

CONSERVING THE SAUDI RED SEA HABITAT: CHALLENGES AND OPPORTUNITIES

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INTRODUCTION

When Saudi Arabia is mentioned, the first image that comes to mind tends to be that of a rocky desert, with sand dunes stretching as far as the eye can see. It is not often the image of an incredibly beautiful underwater habitat, teeming with colorful fish and other marine fauna swimming among undulating sea grasses

and jewel-like coral reefs in crystal-clear waters. Yet that is exactly what is found in the rich marine environment that borders the western coast of Saudi Arabia—the Red Sea.¹ Whether or not this idyllic scene will survive, however, is an open question. Although the Red Sea's bountiful ecosystems have thrived for thousands of years, in recent decades many pressures have combined to pose significant threats to their integrity.

This Note will explore those threats in Part I, before moving on to a review of Saudi Arabia's legal system in Part II. Part III reviews domestic environmental legislation. Part IV surveys Saudi Arabia's participation in a regional organization, the Program for the Environment of the Red Sea and Gulf of Aden (PERSGA), for the protection of the Red Sea. This part will also compare and contrast Saudi laws with environmental regulations in the United Arab Emirates and the United States. To conclude, Part V will present a number of recommendations for Saudi authorities to implement, drawing upon the different methods and examples explored throughout the Note to overcome the problems threatening the integrity of the Red Sea's ecosystems.

I. THE RED SEA UNDER THREAT: FEATURES AND CHALLENGES

This section will discuss features of the Red Sea environment in Saudi Arabia, particularly around the coastline of the city of Jeddah. Beginning with a short historical overview, it will then turn to the biggest issues facing the coral reefs and the species that inhabit these unique marine areas. These threats include pollution, overfishing, desalination, and climate change.

A. *History and Features of the Red Sea and Jeddah*

For thousands of years, countless merchants, explorers, and conquerors have traversed the Red Sea.² Free-flowing trade routes up and down its coast were vital in maintaining connections between the many different civilizations around it, and it remains an important avenue for modern shipping lanes that traverse the

¹ See generally Graham Wood, *Red Sea's Finest – Dive Saudi Arabia's Untouched Reefs*, Dive Magazine, 2008, <http://divemagazine.co.uk/go/4579-explore-the-untouched-coral-reefs-of-saudi-arabia>.

² See Stanley M. Burstein, *Ivory and Ptolemaic Exploration of the Red Sea: The Missing Factor*, 6 *TOPOI* 799, 799 (1996).

world.³ Even amidst these activities, the Red Sea's natural environment has remained an "important reservoir of global biodiversity"⁴ for coral species. The reefs in Saudi Arabia's territorial waters cover more than two thousand square kilometers, from the Gulf of Aqaba in the north to the Gulf of Aden in the south.⁵ As they are subject to harsh natural conditions, such as extreme salinity and temperatures,⁶ this diversity and abundance is a testament to their versatility and resilience.

In addition to coral reefs, the coastal shelf off Saudi Arabia supports an extensive interwoven network of mangroves and sea grass habitats that combine to support a multitude of diverse living species. Many unique species assemblages are found in these habitats, with at least 1400 species of reef fish and 300 species of scleractinian corals identified throughout the region.⁷ Up to 17 percent of Red Sea fish species⁸ and 10 percent of coral species⁹ are endemic, meaning they are found nowhere else in the world.

Since the human population size along the Red Sea is relatively small on average, one might expect this to result in minimal negative human impacts on the wellbeing of the Sea's coral reef systems.¹⁰ However, increased development over the past 200 years resulting from economic growth and industrialization has posed a heightened threat to the vulnerable coral reefs, and to the Red Sea's habitat overall.¹¹ This is particularly true for areas around the metropolitan city of Jeddah,

³ See *Red Sea*, 14 ARAMCO WORLD 8, 8 (1963).

⁴ Lyndon DeVantier et al., *Coral Communities of the Central-Northern Saudi Arabian Red Sea*, 18 FAUNA OF ARABIA 23, 52 (2000).

⁵ See Andrew W. Bruckner & Alexandra C. Dempsey, *The Status, Threats, and Resilience of Reef-Building Corals of the Saudi Arabian Red Sea*, in THE RED SEA: THE FORMATION, MORPHOLOGY, OCEANOGRAPHY AND ENVIRONMENT OF A YOUNG OCEAN BASIN 471, 472 (Najeeb Rasul & Ian Stewart eds., 2015).

⁶ See *id.*

⁷ See Mohammed Kotb et al., *Status of Coral Reefs in the Red Sea and Gulf of Aden in 2004*, in 1 STATUS OF CORAL REEFS OF THE WORLD: 2004 137, 140 (Clive Wilkinson ed., 2004).

⁸ See THE REGIONAL ORGANIZATION FOR THE ENVIRONMENT OF THE RED SEA AND GULF OF ADEN [PERSGA], *THE STATUS OF CORAL REEFS IN THE RED SEA AND GULF OF ADEN: 2009*, at 5, Technical Series No. 16 (Feb. 2010).

⁹ See Bruckner, *supra* note 5, at 472.

¹⁰ See Meres J. Weche, *Sustaining Saudi Arabia's Reefs for the Future*, KAUST News (Nov. 13, 2014), <http://www.kaust.edu.sa/latest-stories/sustaining-saudi-arabias-reefs-for-the-future.html>.

¹¹ See Bruckner, *supra* note 5, at 472.

the second-largest city in Saudi Arabia and its commercial hub. One of the biggest urban centers in the region, it is the largest city located on the Saudi Red Sea coastline.¹²

Nicknamed “the Bride of the Red Sea,” Jeddah began as a Phoenician trading base in the centuries before the common era, and played a noteworthy role on the trading route that provided access to precious goods from India.¹³ Jeddah is also an important port for Muslim pilgrims from around the world whose destination is the holy city of Makkah, which lies sixty miles to its east. This role has continued for Jeddah into the present day, which today has a bustling airport that welcomes millions of pilgrims every year.¹⁴

Unfortunately, largely as a result of anthropogenic activity, nearly 60 percent of the reefs in the Red Sea are currently at risk.¹⁵ The highest threats arise from issues related to industrial development such as pollution, overfishing, and climate change.¹⁶ In fact, by 2030 climate change impacts are expected to cause threat levels to increase to almost 90 percent of the reefs—a figure that reaches 100 percent by 2050.¹⁷ The following paragraphs will discuss these issues and the effects they have on the Red Sea’s environment.

B. *Pollution*

As a semi-enclosed tropical sea, the Red Sea’s water flows from the narrow passages that border it—the Suez Canal to the north, and the Bab al-Mandab Strait to the south.¹⁸ Given this semi-enclosed status, pollution is a significant concern. Any oil or chemical spill from one of the many tankers that traverse Red Sea waters, for instance, would cause substantial negative impacts, and

¹² See Maren Ziegler et al., *Coral Microbial Community Dynamics in Response to Anthropogenic Impacts near a Major City in the Central Red Sea*, 105 MARINE POLLUTION BULLETIN 629, 629 (2016).

¹³ ARAMCO WORLD, *supra* note 3, at 10.

¹⁴ See *Six Million Foreign Pilgrims Performed Umrah*, Arab News (Aug. 20, 2012), <http://www.arabnews.com/saudi-arabia/six-million-foreign-pilgrims-performed-umrah>.

¹⁵ See Laretta Burke et al., *Reefs at Risk Revisited*, World Resources Institute 50 (2011).

¹⁶ See *id.*

¹⁷ See *id.*

¹⁸ See THE REGIONAL ORGANIZATION FOR THE ENVIRONMENT OF THE RED SEA AND GULF OF ADEN [PERSGA], *STATE OF THE MARINE ENVIRONMENT—REPORT FOR THE RED SEA AND GULF OF ADEN*: 2006, at 1 (2006).

the fact that such a spill has not yet occurred is quite fortunate.¹⁹ In some countries, chemical runoff from fertilizers and pesticides seeping into rivers, and consequently into larger bodies of water, poses a major environmental threat.²⁰ This is not the case in Saudi Arabia, due to the lack of river systems in the Arabian Peninsula that empty into the Red Sea.²¹ From an environmental standpoint, this is also fortunate.

The Red Sea habitat has not been so fortunate when it comes to other sources of pollution, primary among which is sewage. Despite the wealth of one of the most oil-rich countries in the world, almost 70 percent of areas in Jeddah do not have access to a centralized sewage system with adequate wastewater treatment facilities.²² Instead, sewage is collected from septic tanks in buildings by trucks, which should dispose of the untreated wastewater at the proper treatment facilities. However, they sometimes dump it directly into the sea, the desert, or one of the extant artificial lakes that were created for sewage disposal.²³

The most notorious of these stagnant lakes, ironically called “Musk Lake” by inhabitants of Jeddah in a nod to its unpleasant odor, was created as a temporary solution for Jeddah’s lack of a sewage system.²⁴ However, the lake ended up becoming the primary dumping site for the city’s untreated waste for many years, as the promised updates to the system were continually delayed.²⁵ In 2010, the city finally took action to drain Musk Lake when it reached dangerous levels of up to twelve meters. This threatened to break the dam that had been built to prevent the lake

¹⁹ See *id.* at 6.

²⁰ See David Biello, *Fertilizer Runoff Overwhelms Streams and Rivers—Creating Vast “Dead Zones”*, SCIENTIFIC AMERICAN (Mar. 14, 2008), <https://www.scientificamerican.com/article/fertilizer-runoff-overwhelms-streams/>.

²¹ See S.S. Sofianos et al., *Heat and Freshwater Budgets in the Red Sea from Direct Observations at Bab el Mandeb*, 49 DEEP-SEA RES. PART II 1323, 1324 (2002); Weche, *supra* note 10.

²² See Salman Zafar, *Waste Management in Jeddah*, ECOMENA (Oct. 19, 2016, 3:04 AM), <http://www.ecomena.org/tag/waste-management-in-jeddah>.

²³ See Saleh Faraj Magram, *A Review on the Environmental Issues in Jeddah, Saudi Arabia with Special Focus on Water Pollution*, 2 J. OF ENVTL. SCI. AND TECH., 119, 123–24, 129 (2009).

²⁴ Asma al Sharif, *Sewage Lake Threatens Jeddah*, THE NATIONAL (Dec. 4, 2008), <http://www.thenational.ae/news/uae-news/environment/sewage-lake-threatens-jeddah>.

²⁵ See *id.*

from spilling over into the city and its inhabitants.²⁶ The eventual drainage of the lake was hailed as a success, and multiple water treatment and pipeline projects that could have solved the sewage problem much earlier were announced at the same time.²⁷

However, years later, the problem remains. The announced projects have largely failed to materialize and thus the stopgap measures continue. For instance, after the lake's drainage, truck drivers simply ended up dumping the sewage into other places, sometimes even in well-frequented areas such as near a pilgrims' road to the Holy Cities.²⁸ Additionally, much of the waste from the 30 percent of homes connected to a centralized system is not adequately disposed of, with more than 270 pipes spewing untreated sewage into the Red Sea.²⁹ Along with this, around 146,000 cubic meters of sewage treated by chlorination are released into the Red Sea every day.³⁰

These discharges have significant environmental impacts. When sampled, the concentration of nitrogen and phosphorus were ten to one hundred times above normal levels in the waters surrounding where these effluents were discharged.³¹ This clearly affects the health of the environmental habitat, with the decline of previously abundant wildlife and proliferation of algae ranking alongside more prosaic concerns like unpleasant odors.³² In fact, 10 percent of overall calls made to the Jeddah Municipality hotline in one year involved complaints about the smell of sewage.³³

Apart from sewage, other pollutants that end up in the Red Sea include solid waste from trash, particularly plastic.³⁴ In Saudi Arabia, industrialization and population growth have led to a high per capita amount of waste generation per day—almost one and a half kilograms.³⁵ In the three largest Saudi cities of Jeddah,

²⁶ See *id.*

²⁷ See Sultan Al-Tamimi, *Jeddah's Infamous Lake Drained*, ARAB NEWS (Oct. 17, 2010, 1:58 AM), <http://www.arabnews.com/node/357971>.

²⁸ See *id.*

²⁹ See Al Sharif, *supra* note 24.

³⁰ See PERSGA, *supra* note 18, at 164.

³¹ See *id.*

³² See Magram, *supra* note 23, at 124.

³³ See Naill M. Momani & Ayman S. Fadil, *Improving Decision Making by Using Hazard Analysis Model for the City of Jeddah, Saudi Arabia*, 1 INT'L J. BUS. ECON. DEV. 83, 86 (2013).

³⁴ See Weche, *supra* note 10.

