [hereinafter WORLD FISHERIES 2014]).
 5. Food and Agric. Org. of the U.N. [FAO], *Fishery and Aquaculture Statistics*, at 52 (2019) (stating the world total for capture fisheries in 2017).
 6. Lam, *supra* note 4, at 1 (citing *World Fisheries 2014*, *supra* note 4, at 223).
 7. See Ben Goldfarb, *Feeling the Heat: How Fish Are Migrating from Warming Waters*, YALE ENV’T 360 (June 15, 2017), <https://perma.cc/8FQG-HXE3> (“As stocks shift, many fishermen face a choice: follow the schools northward, or pursue different species.”); *Climate Change: How It Is Forcing Mass Fish Migration*, CLEANER SEAS (May 30, 2019), <https://perma.cc/Y224-XLK3> (describing species migration in North America).
 8. Craig Welch, *Climate Change May Spark Global ‘Fish Wars’*, NAT’L GEOGRAPHIC (June 14, 2018), <https://perma.cc/82GR-BRYG> (describing how the U.S. National Marine Fisheries Service was caught off guard by catches of tilefish further north than they had ever been seen, “where there were no rules” to govern them).
 9. See *Impacts of Climate Change*, *supra* note 1, at iv (describing how catch is predicted to decrease in some regions, and increase in others).
 10. Marshall Shepherd, *Climate Change May Be Creating a Seafood Tradewar, Too*, FORBES (June 15, 2018), <https://perma.cc/L7RZ-PM2M>; Jessica Spijkers, *Cooling Heated Fish Wars*, OCEAN GOVERNANCE (June 27, 2018), <https://perma.cc/Z829-3QK4>; Welch, *supra* note 8.

in different regions shift in different ways.¹¹ For example, while many species are moving north, “species in the Gulf of Alaska . . . moved *south* in concord with a natural cycle of Pacific cooling.”¹² Similarly, “[i]n the Gulf of Maine, many species are drifting southwest . . . seeking cooler spots that form closer to shore.”¹³ In the North Sea, species are driven more by depth than latitude, staying cool by migrating to deeper water.¹⁴ However, despite variation in regional shifts, one global trend has emerged: Fish around the world are generally shifting towards the poles, away from the warmer tropical water near the equator.¹⁵

Scientists have been studying climate-driven fishery shifts for decades and media reports on the issue are plentiful.¹⁶ However, legal and policy responses have lagged behind.¹⁷ And this work could be critical. Scientists have predicted that “improvements in fisheries management can offset the negative consequences of climate change.”¹⁸ However, this will require “proactive development of effective transboundary institutions.”¹⁹ Despite these urges, a recent study analyzed 127 international fisheries agreements and found that none contained language “related to climate change, range shifts or stock exits.”²⁰ While much work remains to be done, this Note begins to rectify the lack of legal literature on this topic.

Part I offers a brief background on the basic principles of fisheries management. Next, Part II outlines the different legal regimes that govern interna-

11. Malin L. Pinsky et al., *Marine Taxa Track Local Climate Velocities*, 341 SCIENCE 1239, 1239–40 (2013) (discussing how fish are shifting in line with local climate velocities).
12. Goldfarb, *supra* note 7 (emphasis added).
13. *Id.*
14. Nickolas K. Dulvy et al., *Climate Change and Deepening of the North Sea Fish Assemblage: A Biotic Indicator of Warming Seas*, 45 J. APPLIED ECOLOGY 1029, 1030 (2008).
15. Pinsky et al., *supra* note 2, at 1190 (discussing how global fisheries are predicted to move out of the tropics, while countries in temperate regions will receive relatively higher percentages of catch from new fish stocks).
16. See, e.g., Bob Berwyn, *Fish Species Forecast to Migrate Hundreds of Miles Northward as U.S. Waters Warm*, INSIDE CLIMATE NEWS (May 16, 2018), <https://perma.cc/FTZ7-TGMR>; Max Mossler, *Fish Will Migrate as Temperatures Warm, Putting Fisheries at Risk*, SAVING SEAFOOD (June 5, 2017), <https://perma.cc/7Z33-QPG2>; Kendra Pierre-Louis, *Warming Waters, Moving Fish: How Climate Change Is Reshaping Iceland*, N.Y. TIMES (Dec. 3, 2019), <https://perma.cc/GUC2-LU43>.
17. Indeed, one of the most prolific scientists in the field recently published an article in *Science* explicitly calling for policymakers to respond to the problem. See Pinsky et al., *supra* note 2, at 1190 (“Past conflicts, the projected widespread emergence of new transboundary stocks, and the gaps in current government frameworks all suggest that substantial new approaches are needed to forestall future conflict.”).
18. Steven D. Gaines et al., *Improved Fisheries Management Could Offset Many Negative Effects of Climate Change*, 4 SCI. ADVANCES 1, 1 (2018).
19. *Id.*
20. Kimberly L. Oremus et al., *Governance Challenges for Tropical Nations Losing Fish Species Due to Climate Change*, 3 NATURE SUSTAINABILITY 277, 277 (2020).

tional fisheries, and examines how fishery shifts will face different management challenges depending on where they occur. Part II concludes that climate-driven fishery shifts must be considered in three distinct legal spaces: (1) domestic shifts; (2) shifts involving the high seas; and (3) shifts from one country to another. This third problem—when fish move from one country to another—will be referred to as *cross-border shifts*.²¹

The subject of cross-border shifts is the main focus of the second half of this Note. Part III begins by unpacking the problems that will be caused by cross-border shifts. Three main challenges are identified: intercountry conflict, environmental sustainability, and environmental justice.

Parts IV and V focus on potential responses to the cross-border problem. Part IV discusses three potential options: loss and damage compensation, bilateral economic agreements, and regional fisheries management organizations (“RFMOs”). Ultimately, Part IV argues that bilateral economic agreements may in theory be able to address cross-border shifts. However, various factors may undermine the efficacy of these negotiations. While RFMOs could potentially act as third-party neutrals for these negotiations, their lack of formal authority will undermine their effectiveness.

Finally, Part V outlines a potential solution modeled on the Basel Convention on Transboundary Movement of Hazardous Wastes. Like cross-border fishery shifts, international hazardous waste trade implicates potentially efficient bilateral negotiations undermined by significant inequality issues. For years, developed countries exported hazardous waste to ill-equipped disposal sites in less-developed countries.²² These arrangements were driven by unequal bargaining power and resulted in significant environmental and humanitarian disasters. The Basel Convention addressed this issue by implementing a series of procedural safeguards to protect developing nations as they engaged in bilateral negotiations.²³ This Note argues that the analogies between cross-border fishery shifts and hazardous wastes make the Basel Convention a valuable framework for tackling this pressing challenge.

I. BASICS OF FISHERY MANAGEMENT

Fisheries management relies on a mixture of biological expertise and economic principles.²⁴ Unlike finite resources like oil or coal, fisheries are a *renewable* resource.²⁵ However, if a fishery is being overfished, the fish stock will be

21. Shifts involving the high seas also cross borders, but for this Note the term “cross-border shifts” describes when a fishery shifts from one country’s waters to another’s.

22. See *infra* notes 122–125 and accompanying text.

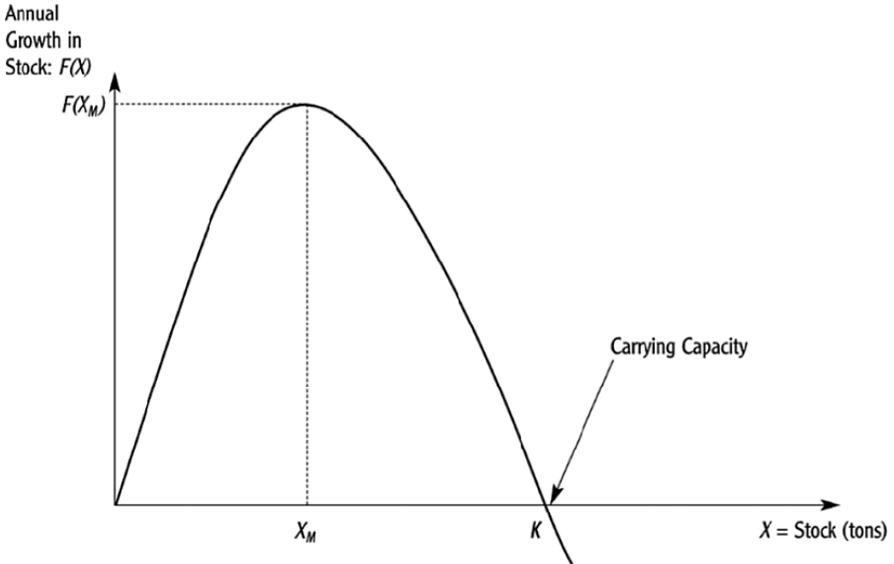
23. See *infra* note 131 and accompanying text.

24. NATHANIEL KEOHANE & SHEILA OLMSTEAD, *MARKETS AND THE ENVIRONMENT* 128–32 (2d ed. 2016).

25. *Id.* at 104, 129–30.

depleted faster than fish can reproduce. If this continues for too long, the stock can crash and the fishery will no longer be commercially viable. Therefore, fishery biologists work hard to determine the Maximum Sustainable Yield (“MSY”) for each fish stock.²⁶ This refers to the population size at which a fish stock replenishes itself at the fastest annual rate (X_M in Figure 1, below). When a fishery population is at this point it allows harvesters to remove the maximum amount of fish without negatively impacting the population.²⁷

FIGURE 1²⁸



There is a great deal of scientific uncertainty involved in determining the MSY for a fishery. Additionally, there is uncertainty in determining how many fish are in a stock at any given time (i.e. where along the X-axis the population is). One fisheries expert explained that “[c]ounting fish is like counting trees, but the trees are invisible and constantly on the move.”²⁹ Fishery scientists work to minimize this uncertainty and provide fishery managers with stock assessments and MSY estimates for every individual fish stock. Fishery managers

26. MSY has been codified in the primary U.S. fishery management law. *See* Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. § 1802 (2018).

27. This is a vast oversimplification of the scientific complexity behind fisheries management, but these basic principles will be sufficient for the purpose of this Note.

28. KEOHANE & OLMSTEAD, *supra* note 24, at 129.

29. Nicola Twilley & Cynthia Graber, *How Many Fish Are in the Sea?*, ATLANTIC (Oct. 5, 2016), <https://perma.cc/NB3E-PHRB> (quoting John Shepherd, Emeritus Professor of Earth System Science, University of Southampton).

then use this to decide whether the fishery can sustain more fishing, or if they should reduce fishing.

Furthermore, in order to ensure that fishery catch is maintained at MSY, fishery managers must overcome problematic economic incentives. Absent government management, fisheries are an open-access resource. Open-access resources are defined by two characteristics: they are *non-excludable*, meaning that anyone may catch fish; and they are *rival*, which means that for every fish caught, one less is available for other fishermen.³⁰ As a result of these two traits, open-access resources are often overutilized, a situation referred to as the tragedy of the commons.³¹

One popular solution to the tragedy of the commons is to privatize the resource.³² In theory, if a resource is controlled by a private owner, the owner will ensure that the resource is managed to provide benefits in the future as well as in the present.³³ In economic terms, the resource manager is taking into account the resource's "scarcity rent," or the additional value that the fishery could bring to future generations if it were not exhausted in the present. This scarcity rent gives managers an incentive to set fishery quota to MSY. As discussed in the next section, U.N. law has made each country the sole manager of fisheries in its own waters. This allocation was meant to incentivize each country to manage their domestic fisheries like responsible private managers.

