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Let the Sunshine In: A Proposal to Ban Chemical Sunscreen

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INTRODUCTION

Some of the best travel destinations in the world are beaches, such as Bora Bora, Maui, and Tahiti.¹ With the peaceful sand, the tranquil sound of waves crashing, and the warmth of the sun, beaches are more than just Instagram-worthy; they are good for our mental

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¹ *World's Best Places to Visit*, U.S. NEWS & WORLD REPS., <https://travel.usnews.com/rankings/worlds-best-vacations> (last visited Mar. 19, 2021).

health.² However, beaches do more than relax us; they help economies all over the world.³ In some countries, fisheries and tourism are the only means of economy.⁴ Tourism has a large impact on beach town economies because of the beaches but also because of the exhilarating world that lives beneath the ocean surface, such as coral reefs.⁵

Millions of people travel to beaches all over the world. Most of these people wear chemical sunscreen,⁶ which dominates the sunscreen market.⁷ Chemical sunscreen is defined as any type of sunscreen that contains chemicals; the main three chemicals used are oxybenzone, octinoxate, and octocrylene, and they are detrimental to human health and our oceans.⁸

Chemicals cause damage to coral reefs⁹ and, thus, affect tourism, fisheries, economies, and biodiversity internationally. For example, the number of scuba divers and snorkelers who explore the oceans illustrates how significant they are to the tourism industry as there are about six million licensed scuba divers and twenty million snorkelers globally.¹⁰ These ocean enthusiasts travel all over the world. As chemical damage is an international problem, it requires an international solution. A few small nations and cities have proposed bans on chemical sunscreen, but local bans will have only minimal effect on the problem. This issue is global, not local, so the only means of an effective resolution requires international cooperation.

² *5 Reasons Why You Need a Beach Vacation*, NORWEGIAN CRUISE LINE (May 22, 2015), <https://www.ncl.com/travel-blog/five-reasons-beach-vacation> [https://perma.cc/R4VC-CGS8].

³ *Coral Reefs Support Jobs, Tourism, and Fisheries*, FLA. KEYS NAT'L MARINE SANCTUARY, <https://floridakeys.noaa.gov/corals/economy.html> [https://perma.cc/TPR5-FKXN] (last visited Mar. 19, 2021) [hereinafter *Coral Reefs*].

⁴ *Id.*

⁵ *Fast Facts: Recreational Scuba Diving and Snorkeling*, DIVING EQUIP. & MKTG. ASS'N, 6–7, <https://www.dema.org/store/download.aspx?id=7811B097-8882-4707-A160-F999B49614B6> [https://perma.cc/W63C-4AS7] (last visited Mar. 19, 2021) [hereinafter *Fast Facts*].

⁶ See *EWG's Sunscreen Guide: EWG's 14th Annual Guide to Sunscreens*, ENV'T WORKING GRP., <https://www.ewg.org/sunscreen/report/executive-summary> [https://perma.cc/YXF3-BQPX] (last visited Mar. 19, 2021).

⁷ *Id.*

⁸ *Id.*

⁹ Elaine Glusac, *Hawaii Passes Bill Banning Sunscreen That Can Harm Coral Reefs*, N.Y. TIMES (May 3, 2018), <https://www.nytimes.com/2018/05/03/travel/hawaii-sunscreen-ban.html> [https://perma.cc/TZP5-WWK5].

¹⁰ *Fast Facts*, *supra* note 5, at 1.

Therefore, there should be an international ban on sunscreen with chemicals. As evident from previous international agreements,¹¹ successfully implementing an international environmental agreement has its own difficulties. Hence, this Comment will focus on the need for an international ban on chemical sunscreen and how to form an effective framework for an international ban based upon successful international bans. First, this Comment will describe the current problems with sunscreen. Next, this Comment will analyze the current laws in places that ban sunscreen with octinoxate, oxybenzone, and octocrylene. Then, this Comment will analyze the structure and success of other international environmental initiatives, mainly the Montreal Protocol, as a preliminary framework for an international ban on sunscreen, and it will analyze the failure of international agreements, such as the Paris Agreement. Finally, this Comment will discuss the success potential of an international ban on chemical sunscreen.

I

DANGERS OF CHEMICAL SUNSCREEN

A. Harmful Impacts of Sunscreen on People

Sunscreen is an important invention. It prevents third-degree sunburns and decreases susceptibility to skin cancer.¹² Fortunately, countries do not want to ban sunscreen itself, but rather, sunscreen containing octinoxate, oxybenzone, and octocrylene.¹³ But these chemicals have a purpose for being in sunscreen.¹⁴ These chemicals are used because they actually block both types of the sun's damaging ultraviolet (UV) rays from entering the skin.¹⁵ The two types of sun UV rays are the long waves of ultraviolet A (UVA), which penetrate deep layers, and the short waves of ultraviolet B (UVB), which affect the

¹¹ See *infra* Part II–III, discussion on success and failure of international agreements.