³⁵ See Abdul-Settar Nizami et al., *An Argument for Developing Waste-to-*

Riyadh, and Dammam, more than six million tons of trash are generated every year. However, there does not seem to have been an increase in the requisite infrastructure to deal with these heightened levels of trash; most garbage is disposed of into landfills, many of which are slated to reach full capacity in the coming decade.³⁶ Less than 20 percent of trash is recycled, largely by the informal sector, rather than through government coordination of a cohesive waste management strategy.³⁷

Most importantly, there is a profound lack of environmental awareness among the general Saudi population about the necessity of recycling, though by some accounts this is changing, particularly among the highly educated.³⁸ Any regular visitor to Jeddah's Corniche may observe families going to picnic on the shoreline and habitually leaving large amounts of trash behind.³⁹ While a number of awareness campaigns to discourage littering in recent years have attempted to alleviate this problem,⁴⁰ it remains ubiquitous.⁴¹ Such pollution is also not limited to areas near urban centers like Jeddah; plastic particles have been detected all along the Saudi coastline.⁴² This poses a threat to the species of Red Sea wildlife that ingest this plastic,⁴³ and consequently to consumers of local seafood. Whether motivated primarily by environmental or public health concerns, stopping the pollution of the Red Sea by both sewage and solid waste should be seen as absolutely essential.

Energy Technologies in Saudi Arabia, 45 CHEM. ENG'G TRANSACTIONS 337, 339 (2015).

³⁶ See Salman Zafar, *Solid Waste Management in Saudi Arabia*, ECOMENA (Mar. 28, 2015, 7:55 PM), <http://www.ecomena.org/solid-waste-management-in-saudi-arabia/>.

³⁷ See *id.*

³⁸ See Mohammed Alhefnawy, *Sustainability Issues Awareness: A Case Study in Dammam University*, 26 J. ARCHITECTURE & PLAN. 15, 26 (2014).

³⁹ See Nadim Al-Hamid, *Municipality to Cleanup Jeddah Corniche*, ARAB NEWS (Feb. 17, 2014), <http://www.arabnews.com/news/526986>.

⁴⁰ See Naif Masrahi, *Anti-littering Campaign Launched in Jeddah*, SAUDI GAZETTE (Nov. 7, 2010), <http://64.65.60.109/index.cfm?method=home.regcon&contentid=2010110786931>; Press Release, Middle East Broadcasting Group, MBC Joins Forces with Albaik to Keep Jeddah Clean (Dec. 19, 2011), <http://www.mbc.net/en/corporate/articles/MBC-JOINS-FORCES-WITH-ALBAIK-TO-KEEP-JEDDAH-CLEAN-.html>.

⁴¹ See Alanoud AlHejailan, *Punish Litterbugs: Keep Our Cities Clean!*, SAUDI GAZETTE (Feb. 26, 2016), <http://saudigazette.com.sa/opinion/voices/punish-litterbugs-keep-our-cities-clean/>.

⁴² See Weche, *supra* note 10.

⁴³ See *id.*

C. *Overfishing*

Another of the main problems facing healthy coral reef systems in the Red Sea is overfishing. When large predators are eradicated through overfishing, delicate ecosystems become unbalanced, and this results in an unpredictable domino effect down the food chain that has wide-ranging consequences.⁴⁴ Marine biologists agree that with the advent of modern development and population growth in Saudi Arabia, which started as many as two or three decades ago, and which increased demand for fish as a food source, many large species fisheries have become severely degraded.⁴⁵ This is corroborated by hands-on evidence from divers who witness firsthand the lack of bigger fish throughout the coral reefs in the region, as well as data from the Saudi Ministry of the Environment, Water and Agriculture's fisheries department.⁴⁶

Current fishing pressure on these regions is concerted and constant. Rather than industrial-sized fleets of trawlers raking in massive amounts of fish at once, it is often fishermen in regular-sized fishing boats, characterized as "artisanal industrial fishing," that operate in Saudi Red Sea fisheries.⁴⁷ Their basic equipment includes hand lines, single lines, nets and traps, rather than any advanced technological methods to maximize their one-time catch.⁴⁸ Though not typically associated with commercial fishing, this fishery structure has still exerted considerable pressure on the region due to the sheer numbers of fishermen involved: an estimated eight thousand to ten thousand fishing boats operate along the Saudi coast.⁴⁹ Research into the catches subsequently brought into the fishery markets has found that the specimens caught are often not fully mature, and thus have not been able to reproduce, which does not bode well for their species' long-term survival.⁵⁰

⁴⁴ See Ransom A. Myers et al., *Cascading Effects of the Loss of Apex Predatory Sharks from a Coastal Ocean*, 315 *SCIENCE* 1846, 1850 (2007).

⁴⁵ See Moheb Costandi, *Overfishing Threatens Middle East Coral Reefs*, *NATURE MIDDLE EAST* (Oct. 15, 2015), <http://www.natureasia.com/en/nmiddleeast/article/10.1038/nmiddleeast.2015.192>.

⁴⁶ See Weche, *supra* note 10.

⁴⁷ *Id.*

⁴⁸ See THE REGIONAL ORGANIZATION FOR THE ENVIRONMENT OF THE RED SEA AND GULF OF ADEN [PERSGA], *Status of the Living Marine Resources in the Red Sea and Gulf of Aden Region and Their Management*, at 18 (2000).

⁴⁹ See Weche, *supra* note 10.

⁵⁰ See Julia L.Y. Spät, *Integrating Fisheries Dependent and Independent*

This is primarily a consequence of a lack of regulation—current fisheries regulations being largely limited and outdated—as well as the lack of a structured, central governing framework.⁵¹ Additionally, fishermen have no external incentive to curtail all-out efforts to maximize their own portion of the catch. The structure of Saudi fisheries incentivizes this disregard of natural resource conservation. Saudi fisheries are based on revenue sharing agreements between boat owners, who are usually Saudis, and boat crews, who are mostly foreigners from low-income developing nations such as Bangladesh and the Philippines.⁵² Their aim in coming to Saudi Arabia is to maximize their short-term profits, without considering any negative environmental impacts this pursuit may have.⁵³ Like other overfished fisheries, the Red Sea marks a prime example of a “tragedy of the commons,” or more precisely, a tragedy of open access fisheries, as well-managed commons are often a feature of traditional marine tenure systems under the principles of communal property.⁵⁴

Further, these species are often valued more for their consumption than they are for their environmental or aesthetic worth,⁵⁵ given the fledgling market for tourism in Saudi Arabia.⁵⁶ This is in contrast to the well-developed marine tourism industry on Egypt’s Red Sea coast, for example,⁵⁷ or in other countries where foreign tourists are often willing to pay to dive with large marine animals, such as South Africa.⁵⁸ Directly across Saudi

Approaches to Assess Fisheries, Abundance, Diversity, Distribution and Genetic Connectivity of Red Sea Elasmobranch Populations 71–72 (unpublished Ph.D. dissertation, King Abdullah University of Science and Technology), <http://repository.kaust.edu.sa/kaust/handle/10754/320296>.

⁵¹ See *Information on Fisheries Management in Saudi Arabia*, U.N. FOOD & AGRICULTURE ORG. (Oct., 2003), <http://www.fao.org/fi/oldsite/FCP/en/SAU/body.htm>.

⁵² See Spät, *supra* note 50, at 82–83.

⁵³ See *id.*

⁵⁴ See Shi-Ling Hsu, *What is a Tragedy of the Commons? Overfishing and the Campaign Spending Problem*, 69 ALBANY L. REV. 75, 101 (2015); David Feeny et al., *The Tragedy of the Commons: Twenty-Two Years Later*, 18 HUMAN ECOLOGY 1, 7 (1990).

⁵⁵ See Spät, *supra* note 50, at 83.

⁵⁶ See Nadia Yusuf, *Tourism Development in Saudi Arabia*, 8 J. BUS. & RETAIL MGMT. RESEARCH 65, 65 (2014).

⁵⁷ See Harald Hasler & Jorg. A. Ott, *Diving Down the Reefs? Intensive Diving Tourism Threatens the Reefs of the Northern Red Sea*, 56 MARINE POLLUTION BULLETIN 1788, 1788 (2008).

⁵⁸ See Melville Saayman & Andrea Saayman, *Who is Willing to Pay to See*

Arabia's Red Sea coast, in Sudan, expeditions have observed thriving fish stocks, partly because of the absence of a substantial fishing industry there.⁵⁹ This provides a glimpse of what the Saudi reefs could become, if this problem were curtailed.

D. *Climate Change*

This section will address the issues posed by climate change and other manmade effects on sea temperature, such as desalination. Such risks pose complicated technical issues to the long-term health of the Red Sea, as addressing them requires scientific advancements as well as fundamental shifts of behavior and policy.

Desalination provides over 70 percent of Saudi Arabia's freshwater needs, due to the dearth of freshwater sources in the country, and Saudi Arabia is the biggest producer and consumer of desalinated water worldwide.⁶⁰ Although the price of desalination makes its usage prohibitive in many countries, the cost it poses to Saudi Arabia is far lower as a result of the low energy prices in the region; additionally, its price has been further reduced in recent years as a result of technical developments.⁶¹ The immediate effect of the process on the environment is the release back into the sea of its byproducts: salinized warm water and toxins such as copper and chlorine.⁶² This can be considered a cause for concern for possible local environmental impacts.⁶³ However, the overall effects these discharges have on ecological health are disputed, at least in the Red Sea region where not much research has been done.⁶⁴ Due to natural conditions in the region such as limited precipitation and high water evaporation as a consequence of a dry

the Big 7?, 20 TOURISM ECON. 1183, 1195 (2014).

⁵⁹ See Costandi, *supra* note 45.

⁶⁰ See U.N. ECON. & SOC. COMM'N FOR W. ASIA, *Role of Desalination in Addressing Water Scarcity*, 10 (2009).

⁶¹ See Noredine Ghaffour et al., *Technical Review and Evaluation of the Economics of Water Desalination: Current and Future Challenges for Better Water Supply Sustainability*, 309 DESALINATION 197, 198 (2013).

⁶² See Andrew W. Bruckner et al., *A Paradigm Shift for Fisheries Management to Enhance Recovery, Resilience, and Sustainability of Coral Reef Ecosystems in the Red Sea*, in SUSTAINABLE FISHERIES: MULTI-LEVEL APPROACHES TO A GLOBAL PROBLEM 87, 87 (William Taylor et al. eds., 2011).

⁶³ See PERSGA, *supra* note 18, at 157.

⁶⁴ See Interview with Mohammed Saud, Engineer, Moya Bushnak, in Jeddah, Saudi Arabia (April 8, 2016) (on file with the author).

hot climate, the Red Sea is already a markedly warm and saline body of water.⁶⁵ Accordingly, these discharges may not have a significant additional impact on general measurements of salinity or temperatures throughout the wider Red Sea,⁶⁶ or on the species living there that have already adapted to such conditions.

Some negative effects of climate change, such as ocean acidification, have already had significant impact on coral reefs in the Red Sea.⁶⁷ Several recent bleaching events have caused mass coral mortality in the region, with one mass bleaching event occurring in 1998 and another in 2010.⁶⁸ By 2050, 100 percent of reefs in the Middle East, including those in the Red Sea, will be considered “threatened,” with 65 percent allotted a risk level of “high,” “very high,” or “critical.”⁶⁹

Significantly, a 2011 study conducted by the King Abdullah University for Science and Technology (KAUST) found that since the mid-1990s, the temperature of the Red Sea has risen sharply by 0.7 degrees, compared to a global increase of 0.5 degrees over the same period, indicating that the Red Sea is warming faster than the global average.⁷⁰ Although researchers could not conclude with complete certainty that this was a result of climate change, their analysis surmised that this swift uptick in temperature was in line with other regions throughout the hemisphere, suggesting that climate change was behind the warming.⁷¹

It should be noted that similarly to desalination, the already-extreme conditions in the Red Sea have brought about reef systems that are hardy and resilient. One Egyptian marine biologist notes, “as coral reefs continue to bleach and die around the world, the last survivors will likely be the corals of the Red Sea.”⁷² This is due to the fact that these corals evolved in challenging conditions, including temperature extremes throughout the year, and so climate change might simply pose another manageable

⁶⁵ See PERSGA, *supra* note 18, at 157.

⁶⁶ *See id.*

⁶⁷ See Bruckner, *supra* note 5, at 472.

⁶⁸ *See id.*

⁶⁹ Burke, *supra* note 15.

⁷⁰ See D.E. Raitsos et al., *Abrupt Warming of the Red Sea*, 38 GEOPHYSICAL RES. LETTERS L14601, L14601 (2011).

⁷¹ See Hazem Zohny, *KAUST Study Reveals Climate Change Impact on the Red Sea*, NATURE MIDDLE EAST (Sept. 8, 2011), <http://www.natureasia.com/en/nmiddleeast/article/10.1038/nmiddleeast.2011.119>.

⁷² *Id.*

development to which they will adapt.⁷³ However, this cannot be taken for granted. One 2010 study in the journal *Science* found that rising sea surface temperatures had slowed the growth of a widespread coral species in the Red Sea, *Diploastrea heliopora*, by 30 percent since 1998.⁷⁴ The researchers warned that by 2070, the species might stop growing entirely.⁷⁵ This is yet another indication that although these corals may be remarkably resilient, they are not invincible, and more in-depth research is needed in order to evaluate the seriousness of these threats.