These basic economic and scientific principles lay at the heart of fisheries management around the globe. However, even with these practices, fishery sustainability remains a major challenge. Many commercial fish stocks have been overfished, and overfishing remains a major problem.³⁴ While countries now have exclusive *management* of their domestic fisheries, the actual fishing is mostly done by commercial and artisanal fishers.³⁵ Like with many other envi-

30. See KEOHANE & OLMSTEAD, *supra* note 24, at 85–86.

31. ELINOR OSTROM, GOVERNING THE COMMONS 2–3 (1990).

32. KEOHANE & OLMSTEAD, *supra* note 24, at 108, 111–13; OSTROM, *supra* note 31, at 12–13. *But see* OSTROM, *supra* note 31, at 13–18 (arguing that there are alternative solutions to the tragedy of the commons). For more background on property rights and fisheries, see Anthony Charles, *Use Rights and Responsible Fisheries: Limiting Access and Harvesting Through Rights-Based Management*, in A FISHERY MANAGER'S GUIDEBOOK - MANAGEMENT MEASURES AND THEIR APPLICATION (Kevern L. Cochrane ed., 2002).

33. KEOHANE & OLMSTEAD, *supra* note 24, at 108, 111–13.

34. See Food and Agric. Org. of the U.N. [FAO], *The State of World Fisheries and Aquaculture*, at 6 (2018) (revealing that ninety-three percent of global fish stocks are either "fished at biologically unsustainable levels"—33.1%—or "fully fished"—59.9%). "Overfishing" is when fish are being caught at an unsustainable rate. This will lead to the stock becoming "overfished," or the total number of fish in the population being too low. See *Overfishing, Overfished, and Rebuilding Stocks*, SUSTAINABLE FISHERIES, <https://perma.cc/5XWU-6KXY>.

35. Artisanal fishing refers to small-scale subsistence fishing, rather than fishing by large commercial vessels. *Artisanal Fisheries*, U.N. FOOD & AGRIC. ORG. (2015), <https://perma.cc/U5V7-5398>.

ronmental issues, governments often struggle to balance future sustainability against immediate commercial gain. In developed countries, powerful fishing lobbies pressure managers to increase quotas.³⁶ In countries struggling with food security, governments are reluctant to reduce fishing, even if it will impose a future burden.

Fishery managers not only operate under intense political pressure, but also in conditions of high scientific uncertainty. There are many factors impacting world fisheries. Ocean acidification, increasing aquaculture, and pollution are all disrupting fisheries in new and under-studied ways.³⁷ Climate-driven fishery shifts present new threats to sustainable management. First, these shifts are increasing scientific uncertainties. Furthermore, these shifts will undermine countries' incentives to manage domestic fisheries that will shift beyond their borders in the future, contaminating the private-manager system.

II. CROSSING LINES: THE DIFFERENT TYPES OF CLIMATE-DRIVEN FISHERY SHIFTS

As marine resources, fisheries are subject to myriad complex legal frameworks that govern the world's oceans. Under international law, the ocean is divided by various jurisdictional lines. Depending on which lines are crossed by a shifting fishery, different legal regimes are implicated. This Part examines how climate-driven fishery shifts interact with these legal frameworks. Ultimately, this Part shows that climate-driven fishery shifts must be considered in three distinct spaces:

- (1) Domestic Shifts: shifts occurring within one country's domestic waters;
- (2) International Shifts: shifts that occur when fisheries move into or out of the high seas; and,
- (3) Cross-Border Shifts: when part or all of a fishery permanently shifts from one country's waters into another's.

36. See, e.g., Aaron Welch, *The Second Commons: Rethinking Fisheries Reform for the Political Market*, 6 STAN. J.L. SCI. & POL'Y 1, 2 (2013) (arguing that U.S. fisheries managers are "little more than an appendage of the commercial fishing industry").

37. See Scott C. Doney et al., *Ocean Acidification: The Other CO₂ Problem*, 1 ANN. REV. MARINE SCI. 169, 172 (2009) (discussing the threat of ocean acidification on marine biota); Dane H. Klinger, Simon A. Levin & James R. Watson, *The Growth of Finfish in Global Open-Ocean Aquaculture Under Climate Change*, 284 PROC. ROYAL SOC'Y B. 1, 1 (2017) (describing the rise in aquaculture and analyzing how climate change will impact it); Nyssa J. Silbiger et al., *Nutrient Pollution Disrupts Key Ecosystem Functions on Coral Reefs*, 285 PROC. ROYAL SOC'Y B. 1, 7 (2018) (discussing how "nutrient pollution[] could make reefs even more vulnerable to global changes in ocean pH"); Mark Tutton & Ed Scott-Clarke, *How Plastic Pollution Ends up in the Ocean*, CNN (June 24, 2019), <https://perma.cc/L955-MH3W> (describing the increase in plastic pollution in the world's oceans and its impact on marine organisms).

A. International Law and Fisheries Management

1. The United Nations Convention on the Law of the Sea

The U.N. Convention on the Law of the Sea (“UNCLOS”) entered into force on November 16, 1994.³⁸ While it has not been ratified by some of the world’s largest economies, UNCLOS is the de facto law of the oceans.³⁹ Under UNCLOS Part V, each coastal country has an Exclusive Economic Zone (“EEZ”), which extends two hundred nautical miles off its coast.⁴⁰ Within these zones, coastal nations have “sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources.”⁴¹ If a country is not able to fully utilize the resources within their EEZ, they *must* allow other countries to fish the surplus.⁴² UNCLOS also instructs countries to responsibly manage their domestic fisheries.⁴³ Indeed, as mentioned above, creating EEZs should incentivize countries to manage their fisheries as private owners, deterring a tragedy of the commons.

Waters beyond EEZs are considered the high seas. These waters are open to all nations of the world for fishing. Roughly twelve percent of global fish catches take place on the high seas, including a majority of the highly lucrative tuna catch.⁴⁴ Under UNCLOS, countries are supposed to “cooperate with each other in the conservation and management of living resources in the areas of the high seas.”⁴⁵ However, because this mandate is not enforceable, it has not eliminated overfishing in the high seas.

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38. United Nations Convention on the Law of the Sea, *opened for signature* Dec. 10, 1982, 1833 U.N.T.S. 397 (entered into force Nov. 16, 1994) [hereinafter UNCLOS].
 39. See Jamison E. Colburn, *Turbot Wars: Straddling Stocks, Regime Theory, and a New U.N. Agreement*, 6 J. TRANSNAT’L L. & POL’Y 323, 333 (1997) (“Despite the absence of several prominent nations to ratify UNCLOS III, it has become the preeminent expression of the public international law of the sea.”).
 40. UNCLOS, *supra* note 39, art. 57.
 41. *Id.* art. 56, ¶ 1(a).
 42. *Id.* art. 62, ¶ 2 (If the coastal nation “does not have the capacity to harvest the entire allowable catch, it shall . . . give other States access to the surplus of the allowable catch”).
 43. *Id.* art. 61, ¶ 2 (“The coastal State, taking into account the best scientific evidence available to it, shall ensure through proper conservation and management measures that the maintenance of the living resources in the exclusive economic zone is not endangered by over-exploitation.”).
 44. Katrina M. Wyman, *Unilateral Steps to End High Seas Fishing*, 6 TEX. A&M L. REV. 259, 260 (2018) (citing A.D. RODGERS ET AL., *THE HIGH SEAS AND US: UNDERSTANDING THE VALUE OF HIGH-SEAS ECOSYSTEMS* 4, 13 (2014)).
 45. UNCLOS, *supra* note 39, art. 118; see also *id.* art. 119 (establishing that States shall “take measures which are designed, on the best scientific evidence available to the States concerned, to maintain or restore populations of harvested species at levels which can produce the maximum sustainable yield”).

The United Nations is currently engaged in negotiations for a new high-seas treaty. It is uncertain what, if any, changes this treaty will bring into effect for fisheries management.⁴⁶ To date, high-seas fisheries have been managed at the regional level by Regional Fisheries Management Organizations.

2. Regional Fisheries Management Organizations

Regional Fisheries Management Organizations (“RFMOs”) are intergovernmental organizations that manage high-seas fisheries.⁴⁷ There are two types of RFMOs.⁴⁸ First, general RFMOs operate broadly within a specific region. They pass regulations dealing with “many different types of fishing activities.” Specialized RFMOs, on the other hand, “have a narrower legal mandate that relates to specific types of fisheries or species.”⁴⁹ Specialized RFMOs usually govern highly migratory species like tuna, and retain jurisdiction over the species even if they enter the geographic jurisdiction of a general RFMO. Both general and specialized RFMOs set the total allowable catch for the high-seas fisheries under their jurisdictions, then try to ensure the catch is fairly allocated among their member countries.⁵⁰

RFMOs in their modern form emerged in 1995 in response to the “straddling stock issue.”⁵¹ When EEZs were established, it quickly became apparent that no one had informed the fish.⁵² This resulted in stocks that “straddled” a country’s domestic waters and the high seas just beyond.⁵³ Countries with distant water fishing fleets soon began targeting the high-seas portions of these

46. See GLEN WRIGHT ET AL., INST. SUSTAINABLE DEV. AND INTERNATIONAL RELATIONS, HIGH SEAS FISHERIES: WHAT ROLE FOR A NEW INTERNATIONAL INSTRUMENT? (2013), <https://perma.cc/2GTE-5NU7>.

47. See *FAQ: What Is a Regional Fisheries Management Organization*, THE PEW CHARITABLE TR. (Feb. 23, 2012), <https://perma.cc/AP6V-QVAC>. RFMOs are notoriously difficult to define. Indeed, there is enough confusion on the subject that the secretary of one of them—the North East Atlantic Fisheries Commission—wrote a short article to try to clear it up. See Stefán Ásmundsson, *Regional Fisheries Management Organisations (RFMOs): Who Are They, What Is Their Geographic Coverage on the High Seas and Which Ones Should Be Considered as General RFMOs, Tuna RFMOs and Specialised RFMOs?*, CTR. FOR BIOLOGICAL DIVERSITY (Sept. 16, 2016), <https://perma.cc/5L9T-BEMV>.

48. Ásmundsson, *supra* note 47, at 6 (noting that RFMOs can be sorted into “General” and “Specialized” types).

49. *Id.* at 3, 6.

50. See Colburn, *supra* note 39, at 342–43.

51. *Id.* at 344–48 (discussing the importance of the Straddling Stocks Agreement, which strengthened RFMO power).

52. To this day, “fish don’t recognize borders as such.” Cian McCormack – RTE Reporter, Ireland, FACEBOOK (June 27, 2018), <https://perma.cc/3YS8-W6U9>.

53. Colburn, *supra* note 39, at 326–28.

stocks.⁵⁴ By fishing just outside another country's EEZ, these ships could take advantage of the positive spillover effects of another country's responsible management, while bearing none of the burdens.⁵⁵ Early RFMOs attempted to regulate these catches, but there was no mandate for countries to join RFMOs or to abide by their quotas.⁵⁶ UNCLOS had firmly established that the high seas were open to all nations.