¹² See generally John Stoddard, *8 Reasons to Wear Sunscreen This Summer*, UNITY POINT HEALTH (Aug. 1, 2018), <https://www.unitypoint.org/desmoines/article.aspx?id=e0a22a4f-77c7-4a9a-b779-ed3c37956982> [<https://perma.cc/CB9E-FH9V>].

¹³ Glusac, *supra* note 9.

¹⁴ Julia Brucculieri, *What You Should Know About Sunscreen Chemicals Oxybenzone and Octinoxate*, HUFFPOST (May 4, 2018, 5:46 AM), https://www.huffpost.com/entry/oxybenzone-chemical-sunscreen_n_5aeb38b0e4b0c4f1931ffce0 [<https://perma.cc/H7NS-HJ7P>].

¹⁵ *Id.*

superficial skin layer.¹⁶ Both are damaging.¹⁷ Even with some of the good effects of chemical sunscreen, they have been linked to other problems.¹⁸

First, chemical sunscreen must be applied frequently to be effective.¹⁹ Every time a person goes in the water, they must apply a new coat of sunscreen.²⁰ Most people go back and forth from the beach to the ocean, which exacerbates the problem by adding more chemicals into the ocean.²¹ Second, chemical sunscreen takes time to be effective because the skin has to absorb the sunscreen into deeper layers to protect the body from UVA rays.²² Third, some allergic reactions have been linked to chemical sunscreen containing oxybenzone.²³ Fourth, oxybenzone has been found in the blood of most people tested and affects the endocrine system, which is the system that produces hormones.²⁴ For instance,

[i]n 2008, the US Centers for Disease Control and Prevention analyzed urine samples . . . and found oxybenzone in 97% of the samples. Since then, studies have shown a potential link between oxybenzone and lower testosterone levels in adolescent boys, hormone changes in men, and shorter pregnancies and disrupted birth weights in babies²⁵

Additionally, “[a] Swiss study found oxybenzone or one of four other sunscreen chemicals in 85% of breast milk samples, sparking concern that newborns could be exposed.”²⁶ Moreover, “[o]xybenzone has been linked to numerous [other] health risks, including

¹⁶ *Sunscreen Facts: What You Should Know*, COOLA, <https://www.coola.com/pages/sun-science> [<https://perma.cc/ZFB7-KPRX>] (last visited Mar. 20, 2021).

¹⁷ *Id.*

¹⁸ Bruculieri, *supra* note 14.

¹⁹ Amanda Frick, *Pros and Cons of Different Types of Sunscreen*, THORNE (July 5, 2019), <https://www.thorne.com/take-5-daily/article/pros-and-cons-of-different-types-of-sunscreen> [<https://perma.cc/9SKZ-VLTY>].

²⁰ *Id.*

²¹ *Id.*

²² *Id.*

²³ *Id.*

²⁴ *Id.*

²⁵ Sandee LaMotte, *Sunscreen Enters Bloodstream After Just One Day of Use, Study Says*, CNN (May 6, 2019, 4:18 PM), <https://www.cnn.com/2019/05/06/health/sunscreen-bloodstream-fda-study/index.html> [<https://perma.cc/X5LH-E2CW>]; see also C.A. Downs et al., *Toxicopathological Effects of the Sunscreen UV Filter, Oxybenzone (Benzophenone-3), on Coral Planulae and Cultured Primary Cells and Its Environmental Contamination in Hawaii and the U.S. Virgin Islands*, 70 ARCHIVES ENV'T CONTAMINATION & TOXICOLOGY 265, 266 (2015).

²⁶ LaMotte, *supra* note 25.

endometriosis and poor sperm quality [O]ther studies report statistically significant associations between oxybenzone exposure and adverse birth outcomes, including . . . [an] increased risk of Hirshsprung’s disease.”²⁷

In response, many companies, such as Raw Elements and TropicSport, have created reef-safe sunscreens.²⁸ They use a non-nanoparticle zinc oxide to block the sun.²⁹ Non-nanoparticle zinc oxide is an active ingredient in chemical sunscreen that still provides UV protection without being harmful to the oceanic environment.³⁰ Further, “[t]he mineral sunscreens zinc oxide and titanium oxide have enough safety data to be designated as safe and effective by the FDA [Food and Drug Administration]” because they are not “absorbed through the skin and [do not] enter[] the bloodstream.”³¹ As there is already an effective alternative to chemical sunscreen, global implementation of a ban on chemical sunscreen will more than likely be successful.

B. Harmful Impacts of Sunscreen to Coral Reefs

Other than potential damage to humans, sunscreen harms coral reefs. Octinoxate and oxybenzone are linked as a cause of coral bleaching in adult coral and mutations in young coral, which prevents coral from growing normally to adulthood.³² There are multiple reasons for protecting coral reefs from the devastation of coral bleaching.

Coral reefs are a \$100 million industry in the United States³³ and a \$375 billion industry through tourism and fisheries worldwide.³⁴ Moreover, coral reefs provide food resources for millions of people.³⁵

²⁷ Frick, *supra* note 19 (footnotes omitted).

²⁸ Glusac, *supra* note 9.