The unique characteristics of the Red Sea stem from its sequestration from other bodies of water. This also renders the isolated water body particularly vulnerable: whatever pollution seeps into it will, effectively, stay there. Additionally, the reefs and the marine life flourishing in it have grown in near isolation—the main reason why the endemicity of Red Sea species is so high.⁷⁶ This is yet another reason why action must be taken now in order to protect the viability of the Red Sea’s natural resources and the beauty of its environmental habitat. The next section will explore the background of the legal frameworks in place to protect the environment in Saudi Arabia.

II. BACKGROUND TO SAUDI ARABIA’S ENVIRONMENTAL LEGAL FRAMEWORKS

This section will first provide an overview of the general background of Saudi law as pertaining to environmental protection. Starting first with the most basic source of Saudi law, Islamic Shariah law, the section will then turn to an examination of the Saudi “Basic Law,” or constitution, and the principles within it that are relevant to government decision-making on environmental policies.

A. *The Environment as a Sacred Trust in Islamic Law*

Saudi Arabia has a unique legal system that is based upon the principles of Islamic law and ethics, which together are called the

⁷³ See C. Roder et al., *First Biological Measurements of Deep-sea Corals From the Red Sea*, 3 SCIENTIFIC REPORTS 1, 6, 8 (2013).

⁷⁴ See Neal E. Cantin et al., *Ocean Warming Slows Coral Growth in the Central Red Sea*, 329 SCIENCE 322, 322 (2010).

⁷⁵ See *id.*

⁷⁶ See Gunnar Bemert, *To Save a Sea*, 31 ARAMCO WORLD 6, 6–11 (1980).

Shariah (*shari'ah* in Arabic). Linguistically, the term Shariah designates a “way to the watering-place,”⁷⁷ which is vital in the desert environment where the term emerged. This illustrates the importance Islam places upon maintaining ethical behavior and the rule of law, likening it to life-giving water. The Shariah must be interpreted by human beings, and no interpretation is epistemologically final; hence various schools of thought and modes of practice are manifested in jurisprudence, all of which are considered essentially valid in Islam. The school of jurisprudence that has legal force in Saudi Arabia is the Hanbali school.⁷⁸ While they manifest in different ways, all modes of practice share basic principles derived from the Qur'an, Islam's holy book, and the Sunnah, the normative practice of the Prophet Muhammad; the latter is expressed in the Hadith, reports of his teachings and actions.⁷⁹ Throughout the centuries, Muslim scholar jurists articulated a large number of legal principles by which the rulings of the Shariah understood and applied to the myriad problems and issues that face societies. Three of these principles that are of special importance for environmental problems are:

1. The interest of the community takes precedence over the interests of the individual;
2. Relieving hardship takes precedence over promoting benefit;
3. A bigger loss cannot be prescribed to alleviate a smaller loss, and a bigger benefit takes precedence over a smaller one. Conversely, a smaller harm can be prescribed to avoid a bigger harm and a smaller benefit can be dispensed with in preference to a bigger one.⁸⁰

As the ultimate community benefit, these principles explain why the protection of the environment has always been of paramount importance in Islam. According to Muslim belief, humankind was placed upon the Earth as stewards (Arabic *khulafa'* and *khala'if*,

⁷⁷ See MOHAMMAD HASHIM KAMALI, *SHARI'AH LAW: AN INTRODUCTION* 2 (2008); Othman Llewellyn, *The Basis for a Discipline of Islamic Environmental Law*, in *ISLAM AND ECOLOGY: A BESTOWED TRUST* 187 (Richard C. Foltz ed., 2003).

⁷⁸ See ABDULLAHI A. AN-NA'IM, *ISLAMIC FAMILY LAW IN A CHANGING WORLD: A GLOBAL RESOURCE BOOK* 136 (Abdullahi A. An-Na'im ed., 2002).

⁷⁹ See WAEL B. HALLAQ, *A HISTORY OF ISLAMIC LEGAL THEORIES: AN INTRODUCTION TO SUNNI USUL AL-FIQH* 1 (1999).

⁸⁰ Fazlun M. Khalid, *Islam and the Environment*, in *5 ENCYCLOPEDIA OF GLOBAL ENVIRONMENTAL CHANGE* 332–39, 334 (Ted Munn ed., 2002).

singular *khalifah*), or caretakers,⁸¹ with a trust and responsibility to fulfill that duty as a servant of the Divine.⁸² As such, people are authorized to benefit from all of God's blessings on Earth, but are not entitled to degrade the environment in which they live.⁸³ Causing such "corruption" in the Earth is considered a violation of mankind's sacred trust and is repeatedly condemned in the Qur'an, as in the verse:

Corruption has appeared throughout the land and sea by [reason of] what the hands of people have earned, so He may let them taste part of [the consequence of] what they have done, that perhaps they will return [to righteousness].⁸⁴

In other words, humankind must learn from their mistakes, a message that holds particular resonance in today's bleak environmental landscape. Thus, preserving the natural environment, for Muslims, is "both an ethical and a religious imperative."⁸⁵

In particular, the preservation and conservation of water as a precious resource is emphasized in Islam. This is not surprising, given Islam's origination in the Arabian Peninsula, a famously arid territory. As previously mentioned, the etymology of the very word "Shariah" has an interesting environmental connotation, through analogizing a path to a life-giving source of water to attaining ultimate salvation through following Divine law. In fact, the Qur'an states that at an essential level, all living things were created from water.⁸⁶ Furthermore, within normative Islamic practice, the usage of water is also given primary importance, since attaining ritual purity through ablutions or bathing is a necessary precursor to many acts of worship.⁸⁷ Therefore, water is considered a valuable resource that should not be squandered. The

⁸¹ See 2 Al-Baqarah 2:30; Abubakr Bagader et al., *Environmental Protection in Islam*, THE WORLD CONSERVATION UNION [IUCN] 1, 18–21 (1994); Llewellyn, *supra* note 77, 195–197.

⁸² See 33 Al-Ahzab 33:72. See Llewellyn, *supra* note 77, 191.

⁸³ See Abubakr Bagader et al., *supra* note 81, at 3; Francesca Gilli, *Islam, Water Conservation and Public Awareness Campaigns 6* (2004) (unpublished manuscript), <http://www.greenfaith.org/files/Islam-%20Water%20Conservation%20and%20Public%20Awareness%20Campaigns.pdf>.

⁸⁴ 30 Ar-Rum 30:41.

⁸⁵ M. IZZI DIEN, *THE ENVIRONMENTAL DIMENSIONS OF ISLAM* 165 (2000).

⁸⁶ 21 Al-'Anbya' 21:30.

⁸⁷ MOHD SUHAIMI ISMAIL, *TACKLING 'INCONSPICUOUS CONSUMPTION' IN MUSLIM ABLUTION PRACTICE THROUGH SYSTEM & SERVICE DESIGN* 76 (2011).

Prophet is reported to have prohibited the wastage or over-usage of water, even while making ablutions for prayer in the presence of an abundant flow of water from a running river.⁸⁸

Given this value, the Shariah mandates that water must be equitably distributed amongst people.⁸⁹ Legal texts mandate specific guidelines for how water should be distributed, and have identified three tiered categories of rights to water.⁹⁰ First comes the right of humans to slake their thirst; second, the right of animals and domestic livestock to use water; finally, the right of irrigation for agriculture.⁹¹ Water allocated to livestock may not normally be withheld from human beings in need, nor may irrigation water normally be withheld from livestock.⁹² There is no hierarchal relationship between particular people's rights to water. Rather, it is granted as an equitable and common right to all, under traditional principles of the Shariah and as per the sayings of the Prophet himself.⁹³

Thus, enhancing water distribution was an integral element of the architectural design and urban planning of traditional Muslim cities, where communal water fountains were frequently placed alongside popular roads.⁹⁴ Mosques were at the center of urban life in Islamic cities,⁹⁵ and ablution basins, which are an essential element of mosques, would provide access to water to all visitors.⁹⁶ Public fountains could be found throughout the city, with basins provided for even animals to drink from.⁹⁷ In traditional buildings from the Mamluk era, schools would include fountains to provide water as well as knowledge.⁹⁸ A final example

⁸⁸ Naser I. Faruqi, *Islam and Water Management: Overview and Principles*, in *WATER MANAGEMENT IN ISLAM* 1, 5 (Naser I. Faruqi et al. eds., 2001); Bagader et al., *supra* note 81, at 7.

⁸⁹ See generally Laura Wickstrom, *Islam and Water: Islamic Guiding Principles on Water Management*, in *25 MANAGING BLUE GOLD* 98–108 (Mari Luomi ed., 2010).

⁹⁰ See *id.*

⁹¹ See *id.*

⁹² See Llewellyn, *supra* note 77, at 204–205.

⁹³ See Faruqi, *supra* note 88, at 2, at 22–23.

⁹⁴ See Hussein A. Amery, *Islamic Water Management*, 26 *WATER INT'L* 481, 484 (2001).

⁹⁵ See JOEL KOTKIN, *THE CITY: A GLOBAL HISTORY* 46 (2005).

⁹⁶ See DOĞAN KUBAN, *THE MOSQUE AND ITS EARLY DEVELOPMENT* 3 (1974).

⁹⁷ See Gilli, *supra* note 83, at 6.

⁹⁸ See *id.*

is the traditional public bath, or *hammam*, that can be found in traditional Muslim societies in places as far-flung as Damascus and Fez, some of which continue in usage to this day.⁹⁹

Preserving the cleanliness of water is considered vital; Muslims are required to make ablutions in preparation for prayer using water that is pure.¹⁰⁰ Additional reports of the Prophet state that he forbade the pollution of water or its degradation, whether of stagnant or running river bodies.¹⁰¹ Muslim scholars have therefore established an important concept when it comes to water preservation, that of the *harim*, which means a protected area.¹⁰² The *harim* is established as a buffer zone, a reserve that prohibits development or other human activities around certain areas such as riverbanks, in order to preserve watersheds and avoid corruption of the water bodies in these areas.¹⁰³ While these protected zones were once widespread throughout the Muslim world, the numbers of traditional *harims* are on the wane today.¹⁰⁴

This description of a *harim* might seem to suggest a form of protection exclusive to rural water sources. However, *harim* zones pertained equally to urban areas, in which the preservation of the cleanliness of water and ensuring its availability to all people was also crucial, given its aforementioned importance in everyday life.¹⁰⁵ Ensuring that these water sources were protected from pollution was, therefore, a vital task that fulfilled the overarching directives of Islamic law, and kept practical sensibilities in mind, such as enabling the general population's access to water and

⁹⁹ See Magda Sibley, *The Historic Hammāms of Damascus and Fez: Lessons of Sustainability and Future Developments*, 23RD INT'L CONFERENCE ON PASSIVE AND LOW ENERGY ARCHITECTURE [PLEA] (2006).

¹⁰⁰ See Nawal Okour, *Sustainable Development Environmental Values and in Islamic Views*, 4 J. ECON. & SUSTAINABLE DEV. 136, 141 (2013); Faruqui, *supra* note 88, at 51.

¹⁰¹ See S.R. Arieff et al., *Foundation: An Introduction to Quranic Principles on Water Environmental Management*, 1ST INTERNATIONAL CONFERENCE ON MULTIPLE-GOVERNANCE IN ISLAM, ENVIRONMENTAL DEVELOPMENT, AND CONSERVATION 39, 40–41 (2012).

¹⁰² See Ali Ahmad, *Islamic Water Law as a Comparative Model for Maintaining Water Quality*, 5 J. ISLAMIC L. & CULTURE 159, 178 (2000).

¹⁰³ See Richard C. Foltz, *Ecology and Religion: Ecology and Islam*, in 4 ENCYCLOPEDIA OF RELIGION 2651, 2652 (2nd ed. 2005); Llewellyn, *supra* note 77, 210–211.

¹⁰⁴ See Foltz, *supra* note 103, at 2652.

¹⁰⁵ See Faruqui, *supra* note 88, at 51.

preventing the spread of disease.¹⁰⁶

In traditional Islamic societies, this task fell to a dedicated force under the authority of the *muhtasib*, a proto-governmental agency responsible for generally supervising matters of public welfare, in accordance with the Islamic concept of the *hisbah*, the obligation to establish good and avert evil.¹⁰⁷ Environmental welfare, therefore, fell within the domain of this office,¹⁰⁸ whose staff would undertake inspections to ensure the implementation of standards such as those relating to cleanliness, pollution disposal, and waste removal.¹⁰⁹

Thus, historically, environmental protection in traditional Islamic societies has concretely implemented essentially spiritual ordinances, by ensuring “the penetration of ethical and religious standards into day-to-day affairs.”¹¹⁰ This put principles into practice and ensured that the values espoused by holy texts in favor of the environment were backed up by action. Thus, these societies adopted an attitude that regarded the preservation of natural resources such as water and prevention of any pollution thereof as an act of worship, more than merely an ethical standpoint that could be forsaken without any real consequences.¹¹¹ Unfortunately, this outlook does not seem to have been maintained in modern Islamic societies like Saudi Arabia. While the requisite lip service through the law has been paid to values of environmental protection, concrete results have consistently failed to materialize. These rules and regulations will be overviewed next, after a review of the nation’s legislative system.