The straddling stocks issue came to a head in 1995, when Canada fired on a Spanish boat fishing just beyond their EEZ and towed it back to a Canadian port.⁵⁷ Illegal fish—and evidence of illegal fishing techniques—were discovered onboard.⁵⁸ This incident helped inspire a new U.N. treaty: the U.N. Fish Stocks Agreement (“UNFSA”).⁵⁹ The UNFSA formalized and gave shape to RFMOs' power.⁶⁰

The UNFSA requires all states fishing in the high seas to join any relevant RFMOs.⁶¹ And, just for good measure, it clarifies that nonmember countries must also follow the rules laid down by RFMOs.⁶² The UNFSA allows member states to board any vessel that is “reasonably suspected of violating management rules ‘for the purpose of ensuring compliance with conservation and management measures.’”⁶³

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54. William T. Abel, *Fishing for an International Norm to Govern Straddling Stocks: The Canada-Spain Dispute of 1995*, U. MIAMI INTER-AM. L. REV. 553, 554–55 (1996).
55. *See id.*
56. *See* Colburn, *supra* note 39, at 342.
57. Abel, *supra* note 54, at 567–68.
58. *Id.* Note that these fish and fishing techniques were “illegal” under the standards set by the RFMO, not under UNCLOS.
59. Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, Dec. 4, 1995–Dec. 4, 1996, 2167 U.N.T.S. 3. (entered into force Nov. 11, 2001) [hereinafter UNFSA]. Canada brought the illegal fishing net that it had seized from the Spanish vessel to New York and displayed it on a barge during the U.N. negotiations. *See* Anne Swardson, *Fish Accord Could Save Many Species*, WASH. POST (Apr. 18, 1995), <https://perma.cc/MAL9-FPMX>. The UNFSA is also sometimes referred to as the Straddling Stocks Agreement. *See, e.g.*, Colburn, *supra* note 39, *passim*.
60. Rosemary Rayfuse, *Fisheries Management Organizations*, in THE OXFORD HANDBOOK OF THE LAW OF THE SEA 439, 441 (Donald R. Rothwell et al. eds., 2017) (“Article 8 of . . . [the UNFSA] ‘institutionalizes’ the duty to cooperate in respect of straddling fish stocks and highly migratory fish stocks by requiring its exercise through regional or subregional fisheries organizations or arrangements. . . . All States having a ‘real interest’ in the fisheries concerned are expected to join the relevant arrangement and to fully participate in its work.”).
61. *See* UNFSA, *supra* note 59, art. 17(1) to 17(3).
62. *See id.* art. 17(1) (“A State which is not a member of [an RFMO] . . . is not discharged from the obligation to cooperate, in accordance with [UNCLOS duties and UNFSA procedures].”).
63. Colburn, *supra* note 39, at 348 n.138 (quoting UNFSA, *supra* note 59, art. 21(1)).

The increased recognition that RFMOs received under the UNFSA made many commentators hopeful that RFMOs would improve high-seas fisheries management.⁶⁴ However, the intervening years have only increased frustration with high-seas management.⁶⁵ Generally, “high seas fisheries under RFMO management are in poor shape . . . [and r]oughly two-thirds of the fish stocks managed by RFMOs are ‘depleted or overexploited.’”⁶⁶

A variety of factors have undermined RFMO effectiveness. First, there is rampant noncompliance with RFMO authority. Under international law’s *pacta tertiis* rule, “[t]reaties are only binding on their parties.”⁶⁷ If a country is not a party to UNFSA, it is under no obligation to adhere to it, and thus under no obligation to join any RFMOs, or abide by their rules. Furthermore, because international law does not “compel treaty adherence” even if a country *has* signed the UNFSA, it can still reject RFMO authority.⁶⁸ Finally, many RFMOs “provide for ‘opt-out’ or objection procedures whereby member States can escape the application of otherwise binding measures.”⁶⁹ Countries that evade RFMO management become free riders, benefiting from the restraint of countries that *do* choose to adhere to RFMO limitations.

RFMOs also struggle with international law’s focus on “flag state jurisdiction.”⁷⁰ Fishing vessels are each registered in a specific country, referred to as their “flag state.” Flag state jurisdiction is important because “[t]raditional law of the sea posits that in relation to activities on the high seas only the flag State has jurisdiction over its vessels and can take action in respect [to] them.”⁷¹ Many fishing vessels may choose to register in a country with lax enforcement, something referred to as a “flag of convenience.”⁷² RFMO member states may enforce RFMO rules, but only if the flag state “is unwilling or unable to act.”⁷³

64. See, e.g., Abel, *supra* note 54, at 580 (describing how “the Convention wisely grants regional organizations the authority to regulate straddling stocks”); Colburn, *supra* note 39, at 345–47.

65. Wyman, *supra* note 44, at 261.

66. *Id.* (quoting Sarika Cullis-Suzuki & Daniel Pauly, *Failing the High Seas: A Global Evaluation of Regional Fisheries Management Organizations*, 34 MARINE POL’Y 1036, 1036 (2010)).

67. Rayfuse, *supra* note 60, at 444.

68. *Id.*; see also Colburn, *supra* note 39, at 343.

69. Rayfuse, *supra* note 60, at 445.

70. *Id.* at 446 (“One of the most significant challenges for RFMOs, however, arises as a consequence of the rule of flag State jurisdiction.”).

71. *Id.*

72. *Id.* at 445, 447.

73. *Id.* at 447. The concept of “unwilling or unable” is a phrase borrowed from general international law, most notably using self-defense against non-state actors. See, e.g., Craig Martin, *Challenging and Refining the “Unwilling or Unable” Doctrine*, 52 VAND. J. TRANSNAT’L L. 387, 387 (2019). UNFSA outlines the specific situations in which an RFMO member state may take action against ships flying the flag of another country. See UNFSA, *supra* note 59, art. 21.

It is important to note that this action *must* be taken by one of the RFMO members states; the RFMO *itself* cannot take any action against wrongdoers. Thus, enforcement of RFMO authority is not guaranteed, and illegal, unreported, and unregulated fishing remains a major issue in the high seas.⁷⁴

Finally, RFMOs face internal management challenges.⁷⁵ In setting the total allowable catch for a fish stock, RFMOs often rely on scientists and data from member states. Many states have an interest in increasing total allowable catch, meaning their data may not be reliable. Meanwhile, nonmembers are not obligated to provide catch data, further undermining the reliability of RFMO estimates. This scientific uncertainty makes it easier for members to dispute RFMO quota decisions or reject the proposed catch limits. Even once the total catch quota has been established, countries may protest the share of the quota that the RFMO allocates to them.⁷⁶

In regions where water further from shore is colder, fish species may shift towards deeper water and into the high seas as the planet warms.⁷⁷ Thus, RFMOs will soon be forced to confront climate-driven fishery shifts. They may struggle to face this new challenge. The tools used to address straddling stocks were not designed to address climate-driven fishery shifts. Indeed, the UNFSA “does not consider the possibility of permanent stock exit, or how they might undermine the conditions for international cooperation.”⁷⁸ Nevertheless, as fisheries shift further offshore, RFMOs will have more high-seas and straddling fish stocks to manage. RFMO adaptation to this new challenge will be critical.

B. Domestic Laws and Fisheries Management

Domestic fisheries management varies greatly from country to country. Thus, climate-driven fishery shifts will impact these management structures in different ways. The United States and the People’s Republic of China are two prime examples of the complexities of domestic fisheries management.

In the United States, the federal government manages domestic fisheries through the Magnuson-Stevens Act (“MSA”). The MSA states that any stock requiring “conservation and management” must have a Fishery Management Plan (“FMP”).⁷⁹ FMPs outline short- and long-term management targets for fish stocks.

74. See Rayfuse, *supra* note 60, at 447–48.

75. Colburn, *supra* note 39, at 342–43, 343 n.113.

76. *Id.*, *supra* note 39, at 343.

77. See Dulvy et al., *supra* note 14, at 1030.

78. See Oremus *supra* note 20 at 277.

79. Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. § 1852(h) (2018).

A range of different bodies prepare FMPs. The MSA divided U.S. waters into eight regions, each with a Regional Fishery Management Council (“RFMC”).⁸⁰ RFMCs are meant to be a “creative form of co-management involving the federal government, state governments (i.e., state officials are council members), and citizen stakeholders.”⁸¹ These RFMCs prepare FMPs for their regions. However, fisheries that exist in state waters (generally the first three nautical miles) may be managed by the state instead.⁸² Many states prepare FMPs for in-state fisheries. However, they may instead delegate this to one of three multi-state fishery commissions.⁸³

After FMPs are prepared, they are evaluated by the National Marine Fisheries Service (“NMFS”) for consistency with the MSA.⁸⁴ In summary, while FMPs are approved by the federal government, they are prepared by a variety of different bodies operating within jurisdictional boundaries.

China, the world’s largest fishing nation, also uses a dual sovereignty approach to its fisheries management. Under China’s Fisheries Law, marine fisheries are subject to “unified leadership and decentralized administration.”⁸⁵ The federal government establishes the overall goals for China’s fisheries and establishes the qualifications for obtaining fishing licenses.⁸⁶ However, fisheries are *managed* by the “provinces, autonomous regions and municipalities directly under the Central Government that are contiguous to the sea areas.”⁸⁷ As fisheries shift between provinces, the central government will need to coordinate management between the provinces, which may pose challenges.⁸⁸

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80. 16 U.S.C. § 1852. The eight RFMCs are the New England, Mid-Atlantic, South Atlantic, Caribbean, Gulf of Mexico, Pacific, North Pacific, and Western Pacific Fishery Management Councils. *Id.*
81. NAT’L RESEARCH COUNCIL, EVALUATING THE EFFECTIVENESS OF FISH STOCK REBUILDING PLANS IN THE UNITED STATES 18 (2014), <https://perma.cc/ME3C-H8S6>.
82. States can also take responsibility for fisheries in federal waters. “For species that are not managed by federal regulations, states have the authority to extend state rules into federal waters for residents of that state or vessels landing a catch in that state.” *State Fishing Regulations*, GULF OF MEX. FISHERY MGMT. COUNCIL, <https://perma.cc/HWX4-TD8M>.
83. These are the Atlantic States, Gulf States, and Pacific States Marine Fisheries Commissions. *See State Agencies*, NOAA FISHERIES, <https://perma.cc/63Q9-TGEJ>.
84. *Id.* The MSA assigns this responsibility to the Secretary of Commerce, who has delegated it to NMFS. *See Ore. Trollers Ass’n v. Gutierrez*, 452 F.3d 1104, 1108 (9th Cir. 2006).
85. Gongming Shen & Mikko Heino, *An Overview of Marine Fisheries Management in China*, 44 MARINE POL’Y 265, 266 (2014) (translating and citing Zhōnghuá rénmín gònghéguó yúyè fǎ (中华人民共和国渔业法) [Fisheries Law of the People’s Republic of China] (promulgated by the Standing Comm. Nat’l People’s Cong., Aug. 28, 2004) art. 7, 2004 STANDING COMM. NAT’L PEOPLE’S CONG. GAZ. 6).
86. *Id.* at 267–68.
87. *Id.* at 266.
88. *See* Ling Cao et al., *Opportunities for Marine Fisheries Reform in China*, 114 PROC. NAT’L ACADEMIES SCI. 435, 439 (2017) (describing challenges collecting data from provincial governments).

Every coastal country will face unique management problems in their domestic waters. In countries with dual sovereignty systems, like the United States and China, climate-driven fishery shifts will require increased cooperation among fishery managers in different jurisdictions, and at different levels of government (state/provincial, and federal).