²⁹ Brucculieri, *supra* note 14.

³⁰ *Id.*

³¹ Frick, *supra* note 19.

³² Maritza Moulite, *Hawaii Bans Sunscreens That Harm Coral Reefs*, CNN (July 3, 2018, 6:21 PM), <https://www.cnn.com/2018/07/03/health/hawaii-sunscreen-ban/index.html> [<https://perma.cc/NT2N-3FTH>].

³³ *The Importance of Coral Reefs*, NAT’L OCEANIC & ATMOSPHERIC ADMIN., https://oceanservice.noaa.gov/education/tutorial_corals/coral07_importance.html [<https://perma.cc/VZ28-4NBK>] (last visited Mar. 20, 2021) [hereinafter *Coral*].

³⁴ *Coral Reefs*, *supra* note 3.

³⁵ *Id.*

With dying coral, reefs cannot sustain the high amount of marine wildlife to which people have grown accustomed.³⁶

Another reason to protect reefs is to sustain the critically important need for environmental biodiversity.³⁷ Coral reefs are home to more than “4,000 species of fish, 800 species of hard corals[,] and hundreds of other species.”³⁸ Additionally, scientists agree that there are probably millions of other organisms that have not been discovered around coral reefs.³⁹ The importance of biodiversity is its beneficial impact on humans. For example, there are many drugs—used for potential cancer cures, for antibiotics, and cures for other diseases—that have been developed from organisms that live on or in coral.⁴⁰

Coral reefs also need protection because they act as a buffer for the coastline.⁴¹ Whether from erosion, flooding, or hurricanes, waves can be detrimental to the coast.⁴² Reefs can help mitigate the damage by decelerating waves, which in turn protects humans and coastal deterioration.⁴³ Additionally, “[o]ver one-third of the total human population, nearly 2.4 billion people, lives within 100 km (60 miles) of an oceanic coast.”⁴⁴ Thus, protecting coral reefs is vitally important for the survival of billions of people across the world.

Even with the importance of coral reefs, they are still dying at a frightening rate.⁴⁵ In the last thirty years, more than fifty percent of reefs have died, and scientists predict that over ninety percent may die this century.⁴⁶ The main reason coral reefs die is coral bleaching.⁴⁷ In 2015, there was a large-scale bleaching episode that killed massive amounts of coral.⁴⁸ Coral bleaching has been linked to many deleterious effects, such as the increase of global temperature, the destruction of biodiversity, and the destruction from the fishing and

³⁶ *Coral*, *supra* note 33.

³⁷ *Id.*

³⁸ *Id.*

³⁹ *Id.*

⁴⁰ *Id.*

⁴¹ *Id.*

⁴² *Id.*

⁴³ *Id.*

⁴⁴ *Living Ocean*, NAT'L AERONAUTICS & SPACE ADMIN., <https://science.nasa.gov/earth-science/oceanography/living-ocean> [<https://perma.cc/D3VY-988B>] (last updated Oct. 13, 2020).

⁴⁵ *Why Coral Reefs Need Our Help*, SECORE, <http://www.secore.org/site/corals/detail/coral-reefs-are-dying.23.html> (last visited Mar. 21, 2021).

⁴⁶ *Id.*

⁴⁷ *See id.*

⁴⁸ *Id.*

tourism industry.⁴⁹ Coral bleaching has also been linked to chemical sunscreen.⁵⁰

Although sunscreen has been proven to be beneficial to humans,⁵¹ sunscreen is destroying the destinations that people want to see, by being linked to coral bleaching.⁵² This bleaching destroys the natural beauty of those sites. Approximately 14,000 tons of sunscreen are washed off in the ocean and absorbed by coral reefs every year, killing the coral and ruining not only their pristine beauty but destructively altering an already fragile ecosystem.⁵³ Coral bleaching is ruining large portions of coral around the world.⁵⁴ Some places throughout the world are trying to do their part in decreasing the impact of these problems by banning sunscreen that contain the harsh chemicals of octinoxate, oxybenzone, and octocrylene that damage the coral. The only problem with this noble effort is that it is far too small an effort when coral bleaching is such a global problem. Additionally, the oceans move; the current migrates water all over the globe to the point that water that started in the Arctic Ocean will eventually migrate down to the Antarctic and back up to the Arctic again.⁵⁵ To make a long-lasting impact to help the dying coral reefs, the world must come together and create an international law to ban sunscreen that contains octinoxate, oxybenzone, and octocrylene, not just individual city or country initiatives.

C. Hawaii Bans Sunscreen Containing Toxic Chemicals

While it is important to ban internationally, it is also instructive to examine local initiatives to ban sunscreen. In 2018, Hawaii passed a law banning the sale of sunscreen containing octinoxate, oxybenzone, and octocrylene.⁵⁶ As of 2019, Hawaii is the only state in the United

⁴⁹ *Id.*

⁵⁰ Moulite, *supra* note 32.

⁵¹ Bruculieri, *supra* note 14.

⁵² Glusac, *supra* note 9.