B. *Legislative Power in the Saudi Legal System*

At first glance, Saudi Arabia’s aim to be an exemplar Islamic nation may seem to indicate zealous implementation of all Shariah

¹⁰⁶ See Gilli, *supra* note 83, at 4.

¹⁰⁷ See 3 ‘Ali ‘Imran 3:104; Llewellyn, *supra* note 77, at 220.

¹⁰⁸ See Fadila Grine et al., *Sustainability in Multi-Religious Societies: An Islamic Perspective*, 34 J. BELIEFS & VALUES 72, 76 (2013).

¹⁰⁹ See Muhammad Ramzan Akhtar, *Towards an Islamic Approach for Environmental Balance*, 3 ISLAMIC ECON. STUD. 57, 72 (1996); see also Llewellyn, *supra* note 77, at 221.

¹¹⁰ Grine et al., *supra* note 108, at 76.

¹¹¹ See generally Muhammad Abdel Haleem, *Water in the Qur’an*, 33 ISLAMIC QUARTERLY 34, 34–50 (1989).

principles without exception, including that of environmental protection. The country's "Basic Law" states categorically that its constitution is, in fact, the Qur'an and the Sunnah.¹¹² This declaration is not the most practical delineation of a system of rule, given the need for human beings to interpret the Quran and Sunnah and the various interpretations of rulings derived from them, but it can be taken as a measure of intentionality. Notwithstanding that declaration, the Basic Law as drafted in 1992 is the closest equivalent to a written constitution in the country's legal system. It provides a number of fundamental principles for the functioning of the Saudi government that are relevant to this study. Articles 14 and 15 enshrine the State's ownership and control over all natural resources.¹¹³ In particular, Article 32 of the Basic Law stipulates: "[t]he State shall endeavor to preserve, protect, and improve the environment and prevent its pollution."¹¹⁴

The Basic Law also describes the system of government in Saudi Arabia that applies these principles. Article 5 stipulates that the Saudi system shall be monarchical, headed by a King who is de facto head of the executive branch.¹¹⁵ Additionally, although Article 44 delineates a division of government functions into executive, judicial and organizational (namely, legislative), it states that the King is the final authority of all these branches. This includes the judiciary, although it is granted formal independence under Article 46 and deemed to function as entirely removed from royal authority.¹¹⁶

Under Article 56, the King also serves as the Prime Minister, head of the Cabinet of Ministers.¹¹⁷ Article 70 determines that laws, treaties, and international agreements are all to be issued and modified by Royal Decrees, directly from the King.¹¹⁸ Therefore, the King is extensively involved at all stages of governmental action. There is one method through which Saudi citizens can directly participate in the legislative process: the Shura Council.¹¹⁹ The word *shura* means "consultation" in Arabic, and it is taken

¹¹² See BASIC LAW OF GOVERNANCE Mar. 5, 1992, art. 1 (Saudi Arabia).

¹¹³ See *id.* at art. 14, 15.

¹¹⁴ *Id.* at art. 32.

¹¹⁵ See *id.* at art. 5.

¹¹⁶ See *id.* at art. 46.

¹¹⁷ See *id.* at art. 56.

¹¹⁸ See *id.* at art. 70.

¹¹⁹ See *id.* at art. 68–69.

from a verse of the Quran which urges Muslims to decide on their affairs by following such mutual consultation.¹²⁰ Accordingly, the Shura Council is a consultative body given the right to “express its opinion on the State’s general policies,” as specified in Article 15 of the Shura Council Law.¹²¹ Specifically, the Council can revise and analyze laws and issue resolutions on its opinions as to general governmental matters.¹²² Article 23 also grants the Council the jurisdiction to propose drafts of new laws or amendments of existing laws, but, in accordance with Article 17, resolutions are only issued with the King’s final approval after being referred to the Cabinet.¹²³

While the Shura Council’s mandate may appear to generally resemble the legislative powers of other systems around the world, such as the United Kingdom and Canada’s bicameral system of the House of Lords and House of Commons, or the Senate and House of Representatives within the United States, there is one crucial difference that goes beyond the fact that there is no bicameral Saudi legislature—all 150 members of the Shura Council are not elected by the Saudi population but rather are appointed by the King himself, in accordance with Article 3 of the Shura Council Law.¹²⁴ This is true for the Cabinet as well, since the King appoints all Ministers under Article 58 of the Basic Law.¹²⁵ As indicated by these clauses of the Basic Law and the Shura Council Law, the King’s overarching power over the formulation, promulgation, and implementation of Saudi law is quite significant. Accordingly, it is important to note that a great deal of Saudi policy depends on whichever king is currently in power, including bringing about needed reforms of the law.

King Abdullah, who was officially head of state from 2005 to 2015, stood for a policy of cautious and incremental change, issuing reforms that attempted to compromise between general demands for reform and the religious and political Saudi establishment that favors the status quo.¹²⁶ One of these reforms

¹²⁰ 11 Saad Al-Ghamadi 11:38.

¹²¹ BASIC LAW OF GOVERNANCE, Mar. 5, 1992, art. 15 (Saudi Arabia).

¹²² *See id.*

¹²³ *See id.* at art. 17, 23.

¹²⁴ *See id.* at art. 3.

¹²⁵ *See* BASIC LAW OF GOVERNANCE, Mar. 5, 1992, art. 58 (Saudi Arabia).

¹²⁶ *See* Angus McDowall, *Saudi King Abdullah was a Cautious Reformer*, REUTERS (Jan. 22, 2015, 7:12 PM), <http://www.reuters.com/article/us-saudi->

was King Abdullah's 2011 decision to grant women the right to vote and run in municipal elections and to join the Shura Council, as well as the 2013 mandate that 20 percent of the Council's members be female.¹²⁷ This constituted a step forward in the eyes of many Saudi women who valued the gesture.¹²⁸ The successor to King Abdullah, King Salman, is the current Saudi head of state, and recent developments, including granting women the right to drive, have illustrated that this path forward is set to continue, along with other reforms that encourage the Kingdom's economic diversification.¹²⁹

While the area of environmental policy is of less obvious contention within Saudi Arabia than hot-button topics such as women's rights, there are a number of environmental issues that pose significant challenges. As discussed in Part I of this Note, one example is climate change. Since Saudi Arabia is one of the top fossil fuel producers in the world, addressing climate change effectively will require creative adaptation and investment in alternative renewable energy sources.¹³⁰ The government has also recognized the need to diversify the economy beyond oil, which is currently the source of more than 90 percent of its fiscal revenue.¹³¹

A recent development in this area is Saudi Arabia's "Vision 2030," outlining a comprehensive plan to diversify the economy and bring about reforms into the future.¹³² As a wide-ranging proposal spanning economic, social, cultural, and political matters, the document only touches upon environmental issues in a single

succession-abdullah-obituary-idUSKBN0KW00720150123.

¹²⁷ See Frank Gardner, *Saudi Arabia's King Appoints Women to Shura Council*, BBC (Jan. 11, 2013), <http://www.bbc.com/news/world-middle-east-20986428>.

¹²⁸ See *id.*

¹²⁹ See Zahraa Alkhalisi, *Women Driving Could Rev Up Saudi Economy*, CNN MONEY (Sept. 27, 2017, 1:17 PM), <http://money.cnn.com/2017/09/27/news/economy/saudi-women-driving-economy/index.html>.

¹³⁰ See generally, Jeffrey Ball, *Why the Saudis Are Going Solar*, 316 THE ATLANTIC 72, (2015).

¹³¹ See IMF, *Saudi Arabia: Tackling Emerging Economic Challenges to Sustain Growth*, Departmental Paper 19 (2015).

¹³² See Matt Clinch & Hadley Gamble, *Saudi Arabia Unveils 15-Year Plan to Transform its Economy*, CNBC (Apr. 25, 2016, 10:30 AM), <http://www.cnbc.com/2016/04/25/saudi-arabias-government-officially-unveils-long-term-economic-plan.html>.

clause, 1.2.4, on “achieving environmental sustainability.”¹³³ This same clause contains pledges to increase the efficiency of waste management, encourage recycling, and reduce pollution, as well as direct efforts towards rehabilitating and protecting beaches and natural reserves.¹³⁴ However, these promises lack detail as to how they will be carried out. The proposal also fails to mention how Saudi authorities plan to resolve any future discrepancy between its overall focus on diversifying the economy and its pledge to address environmental concerns. Heavy-handed prioritization of economic development at all costs may bring about environmental degradation. Increased industrial development around the country threatens hitherto-untouched natural habitats, and increased greenhouse gas emissions exacerbate the problem of climate change.

The next part of this Note will provide an overview of the general environmental statute in Saudi Arabia, which suffers from some of the same issues noted here with the proposal of “Saudi Vision 2030.”

III. SAUDI ARABIA IN THE DOMESTIC ENVIRONMENTAL ARENA

This section will summarize the main environmental laws in Saudi Arabia. The General Environmental Law and other environmental laws that deal with more specialized areas, such as water quality and waste management regulations, will be reviewed and analyzed.

A. *Summary and Analysis of the General Environmental Law*

The first national statute providing for comprehensive environmental legislation in Saudi Arabia was enacted in 2001, under the name of the General Environmental Law (GEL). It entered into force in 2002, and its Executive Regulation was published in 2003.¹³⁵ The aims of the law, as stated under Article 2, include preserving the environment and safeguarding it from pollution, protecting public health, conserving natural resources,

¹³³ *Full Text of Saudi Vision 2030*, AL-ARABIYA ENGLISH cl.1.2.4 (2016), <http://english.alarabiya.net/en/perspective/features/2016/04/26/Full-text-of-Saudi-Arabia-s-Vision-2030.html>.

¹³⁴ *See id.*

¹³⁵ *See Saudi Arabian Law Overview: Environmental Laws*, SAUDI LEGAL, http://www.saudilegal.com/saudilaw/18_law.html (last visited Apr. 1, 2017).

and raising awareness of environmental matters.¹³⁶ While the GEL contains only 24 articles and is comparatively short, the Executive Regulation elaborates upon these articles.¹³⁷ It contains six appendices that include a detailed section on violations and fines.¹³⁸

Article 3 of the GEL grants jurisdiction for the relevant authority to implement and generally supervise all affairs relating to the environment. This authority is the General Authority for Meteorology and Environmental Protection (GAMEP) (formerly the Presidency of Meteorology and the Environment), situated organizationally under the Ministry of Defense.¹³⁹ The GAMEP is also tasked with evaluating the state of the environment, issuing further standards and regulations, and ensuring adherence to such regulations.¹⁴⁰ This adherence includes both public agencies (specifically included in its mandate under Article 4, and given particular duties under Article 8) and individuals. As per Article 9, the GAMEP also must develop environmental disaster management plans.¹⁴¹

The GAMEP's role is not deployed as effectively as it should be, which will be elaborated upon later in Part IV of this Note. Nominally, the GAMEP can ensure that other public agencies carry out its regulations. However, in practical terms, this has not proven to be the case. A recent study concluded that government departments are responsible for over 80 percent of environmental violations on Jeddah's coastline.¹⁴² Public agencies are given some specific environmentally friendly tasks in Article 8 of the GEL, such as developing renewable resources and recycling.¹⁴³ However, these mandates are far too narrow, and do not touch upon the environmental degradation that the agencies themselves are causing.

¹³⁶ See Royal Decree no. 34, Aug. 24, 2012, General Environmental Law, art. 2 (Saudi Arabia).

¹³⁷ See Executive Regulation for the General Environmental Law, Aug. 28, 2003, in Umm al-Qura Gazette no. 3964.

¹³⁸ See *id.* at art. 6.

¹³⁹ See Royal Decree no. 34, *supra* note 136, at art. 1, 3.

¹⁴⁰ See *id.* at art. 3.

¹⁴¹ See *id.* at art. 9.

¹⁴² See *80 Percent of Jeddah Coast Pollution Caused by government Departments*, ARAB NEWS (Jan. 22, 2013), <http://www.arabnews.com/80-percent-jeddah-coast-pollution-caused-government-departments>.

¹⁴³ See Royal Decree no. 34, *supra* note 136, at art. 8.

As for private actors, the GEL places additional responsibilities on parties involved in industry or other economic activities. They must ensure their compliance with all relevant standards, specifications and guidelines set out in the Law or the Executive Regulation and its appendices. Any “project,” defined in Article 1 of the Executive Regulation to refer to “any utilities, installations, or activities of potential impact on the environment,”¹⁴⁴ must be preceded by conducting an Environmental Impact Assessment (EIA), as stipulated in Article 5.¹⁴⁵ Additionally, the parties must utilize the “Best Available Technologies” on their projects, as per Article 6.¹⁴⁶ Under Article 11, they must ensure that the design for their project complies with the relevant standards.¹⁴⁷ They must also take necessary precautions to safely store and dispose of waste, prevent environmental contamination of water and soil, and limit noise pollution, in accordance with Articles 12 and 13.¹⁴⁸

This is useful for addressing the pollution caused by private actors such as companies that are carrying out projects, particularly along Jeddah’s coastlines. However, the requirement to undertake EIAs is often overlooked, and anticipated environmentally unsound results of projects do not prevent them from being carried out.¹⁴⁹ Projects also often leave behind a significant amount of industrial and commercial waste that is not disposed of properly by companies.¹⁵⁰ Even if these violations are detected and penalized, many of the penalties are too low to truly be effective. This is a consequence of prioritizing economic development over environmental protection.