C. Conclusion: Not One, But Three Distinct Challenges

As a result of the legal frameworks discussed above, there are three distinct types of climate-driven fishery shifts. First, countries will have to deal with shifting fish stocks domestically. For example, in the United States, individual states, multi-state fishery commissions, and RFMCs split responsibility for domestic fish stocks. As stocks shift to cooler waters, they are moving across these jurisdictions. China, another major fishing nation, is facing similar problems as fish stocks shift between provinces.

Second, fish stocks will move in and out of high-seas waters. Some fisheries that once resided entirely within a country's EEZ will move into the high seas, making it available to any country with capacity to fish them. On the flip side, fisheries that were once classified as a common resource on the high seas may move into a country's EEZ.⁸⁹ These shifts will force RFMOs to update their management strategies for straddling stocks and high-seas fisheries.

Third, fish stocks will shift from one country's EEZ into another's. The remainder of this Note elaborates on problems and potential solutions for these cross-border shifts.

While there is pressing need for research on both domestic and international shifts, cross-border shifts present an urgent global challenge. As discussed below, these shifts will increase international tensions and may exacerbate serious global inequities. And while cross-border shifts are a global problem, each country will be forced to address them alone, unless we take quick action to standardize an approach.

III. OUTLINING THE CHALLENGES PRESENTED BY CROSS-BORDER SHIFTS

In considering cross-border shifts, this Note will assume that the legal regimes discussed above remain as they are.⁹⁰ This means that when a fishery shifts from one EEZ to another, the receiving country now has exclusive rights

89. These problems will be particularly exacerbated in the Arctic Regions. See Lam, *supra* note 4, at 3 fig. 1.

90. It is possible that the impact of climate change on global fisheries will be severe enough that a new legal regime will be established to deal with them. Indeed, the ongoing U.N. high seas treaty negotiations would be remiss if they failed to address this issue. See McGrath, *supra* note 46.

to harvest these fish.⁹¹ This will result in a plethora of problems, three of which are discussed below.

A. Conflict over Fisheries

Fishery conflicts are often driven by fishermen's notorious reluctance to share their best spots. For example, in the 1400s, the Basque fishing fleet began returning to docks laden with cod.⁹² Their new fishing ground remained a closely-guarded secret until European explorers finally made it to Nova Scotia, where they discovered a massive abandoned Basque fish processing site.⁹³ The new fishing spot was good enough to keep the discovery of a new continent hidden from the rest of Europe.

The famous cod wars between Iceland and the United Kingdom provide a more modern example. In the lead-up to WWII, Iceland became concerned with the number of British boats fishing for cod near its shores.⁹⁴ Years before UNCLOS established EEZs, Iceland announced a territorial claim to its waters and banned fishing by British boats.⁹⁵ The ensuing cod wars lasted for over twenty years, during which British and Icelandic fishing boats regularly rammed and fired on each other.⁹⁶

In the last century, fishing has become a global industry and nations have continued to clash—often violently—over fishing rights. In addition to Canada and Spain's 1995 straddling stocks conflict, there are countless examples of modern fishery conflicts. The United States and Canada have seen fishing conflicts on both coasts,⁹⁷ while Indonesia has resorted to blowing up foreign fishing boats caught within their EEZ.⁹⁸

Climate-driven fishery shifts have already begun to cause tension around the world.⁹⁹ For example, northern shifts in mackerel stocks have reignited old

91. UNCLOS, *supra* note 39, art. 56, ¶ 1(a).

92. MARK KURLANSKI, *COD: A BIOGRAPHY OF THE FISH THAT CHANGED THE WORLD* 24–29 (1998).

93. *Id.*

94. Natasha Frost, *How Iceland Beat the British in the Four Cod Wars*, ATLAS OBSCURA (June 21, 2018), <https://perma.cc/X664-BAWD>.

95. *Id.*

96. *Id.*

97. Anthony Depalma, *Canadians End Blockade in Salmon-Fishing Dispute*, N.Y. TIMES (July 22, 1997), <https://perma.cc/7VXP-48AW>; Heather Goldstone & Elsa Partan, *There's a Quiet War over Lobster near the Canadian Border*, WGBH (Jan. 29, 2019), <https://perma.cc/5EMH-JY6K>.

98. Reniel B. Cabral et al., *Rapid and Lasting Gains from Solving Illegal Fishing*, 2 NATURE ECOLOGY & EVOLUTION 650, 651 (2018); Michael Tennesen, *Blowing Up Illegal Fishing Boats Helps Indonesian Fishers*, SCI. AM. (Aug. 6, 2018), <https://perma.cc/VT56-P4EP>.

99. Pinsky et al., *supra* note 2, at 1189–90.

tensions between the United Kingdom and Iceland.¹⁰⁰ These fisheries—once a major source of income for the United Kingdom’s fishing fleet—have been driven north to Iceland’s cooler waters.¹⁰¹ “Almost overnight, this seafood gold began shredding relations between some of the world’s most stable governments. It led to unsustainable fishing, trade embargoes, and boat blockades. It even helped convince Iceland to drop its bid to join the EU. And that was among friendly nations.”¹⁰² Similar situations are threatening to emerge in Africa.¹⁰³ If history is any guide, these international tensions will increase in the coming years.¹⁰⁴

B. Environmental Sustainability

Cross-border shifts present a new type of fisheries conflict. First, these stocks are not merely straddling the border between two countries—many stocks will permanently move from one EEZ into another one. Thus, the shifts will result in winners and losers. Countries with cooler water, or “receiving countries,” will gain new resources, while countries with warmer water, or “losing countries,” will lose their historic fisheries. Second, these shifts are somewhat predictable. Countries already have access to the best scientific estimates of how, where, and when these shifts will occur. These factors introduce new, problematic incentives that were not present in prior fisheries struggles.

The pattern of these shifts presents two major problems for sustainable fisheries management. The first problem occurs in the losing country. As discussed above, EEZ’s are meant to incentivize countries to be responsible stewards of their domestic fish stocks. However, if a country knows it will not have access to the fishery in the future, it will have the opposite incentive. The country currently managing the fish stock will have economic and political incentives to remove fishing limitations and allow industry to fish the stock until the resource is no longer commercially viable. Industry in the losing country will want to extract all present value from the resource before it loses access to the fishery. In other words, the losing country will regress from managing their fishery as a privatized renewable resource back to managing it as an open-access resource.

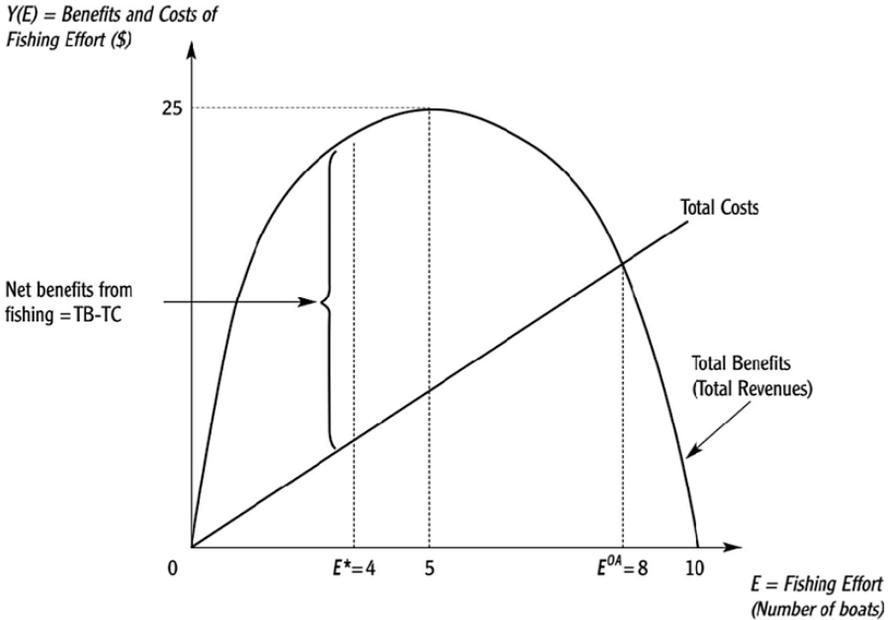
100. Welch, *supra* note 8.

101. *Id.*

102. *Id.*

103. Pierre-Louis, *supra* note 16 (quoting professor Daniel Pauly discussing rising tension in Africa over shifting fisheries).

104. See *supra* note 10 and accompanying text.

FIGURE 2¹⁰⁵

This change in management style is reflected in Figure 2: the losing country will now fish at E^{0A} rather than E^* . Because the losing country does not benefit from future yields, they no longer have an incentive to consider the rate at which the fishery can renew itself, leading to overfishing in losing countries.

In theory, this should not be permitted under UNCLOS, which tasks countries with “proper conservation and management” of their domestic fisheries.¹⁰⁶ However, as discussed above, this mandate is not enforceable and has not prevented countries around the world from overfishing.¹⁰⁷

The second sustainability problem caused by cross-border shifts is the potential for mismanagement by the receiving country. The country that is receiving the new fish stock will likely not have the data, expertise, or infrastructure to successfully manage the fishery. Indeed, the first response will likely be to increase catch quota as the supply of domestic fish increases. For example, when mackerel shifted into Iceland’s waters, Iceland responded by raising its

105. KEOHANE & OLMSTEAD, *supra* note 24, at 131.

106. UNCLOS, *supra* note 39, art. 61, ¶ 2.

107. See *supra* note 34 and accompanying text.

quota.¹⁰⁸ EU fisheries experts—who historically managed this fishery—have criticized Iceland’s quota as unsustainably high.¹⁰⁹

C. International Environmental Justice

Cross-border fishery shifts will cause significant environmental justice issues. Environmental justice is concerned with the uneven distribution of environmental benefits and harms. The classic environmental justice problem is when hazardous wastes, factories, or other unwanted sites are disproportionately located in poor or minority communities.¹¹⁰ In recent decades, environmental justice has continued to examine new ways that environmental harms impact low-income communities while environmental benefits accumulate in wealthy communities.¹¹¹ Environmental justice has also been increasingly applied in the international context.¹¹²

Because cross-border shifts are driven by climate change, they must be considered within the broader environmental justice implications of climate change, often referred to as climate justice: Developed countries are responsible for a majority of carbon emissions, but developing nations will bear the brunt of the harms.¹¹³ Many cross-border fishery shifts will fit within this general trend.¹¹⁴

108. David Jolly, *Iceland Defies Europeans on Mackerel Catch*, N.Y. TIMES (Dec. 22, 2010), <https://perma.cc/DX8L-KH6Z>.

109. *See id.*

110. *See* Richard Lazarus, *Pursuing “Environmental Justice”: The Distributional Effects of Environmental Protection*, 87 NW. U. L. REV. 787, 801–04 (1993).

111. *Id.* at 796–99. For example, urban green spaces are often concentrated in wealthier neighborhoods. *See* Robert García & Ariel Collins, *The EPA and Parks, Environmental Justice and the Disposable of Society*, NAT’L RECREATION & PARK ASS’N (Aug. 1, 2015), <https://perma.cc/32AK-J9QD> (discussing this phenomenon in Los Angeles).