⁵³ Bruculieri, *supra* note 14.

⁵⁴ *What Is Coral Bleaching?*, NAT'L OCEANIC & ATMOSPHERIC ADMIN., https://oceanservice.noaa.gov/facts/coral_bleach.html [<https://perma.cc/E2SQ-LTT3>] (last visited Mar. 21, 2021).

⁵⁵ *See generally Ocean Currents*, NAT'L OCEANIC & ATMOSPHERIC ADMIN., <https://www.noaa.gov/education/resource-collections/ocean-coasts/ocean-currents> [<https://perma.cc/J2GG-QWUL>] (last visited Mar. 21, 2021).

⁵⁶ HAW. REV. STAT. § 342D-21 (2018) (formally known as S.B. 2571, 29th Leg., Sess. (Haw. 2018)); *see also* Shannon McMahon, *What Travelers Need to Know About Sunscreen*

States to ban such sunscreen.⁵⁷ Hawaii is not the only area to ban these sunscreens, however. Some other small areas to ban chemical sunscreen are Key West, Florida; Bonaire, Caribbean Netherlands; Palau, Oceania;⁵⁸ U.S. Virgin Islands; and particular areas in Mexico, such as Garrafon Natural Reef Park and the Riviera Maya.⁵⁹ However, while many of these bans do not go into effect until 2021, the U.S. Virgin Islands ban started March 30, 2020.⁶⁰ While the European Union has not initiated any formal bans, it

has mostly replaced oxybenzone in its sunscreen products with newer, more protective substances that block out more of the dangerous UVB and UVA rays. But those newer products have not passed the safety tests needed for FDA approval. So oxybenzone remains in use; in fact, a 2018 report by the EWG [Environmental Working Group] estimated that it was in two-thirds of all chemically based sunscreens sold in the United States.⁶¹

The importance of these bans cannot be overstated. In addition to being highly toxic to—and in some cases, killing—juvenile and adult coral, sunscreen chemicals affect the growth of green algae, mussels, sea urchins, fish, dolphins, and other creatures in the ocean.⁶² As stated by the Governor of the U.S. Virgin Islands, Albert Bryan Jr., coral reefs and “[t]ourism in the Virgin Islands is our lifeblood.”⁶³ In order to preserve this driver of the economy and “to ensure we continue to entice visitors with our world-class beaches and natural beauty in the coming years, we need to protect our coral reefs . . . This is crucial all

Bans, USA TODAY (Apr. 18, 2019), <https://www.usatoday.com/story/travel/destinations/2019/04/18/sunscreen-bans-hawaii-key-west-bonaire-palau-mexico/3497701002> [<https://perma.cc/UB55-LPF8>] [hereinafter McMahon, *Travelers Need to Know*].

⁵⁷ McMahon, *Travelers Need to Know*, *supra* note 56.

⁵⁸ *Id.*

⁵⁹ Shannon McMahon, *6 Destinations with Sunscreen Bans, and What You Need to Know*, SMARTERTRAVEL (Aug. 20, 2019), <https://www.smartertravel.com/sunscreen-ban-destinations> [<https://perma.cc/UB55-LPF8>].

⁶⁰ Matt Turner, *USVI'S Sunscreen Ban Officially Takes Effect*, TRAVEL AGENT CENT. (Mar. 31, 2020, 2:43 P.M.), <https://www.travelagentcentral.com/caribbean/usvi-s-sunscreen-ban-officially-takes-effect> [<https://perma.cc/BCQ9-SV2Y>].

⁶¹ LaMotte, *supra* note 25.

⁶² *Skincare Chemicals and Coral Reefs*, NAT'L OCEANIC & ATMOSPHERIC ADMIN., <https://oceanservice.noaa.gov/news/sunscreen-corals.html> [<https://perma.cc/XWT2-E8ZX>] (last visited Mar. 21, 2021).

⁶³ Mary Forgione, *U.S. Virgin Islands' Ban on Harmful Sunscreens to Go into Effect Jan. 1*, L.A. TIMES (Aug. 28, 2019), <https://www.latimes.com/travel/story/2019-08-27/us-virgin-islands-ban-on-harmful-sunscreens-to-go-into-effect-jan-1> [<https://perma.cc/H73C-D895>].

over the Caribbean.”⁶⁴ While sunscreen chemicals are not the only cause of coral bleaching, they intensify the problem caused by increasing global temperatures and climate change.⁶⁵ Overall, banning sunscreen with oxybenzone, octinoxate, and octocrylene is probably not the hardest issue on which the world could come to an agreement. Thus, the time has come to form an international agreement to ban sunscreen that contains octinoxate, oxybenzone, and octocrylene.