Article 17 of the Executive Regulation deals with violations of environmental criteria and standards.¹⁵¹ The law states that an

¹⁴⁴ Executive Regulation of the General Environmental Law, *supra* note 138, at art. 1(20).

¹⁴⁵ *See id.* at art. 5.

¹⁴⁶ *Id.* at art. 6.

¹⁴⁷ *See id.* at art. 6, 11.

¹⁴⁸ *See id.* at art. 12–13.

¹⁴⁹ *See* Faisal K. Alturki, Promoting Sustainable Development Through Environmental Law: Prospects for Saudi Arabia 26 (Jun. 2015) (SJD dissertation, Pace University School of Law), <http://digitalcommons.pace.edu/lawdissertations/17/>.

¹⁵⁰ *See Pollution Threatens Gulf Coral Reefs*, ARAB NEWS (Nov. 1, 2015), <http://www.arabnews.com/saudi-arabia/news/828846>.

¹⁵¹ *See* Executive Regulation of the General Environmental Law, *supra* note

effective injunction is to be issued against any violator to immediately halt and rectify the negative effects. The most stringent penalty relates to any violation of Article 14, which prohibits the entrance of hazardous, poisonous or radioactive wastes into the Kingdom, its territorial waters or its Exclusive Economic Zone (EEZ).¹⁵² Violators of Article 14 are to be punished with a fine not to exceed 500,000 Saudi riyals, approximately \$133,300, or an imprisonment not to exceed five years.¹⁵³ Violations of other articles are subject to fines not to exceed 10,000 Saudi riyals.¹⁵⁴ Upon any recurring violations, the maximum limit of the fine is to be lifted, but should not exceed double the original amount; therefore, it should be less than 20,000 Saudi riyals.¹⁵⁵

More specific violations and penalty amounts are outlined in Appendix 6 of the GEL. However, many of the penalty amounts are extremely low, compared with the environmental violation penalty regimes of other countries such as the US.¹⁵⁶ As a result, polluters may find it more economically efficient to simply commit the violation and pay the penalty, rather than taking costly measures to prevent the pollution from happening in the first place. Penalties for violations that may harm the Red Sea environment include one for dumping untreated sewage and untreated industrial drainage water into water bodies which amounts to only 10,000 riyals, or less than \$3,000.¹⁵⁷ Disposal of “slime” into seas is granted a penalty of only 7,000 riyals, or about \$1,850.¹⁵⁸ This weak penalty regime is one of the main issues with the current structure of environmental laws. It is most likely a troubleshooting area for amendments to the law in the near future, and according to some sources, this process is already being explored.¹⁵⁹

137, at art. 17.

¹⁵² *See id.* at art. 14.

¹⁵³ *See id.* at art. 18.

¹⁵⁴ *See id.*

¹⁵⁵ *See id.*

¹⁵⁶ *See* Sean McLernon, *EPA Raises Fines for Air, Water Pollution Violations*, LAW 360 (Nov. 5, 2013, 2:17 PM), <https://www.law360.com/articles/486315/epa-raises-fines-for-air-water-pollution-violations>.

¹⁵⁷ *See* Executive Regulation of the General Environmental Law, *supra* note 137, at art. 6(1), (16).

¹⁵⁸ *See id.* at art. 6(7).

¹⁵⁹ Interview with Dr. Othman Lewellyn, environmental planner at the Saudi Wildlife Authority, Riyadh, Saudi Arabia (9/7/2017) (on file with author).

Finally, Article 7 of the law deals with the significant lack of environmental awareness among the Saudi public by discussing methods to raise and enhance this awareness.¹⁶⁰ First, it calls upon education officials to include environmental themes in official school syllabi at every grade level, in order to educate youth and students in general about the environment.¹⁶¹ Second, it calls upon information authorities to disseminate environmental awareness throughout the mass media, aiming to reach all segments of the population.¹⁶² Third, it calls upon religious leaders and authorities over Islamic affairs to enhance the role of mosques in Islamic environmental discourse and messaging.¹⁶³ Finally, it directs the concerned authorities to set up specialized training programs to train the next generation of leaders in the environmental arena.¹⁶⁴

Unfortunately, few of these recommended actions are undertaken regularly. The author's experience in the Saudi school system, from elementary school through university, lacked any environmental studies other than a single course at the high school level. In addition, few governmental mass media campaigns or training programs about the environment have taken place over the past several years. Private companies have taken the lead to initiate environmental awareness campaigns in recent years, including one mass media campaign to discourage littering undertaken in 2012 by a popular fast food chain.¹⁶⁵ As discussed earlier, an extensive body of knowledge can be drawn upon from Islamic beliefs and practices to support environmental protection. However, this tradition is not utilized as it ought to be.

B. *Other Specific Environmental Laws*

As noted earlier, the GEL is not the only law governing environmental-related activities in Saudi Arabia. There are a number of statutes that deal with specific environmental problems. In 2012, the government issued updated rules relating to national

¹⁶⁰ See Executive Regulation of the General Environmental Law, *supra* note 137, at art. 7.

¹⁶¹ See *id.* at art. 7(1).

¹⁶² See *id.* at art. 7(2).

¹⁶³ See *id.* at art. 7(3).

¹⁶⁴ See *id.* at art. 7(4).

¹⁶⁵ See *Raising Awareness on Anti-Littering*, ALBAIK, <http://www.albaik.com/en/news/albaik-talk/latest-news/raising-awareness-on-anti-littering.html> (last visited Apr. 5, 2017).

ambient water quality standards, wastewater discharge standards, and waste treatment standards.¹⁶⁶

The National Ambient Water Quality Standard of 2012 provides a framework for sustainably managing water quality that applies to all water sources in the country, whether coastal, surface water, or groundwater.¹⁶⁷ Detailed concentrations for particular substances within different waterbodies are prescribed in Appendix B of the law.¹⁶⁸ Under Article II(2) of the law, all classified waterbodies must meet those standards; if existing conditions are better than the standards, those conditions must be maintained.¹⁶⁹ The GAMEP is obliged by Article IV to undergo a national monitoring program,¹⁷⁰ as well as a program to maintain and improve the quality of all water bodies in the Kingdom.¹⁷¹ No person or organization is allowed to cause those criteria to be exceeded, under penalty of the violation codes under the General Environmental Law.¹⁷² While these standards themselves may seem strong, the GEL's weak violation regime presents a flaw in the enforcement mechanisms for this law.

Under Article III(2), all water bodies must be classified in accordance with their type and usage value, with coastal water bodies, including the Red Sea, categorized under a three-pronged system: high-value (given the code C2), marine (C1), or industrially classified (C3).¹⁷³ The category enjoying the highest protection is the "high-value" C2 area, which applies if the area is designated as locally, nationally or internationally protected by any concerned agency, such as a marine protected area (MPA).¹⁷⁴ Article 2(c) specifies that a 3-kilometer buffer zone should be established around high-value areas in order to guard protected habitats, and the flora or fauna within them.¹⁷⁵ An "industrial"

¹⁶⁶ See Sanaa Chakibi, *Looking Back at 2012: Recent Developments in EHS in Saudi Arabia*, EHS TODAY (Mar. 7, 2013), <http://ehstoday.com/consensus/looking-back-2012-recent-developments-ehs-saudi-arabia>.

¹⁶⁷ See Presidency of Meteorology and Env't, Kingdom of Saudi Arabia National Environmental Standard: Ambient Water Quality (2012).

¹⁶⁸ See *id.* at app. B.

¹⁶⁹ See *id.* at art. 2(4).

¹⁷⁰ See *id.* at art. 4(1)(B).

¹⁷¹ See *id.* at art. 5(1)(a).

¹⁷² See *id.* at art. 2(3)(c).

¹⁷³ See *id.* at art. 3(2).

¹⁷⁴ See *id.* at app. A.

¹⁷⁵ See *id.* at art. 2(2)(c).

classified C3 area is designated such if it is adjacent to zones classified as industrial through local or national planning, and cannot impinge on any C1 or C2 areas.¹⁷⁶ Additionally, industrial conditions cannot extend further than a five hundred meter radius from the edge of any mixing zone.¹⁷⁷

Midway between the two is the “marine” C1 area, which is the default categorization for any coastal water body that does not meet the criteria for being either a high-value area, or an industrially classified area.¹⁷⁸ Any of the three categories can also be classified further into two categories regarding recreational uses, which may require a particular microbiological water quality. Primary contact areas are water bodies within one kilometer of an area used frequently for recreational activities where water ingestion is likely to occur, such as swimming or diving.¹⁷⁹ Secondary contact areas are those water bodies within one kilometer of an area used frequently for recreational activities involving contact with water, but where ingestion is unlikely to occur, such as boating.¹⁸⁰ Some water bodies are exempted from the standards under Article I(5), such as private water bodies including swimming pools, mixing zones while discharge is operational, and water in isolated tanks or sewage systems, as long as the liquid is fully contained.¹⁸¹

Different areas within the Red Sea are categorized under all three tiers within the Red Sea; for instance, sites where wastewater is dumped are classified as industrial C3 areas, and swimming and any other human activity within the water in these areas is prohibited.¹⁸² These classifications only stress the need to establish more MPAs in the region, in order to ensure that they are fully protected to the fullest extent of the law; the GAMEP has the authority to introduce MPAs, as arranged for under the PERSGA agreement, which will be discussed in Part IV of this Note. If the three-kilometer buffer zone mandated in Article 2(c) was established and enforced around the most significant reefs, prohibiting the discharge of pollution as well as fishing activities,

¹⁷⁶ *See id.* at app. A.

¹⁷⁷ *See id.*

¹⁷⁸ *See id.*

¹⁷⁹ *See id.* at app. A.

¹⁸⁰ *See id.*

¹⁸¹ *See id.* at art. 1(5).

¹⁸² *See id.* at app. A.

this could prove to enable recovery for the species that are most in need of conservation.

The Standard for Industrial and Municipal Wastewater Discharges, also issued in 2012, is meant to accompany the Ambient Water Quality Standard and enable the achievement of its objectives.¹⁸³ These discharges comprise any liquid effluents, including, for our purposes, liquid waste such as sewage and desalination reject water (Article I-5).¹⁸⁴ As discussed, both of these can pose the significant harm to the Red Sea habitats with which this Note is concerned. Discharge limits set out in Appendix B are established at quantitative standards that are achievable using Best Available Techniques (BAT), without harming public health or resulting in adverse impact on adjacent waters.¹⁸⁵ When applied to coastal waters, discharge limits must maintain marine life, protect fisheries, and uphold the aesthetic value of the waters, under Article IV(1)(c).¹⁸⁶

Finally, two other domestic standards that are relevant to this Note include the Environmental Standards for Material Recovery and Recycling of Waste, which set guidelines that should be followed in order to solve the problem of solid waste and littering in the Red Sea,¹⁸⁷ and the Biological Treatment Standard, which must also be implemented in order to resolve the issue of sewage that has plagued the Red Sea for so long.¹⁸⁸

The conservation of Saudi Arabia's biological diversity is addressed through legislation associated with and developed by the Saudi Wildlife Authority (SWA), originally called the National Commission for Wildlife Conservation and Development (NCWCD).¹⁸⁹ This agency was established by Royal Decree in 1986 with a mandate to, among other things, "develop and implement plans to preserve wildlife in its natural ecology, to propose the establishment of proper protected areas and reserves for wildlife in the Kingdom, and to manage such areas False"¹⁹⁰

¹⁸³ *See id.*

¹⁸⁴ *See id.* at arts. 1–5.

¹⁸⁵ *See id.* at app. B.

¹⁸⁶ *See id.* at art. 4(1)(c).

¹⁸⁷ *See* Chakibi, *supra* note 166.

¹⁸⁸ *See id.*

¹⁸⁹ *See* Royal Decree no. 22/M, May 21, 1986, Act Establishing the National Commission for Wildlife Conservation and Development, art. I (Saudi Arabia).

¹⁹⁰ *Id.* at art. III.

Wildlife here includes all the country's native wild animals and plants with their habitats, both terrestrial and marine.¹⁹¹ The SWA is further charged with conducting scientific research, raising public awareness, convening seminars and conferences, and executing the relevant laws.¹⁹²

IV. SAUDI ARABIA IN THE INTERNATIONAL ENVIRONMENTAL ARENA

Domestic regulations are not the only environmental commitments that have been made by the Kingdom relating to the Red Sea. The next section of this Note will discuss an important 1982 regional agreement on protecting the Red Sea environment. Additionally, the formulation of the Saudi environmental laws might be improved significantly by following the example of other countries that have enacted stricter environmental regimes successfully, such as the United Arab Emirates and the United States, whose laws will also be overviewed and compared with the Saudi system.