112. *See, e.g.*, ROYAL IRISH ACAD., *THE GEOGRAPHY OF CLIMATE JUSTICE* (2011); Christopher Todd Beer, *Climate Justice, the Global South, and Policy Preferences of Kenyan Environmental NGOs*, 8 GLOBAL SOUTH 84, 86 (2014); Margaret V. du Bray et al., *Emotion, Coping, and Climate Change in Island Nations: Implications for Environmental Justice*, 10 ENVTL. JUST. 102 (2017); Andrew Hurrell & Sandeep Sengupta, *Emerging Powers, North–South Relations and Global Climate Politics*, 88 INT’L AFF. 463 (2012); Karin Mickelson, *Beyond a Politics of the Possible? South–North Relations and Climate Justice*, 10 MELBOURNE J. INT’L L. 411 (2009); Hari M. Osofsky, *Learning from Environmental Justice: A New Model for International Environmental Rights*, 24 STAN. ENVTL. L.J. 71, 150 (2005); Hein-Anton Van Der Heijden, *Recent Trends in Global Environmental Politics*, 15 ENVTL. POL. 490 (2006).

113. *See* ROYAL IRISH ACAD., *supra* note 112, at 3; du Bray et al., *supra* note 112, at 103 (discussing the mental burden that climate change imposes on small island nations); Lam, *supra* note 4, at 3 fig. 1 (mapping estimated fishery losses due to climate change).

114. *See also* GRAEME MACFADYEN & EDWARD ALLISON, *CLIMATE CHANGE, FISHERIES, TRADE AND COMPETITIVENESS: UNDERSTANDING IMPACTS AND FORMULATING RESPONSES FOR COMMONWEALTH SMALL STATES* at viii–xii (2009).

At the heart of the problem is where fish are moving from, and where fish are moving to. While patterns vary regionally, most fisheries are generally moving away from tropical waters and towards the poles.¹¹⁵ Thus, there is a general trend of fisheries moving *from* low-income countries and *towards* high-income countries. While this pattern will not hold true in each individual case, the overall pattern is troubling.

According to current projections, the harms of fishery shifts are predicted to fall hardest on developing countries.¹¹⁶ And these losses will be felt. “[P]oorer countries tend to be more nutritionally and economically dependent on fish than wealthier countries (in terms of higher per capita consumption, a greater share of agriculture sector employment and GDP, and a larger share of exports).”¹¹⁷ This reliance means that fishery losses are comparatively worse when they occur in a developing country than they would be if they occurred in a developed country.¹¹⁸

Furthermore, developed nations are more likely to benefit from these fishery shifts. Not only are developed countries less likely to suffer severe losses, they are more likely than developing nations to gain new species.¹¹⁹ To add insult to injury, developed nations are often able to benefit more from fisheries within their EEZs. These countries have the “technological harvesting capabilities necessary to [exclude foreign fleets and] take full advantage of” their fisheries.¹²⁰ In contrast, developing nations often end up selling fishing rights to other countries for “a fraction of the actual resource value.”¹²¹

Thus, not only are fish generally leaving developing countries, where the loss will be felt more acutely; but they are migrating into developed countries, which will be able to capture more of the benefit from the fishery. In this way, climate-driven fishery shifts are one of the most extreme versions of the climate justice issue.

Cross-border shifts also display many similarities to another well-known environmental justice issue: hazardous waste disposal. Global concerns over hazardous waste disposal “began with the increased production of hazardous

115. See Goldfarb, *supra* note 7; Pinsky et al., *supra* note 11, at 1240.

116. See Lam, *supra* note 4, at 3 fig. 1. One exception to the rule that fish shifts will benefit developed countries more than developing is in the arctic region. Greenland, for example, will likely receive many fish stocks in the coming years.

117. MACFADYEN & ALLISON, *supra* note 113, at vii (citing E.H. Allison et al., *Vulnerability of National Economies to Potential Impacts of Climate Change on Fisheries*, 10 FISH & FISHERIES 173 (2009)).

118. For a discussion of the types of harm that developing nations may face as a result of shifting fisheries, see *id.* at viii–xii.

119. See Pinsky et al., *supra* note 2, at 1190 (showing the number of new fishery stocks that are projected for each EEZ).

120. Colburn, *supra* note 39, at 337.

121. MARCOS A. ORELLANA, CTR. FOR INT’L ENVTL. LAW, *Towards Sustainable Fisheries Access Agreements 1–2* (2008), <https://perma.cc/NYV8-XUKL>.

waste in the 1980s and the increased cost of disposal.”¹²² In response, many generators in industrialized countries began to export their hazardous waste to underdeveloped countries where disposal costs were much cheaper. The disposal of the hazardous waste in these countries was often not environmentally sound, leading to increased health and safety risks for local residents.¹²³ Situations “where underdeveloped states are used as inexpensive alternatives for the export or disposal of hazardous waste pollution by developed states” are considered toxic waste colonialism.¹²⁴ For many years, toxic-waste colonialism was primarily driven by financial incentives. Developing nations were willing to accept hazardous waste for compensation, and environmental regulation made disposal more expensive in wealthy countries.¹²⁵

Toxic-waste colonialism is similar to cross-border fishery shifts in several ways. First, in both situations, developed nations have exported an externality (either the climate-driven loss of a domestic fish stock or hazardous waste) to a developing nation. Second, both situations occur on a global scale, but individual countries deal with them in bilateral settings. Finally, developing nations may have short-term needs that undermine their long-term interests.

It is important to note that environmental justice is not just a moral problem; it has significant impact on how problems are (or are not) solved. International efforts to address climate change have been complicated by environmental justice. Environmental justice was widely discussed at the 1992 U.N. Conference on Environment and Development.¹²⁶ Ultimately, developed nations agreed that countries should tackle climate change “in accordance with their common but differentiated responsibilities and respective capabilities.”¹²⁷ Accordingly, developed countries were expected to “take the lead in combating climate change and the adverse effects thereof.”¹²⁸ Today, the topic of countries’ “respective capabilities” has remained a major topic in negotiations.¹²⁹ One recurring issue is driven by the fact that carbon emissions increase with affluence.¹³⁰ Therefore, if developing countries follow the same path as currently-

122. Kenneth D. Hirschi, *Possibilities for a Unified International Convention on the Transboundary Shipment of Hazardous Wastes*, 10 GEO. INT’L ENVTL. L. REV. 169, 170 (1997).

123. *Id.*

124. Laura A.W. Pratt, *Decreasing Dirty Dumping? A Reevaluation of Toxic Waste Colonialism and the Global Management of Transboundary Hazardous Waste*, 41 TEX. ENVTL. L.J. 147, 149 (2011).

125. *Id.* at 154.

126. Hurrell & Sengupta, *supra* note 112, at 467.

127. U.N. Framework Convention on Climate Change, art. 3(1) *opened for signature* June 4, 1992, S. TREATY DOC. No. 102-38, 1771 U.N.T.S. 107.

128. *Id.*

129. *Common But Differentiated Responsibilities and Respective Capabilities (CBDR-RC)*, CLIMATE NEXUS, <https://perma.cc/TWA2-9KBM>.

130. *Id.* This only holds true up to a point. While a country’s carbon emissions tend to increase with the level of development, at a certain point emissions begin to level out and then even-

developed countries, they would need to sacrifice economic development to avoid increasing their carbon footprint—something they are unwilling to do.

The international community has had more success tackling the environmental justice concerns associated with hazardous waste disposal. In 1992, the Basel Convention on Transboundary Movement of Hazardous Wastes entered into force.¹³¹ This Convention implemented a series of safeguards meant to protect developing nations against exploitation. This Convention—and its potential as a model solution for cross-border fishery shifts—will be further discussed in Part V.

D. Conclusion

While cross-border fishery shifts will present many challenges, this section has outlined the three most pressing: (1) increased international conflict; (2) environmental sustainability; and (3) environmental justice. The rest of this Note focuses on potential international responses to cross-border shifts.

IV. POTENTIAL SOLUTIONS FOR CROSS-BORDER SHIFTS

Cross-border fishery shifts are already occurring, and countries are reacting.¹³² The best solution to this problem would be for losing countries to receive compensation from the parties responsible for climate change.¹³³ Section A discusses the potential for countries to receive climate-related loss and damages. However, given the current state of international law, it is unlikely that this option will be viable.

With liability likely off the table, the two easiest options will be for countries to negotiate bilateral arrangements with their neighbor or to make use of RFMOs. Sections B and C describe and analyze each of these solutions. These Sections conclude that neither option is fully suited to address climate-driven fishery shifts: Bilateral negotiations could theoretically address this problem, but will likely be undermined by real-world inequities. And while these inequities could be partially mitigated by using RFMOs as third-party neutrals, RFMOs are not well-equipped to provide this service. Part V argues that a

tually decrease. This is known as the Environmental Kuznets Curve. See Jon Sanders, *Emissions from Electricity Generation Falling Thanks to Market Forces, Economic Growth & Development, Economics & Environment, Energy & Environment, Property Rights*, JOHN LOCKE FOUND. (Apr. 19, 2018), <https://perma.cc/24UQ-QLCA>.

131. Basel Convention on the Control of Transboundary Movement of Hazardous Waste and Their Disposal, *adopted and opened for signature* Mar. 22, 1989, 1673 U.N.T.S. 57 (entered into force May 5, 1992) [hereinafter Basel Convention].

132. See Goldfarb, *supra* note 7; Welch, *supra* note 8.

133. For a discussion of the benefits of imposing liability, see Elisabeth Gsottbauer et al., *Broadening the Scope of Loss and Damage to Legal Liability: An Experiment*, 18 CLIMATE POL'Y 600 (2018).

multilateral treaty modeled on the Basel Convention is the best option to address cross-border fishery shifts.

A. Liability for Fishery Loss and Damage

At the 2013 UNFCCC Conference of the Parties (“COP 19”), parties developed the Warsaw International Mechanism for Loss and Damage.¹³⁴ This mechanism would allow countries “to address loss and damage associated with impacts of climate change,”¹³⁵ but, critically, it was not accompanied by a funding mechanism.¹³⁶ During negotiations for the Paris Agreement, the topic of loss and damage became a major sticking point. Eventually, an uneasy compromise was reached. Article 8 of the Paris Agreement formally recognized the Warsaw International Mechanism.¹³⁷ But an accompanying decision removed the Mechanism’s teeth, stating that Article 8 “does not involve or provide a basis for any liability or compensation.”¹³⁸

The status of the loss and damage provision remains uncertain.¹³⁹ Legal literature on the topic is continuing to develop, and outlining the full scope of these arguments is beyond the scope of this Note. If the Warsaw Mechanism becomes legally enforceable in the future, climate-driven fishery shifts should qualify as “loss and damage.” Thus, it would be wise for developing countries to keep careful records of their losses in this space.

However, because liability seems unlikely under the language in paragraph 51, other solutions will be needed.

B. Bilateral Negotiations

1. Describing the Bilateral Negotiations Approach

The solution to cross-border fishery shifts may lie in simple bilateral economic negotiations. To illustrate this, let’s reduce a cross-border shift to its simplest form: a losing country and a receiving country dealing with a single fish stock (Figure 3, Panel A). Say that the losing country can extract 50 “Dol-

134. U.N. Framework Convention on Climate Change, *Warsaw International Mechanism for Loss and Damage Associated with Climate Change Impacts*, U.N. Doc. FCCC/CP/2013/L.15 (Nov. 22, 2013).