II

FRAMEWORK OF A SUCCESSFUL INTERNATIONAL AGREEMENT: MONTREAL PROTOCOL

A. The Efficacious Montreal Protocol

While there are cynics who will say that international environmental agreements do not work—mainly, from free rider problems⁶⁶—an international ban on sunscreen has potential for success. In order to form a successful and functioning international agreement, we must look at an international environmental agreement that was widely successful, the Montreal Protocol. The Montreal Protocol is considered so successful because it was “flexible [and] innovative, and [it had] effective approaches.”⁶⁷ It was an agreement signed in 1987 by the world to eradicate production of ozone-depleting substances, such as chlorofluorocarbons [CFCs].⁶⁸

⁶⁴ *Id.*

⁶⁵ *Skincare Chemicals and Coral Reefs*, *supra* note 62.

⁶⁶ “The free rider problem is the burden on a shared resource that is created by its use or overuse by people who aren’t paying their fair share for it or aren’t paying anything at all.” Jim Chappelow, *Free Rider Problem*, INVESTOPEDIA (July 25, 2019), https://www.investopedia.com/terms/f/free_rider_problem.asp [<https://perma.cc/Y9QX-EWAV>]. Free riders are “considered a failure of the conventional free market system,” and “[t]heir failure to contribute makes the resource economically infeasible to produce.” *Id.*; *see also* Derek Kellenberg & Arik Levinson, *Waste of Effort? International Environmental Agreements*, VOX (Mar. 1, 2014), <https://voxeu.org/article/international-environmental-agreements-don-t-work> [<https://perma.cc/768D-CV7T>].

⁶⁷ *The Montreal Protocol on Substances that Deplete the Ozone Layer*, U.S. DEP’T OF STATE (Feb. 11, 2019), <https://www.state.gov/key-topics-office-of-environmental-quality-and-transboundary-issues/the-montreal-protocol-on-substances-that-deplete-the-ozone-layer> [<https://perma.cc/E6YZ-EVU8>] [hereinafter *The Montreal Protocol*].

⁶⁸ *Id.*

Before the agreement, there was an increasing hole in the ozone,⁶⁹ which was problematic because the ozone blocks destructive UV rays from entering the atmosphere.⁷⁰ More than thirty years after the Montreal Protocol, the ozone hole is the smallest it has ever been since the discovery of the ozone hole,⁷¹ which demonstrates how successful the Montreal Protocol was. Additionally, the ozone layer is expected to make a full recovery by 2050.⁷² It was so successful that on October 15, 2016, the parties adopted the Kigali Amendment, which is meant to phase out hydrofluorocarbons, which replaced the ozone-depleting CFCs and hydrochlorofluorocarbons in the original Montreal Protocol.⁷³ Not only did parties of the Montreal Protocol support this amendment, individual companies supported the amendment and are working diligently to decrease their use of hydrofluorocarbons.⁷⁴ Therefore, to have any effective international environmental ban, it should be modeled after the framework of the Montreal Protocol.

B. The Framework of the Montreal Protocol

There are many factors that led to the successful ban on CFCs, and many of these factors are similar to a potential ban on chemical sunscreen. Thus, when framing an international ban on sunscreen, it is important to analyze the successful elements of the Montreal Protocol.

First, the United States was a prominent leader in the Montreal Protocol.⁷⁵ A study, which was strongly supported around the world, stated that CFCs were linked to the destruction of the ozone layer, and the destruction of the ozone layer was “connected to increased skin cancer diagnoses.”⁷⁶ These reports were alarming to many people and “provoked an immediate response from other scientists, the federal

⁶⁹ See generally Lidia Wassenhoven, *Ozone Hole History*, THE OZONE HOLE (June 2, 2006), <https://www.theozonehole.com/ozoneholehistory.htm> [<https://perma.cc/AB7W-QSMU>].

⁷⁰ *The Montreal Protocol*, *supra* note 67.

⁷¹ Eleanor Imster, *2019 Ozone Hole Is the Smallest on Record Since Its Discovery*, EARTH SKY (Oct. 22, 2019), <https://www.earthsky.org/earth/2019-ozone-hole-smallest-since-its-discovery-video> [<https://perma.cc/XX6Y-J4Z4>].

⁷² Stephen Leahy, *Without the Ozone Treaty You'd Get Sunburned in 5 Minutes*, NAT'L GEOGRAPHIC (Sept. 25, 2017), <https://www.nationalgeographic.com/news/2017/09/montreal-protocol-ozone-treaty-30-climate-change-hcfs-hfcs.html> [<https://perma.cc/3272-QZ9M>].

⁷³ *The Montreal Protocol*, *supra* note 67.

⁷⁴ Leahy, *supra* note 72.

⁷⁵ *The Montreal Protocol*, *supra* note 67.

⁷⁶ Olga Goldberg, *Biodegradable Plastics: A Stopgap Solution for the Intractable Marine Debris Problem*, 42 TEX. ENV'T L.J. 307, 338 (2012).

government, and [the] industry.”⁷⁷ While the industry tried to discredit this information, the United States government took swift action to counter the increasing ozone hole.⁷⁸ The immediate action and determination by the United States is one of the reasons the Montreal Protocol is considered so successful.