A. *Saudi Arabia's Commitments Under PERSGA*

Since Saudi Arabia is not the only nation bordering the Red Sea, the cooperation of all countries involved is imperative for the overall health of the region. The Program for the Environment of the Red Sea and Gulf of Aden (PERSGA), initiated in 1974, is a regional agreement between countries that border the relevant bodies of water: Saudi Arabia, Djibouti, Egypt, Jordan, Somalia, Sudan, and Yemen.¹⁹³ The 1982 Jeddah Convention outlines the rights and duties of the parties regarding the protection of the marine environment. Additional PERSGA documents include a Protocol for combating "emergency" pollution cases, such as oil spills, and a legally binding Action Plan that provides for a number of points of coordination for the parties.¹⁹⁴

However, as is characteristic of such regional seas agreements, the Action Plan does not include specific control

¹⁹¹ *See id.*

¹⁹² *See id.*

¹⁹³ *See Mission and Objectives*, REG'L CONVENTION FOR THE CONSERVATION OF THE RED SEA AND GULF OF ADEN, <http://www.persga.org/inner.php?mainid=1> (last visited Apr. 6, 2017).

¹⁹⁴ *See Consolidated Jeddah Convention*, REG'L CONVENTION FOR THE CONSERVATION OF THE RED SEA AND GULF OF ADEN, <http://www.persga.org/inner.php?mainid=32> (last visited Apr. 6, 2017).

measurements and actions mandated for each country. Instead, each is given the requisite freedom to undertake such actions that will fulfill its responsibilities under the Convention. The Convention provides general commitments related to the environment, including obligations to establish national standards for the conservation of the PERSGA environment,¹⁹⁵ curb pollution from land-based sources, ships, and any other activities,¹⁹⁶ and arrange for scientific and technological cooperation.¹⁹⁷

Generally, the Action Plan elaborates upon these commitments, and also provides a framework for institutional and financial arrangements to carry them out. Article 12 of the Action Plan mandates that countries cooperate in undertaking environmental assessment programs whose goal is to overview many different factors relevant to the region's ecology. These include the magnitude of pollutants affecting the region, the health of marine resources including reefs, and the national capabilities of each country in the region in the field of marine sciences and research.¹⁹⁸ Among PERSGA countries, Saudi Arabia is the country with the greatest capacity to undertake many of these actions. One example of how this can be done is through employing the scientific expertise and resources available at the Faculty of Marine Sciences at King Abdulaziz University (KAU) and at KAUST, through the newly established Saudi Aramco-KAUST Marine Environmental Research Center.¹⁹⁹

Article 18 of the Plan encourages reasonable environmental management, calling for the establishment of additional MPAs in the region, as although twelve MPAs have been listed under PERSGA, only two are in Saudi territory: the Farasan Islands and the Straits of Tiran (the latter jointly with Egypt).²⁰⁰ There is

¹⁹⁵ See The Reg'l Convention for the Conservation of the Red Sea and Gulf of Aden [PERSGA], Feb. 14, 1982.

¹⁹⁶ See *id.* at art. 3(3).

¹⁹⁷ See *id.* at art. 10.

¹⁹⁸ See *id.* at art. 10.

¹⁹⁹ See *An Ocean Observatory for the Red Sea*, KAUST (Feb. 28, 2016), <https://discovery.kaust.edu.sa/en/article/195/an-ocean-observatory-for-the-red-sea>.

²⁰⁰ See Reg'l Convention for the Conservation of the Red Sea and Gulf of Aden [PERSGA], *The Red Sea and Gulf of Aden Regional Network of Marine Protected Areas: Regional Master Plan*, at app. I, Technical Report Series No. 1 (2002).

therefore a need to expand the network of MPAs in Saudi territory in order to provide enough protection to the region's marine wildlife and native species. This was elaborated upon in additional protocols established under PERSGA in 2005, one on the Conservation of Biological Diversity and the Establishment of a Network of Protected Areas, and another on the Protection of the Marine Environment from Land-Based Activities.²⁰¹ An additional Protocol was established in 2009 to "Facilitate Exchange and Transfer Experts, Technicians, Equipment and Materials in Cases of Emergency."²⁰²

The designation and proposal of Saudi Arabia's MPAs is carried out by the Saudi Wildlife Authority, in line with the targets set by the Convention on Biological Diversity.²⁰³ The SWA's protected area system plan shows thirteen designated and proposed marine protected areas in Saudi Arabia's territorial waters, including eight in the Red Sea, of which four are designated and four proposed.²⁰⁴ The designated protected areas include two nature reserves managed by the Saudi Wildlife Authority: the 5,408 square kilometer protected area of Farasan Islands and the four square kilometer protected area of Umm al-Qamari.²⁰⁵ They also include the 10.4 square kilometer Yanbu Coastal Conservation Area, managed by the Royal Commission for Jubail and Yanbu, and the 898.2 square kilometer marine portion of the 6,490.7 square kilometer Asir National Park, which comes under the jurisdiction of the Ministry of the Environment, Water and Agriculture, but is not yet actively managed.²⁰⁶ The proposed marine protected areas in the Red Sea include three to be managed by the Saudi Wildlife Authority: the 3,705 square kilometer MPA of Ra's Suwayhil/Ra's al-Qasbah, the 3,857.6 square kilometer protected area of Al-Wajh Bank, and the 16.6 coastal strip of the Makhshush protected area, as well as the 468 square kilometer area of Ra's Kishran/Jazirat Sharifah, to be managed by the Ministry of the Environment, Water and Agriculture.²⁰⁷

201 See Consolidated Jeddah Convention, *supra* note 194.

202 *Id.*

203 See OTHMAN A. LLEWELLYN, THE PROTECTED AREA SYSTEM IN THE KINGDOM OF SAUDI ARABIA: REVISED PLAN (drft.).

204 *See id.* at 15.

205 *See id.*

206 *See id.* at 10, 15.

207 *See id.* at 12, 15.

While the Protocol on Land-Based Activities contains a number of important commitments, particularly on waste disposal control and used water treatment and management, it does not appear to have been implemented in Saudi Arabia sufficiently. The rampant pollution and overfishing that still plague Saudi Arabia's Red Sea, as discussed in Part I of this Note, is evidence enough of the insufficient implementation. It is clear that the Protocol's commitments to "prevent, reduce, and control pollution from land-based sources and activities"²⁰⁸ as well as the Action Plan's commitment to sustainably manage marine living resources²⁰⁹ have not been fully upheld.

Interestingly, the 2005 Protocol on Biological Diversity contains a number of clauses displaying a commendable viewpoint on ecological concerns. Alongside measures for protecting endangered species, Article 14 on Integrated Coastal Areas Management states that biodiversity conservation and environmental considerations must be included at early stages of economic planning. It also states that the use of resources generated by coastal systems must be recognized as limited, and that the carrying capacity of coastal systems to support human activities is variable but not infinite.²¹⁰ These principles must be turned into more concrete commitments to enforcing PERSGA's goals, particularly in the implementation of Saudi Vision 2030. Overall, Saudi Arabia must use such agreements and well as best practices in other countries to improve the status and implementation of its own environmental laws.

B. *Environmental Protection in the United Arab Emirates*

As a fellow Muslim country bordering Saudi Arabia on the Arabian Peninsula, the United Arab Emirates (UAE) shares many similarities with the Kingdom. These include its climate and topography, leading to a natural environment that is overall very similar to that of Saudi Arabia's eastern region. One main

²⁰⁸ Protocol Concerning the Protection of the Marine Environment from Land-Based Activities in the Red Sea and Gulf of Aden, Sept. 25, 2005, P.E.R.S.G.A., art. 6(2).

²⁰⁹ See Action Plan for the Conservation of the Marine Environment and Coastal Areas in the Red Sea and Gulf of Aden, 1982, P.E.R.S.G.A., art. 18(1)(a).

²¹⁰ See Protocol on Conservation of Biological Diversity and the Establishment of a Network of Protected Areas in the Red Sea and Gulf of Aden, Dec. 12, 2005, P.E.R.S.G.A., art. 14.

difference between the two countries is in their political systems. The UAE is a federal system, as in the United States, with seven “emirates” retaining certain powers not reserved for the national government.²¹¹ This means that its environmental legislation, comprising of several separate laws, can apply at the federal or emirate level. Additionally, the UAE government has historically been far more dynamic than its Saudi counterpart when it comes to environmental protection, a vision clearly outlined in its own development plan, the UAE Vision 2021.²¹² This may be due to a governmental system that is less inhibited by the bureaucracy that plagues the Saudi structure. Furthermore, the UAE places a premium on environmental protection due to its relevance for tourism. Tourism has simply not been as great a priority for Saudi Arabia in the past, although this is due to change in the near future, as per Vision 2030.²¹³

Initially, the UAE’s Federal Environment Agency (FEA), established in 1993, was charged with the enforcement of environmental standards at the federal level, with individual agencies also involved with environmental protection at the emirate level.²¹⁴ However, the FEA was abolished in 2009, with the Ministry of Environment and Water assuming all its prerogatives and the functions associated with its responsibilities for environmental oversight throughout the UAE. The Ministry’s role was further expanded in 2016 to manage all aspects related to international and domestic climate change affairs, and was renamed the Ministry of Climate Change and the Environment (MCCE).²¹⁵

The MCCE’s relevant responsibilities are set out in the Federal Law No. 24 of 1999 for the Protection and Development

²¹¹ See *Political System*, UAE INTERACT, http://www.uaeinteract.com/government/political_system.asp (last visited Apr. 12, 2017).

²¹² See *UAE Vision 2021 Brochure*, UAE (2017), <https://www.vision2021.ae/sites/default/files/uae-vision2021-brochure-english.pdf>.

²¹³ See Eleanor Dickinson, *Saudi Vision 2030 Aims to Double Tourism Sector by 2020*, GULF BUSINESS (June 8, 2016), <http://gulfbusiness.com/saudi-vision-2030-hopes-double-hotel-sector/>.

²¹⁴ See *About the Ministry*, UAE MINISTRY OF CLIMATE CHANGE AND THE ENVIRONMENT, <http://www.moccae.gov.ae/en/about-ministry/about-the-ministry.aspx> (last visited Apr. 12, 2017); *About Us*, ENVIRONMENTAL AGENCY—ABU DHABI, <https://www.ead.ae/Pages/who-we-are/index.aspx> (last visited July 30, 2017).

²¹⁵ See *id.*

of the Environment, which provides the regulatory framework for environmental legislation in the UAE.²¹⁶ Chapter 2 is dedicated to the protection of both marine and freshwater environments from pollution, with Article 35 prohibiting the discharge of any untreated substances such as sewage into the marine environment.²¹⁷ While the MCCE is the ultimate authority for enforcing the law, the “competent authorities” in each individual emirate are also mandated responsibility for enforcing its provisions.²¹⁸ Thus, these institutions are granted a complimentary but partially overlapping role that has arguably been more effective than that of the GAMEP and other relevant institutions in Saudi Arabia. This may be explained by pointing to the UAE’s federal system as simply being more efficient in cooperation and coordination at the national and emirate level, as well as the fact that the Ministry is granted more powers overall to enforce the laws at every level.

Relevant for this Note’s purposes is the fact that a specialized law, the 1999 Federal Law No. 23 for the Protection of the Marine Environment, contains a number of provisions that are precisely what Saudi Arabia needs to implement.²¹⁹ Federal Law 23 covers a range of topics relevant to the protection, exploitation and development of marine biological resources, including rules for fishing, catch limits, closed seasons, and the protection of restricted areas.²²⁰ The law also includes restrictions on the number of fishing vessels that can be registered, regulation of minimum animal sizes caught, and bans on the usage of certain fishing equipment. These are all effective mechanisms to ensure that the devastating amount of overfishing that has brought so much harm on Saudi Arabia’s Red Sea environment does not occur in the UAE’s Persian Gulf.²²¹

Another reason why this law is so effective is because of its stringent penalty regime. For violations of any of the law’s specific

²¹⁶ See Federal Law no. 24, 1999, for the Protection and Development of the Environment (United Arab Emirates).

²¹⁷ See *id.* at art. 35.

²¹⁸ *Id.* at art. 3.

²¹⁹ See Federal Law no. 23, 1999, for the Protection of the Marine Environment (United Arab Emirates).