135. *Id.*

136. Joydeep Gupta, *No Money for Climate Loss and Damage*, THIRD POLE (Dec. 10, 2019), <https://perma.cc/5F5K-3ZG4>.

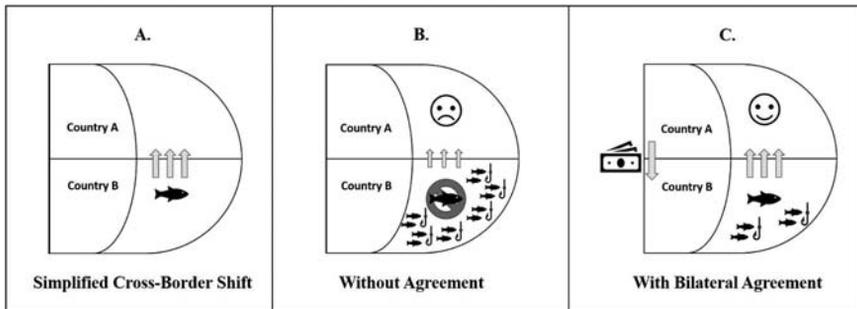
137. U.N. Framework Convention on Climate Change, *Adoption of the Paris Agreement*, U.N. Doc. FCCC/CP/2015/L.9/Rev.1 (Dec. 12, 2015).

138. U.N. Framework Convention on Climate Change, *Adoption of the Paris Agreement*, U.N. Doc. FCCC/CP/2015/10/Add.1 (Jan. 29, 2016).

139. EUROPEAN CAPACITY BLDG. INITIATIVE, POCKET GUIDE TO LOSS AND DAMAGE UNDER THE UNFCCC (2018).

lars” out of the fishery by fishing it to extinction before it shifts out of its waters (Figure 3, Panel B). Meanwhile, the receiving country considers receiving a healthy fish stock to be worth 100 Dollars. The receiving country should be willing to pay any price up to 100 Dollars to receive a healthy fishery. Meanwhile, the losing country should be willing to preserve the fishery for any price above 50 Dollars. As long as there is a range of Dollars in which the receiving country is willing to pay and the losing country is willing to “sell,” then the two countries can reach an economic solution (Figure 3, Panel C).

FIGURE 3



In theory, the losing country’s threat to overfish the stock before it crosses the border is their crucial bargaining chip. This is how they can drive the receiving country to the negotiating table. And because fisheries are a renewable resource, a sustainable fishery can always provide more value in the future than could be gained by overfishing it in the present. Thus, theoretically, there should always be a range of Dollars in which countries are willing to strike a deal.¹⁴⁰ Like in most classic game theory situations, cooperation will increase the payout for both players.

Now that the basic theory is explained, it’s time to reintroduce some complexity. First, depending on the geography of the region, fish may be moving between more than two countries. In these instances, multilateral rather than bilateral negotiations may be required.

Furthermore, the ahead-of-time monetary payment described above is highly unlikely.¹⁴¹ Instead, there is a wide range of options for how these bilat-

140. The only situation in which this would not hold would be if another factor were impacting the fishery in a negative way. For example, if ocean acidification or habitat alteration would deplete the fishery in the future regardless of how it is managed, then the receiving country would not be willing to pay for the losing country’s responsible management of the resource.

141. The lack of complete scientific certainty would make it unlikely for any country to agree to pay a large sum to another country for an uncertain future gain. The paying country would also face a monitoring problem as it attempts to check that the losing country is complying with the terms of their agreement.

eral arrangements might be structured. For example, the receiving country could “pay” the losing country by granting them future fishing rights that they would not otherwise have.¹⁴² Or, the receiving country could transfer a set percentage of future fishery revenue to the losing country. If the fishery is managed under a quota system, the receiving country could allocate quota to the losing country that is proportional to their historic share in the fishery. The losing country could then sell this quota to fishermen in the receiving country for fair market value.

There is significant need for further research on how these bilateral arrangements can be structured. Two promising examples are the transboundary agreements between Canada and the United States and between Russia and Norway. The United States and Canada established a Transboundary Management Guidance Committee to “sustainably manage their shared resources, collaborate on stock assessments, and coordinate their research and enforcement efforts” for three transboundary species in New England.¹⁴³

Meanwhile, Norway and Russia have developed a fascinating and unique “bilateral fisheries regime” for transboundary fisheries in the Barents Sea.¹⁴⁴ A joint Fisheries Commission coordinates scientific research and allocates quota, which the countries can subsequently swap under a quota exchange system.¹⁴⁵ The two countries also have a reciprocal fishing system, which allows fishing boats to operate in each other’s waters. This arrangement is critical for sustaining the Barents Sea cod stock.¹⁴⁶ Barents Sea cod often mature in Russian waters and then migrate to Norway.¹⁴⁷ Reciprocal fishing allows fishermen from both countries to focus their effort on the mature fish (in Norway), while the juveniles mature in relative safety (in Russia).¹⁴⁸ The success of these agree-

142. This solution would be economically inefficient because it would involve fishermen traveling further to fish. This would also lead to an increase in carbon emissions from boat fuel. For more information on carbon emissions from the global fisheries sector, see Robert W. Parker et al., *Fuel Use and Greenhouse Gas Emissions of World Fisheries*, 8 NATURE CLIMATE CHANGE 333 (2018).

143. See TRANSBOUNDARY MGMT. GUIDANCE COMM., GUIDANCE DOCUMENT 2018/01 (2018), <https://perma.cc/JW2Z-F986>; *Transboundary Management Guidance Committee (TMGC) Overview*, NEW ENGLAND FISHERY MGMT. COUNCIL (2020), <https://perma.cc/3VMZ-VM36>.

144. See generally Arne Eide et al., *Challenges and Successes in the Management of a Shared Fish Stock – the Case of the Russian–Norwegian Barents Sea Cod Fishery*, 30 ACTA BOREALIA 1 (2013); Olav Schram Stokke, *Management of Shared Fish Stocks in the Barents Sea*, in FAO, PAPERS PRESENTED AT THE NORWAY-FAO EXPERT CONSULTATION ON THE MANAGEMENT OF SHARED FISH STOCKS (2002), <https://perma.cc/9QNN-35QE>.

145. See, e.g., Schram Stokke, *supra* note 144 (describing how “Norway has received primarily cod, shrimp, and scallop in exchange for larger quantities of redfish, blue whiting, and sometimes herring”).

146. Eide et al., *supra* note 144, at 1.

147. *Id.* at 9.

148. *Id.* at 7.

ments show what can be accomplished by well-drafted bilateral fishery arrangements.

In many ways bilateral arrangements are well suited to address cross-border shifts. The complex nature of fisheries management makes innovative and flexible arrangements *critical* to the successful management of these shifts. Cross-border shifts will not be simple, unilateral, or easily predictable. Each fish stock is unique, and bilateral negotiations allow countries to design solutions that are suited to their specific situations. Countries also have incentives to enter into bilateral negotiations. Both can benefit by cooperating to find a creative solution to their mutual problem.

2. *Analyzing the Bilateral Negotiations Approach*

Unfortunately, there are several factors that will interfere with these bilateral negotiations in the real world. As discussed above, fisheries globally are generally shifting from poorer to wealthier countries. This trend could undermine unsupervised bilateral agreements in four ways.

a. *Unequal Bargaining Power*

It is likely that the losing and receiving country have a preexisting relationship that will cast a shadow over negotiations on cross-border fishery shifts.¹⁴⁹ The bilateral negotiations between the two countries will take place in pre-arranged channels which have historically favored the more powerful country.¹⁵⁰ Military strength, debt, visa access, immigration, and other topics will overlay discussions on the future of fishing rights. Because many fish species are migrating away from less-developed tropical nations, there could be a global trend in which losing countries have less bargaining power compared to receiving countries. Thus, bilateral arrangements around the world could be biased towards receiving countries' interests more than is equitable or efficient.

b. *Comparative Value of the Fishery*

In many instances, the receiving country will have less reliance on fisheries than the losing country.¹⁵¹ Thus, while the losing country may have an urgent stake in resolving this issue, the receiving country may be significantly less invested. This difference is partially due to the percentage of national revenue generated by fisheries and the availability of substitute jobs for fishermen.

149. See Britta Redwood, *When Some Are More Equal than Others: Unconscionability Doctrine in the Treaty Context*, 36 BERKELEY J. INT'L L. 396, 401 (2018).

150. *Id.* at 411–12.

151. MACFADYEN & ALLISON, *supra* note 113, at vii.

While fishermen in developed countries may be loath to leave their boats behind, there are often other jobs available for them to take up.

On the other hand, fishermen in developing countries may have fewer options. Thus, the comparative value of the fishery may be significantly higher in losing countries compared to receiving countries. This inequality in how countries *value* fishery-related Dollars may remove the range in which a bargain is efficient.

To revisit the above example, while the losing country may only be able to extract fifty Dollars out of the fishery by overfishing before the stock relocates, this may actually be worth 100 “Utils” to the losing country’s government.¹⁵² The difference in these values is due to the lack of alternative jobs for fishermen and the political salience of the issue. On the other hand, while the receiving country may value a healthy fishery at 100 Dollars, it may only be worth seventy-five Utils to them. This could be because the receiving country knows that their fishermen can find other work, or because fisheries are not very important to the national economy. Thus, while it may appear that there is a financial range in which the two governments would be willing to reach a deal, this may not actually be the case.

c. *Limited Fishing Capacity*

The solution above assumes that the losing country will be able to legitimately threaten to overfish the stock before it migrates to the receiving country’s waters. However, the losing country may not be able to fulfill this threat. As discussed above, many developing countries are not able to fully utilize their domestic fisheries. Instead, they sell extra quota to other nations.¹⁵³ Thus, the idea that the losing country can simply lift fishing restrictions and their fleet will automatically overfish a stock could be a myth for many developing countries. Instead, they may need to sell this additional catch to another country.¹⁵⁴ Without this threat, receiving countries may not have any incentive to come to the negotiating table.

From an environmental sustainability approach, a country’s inability to overfish its own stocks may seem like a solution rather than a problem. This is not so. First, it is uncertain how many fish stocks would be in this situation, meaning that the problems associated with shifting stocks still need to be addressed. Furthermore, even if a country cannot overfish a fish stock entirely,

152. Utils are a hypothetical unit of measurement that are meant to encompass the *utility* an item provides to a particular consumer—or in this case country. See *Utils*, FIN. DICTIONARY, <https://perma.cc/7VRK-6DSL>.

153. Colburn, *supra* note 39, at 337 (discussing how countries without the capacity to fully utilize their fishery must sell quotas to other countries).

154. Indeed, if the receiving country is sufficiently developed, they may even be able to buy this additional quota themselves, thus derailing the losing country’s threat to overfish.

they can still increase their fishing efforts above the sustainable level. Even if the stock is not depleted, it could still be unnecessarily damaged.

d. Climate Justice and Behavioral Economics

Many of the countries that will be hit hardest by these shifts are developing nations that have not significantly contributed to climate change. Many of these countries may feel that they are entitled to the full future value of their historic fisheries, regardless of the fisheries' new location.

This not only challenges the moral basis of bilateral negotiations, but may impede the possibility for success. Like many economic models, the solution above assumes rational, self-interested negotiators.¹⁵⁵ However, behavioral economists have demonstrated that "equity [and] fairness plays a major role" in human behavior.¹⁵⁶ People are often more focused on receiving an "equitable payoff" than an efficient one.¹⁵⁷ If the losing country considers the fishery to be rightfully theirs, they may protect this interest passionately.¹⁵⁸ Indeed, there is a chance that they would refuse any deal that does not grant them the full future value of the fishery. But the receiving country would have no incentive to make such a deal. Just like in climate change negotiations, debates over cross-border fishery shifts may be significantly derailed by the environmental justice issue.