While it may seem hard to believe that one country can have that much influence over the rest of the world, the United States has been considered a world powerhouse since World War II⁷⁹ because it has “the world’s foremost economic and military power. . . . It has the third largest population, and its economy produces around one quarter of the world’s wealth.”⁸⁰ Additionally, the United States “provides the greatest amount of international aid.”⁸¹ Thus, the world watches the actions of the United States. If the United States proposed an international ban on chemical sunscreen, the probability of success would increase dramatically, especially as the European Union is already phasing out chemical sunscreen,⁸² but the United States must be the major influence behind this treaty.

Second, the United States not only took strong international action, but it also took strong internal action to eradicate products that contain ozone-depleting substances.⁸³ The federal government created a task force to investigate if CFCs were a real reason for concern.⁸⁴ Because of this swift internal action, the United States–funded studies “definitively stated that ‘substantial growth in CFCs will bring large ozone depletion, regardless of the trends in other pollutants.’”⁸⁵ Because of this study, the United States conducted a cost-benefit analysis that showed increased cases of skin cancer outweighing industry regulations.⁸⁶ Thus, the United States had an extreme position on how much CFCs it should emit, which allowed the United States to have an aggressive position abroad because “[t]he U.S. was not asking

⁷⁷ *Id.*

⁷⁸ *Id.*

⁷⁹ See generally RONALD O’ROURKE & MICHAEL MOODIE, CONG. RES. SERV., R44891, U.S. ROLE IN THE WORLD: BACKGROUND AND ISSUES FOR CONGRESS 1 (2019).

⁸⁰ *The USA’s International Influence*, BBC BITESIZE, <https://www.bbc.co.uk/bitesize/guides/z6frq3/revision/2> [<https://perma.cc/NCF6-DXCC>] (last visited Mar. 22, 2021).

⁸¹ *Id.*

⁸² See *supra* p. 274.

⁸³ *The Montreal Protocol*, *supra* note 67.

⁸⁴ Goldberg, *supra* note 76.

⁸⁵ *Id.*

⁸⁶ *Id.* at 342.

for more stringent regulation than it was already willing to impose domestically.”⁸⁷

As aforementioned, there are a few places in the United States that have implemented policies against chemical sunscreen, but without national cooperation the United States will not have the advantage it had with CFCs. In order to have full cooperation, the United States must run a cost-benefit analysis of the disadvantages of chemical sunscreen for the industry.⁸⁸ But states having local initiatives can aid the nation to follow suit. For example, Oregon led the way for an international ban on CFCs because it banned CFC products in 1975, fourteen years before the Montreal Protocol went into effect.⁸⁹ In this case, Hawaii and parts of Florida are seeing the devastating impacts chemical sunscreen have on their environment so those local governments are implementing legislation to prevent further damage. Hopefully, the rest of the country does not take more than a decade to recognize the significance of releasing these chemicals into the oceans, as it did with CFCs.

Third, the Montreal Protocol had “financial provisions to assist in phase-outs,” which enabled poor countries to still phase out the ozone-depleting substances⁹⁰ and nonparticipation or noncompliance sanctions.⁹¹ For example, there were sanctions levied against a party if the party imported or exported products containing CFCs to nonparties.⁹² These sanctions were not needed as much because there were alternatives for CFCs already established by the time the Montreal Protocol went into effect.⁹³

As there are alternatives for chemical sunscreen that already exist, in the formation of the structure of an international ban on chemical sunscreen, there should be strict sanctions in a similar fashion to the Montreal Protocol. For instance, sanctions for importing or exporting

⁸⁷ *Id.*

⁸⁸ This can only be done with more research examining the adverse effects of chemical sunscreen, which have not been conducted. LaMotte, *supra* note 25.

⁸⁹ Chris Peloso, *Crafting an International Climate Change Protocol: Applying the Lessons Learned from the Success of the Montreal Protocol and the Ozone Depletion Problem*, 25 J. LAND USE & ENV'T L. 305, 311 (2010).

⁹⁰ Patrick Low, *Why the Montreal Protocol Is the Most Successful Climate Agreement Ever*, S. CHINA MORNING POST (Oct. 26, 2016, 11:01 AM), <https://www.scmp.com/business/article/2040177/why-montreal-protocol-most-successful-climate-agreement-ever> [<https://perma.cc/8CJT-88E3>].

⁹¹ Goldberg, *supra* note 76, at 342.

⁹² *Id.*

⁹³ Low, *supra* note 90.

chemical sunscreen with any nonparty. The rigorous nature of these sanctions is in part because we have such alternatives that it should not be challenging to ban all types of chemical sunscreen successfully.

Fourth, the Montreal Protocol had a technology transfer mechanism that enabled parties to share “technical information related to the alternative technologies that have been investigated and employed to . . . eliminate . . . [CFCs].”⁹⁴ While alternatives exist for chemical sunscreen, a provision for technology transfer is a smart provision to add because technology changes rapidly and new studies show new information. So, having all parties be privy to any findings would help stop these chemicals from entering the ocean, and the new technology would help consumers, as well.