²²⁰ See *id.*

²²¹ See Simon Aspinall, *Environmental Development and Protection in the UAE*, in UNITED ARAB EMIRATES: A NEW PERSPECTIVE, 277–304 (Paula Vine & Ibrahim Al Abed eds., 2001).

rules, the penalties for its breach include monetary fines that are higher than those allotted in Saudi Arabia's laws. Other penalties include confiscation of offenders' fishing boats or tools, and even imprisonment, with repeat offences being punished firmly.²²² For instance, fishing in the closed season or using forbidden fishing methods results in a fine of 25,000 to 50,000 UAE dirhams (Dh) (equivalent to about \$6,800 to \$13,500) and three months in prison, or both; a repeat offender would incur a minimum of a 50,000 to 100,000 Dh fine (approximately \$13,500–\$27,000) and a minimum of one year in prison.²²³

Recently, even stricter environmental rules have been enacted and proposed, with 2014's Ministerial Decree No. 500 banning the capturing of any species that are protected under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).²²⁴ This had an impact on saving rare shark species that had previously been overfished. Although a ban on shark fishing was promulgated in a 2008 Saudi royal decree to address similar overfishing in Saudi Arabia, the lack of implementation or enforcement for this law means that any venture into Jeddah's local fish markets will still find plenty of sharks on display.²²⁵ Stricter UAE enforcement mechanisms mean that any sharks seen at markets would not be rare or endangered species.²²⁶ Additionally, further changes to the law have been proposed to grant the MCCE the ability to bypass the courts in order to punish offenders and respond to violations in a timely manner.²²⁷ Overall, the UAE also has a far greater rate of environmental awareness, driven by government-sponsored awareness campaigns such as the "Say No to Plastic Bags" campaign undertaken by the Dubai municipality in 2013 in the lead-up to a ban on non-biodegradable

²²² See Federal Law No. 23, *supra* note 219, at arts. 75–77.

²²³ See *id.* at art. 52.

²²⁴ See Vesela Todorova, *Protected Sharks Absent From UAE Fish Market*, THE NATIONAL (Oct. 26, 2014), <http://www.thenational.ae/uae/environment/protected-sharks-absent-from-uae-fish-markets>.

²²⁵ See Spät, *supra* note 50, at 19.

²²⁶ See Nivriti Butalla, *Why You See Sharks in UAE Markets Though They're Banned*, KHALEEJ TIMES (Nov. 1, 2015), <http://www.khaleejtimes.com/nation/general/why-you-see-sharks-in-uae-markets-though-theyre-banned>.

²²⁷ See Vesela Todorova, *Sweeping Changes to Environmental Protection in the UAE*, THE NATIONAL (Jan. 9, 2014), <http://www.thenational.ae/uae/environment/sweeping-changes-to-environmental-protection-in-the-uae>.

plastic products.²²⁸ Saudi Arabia would do well to follow the UAE's lead on these issues.

C. *Environmental Protection in the United States*

In the United States, the Clean Water Act (CWA) provides the largest overarching federal environmental framework that establishes the structure for the protection of water from pollution. However, prior to providing an overview of the laws themselves, a few basic structural differences between Saudi Arabia and the United States should be outlined to help streamline the comparison properly. First, similar to the UAE, the United States is a federal entity containing many different states that can each implement their own, more rigorous standards for water quality, while Saudi Arabia's issued standards apply equally to all Saudi regions. Second, the United States's common law system generally dictates that case outcomes provide mandatory precedent in the application of the law; of course, this is not the case for the Kingdom. Finally, Saudi Arabia and the United States face distinct sets of environmental conditions and challenges, such that it may seem incongruous to attempt a comparison between the two.

However, these differences can be overcome to find real benefit in comparison, since many of the elements of the CWA can be broadened into general principles that do not depend on each individual country's circumstances. The CWA sets a high standard that can be followed, and may indeed have been followed as a blueprint in the drafting of Saudi Arabia's laws. Some similarities are, in fact, immediately visible.

For instance, the CWA regulates quality standards for surface waters through designating uses of the navigable water body, setting water quality criteria to support those uses, and allowing states to implement these standards by developing total maximum daily loads (TMDLs) to allocate the burden of pollution reduction among different sources.²²⁹ While Saudi Arabia's version lacks this last point, the 2012 Ambient Water Quality standards allocates the same distinctions between water bodies and standards accordance with their different uses, as outlined in Part III of this

²²⁸ See Samir Salma, *UAE Bans Non-biodegradable Plastic Products*, GULF NEWS (Mar. 3, 2013), <http://gulfnews.com/news/gulf/uae/environment/uae-bans-non-biodegradable-plastic-products-1.1153432>.

²²⁹ See 33 U.S.C. § 1313(d) (2012).

Note. The CWA also provides for three tiers of water classification and prevents further degradation of existing water usage, as do the Saudi standards.²³⁰

Not all the standards are similar, however. The CWA regulates discharges of pollutants into water from point sources. New sources must meet strict federal performance standards to achieve the greatest degree of effluent reduction, through the usage of the best available demonstrated control technology.²³¹ Existing sources at the time of the Act's 1972 passage were addressed through a phased approach, making effluent limitations more stringent over time.²³² Nonpoint sources, or whatever source of pollution that is not a "point" source (namely, discrete conveyances such as manmade pipes or ditches), are addressed through water quality trading schemes, area-wide waste treatment plans, and state management programs. However, the efficacy of such programs is contended, since regulation of nonpoint sources is largely seen as a weak link in United States environmental protection standards.²³³

The Saudi 2012 Wastewater Discharge standard does not make any of these distinctions, whether between new and existing or point and nonpoint sources. Nonpoint sources are referenced only in passing under Article I-11 regarding periodic review, which states that an adjustment of the standards may be required in the future following an improved understanding of the effects of nonpoint source wastewater discharges.²³⁴ However, this can be mainly attributed to the natural differences between the environment in Saudi Arabia and the United States. For instance, as mentioned in Part I of this Note, due to the arid climate and lack of freshwater sources such as rivers, chemical runoff is not as great a concern in Saudi Arabia as it is in the United States, where it is one of the biggest problems concerning nonpoint source

²³⁰ See Jeffrey M. Gaba, *Generally Illegal: NPDES General Permits Under the Clean Water Act*, 31 HARV. ENVTL L. REV. 410, 453–54 (2007).

²³¹ See Victor B. Flatt, *A Dirty River Runs Through It: The Failure of Enforcement in the Clean Water Act*, 25 B.C. ENVTL AFF. L. REV. 1, 10–11 (1998).

²³² See *id.* at 8–9.

²³³ See Margot J. Pollans, *Drinking Water Protection and Agricultural Exceptionalism*, 77 OHIO ST. L. J. 1195 (2016).

²³⁴ See Presidency of Meteorology and Env't, Kingdom of Saudi Arabia National Environmental Standard: Industrial and Municipal Wastewater Discharges, art. 1(11) (2012).

pollution.²³⁵

The next salient point of comparison is between the agencies entrusted with fulfilling the regulations. The Environmental Protection Agency (EPA) is the federal agency responsible for implementing the CWA. It enforces water quality standards for all surface water contaminants as well as pollution control programs, such as industry wastewater standards. One program implemented by EPA at the state level is the National Pollutant Discharge Elimination System (NPDES), which grants permits to discharge pollutants from a point source, such as a sewer collection system, into navigable surface waters.²³⁶ Discharging these pollutants without a permit is otherwise prohibited for industrial, municipal, and any other facilities, except for from individual homes. EPA also monitors compliance, conducts investigations and inspections, and authorizes for inspections to be carried out at the state level to ensure compliance. Upon any violation of the CWA, EPA undertakes civil or criminal enforcement actions to penalize such violators.²³⁷

As discussed, the competent Saudi environmental agency is the General Authority for Meteorology and Environmental Protection (GAMEP) (formerly the Presidency of Meteorology and the Environment), which is granted full legal powers to cooperate with any relevant institutions, as well as the mandate to enforce all environmental regulations and standards. Under Article 3 of the General Environmental Law, the GAMEP is to review and evaluate the condition of the environment, prepare and issue regulations, ensure that public agencies abide by the regulations, and adopt the necessary procedures in coordination with the concerned agencies.²³⁸ However, the environmental protection regime is quite fragmented among different Saudi ministries. Around sixteen government institutions are responsible for environmental issues, including the newly constituted Ministry of

²³⁵ See Brian M. Dowd, Daniel Press & Marc Los Huertos, *Agricultural Nonpoint Source Water Pollution Policy: the case of California's Central Coast*, 128 AGRICULTURE, ECOSYSTEMS AND ENV'T 151, 151 (2008).

²³⁶ See Wesley A. Magat & W. Kip Viscusi, *Effectiveness of the EPA's Regulatory Enforcement: The Case of Industrial Effluent Standards*, 33 J. L. & ECON. 331, 336–37 (1990).

²³⁷ See *Enforcement Basic Information*, EPA, <https://www.epa.gov/enforcement/enforcement-basic-information> (last visited Sept. 8, 2017).

²³⁸ See Royal Decree no. M/34, Oct. 15, 2001, General Environmental Law, art. 3 (Saudi Arabia).

Environment, Water and Agriculture, the Saudi Wildlife Authority, and the Ministry of Interior.²³⁹ Each has its own differing plans to protect the environment while performing its duties in its own area of work. These institutions are ordered to liaise with the GAMEP to coordinate efforts in environmental protection. However, there is an observable lack of coordination and cooperation amongst the relevant environmental actors, which is arguably part of what has brought about the exceedingly weak enforcement regime.²⁴⁰ The rules and regulations themselves appear to be strong, with an exception perhaps for the penalization system. Yet this strength on paper does not correspond to the reality: these plans have not resulted in the protection that the environment needs, particularly that of the Red Sea.

Overall, enforcement of the rules has been lacking because of the “weak institutional framework, inadequate coordination of the activities of agencies responsible for environmental policies and inadequate monitoring and oversight functions,”²⁴¹ along with a general lack of political will. Thus, to truly bring about an effective implementation of environmental regulations, it is necessary to critique the current institutional structure and perhaps even overhaul it. The GAMEP must be given greater oversight and coordination functions in order to enhance cooperation among the relevant institutions. It should also be granted the requisite resources necessary to handle the myriad demands on its jurisdiction required in order to perform its role effectively. All in all, the GAMEP should embrace a role similar in breadth to EPA’s, in order to effectively enforce the rules it sets forth. This is not the only change that must be undertaken, however—a multilayered range of solutions must be implemented in order to bring about truly sustainable change.

V. RECOMMENDATIONS AND CONCLUSION

This final section will discuss a number of recommendations that have already been mentioned in this Note. These recommendations are comprised of legal, policy, and “big picture” steps. Comprehensive reform in all three areas will be key in

²³⁹ See NAHED TAHER & BANDAR AL-HAJJAR, ENERGY AND ENVIRONMENT IN SAUDI ARABIA: CONCERNS & OPPORTUNITIES 11–12 (2013).

²⁴⁰ See *id.* at 13.

²⁴¹ *Id.* at 17.

resolving overall environmental issues, as well as dealing with each of the specific problems hallmarked in the first section of this Note.

A. *Legal Steps*

The first step that must be taken in order to fully address the problem is to acknowledge past successes, and review how they should be built upon and continued. There have already been efforts to fill the gaps in the current patchwork legal framework. Multiple laws have been issued to address areas that had previously been unregulated, such as the Ambient Water and Wastewater Discharges laws in 2012. Therefore, comprehensive reviews of each law and its corresponding regulations should be regularly conducted. Any gaps may be addressed by adding to or amending the relevant statute. Additionally, developments in current events mandate corresponding updates to the law itself. For example, since the Vision 2030 plan includes expansion of mining and manufacturing industries as part of the government's efforts to diversify the country's sources of revenue, updates to the laws must be made to ensure that these efforts do not compromise the health of the natural environment.

There is a risk that these updates will be made in a haphazard fashion, making them difficult to enforce and hard to coordinate. As mentioned, the mandates of several of these laws already overlap, particularly when it relates to the Red Sea.²⁴² In order to adequately protect against fragmentation, a comprehensive new law is needed to specifically address the unique challenges faced by the Red Sea's habitat. One possibility is to follow the UAE's lead in issuing a specific law for the protection of the marine environment.²⁴³ A comprehensive legal framework should include measures to counter environmental degradation and address issues discussed in this Note such as water pollution and overfishing. These solutions should aim to enact the PERSGA conservation goals and Action Plan. Implementation of the SWA's protected area system plan should be prioritized and the designation process streamlined to facilitate the country's meeting its international obligations under the Convention on Biological Diversity. Cost-benefit analysis should also be included in any new framework.

²⁴² See *id.* at 13.

²⁴³ See Federal Law No. 24, *supra* note 216.

Placing an economic value on the health of the natural environment provides a concrete reason to enforce environmental regulations beyond pie-in-the-sky principles.

More robust rules should also be enforced. For instance, EIAs for projects that will impact the Red Sea should be examined more thoroughly. Current regulations do not specify a point at which it is mandatory to make changes or even abandon plans for a certain project. They only require that those who wish to implement projects present a statement of adherence to the relevant environmental standards.²⁴⁴ Under a new framework, a project should undergo a structured cost-benefit analysis. This would consider the value of a project vis-à-vis its environmental harm and the resulting economic damage. After a certain percentage of degradation, there should be a rule mandating changes to the project's plans in order to lessen its impact on the environment, or even abandon it altogether.

Any new law that fails to address the motivations of violators and incentivize them to balance their needs with environmental goals will ultimately fall short. Rather than idealistically aiming to eradicate negative behavior, curtailing the amount and impact of such pollution may bring about more effective results. One possible addition to the law would be a permitting regime that requires polluters to obtain in advance permits or licenses to pollute, restricted by specific amounts of discharge quotas. In order to obtain such permits, polluters would have to quantify the amount of waste materials that they would previously have surreptitiously dumped into the natural environment. This information would then be disclosed to a monitoring body, such as the GAMEP. In addition to using this data to allocate permits, a regulatory agent could utilize this data to help maintain ambient water quality under current laws. To enact such a regime would thus be an excellent step towards keeping any pollution regulated, monitored and under control.