While bilateral economic solutions have the potential to address cross-border shifts, real-world inequities will interfere with this process. This Section has outlined the dangers of allowing countries to negotiate bilateral management arrangements in an unsupervised, bilateral setting.

C. RFMOs as a Potential Solution

As outlined above, RFMOs provide regional management for high-seas fisheries. RFMOs have preexisting relationships with regional governments and they already provide a forum for countries to discuss fisheries management, catch quotas, and allocation. RFMOs could expand their capabilities to take on cross-border fishery shifts, even though they take place entirely within countries' EEZs. RFMOs could play a broad range of roles in this context. One option would be for countries to delegate decision-making to a relevant RFMO. A second option would be to have an RFMO act as a third-party neutral. In this role, an RFMO could provide a forum for negotiations, offer

155. Frans van Winden, *Affect and Fairness in Economics*, 20 SOC. JUST. RES. 35, 35 (2007).

156. *Id.* at 37.

157. *Id.* at 38.

158. Under prospect theory, people feel losses more acutely than commensurate gains, so they react strongly to protect themselves against losses. See Aurora Harley, *Prospect Theory and Loss Aversion: How Users Make Decisions*, NEILSON NORMAN GRP. (June 19, 2016), <https://perma.cc/WZ7C-JJYP>.

technical expertise, or even mediate bilateral negotiations like those discussed above. Both of these options are described and analyzed in turn.

1. *Option 1: Delegate Decision-Making to RFMOs*

RFMOs were established to deal with the open-access resource problems posed by high-seas fish stocks. In this capacity, RFMOs will be forced to tackle climate-driven fishery shifts and therefore may develop some expertise in the area. RFMOs have the technical capabilities to coordinate scientific data, set total allowable catch, and negotiate the allocation of limited resources between countries.¹⁵⁹ These same skills could help RFMOs establish catch limits and distribute catch for cross-border fishery shifts. Countries could simply hand control of the situation to RFMOs.

To ensure the fishery is sustainably managed, the RFMO would need to manage both the present and future value of the fishery. They would need to make the losing country responsibly manage its fishery in the present. And they would have to secure some of the fishery's future value from the receiving country.

RFMOs use a wide range of decision-making procedures. Generally, they have a scientific committee composed of scientists from the member countries.¹⁶⁰ This committee "gathers data to guide establishment of sustainable catch levels."¹⁶¹ Then, managers from the various member countries will "devise an implementation plan" based on these recommendations.¹⁶² Finally, this plan is passed through a "consensus . . . or a voting process."¹⁶³ Thus, giving decision-making power to an RFMO means that a collection of fishery managers from different countries would be in charge of setting responsible catch levels for the losing country in the present, and also for designing a system for the receiving country to transfer value to the losing country in the future.

2. *Analyzing RFMOs as Decision-Makers*

The first consideration is whether RFMOs actually have the capacity to manage these cross-border shifts. The straddling stock issue addressed by the UNFSA could be compared to cross-border fishery shifts. However, while both problems implicate fish crossing international borders, the analogy does not extend much further. First, straddling stocks involve domestic-international

159. Rayfuse, *supra* note 60, at 451–53.

160. Tom Polacheck, *Politics and Independent Scientific Advice in RFMO Processes: A Case Study of Crossing Boundaries*, 36 MARINE POL'Y 132, 132–33 (2012).

161. *FAQ: What is a Regional Fisheries Management Organization*, PEW CHARITABLE TR. (Feb. 23, 2012), <https://perma.cc/Q76F-F97T>.

162. *Id.*

163. *Id.*

borders, while cross-border shifts involve a shift from one country's EEZ to another's. Furthermore, straddling stocks are expected to remain static, while climate-driven shifts will cause long-term and ongoing relocation of fish stocks. Thus, while RFMOs deal with fish that cross international borders, cross-border shifts would present a new challenge.

Furthermore, RFMO management is not always successful. While criticizing RFMOs is a tired trope in fisheries literature, it is necessary to acknowledge their flaws in evaluating whether they would be effective decision-makers in this context. As discussed above, there are numerous external and internal factors that undermine the effectiveness of RFMOs. Externally, flag state jurisdiction limits their enforcement power and international law gives states multiple opportunities to evade RFMO management decisions. Internally, scientific uncertainty, pressure from member states, and incomplete or unreliable data can weaken their decision-making process.

RFMOs' lack of enforcement authority significantly undermines their ability to address cross-border fishery shifts. They will not be able to force countries to abide by their decisions. This lack of power not only makes RFMOs ineffective, but is problematic for both countries involved. The losing country wants something enforceable in the future, which the RFMO cannot assure them. Meanwhile, the receiving country wants to ensure that the losing country is properly managing its domestic fisheries, which the RFMO cannot actually force them to do. Ultimately, if either country is unsatisfied with the RFMO's decision, they can simply ignore it.

3. *Option 2: RFMOs as Third-Party Neutrals*

Another option would be for RFMOs to provide a forum for bilateral negotiations to take place. Having RFMOs serve as some type of mediator could help counteract some of the failings of unsupervised bilateral negotiations discussed above.

This would be a new role for RFMOs, although many are experienced with dispute resolution methods. The UNFSA directs RFMO members to "settle their disputes by negotiation, inquiry, mediation, conciliation, arbitration, judicial settlement, resort to regional agencies or arrangements, or other peaceful means of their own choice."¹⁶⁴ RFMOs regularly negotiate disagreements between parties and all have established procedures for dealing with disputes.¹⁶⁵ Multiple RFMOs use review panels to handle member disputes.¹⁶⁶

164. UNFSA, *supra* note 59, at art. 28.

165. For an overview of RFMO dispute resolution practices and how they interact with Fishing Entities, see Michael Sheng-Ti Gau, *The Practice of the Concept of Fishing Entities: Dispute Settlement Mechanisms* 37 OCEAN DEV. & INT'L L. 221 (2006).

166. See Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, art. 20(6), *opened for signature* Sept. 5, 2000, 2275

Others bring in neutral parties to resolve contentious issues.¹⁶⁷ If the RFMO is not able to resolve a dispute, parties may be sent to an international court, like the International Tribunal for the Law of the Sea or the International Court of Justice.¹⁶⁸

Their experience with dispute resolution could make RFMOs well-equipped to help countries reach fair and efficient bilateral agreements. An RFMO could agree to supervise bilateral negotiations on cross-border shifts as if such shifts were any other substantive disagreement between two members. Although the dispute could not be referred to a court outside the RFMO, the 'in-house' dispute resolution tools could be made available. Their role could be purely procedural; focused on ensuring that the bilateral negotiations take place on equal footing. Or the RFMO could engage in the negotiations and try to help parties reach a substantively equitable agreement.

4. *Analyzing RFMOs as Third-Party Neutrals*

The primary question in evaluating RFMOs as third-party neutrals is how effectively they will alleviate the issues presented by an unmediated alternative. As discussed above, country-to-country negotiations will be undermined by a litany of environmental justice issues. As third-party neutrals, RFMOs could work to balance the demands of both sides and try to prevent smaller or developing nations from being taken advantage of. This role will draw on their procedural dispute resolution skills, rather than on their ability to manage the substance of the negotiations. Having RFMOs serve as third-party neutrals may allow parties to build on the positive aspects of bilateral negotiations (flexible country-country negotiations) while alleviating some of the problems (unequal bargaining power).

However, the quality of RFMO oversight will depend on the procedures it decides to enforce. For example, the RFMO could require that countries negotiate the cross-border shifts independent of all other arrangements, or it might

U.N.T.S. 43 (entered into force June 19, 2004); *see also* Convention on the Conservation and Management of High Seas Fishery Resources in the South Pacific Ocean, art. 17(2)(c), Nov. 14, 2009, T.I.A.S. No. 17-218.

167. Convention for the Strengthening of the Inter-American Tropical Tuna Commission Established by the 1949 Convention Between the United States of America and the Republic of Costa Rica, art. XXV(3), Nov. 14, 2003, S. TREATY DOC. No. 109-2 (2005) (stating that if two members have a technical dispute they may refer it to a "non-binding ad hoc expert panel" that will "confer with the members concerned and shall endeavor to resolve the dispute expeditiously without recourse to binding procedures for the settlement of disputes").

168. UNFSA, *supra* note 59, art. 30(3) (referencing UNCLOS art. 287), grants member states access to "(a) the International Tribunal for the Law of the Sea . . . (b) the International Court of Justice; (c) an arbitral tribunal constituted in accordance with Annex VII; (d) a special arbitral tribunal constituted in accordance with Annex VIII." UNCLOS, *supra* note 39, at art. 287; *see also* UNFSA, *supra* note 59, at art. 30(3).

ignore the issue, allowing the receiving country to apply external financial pressures.

RFMO negotiations are not immune to issues of inequity. Indeed, inequality may even be institutionalized in the RFMO space as countries have spent years jockeying for quota allocations in this forum. The UNFSA requires that members give “full recognition to the special requirements of developing States.”¹⁶⁹ However, the RFMO track record on equality is still a work in progress.¹⁷⁰ These preexisting power dynamics could influence RFMOs’ capabilities in solving cross-border shifts.

These power dynamics can work both ways. Countries that will find themselves losing multiple fisheries could form a negotiating bloc and lobby the RFMO to develop favorable procedural safeguards. However, these countries may not have enough leverage to ensure that the RFMO oversight is evenhanded.

In short, having RFMOs serve as third-party neutrals is an improvement over the unsupervised country negotiations discussed above. However, the same environmental justice issues may undermine the ability of the parties to properly negotiate.

V. THE BASEL CONVENTION AS A MODEL

While perhaps not an intuitive place to look, international hazardous waste law may provide some solutions for the problem of shifting fisheries. Both areas suffer from environmental justice concerns, and both involve externalities shifting across borders. In this semi-analogous situation, the United Nations stepped in to provide a framework for countries to reach bilateral arrangements.

A. *The Basel Convention*

The Basel Convention on Transboundary Movement of Hazardous Wastes entered into force in 1992 to address the issue of transboundary hazardous waste.¹⁷¹ The Convention “does not expressly ban the export of hazardous waste to certain countries, but rather seeks to control these movements through a system of prior informed consent, strict notification, and tracking requirements.”¹⁷² Under the Basel Convention, export states must “provide detailed

169. UNFSA, *supra* note 59, art. 24(1).

170. See MICHAEL W. LODGE ET AL., RECOMMENDED BEST PRACTICES FOR REGIONAL FISHERIES MANAGEMENT ORGANIZATIONS 38–39 (2007).

171. See Basel Convention, *supra* note 131; see also Muthu S. Sundram, *Basel Convention on Transboundary Movement of Hazardous Wastes: Total Ban Amendment*, 9 PACE INT’L L. REV. 1, 16 (1997).

172. Pratt, *supra* note 124, at 160.

information” about waste to potential import states, and they must obtain “informed written consent, and approval” before exporting the waste.¹⁷³ The Convention also requires that this hazardous waste be disposed of in an “environmentally sound manner.”¹⁷⁴ Some have criticized the Basel Convention for not going far enough to reduce toxic-waste colonialism. However, the treaty did reduce the influx of hazardous waste into developing countries, and it has provided the basis for all subsequent efforts in the field.¹⁷⁵

While the Basel Convention is an environmental treaty, it reads like a trade agreement.¹⁷⁶ The Convention’s primary task is to reduce inequity in hazardous waste trade agreements. It “creates an extensive system of restrictions on hazardous waste movement . . . [including] notification and informed consent requirements, as well as certification and movement restrictions.”¹⁷⁷ Together, these requirements level the playing field for bilateral negotiations.