Fifth, the members of the Montreal Protocol realized air pollution was a global problem, not just a local problem. Before the studies released by the United States government, CFCs and air pollution were considered local problems.⁹⁵ In the 1950s and 1960s, some judges held that air pollution was simply a localized nuisance.⁹⁶ After two decades of studies, scientists conclusively agreed that air pollution was a global problem.⁹⁷ Sunscreen damage to coral reefs is thought to be a local problem because the problem is where the sunscreen is being released into the oceans.⁹⁸ However, the water does not stay in one place, so damage to coral reefs is a global problem.⁹⁹ This is further suggested by the effect of coral reefs on the fishing and tourism industries.¹⁰⁰ Therefore, as with CFCs in the Montreal Protocol, the damage to the environment from chemical sunscreen can be found globally.

Finally, the biggest and most important similarity between CFCs and chemical sunscreen is the similarity in their production. Both products are human-made substances. Because they do not naturally exist, it is easier to eradicate them as opposed to substances that are found naturally.¹⁰¹ Accordingly, legislation that minimizes the use of human-

⁹⁴ *Technology and Economic Assessment Panel (TEAP)*, U.N. ENV'T PROGRAMME, <https://www.ozone.unep.org/science/assessment/teap> [<https://perma.cc/GG7W-VJA7>] (last visited Dec. 4, 2019).

⁹⁵ Peloso, *supra* note 89, at 309.

⁹⁶ See, e.g., *Madison v. Ducktown Sulphur, Copper & Iron Co.*, 83 S.W. 658 (Tenn. 1904). *But see* *Borough of Brookhaven v. Am. Rendering, Inc.*, 434 Pa. 290 (1969).

⁹⁷ Peloso, *supra* note 89, at 308–10.

⁹⁸ See *Bruculieri*, *supra* note 14.

⁹⁹ See *Ocean Currents*, *supra* note 55.

¹⁰⁰ See *Coral Reefs*, *supra* note 3.

¹⁰¹ See *infra* Part III, for a discussion on naturally occurring substances.

made substances would greatly reduce the existence of the chemicals in the environment.¹⁰² Oversimplifying this idea, if we stop creating the damaging substance, the substance will dissipate and stop damaging its surroundings. Thus, since local legislation alone is not enough, sweeping national and international legislation is the most effective means to cease the destruction caused by chemical sunscreen.

III

FRAMEWORK OF A FAILING INTERNATIONAL AGREEMENT: PARIS AGREEMENT

A. Paris Agreement Background

In order to form a successful international agreement, we cannot look simply at one successful ban; it is also important to examine why some international agreements do not work.¹⁰³ Other than the free rider problem,¹⁰⁴ another significant cause of failing environmental agreements is that the agreements are so poorly crafted that they are destined to fail.¹⁰⁵ Most international agreements have back doors that allow countries to avoid certain obligations. These loopholes are implemented because the creators of the agreement are trying to get as many countries to sign as possible.¹⁰⁶ Sometimes, to get countries to sign the agreement, some concessions must be made.¹⁰⁷ These concessions lead to a weaker and poorly crafted agreement.¹⁰⁸ One such concession is the absence of any kind of monitoring and compliance provision.¹⁰⁹ Some agreements do have monitoring provisions, but the resources are so small and benign that countries can get away with violating the agreement.¹¹⁰ Even if countries are found guilty of violating the agreement, the sanctions are so mild that the agreement is not taken seriously.¹¹¹

¹⁰² Peloso, *supra* note 89, at 307–09.

¹⁰³ Kellenberg & Levinson, *supra* note 66.

¹⁰⁴ See Chappelow, *supra* note 66.

¹⁰⁵ Trevor Findlay, *Why Treaties Work or Don't Work, and What to Do About Them*, CANADIAN INST. INT'L AFF., 1, 5 (Feb. 22, 2006), <https://3mea0n49d5363860yn4ri4go-wpengine.netdna-ssl.com/wp-content/uploads/2017/08/BTH-63-1-2006.pdf> [<https://perma.cc/PMR7-QZDY>].

¹⁰⁶ *Id.*

¹⁰⁷ *Id.*

¹⁰⁸ *Id.*

¹⁰⁹ *Id.* at 7.

¹¹⁰ *Id.* at 6.

¹¹¹ *Id.* at 7.

The Paris Agreement [the Agreement] is the highest-profile international environmental agreement that is failing. The Agreement was a momentous agreement signed by 189 countries.¹¹² It was meant to lessen our impact on climate change and increase our actions to create “a sustainable low carbon future” by 2030.¹¹³ This agreement was so momentous because it brought the world together to combat human-caused climate change, outlined how to act to face climate change, and provided a means of support for participants.¹¹⁴ Additionally, every country must report their progress toward the goals in the Agreement every five years.¹¹⁵ The Agreement is considered to be very ambitious, but it has significant problems that must be analyzed when forming an international environmental agreement to prevent the failure from happening again.