Similarly, in order to tackle overfishing, the underlying problem addressing violators' incentives must be addressed. Fishermen do not have property rights in fish until they catch them, thus encouraging all-out efforts that disregard any sustainable long-term maintenance of the natural habitat. Many fishery management experts now argue that catch shares,

²⁴⁴ See Royal Decree no. M/34, *supra* note 238, at art. 5(5).

predicated on binding annual catch limits, are necessary to protect the long-term sustainability of fisheries.²⁴⁵ As in the United States, these limits should be based on empirical evidence, and research from KAUST and KAU would be well placed to provide such data.

It is also necessary to introduce additional rules that manage issues such as off-seasons, the number of fishing boats and tools allowed, no-take zones, and laws that control or ban fishing of endangered species such as sharks. These measures, which should be adopted as part of a comprehensive framework to address fishery depletion in the region, would adhere to the principles of the Food and Agriculture Organization's Code of Conduct for Responsible Fisheries.²⁴⁶ Relevant clauses include Article 6.5, advocating the implementation of a precautionary approach for exploiting marine resources, as well as Article 7.1.8, recommending that states oversee fishing efforts to confirm that they are appropriate to "sustainable use of fishery resources."²⁴⁷ In Saudi Arabia, such measures must be established, implemented, and monitored effectively. The failed 2008 ban on shark fishing can serve as a cautionary tale for future conservation efforts.²⁴⁸

An additional lesson learned from previously unsuccessful attempts at environmental conservation is the importance of enacting a more stringent penalty regime. Too-low penalties provide incentives for violators to exploit resources at will. Paying meager penalties for any harm caused ultimately may make more rational economic sense than shouldering the requisite costs to conform to the law. A more robust penalization system must be put in place, with heavier fines that reflect the magnitude and consequences of these crimes. Imprisonment may be included among the penalties that may be imposed on offenders as an appropriate deterrent, as is the case in the UAE.²⁴⁹ Raising penalties will only have an impact, however, if the penalties are adequately enforced. This will be more closely examined in the next section.

²⁴⁵ See Christopher Costello, Steven Gaines, & John Lynham, *Can Catch Shares Prevent Fisheries Collapse?*, 321 *SCIENCE* 1678, 1680 (2008).

²⁴⁶ See Food and Agriculture Org., Code of Conduct for Responsible Fisheries, U.N. doc. 92-5-103834-5 (1995).

²⁴⁷ *Id.* at art. 6.5, 7.1.8.

²⁴⁸ See Spät, *supra* note 50.

²⁴⁹ See Federal Law No. 23, *supra* note 219.

B. Policy Steps

As this Note has established, even if Saudi Arabia's regulations were improved to deal appropriately with these problems, it would still probably be inadequate to deal with the issues that face the Red Sea's environment. Many of the rules already in place are not enforced to the degree necessary to provide real protection for the environment. In order to address this problem, it is imperative to refocus on the necessity of efficient and stringent application of laws, and overhaul the current institutional framework.

First, it is necessary to reevaluate the practice and role of the GAMEP. The dismal state of enforcement of the laws exposes clear shortcomings in the agency's fulfillment of its designated role. Whether the root cause of this is lack of resources, lack of drive from higher authorities, or simple ineptitude, this lack of enforcement must be evaluated and addressed. For instance, legal violations often go undetected. The GAMEP must reinvigorate its efforts to monitor violations of the law, such as sewage dumping. Challenges with monitoring can be solved through creatively utilizing existing regulations. For instance, current border control regulations could be used to enforce quotas to address overfishing. Each fishing boat must report to the coast guard authorities whenever leaving or returning to port. At this time, these guards could investigate each boat's catch to ensure it does not exceed the overfishing quota, without requiring additional personnel training or cost.²⁵⁰

Though the GAMEP does have shortcomings, the blame cannot be placed solely on the agency. The GAMEP lacks much of the authority customarily granted to other environmental agencies worldwide, such as EPA. Because a disproportionate percentage of Saudi polluters are governmental entities themselves, there is a need to strengthen the GAMEP's mandate among other agencies, to bring them to justice.²⁵¹

The aforementioned overlapping environmental mandate of different governmental authorities has the potential to ensure more stringent environmental protection. Ideally, these institutions would provide checks on each other, fill any gaps left by others,

²⁵⁰ See Spät, *supra* note 50, at 83–84.

²⁵¹ See *80% of Jeddah Coast Pollution Caused by Government Departments*, ARAB NEWS (Jan. 22, 2013).

and reduce the burden of concentrated responsibility on the GAMEP. This has worked well in the UAE, whose two-level system of federal and emirate government and multiple relevant institutions has enabled it to enact and enforce more robust environmental protection laws.

However, in Saudi Arabia, such fragmentation is a key issue that has prevented adequate implementation of the laws. This is due to a lack of cooperation and coordination between the relevant agencies, and an inefficient bureaucracy. The institution of an environmental task force comprising the relevant agencies, dedicated specifically to Red Sea conservation issues, could help address this problem. Representatives from each agency would meet periodically to address current issues, which would ensure that each authority is tackling them adequately and is being held accountable. Key to this pursuit is for each agency to be fully integrated and aware of the efforts of others, and successfully coordinate with them to ensure maximum efficiency.

Further, since the GAMEP and other governmental agencies operate nationwide, municipal governments along the Red Sea should be granted greater authority to address local environmental issues, to offset potential weakness on the GAMEP's part. These local governments are often the first line of defense against urgent environmental issues, as they have the greatest incentives to solve these issues and fastest response capabilities. They have already been afforded the responsibility of achieving a more environmentally sustainable urban environment, such as formulating regulations for green buildings.²⁵² The appropriate resources and funds should be provided to them, so as to ensure that municipalities can implement the requisite laws without being overwhelmed. Sections within the Jeddah municipality that deal with Red Sea issues should also be granted additional support.

Greater involvement on the part of other, non-governmental local actors should also be enabled. Emulating the success in other countries of grassroots-level, bottom-up efforts for environmental action might be vital in holding governmental agencies accountable.²⁵³ Civil representatives of the concerned local

²⁵² See OXFORD BUSINESS GROUP, *Saudi Arabia Seeks to Reduce Energy Waste and Environmental Impact*, in THE REPORT: SAUDI ARABIA (2015).

²⁵³ See Archon Fung & Dara O'Rourke, *Reinventing Environmental Regulation From the Grassroots Up: Explaining and Expanding the Success of the Toxics Release Inventory*, 25 ENVTL MGMT. 115, 124 (2000).

population, such as divers' associations and universities, should be able to present their complaints to the government bodies concerned, whether the GAMEP and other national agencies or the municipality.

Should any kind of environmental task force such as the one suggested above be implemented, such representatives, as well as the municipality, should also have a place at the table. Furthermore, independent judicial oversight should be sought by enabling concerned citizens or organizations to initiate lawsuits against polluters. Governmental bodies charged with enforcement, such as the GAMEP or the municipality, that have not adequately implemented the laws might also be potential targets for litigation. Finally, it might also be useful to allow the GAMEP to bypass courts altogether to charge polluters directly, as in the UAE, given the enormous backlog at the docket of many courts within the country.

C. “Big Picture” Steps

Along with the necessary legal and policy improvements, a number of system-wide background changes should take place to ensure the longevity of these advancements, and guarantee their adequate long-term implementation. Implementing such change will be more arduous than strengthening regulations or creating a streamlined enforcement environment, in the face of practical and financial obstacles. Other wholesale societal and governmental shifts in attitude are challenging to bring about by definition.

One example is the necessity for an infrastructure update to finally give Jeddah a modern and comprehensive citywide sewage system. This system must reach all of Jeddah's inhabitants, and efficiently treat sewage to the degree that it can be re-released into the sea without negative environmental consequence. Perhaps no legal steps will be as effective in negating harmful pollution from sewage discharge as this practical solution. However, it will be time-consuming and costly, and thus may not be viable in the current fiscal environment. According to the deputy chairman of the Saudi Environment Society, it would cost 75 billion Saudi riyals to establish a comprehensive sewage system in Jeddah.²⁵⁴ These difficulties aside, implementing a sewage system is a goal

²⁵⁴ See *Pollution Threatens Gulf Coral Reefs*, ARAB NEWS (Nov. 1, 2015), <http://www.arabnews.com/saudi-arabia/news/828846>.

widely acknowledged by the municipal government to be an essential element of modernizing Jeddah's infrastructure. Overall, the general perception is that it will eventually come about, whether in the next ten years or several decades. The question is whether it will happen in time to prevent irreversible damage to the Red Sea's habitat.

The second kind of change is that which brings about a more sustainable, organic shift of attitude and behavior on the part of society itself. The clearest example of this is the necessity for strengthened public awareness of environmental issues. The success of awareness campaigns undertaken in other countries, such as the UAE, to spur environmental consciousness should be a useful example. Additionally, other private sector actors in society should be encouraged to undertake environmental awareness campaigns, such as the previously mentioned fast food chain that was mentioned earlier.

Creating an informed and aware society that will curb its own negative habits and demand increased environmental protection from the authorities is the only real way to ensure adequate implementation of the laws. Nothing can be as effective as ensuring that each and every citizen is aware of their rightful role in safeguarding the treasures of the Red Sea for future generations. The relatively recent opening of the first aquarium in Saudi Arabia, the Fakieh Aquarium, on the Jeddah coastline was a sign of hope for many researchers. They expressed confidence that it would bring about the next generation of Saudi conservationists, eager to protect the marine wildlife they may never before have been able to imagine.²⁵⁵

Behavioral changes are also necessary to combat other issues. For instance, the usage of desalination will probably never be completely halted, simply because of Saudi Arabia's lack of many freshwater sources. The government should not wait for technical solutions to circumvent issues caused by current before taking action. It is necessary, both for the Red Sea's environment and for the sustainability of Saudi water usage as a whole, to encourage greater water conservation by the Saudi population. One significant factor in enabling widespread wastage has been the low price of water, fixed by generous governmental subsidies. However, in recent months, the government made a number of

²⁵⁵ See Weche, *supra* note 10.

important decisions with regard to lifting the subsidies and increasing charges on water consumption.²⁵⁶ Data on whether or not this increase in price caused cuts in consumption is not yet available, but if so, it would be a welcome change in longtime profligate habits. Along with raising water prices, researchers have suggested a number of possible strategies, such as awareness campaigns and mandatory quotas, to further bring down consumption and thus the demand for desalination.²⁵⁷

Another area of concern that requires a widespread paradigm shift by the Saudi population is climate change. The existential threat it poses to Saudi Arabia's way of life cannot be overstated, due to the entire economy's dependency on fossil fuels. Behavioral changes must also be undertaken to lessen individual carbon footprints. Saudi Vision 2030 is an important step forward to curb the country's "oil addiction." While its content on environmental conservation was limited, it is to be hoped that the new generation of rulers will be aware of the need for Saudi Arabia to minimize its greenhouse gas emissions while growing its economy. A number of ambitious steps are outlined in the document, which will have to be navigated carefully to ensure that the aimed-for growth in the Saudi economy is decoupled from greenhouse gas emissions.

Vision 2030 could also provide a more pragmatic aid for the Red Sea, due to its stated intentions to intensify efforts to develop and expand the Saudi tourism sector. The potential for tourism in these areas is huge, which intersects well with those plans. This could provide the requisite political will to implement enforceable changes to current practices that damage the long-term viability and health of marine life in the region. Environmental protection might climb up the political agenda by reframing it as yielding concrete economic benefits, rather than being motivated solely by moral, ethical, and scientific considerations. It would also bring about more concerned constituencies to support environmental protection, such as eco-lodges and other nature-based tourism-related industries. These could in turn generate pressure on governmental agencies such as the GAMEP to bring about more

²⁵⁶ See Somya Rajawat, *Saudi Arabia Faces Possible Backlash over Cuts to Water Subsidies*, FUTURE DIRECTIONS INT'L (May 11, 2016), <http://www.futuredirections.org.au/publication/saudi-arabia-faces-possible-backlash-cuts-water-subsidies/>.

²⁵⁷ See Omar K. M. Ouda et al., *Review of Domestic Water Conservation Practices in Saudi Arabia*, 3 APPLIED WATER SCI. 689, 689–99 (2013).

stringent regulations, and more effective enforcement of the laws.

CONCLUSION

The Red Sea has been a place of ethereal, otherworldly underwater beauty for thousands of years. In order to protect this interwoven abundance of coral reef, mangrove, and sea grass habitats, it is high time for Saudi Arabia to live up to its own religious tradition of maintaining the environment's sanctity. This will entail improving the strength and application of its environmental laws, through emulating the best practices of other countries and international standards, and raising environmental awareness among its citizens. It will also be necessary to create and implement plans to safeguard environmental health while maintaining accelerated economic development. In this way, the nation can value the treasure of the Red Sea as it should be valued, and grant it the effective protection it deserves.