The Basel Convention is a procedural convention; it essentially establishes a checklist that countries must complete if there is going to be any hazardous waste transfer between them. To discourage developed countries from making these transfers, this checklist is fairly extensive. For example, any country that is exporting hazardous waste:

must provide, among other things: the name, process and site of generation; reason for export; name of exporter; name of carrier; means of transportation; method, site and name of disposer; designation; estimated quantity and description of waste; projected dates and period of time over which waste is expected to be exported; and information which indicates that waste will be managed in an environmentally sound manner.¹⁷⁸

It is critically important to note that as long as the various requirements are met, the Basel Convention still allows individual countries to negotiate bilateral contracts for the movement of waste across their borders.¹⁷⁹

B. Applying the Basel Convention to Cross-Border Fishery Shifts

The Basel Convention is triggered when a country decides to export hazardous waste. However, unlike with hazardous waste, countries cannot control

173. *Id.* at 159.

174. Basel Convention, *supra* note 131, art. 4(2)(e).

175. Pratt, *supra* note 124, at 156, 167–71.

176. Sundram, *supra* note 171, at 3.

177. LaRue Corbin et al., *The Environment, Free Trade, and Hazardous Waste: A Study of the U.S.-Mexico Border Environmental Problems in the Light of Free Trade*, 1 TEX. WESLEYAN L. REV. 183, 193 (1994).

178. Hirschi, *supra* note 122, at 173.

179. Pratt, *supra* note 124, at 160.

cross-border fishery shifts. So instead of the treaty being triggered when a country attempts to export waste, a fisheries treaty would be automatically triggered as soon as there is a cross-border shift. This language would make a "cross-border shift" a contentious legal definition. Ideally, the United Nations would establish a science and technical committee to write a broad-reaching definition of cross-border shifts. This body could also maintain a list of cross-border shifts, which could be cross-referenced in the treaty.

Once a potential cross-border shift has been identified, a Basel-like checklist would apply to the countries experiencing the shift. This checklist would establish certain procedural steps that must be taken between the countries.

If the procedural requirements are properly formulated, they can counter the various problems presented above. For example, the treaty could require that any countries predicted to experience a cross-border shift meet to discuss potential solutions, incentivizing communication between the countries.¹⁸⁰ The treaty could also require that these negotiations be independent of any other inter-country negotiations. It could also design a mediation process allowing a mutually agreed upon third party to aid countries in reaching an agreement. These safeguards could help protect smaller countries from feeling trapped in unequal negotiations. Countries could also be required to share all fisheries management data for any stock in danger of shifting across an international border, something that would help managers in both countries develop management plans more quickly.

The treaty could also impose procedural requirements on the products of these negotiations. It could require that any agreement reached between countries be made publicly accessible, include viable enforcement mechanisms, and establish mutually-agreed upon sustainability indicators.¹⁸¹ These procedural requirements could help mitigate the losing country's unwillingness to negotiate, reduce the pressure that powerful countries could place on their neighbors, and improve unenforceable or vague environmental standards.

Procedural requirements are powerful tools. The suggestions above would help counteract some of the bargaining inequities presented by bilateral or RFMO-mediated negotiations. However, the procedures that are chosen will need to create a combination of benefits for receiving and losing countries. For a set of conditions to be agreed upon, countries on both sides will need to be benefited by at least some of the conditions. Thus, a complete list of requirements will require intense international negotiations, and it is impossible to predict what the final product might look like. However, if developing coun-

180. This requirement would be analogous to Article 6 of the Basel Convention. Basel Convention, *supra* note 131, at art. 6.

181. For more on sustainability indicators, see EPA, A FRAMEWORK FOR SUSTAINABILITY INDICATORS AT EPA (2012), <https://perma.cc/3WP4-RRRK>.

tries negotiate as a bloc, they are more likely to secure advantageous procedural safeguards.

The treaty could also impose substantive requirements on countries that are dealing with cross-border shifts. For example, countries could be required to initiate technology transfers, analogous to those required by article 10 of the Basel Convention.¹⁸² The receiving country could provide monitoring technology—like artificial intelligence software or vessel monitoring devices to help collect spatial and biological information. These technology transfers would improve developing countries' fisheries management, something that both receiving and losing countries have an interest in. An ambitious treaty could even include a requirement that losing countries will manage their fisheries well. In return, receiving countries could commit to ensuring that the losing countries retain (in some form) the same percentage of fisheries revenue to which they have historically been entitled.¹⁸³

Once countries have met the procedural and substantive requirements, they will still need to negotiate a bilateral agreement that is tailored to their specific situation. As discussed above, countries could reach a wide range of solutions in these bilateral negotiations.¹⁸⁴ A Basel-like convention *should not limit* these substantive options; countries should be free to pursue a fishery access agreement, a quota-allocation system, a partial ownership system, or any other arrangement that will best suit their needs. However—like under the Basel Convention—parties will negotiate within a procedural framework that mitigates the problems that arise when these negotiations are unsupervised.

C. Analyzing a Basel-Like Framework

Direct U.N. oversight would work to mend some of the gaps that exist in both bilateral negotiations, and negotiations under RFMO oversight. First, the U.N. has more experience and success designing procedural mechanisms to oversee bilateral agreements.¹⁸⁵ Another advantage of a U.N. treaty is the global reach, which would allow developing nations to coordinate with one another more effectively and on a broader scale. Working together, developing countries have a better chance of securing favorable procedural protections. And, while these countries may not be able to fully benefit from their collective

182. Basel Convention, *supra* note 131, art. 10.

183. For example, say a stock is currently 80% in the losing country's waters and 20% in the receiving country's waters. The receiving country could agree to ensure that the losing country continues to receive at least 70% of the future fishing revenue.

184. See *supra* notes 141–148 and accompanying text.

185. Indeed, because the new treaty could be modeled on the Basel Convention, the U.N. should in theory have a great deal of specific expertise.

bargaining power in the RFMO space, there is proof that they can in the United Nations.¹⁸⁶

Finally, negotiating this issue at a global scale would greatly simplify all subsequent negotiations on this topic.¹⁸⁷ While there is a greater up-front cost, in the long run countries would require less effort to negotiate cross-border fishery shifts. The treaty would provide a checklist and a framework for countries confronting this problem.

One major concern, as with all international treaties, is that countries would not ratify it.¹⁸⁸ Indeed, the United States has still not formally ratified either UNCLOS or the Basel Convention.¹⁸⁹ However, it still abides by many of the requirements of both treaties.¹⁹⁰ The crux of this treaty's success would depend on its ability to offer an apple to both sides. Returning to the early economic analysis of the issue, both countries could come away winners if they cooperate with each other.

Countries will have multiple incentives to agree to this framework. First, it can help them out of the prisoner's dilemma that they are currently facing. Second, because fishery shifts may operate on *both* of a country's borders, a single country may be a winner in some situations and a loser in others. Thus, countries have an incentive to ensure that the procedural safeguards operate fairly for both parties. This incentive would be lost if each country simply negotiated bilateral treaties. They could simply act in different ways if they were a 'loser' or a 'winner' in the negotiation. Imposing a multilateral treaty would remove this incentive.

Ultimately, by proactively providing a Basel-style framework for receiving and losing countries to negotiate their problems, the United Nations could prevent conflict and significantly reduce economic and environmental losses. Negotiating these conditions at a global scale would allow developing nations to coordinate their efforts—as the G77 negotiating bloc did in the climate change space—and hopefully reduce environmental justice concerns.

186. Christopher Todd Beer, *Climate Justice, the Global South, and Policy Preferences of Kenyan Environmental NGOs*, 8 GLOBAL SOUTH 84, 86 (2014) (discussing the success of the G77 negotiating bloc when discussing climate agreements at the United Nations).

187. Gonzalo Biggs, *Latin America and the Basel Convention on Hazardous Wastes*, 5 COLO. J. INT'L ENVTL. L. & POL'Y 333, 336–38 (1994) (arguing that the international nature of the Basel agreement is preferred over “separate legal instruments [which] ha[ve] made institutional coordination and management at national levels more difficult”).

188. The current populist wave of anti-globalism heightens this concern. *But see* Suzanne Berger, *Globalization Survived Populism Once Before – and It Can Again*, BOS. REV. (Jan. 30, 2018), <https://perma.cc/3GJ5-ZEBC>.

189. Tseming Yang & C. Scott Fulton, *The Case for U.S. Ratification of the Basel Convention on Hazardous Wastes*, 25 N.Y.U. ENVTL. L.J. 52, 52 (2017).

190. *Id.* at 66–68; Colburn, *supra* note 39, at 333. *But see* Sejal Choski, *The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal: 1999 Protocol on Liability and Compensation*, 28 ECOLOGY L.Q. 509, 509 (2001).

CONCLUSION

This Note has argued that global shifts fall into three distinct categories: domestic, international, and cross-border shifts. This division is the result of the various legal regimes that govern global fisheries. A great deal of legal and policy work remains to be done on fishery shifts in domestic waters and in the high seas. The Arctic region in particular will require a great deal of international cooperation in the coming years. Thankfully, Arctic fisheries may have some time to address these issues thanks to a recent international treaty banning unregulated fishing in the region for the next sixteen years.¹⁹¹

Cross-border fishery shifts could cause many problems, three of which are (1) increases in international conflict, (2) poor environmental stewardship, and (3) climate justice issues. This Note has argued that countries are likely to reach for bilateral negotiations or RFMO management to solve this issue, as they are administratively simpler than engaging in international negotiation. Unfortunately, both options will be insufficient to fully address the problems caused by cross-border shifts. However, if these solutions *are* pursued in the future, the issues identified in this Note should be considered so that negotiators can attempt to avoid the pitfalls identified above.

Climate-driven fishery shifts and hazardous waste disposal share many essential features. In both, the developed world is responsible for an environmental disaster that is being experienced worst in the developing world. In both situations, countries will need to be able to develop flexible bilateral treaties to deal with the specific challenges that exist between them. Finally, in both there is a great deal of bargaining inequity that can be combatted by consolidating the negotiations at a global scale. While there may be greater administrative costs to an international fisheries agreement, these costs will be offset by reductions in international conflict, overfishing, and environmental justice infractions.

The plethora of problems posed by climate-driven fishery shifts will only increase in the coming years. Despite the broad fixation on them, commercial fish stocks do not exist alone in the ocean. They rely on a full and complex ecosystem, the whole of which will be affected by the global climate crisis. This Note has focused on macro-level forecasts, which predict global fisheries will shift away from the tropics and towards the poles. However, regional shifts will vary greatly.¹⁹² Thus, the greatest challenge facing local fishery managers may simply be increasing uncertainty. As managers cope with a changing ocean, it will be essential that they receive the best available information.

In addition to the benefits identified above, a Basel-like intervention would be well-designed to help local fishery managers handle this uncertainty.

191. Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean, Oct. 3, 2018, <https://perma.cc/29C5-ATU2>.

192. See *supra* note 11 and accompanying text.

High-level procedural safeguards can increase information sharing across borders. Creating a space for creative and flexible bilateral arrangements will help give fishery managers the flexibility they need to address new challenges.

Modeling a new international fisheries treaty on a hazardous waste agreement that is nearly three decades old may not be an intuitive step, but creative new solutions are required for our changing ocean. The fish are already on the move; it is time we do some forward swimming of our own.