Former President Trump threatened numerous times that he would pull the United States out of the Paris Agreement because it is a “terrible, one-sided [agreement].”¹¹⁶ And, on November 4, 2019, he officially withdrew the United States from the Agreement.¹¹⁷ However, the Biden administration has stated that it will reverse the withdrawal, and the United States may regain its responsibilities for emission reduction.¹¹⁸ Even if the United States remained in the Agreement, global temperatures are on track to increase by three degrees Celsius by the end of the century, unless the world seriously ramps up the transition to clean energy.¹¹⁹

¹¹² *Paris Agreement – Status of Ratification*, UNFCCC, <https://unfccc.int/process/the-paris-agreement/status-of-ratification> [<https://perma.cc/7277-5FM7>] (last visited Mar. 22, 2021).

¹¹³ *What Is the Paris Agreement?*, UNFCCC, <https://unfccc.int/process-and-meetings/the-paris-agreement/what-is-the-paris-agreement> (last visited Mar. 21, 2021).

¹¹⁴ *Id.*

¹¹⁵ *Id.*

¹¹⁶ Carolyn Beeler, *Nov. 4 Is the First Day Trump Can Legally Leave the Paris Accord*, THE WORLD (Nov. 1, 2019, 4:30 AM), <https://www.pri.org/stories/2019-11-01/nov-4-first-day-trump-can-legally-leave-paris-accord> [<https://perma.cc/964J-FD3W>].

¹¹⁷ Rebecca Hersher, *U.S. Formally Begins to Leave the Paris Climate Agreement*, NPR (Nov. 4, 2019, 3:46 PM), <https://www.npr.org/2019/11/04/773474657/u-s-formally-begins-to-leave-the-paris-climate-agreement> [<https://perma.cc/XT24-SXEP>].

¹¹⁸ Emma Newburger, *Biden Will Rejoin the Paris Climate Accord. Here's What Happens Next*, CNBC (Nov. 20, 2020, 11:51 AM), <https://www.cnn.com/2020/11/20/biden-to-rejoin-paris-climate-accord-heres-what-happens-next-.html> [<https://perma.cc/4EMB-9KF3>].

¹¹⁹ Brad Plumer & Nadja Popovich, *The World Still Isn't Meeting Its Climate Goals*, N.Y. TIMES (Dec. 7, 2018), <https://www.nytimes.com/interactive/2018/12/07/climate/world-emissions-paris-goals-not-on-track.html> [<https://perma.cc/3A2F-CNBT>].

This failure to meet goals can be attributed to the lack of confidence that some countries have in the United States to remain in the Paris Agreement and the lack of proper sanctions if a country does not meet its goals.¹²⁰ As Andrew Light, a former climate official in the State Department, stated, “If we were a tiny country with small emissions, it wouldn’t matter so much But . . . [w]e’re a big country with a lot of power and a lot of influence around the world. And so for us to be the exception on this issue is holding the world back.”¹²¹ An example with regard to the lack of proper sanctions is Brazil, which pledged that it would protect the Amazon rainforest as a part of its Paris Agreement goals.¹²² The Amazon is crucially important in the carbon dioxide-increasing world because the Amazon absorbs two billion tons of carbon dioxide out of the atmosphere.¹²³ However, President Jair Bolsonaro rolled back many of the protections of the Amazon when he took office in January 2019, and 2019 was the worst year for forest fires in Brazil since 2010.¹²⁴ As of late 2019, there have been very few sanctions on Brazil, and it remains an unanswered question whether the international community will apply sanctions.¹²⁵

In December 2019, the members of the Paris Agreement met to reevaluate their goals.¹²⁶ The negotiations were not as inspired as people had hoped.¹²⁷ Large countries, such as the United States, blocked measures “that would have encouraged countries to adopt

¹²⁰ *Id.*

¹²¹ Hersher, *supra* note 117.

¹²² Plumer & Popovich, *supra* note 119.

¹²³ Becky Oskin, *Amazon Rainforest Breathes In More than It Breathes Out*, LIVE SCI. (Mar. 20, 2014), <https://www.livescience.com/44235-amazon-rainforest-carbon-cycle-measured.html> [<https://perma.cc/FLQ9-Q4MU>].

¹²⁴ André Shalders, *Amazon Fires: Fines for Environmental Crimes Drop Under Bolsonaro*, BBC (Aug. 24, 2019), <https://www.bbc.com/news/world-latin-america-49460022> [<https://perma.cc/Y9PS-P5SP>].

¹²⁵ Elisângela Mendonça, *Bolsonaro’s Brazil Unlikely to Achieve Paris Agreement Goals: Experts*, MONGABAY (Sept. 22, 2019), <https://news.mongabay.com/2019/09/bolsonaros-brazil-unlikely-to-achieve-paris-agreement-goals-experts> [<https://perma.cc/X782-8R3R>]. However, European leaders did try to retaliate by “threaten[ing] to tear up a trade deal with South America,” but not much has come from this. Lisandra Paraguassu & Gabriela Baczynska, *As EU Threatens Trade Retaliation, Brazil Sends Army to Fight Amazon Fires*, REUTERS (Aug. 23, 2019, 5:17 AM), <https://www.reuters.com/article/us-brazil-politics/as-cu-threatens-trade-retaliation-brazil-sends-army-to-fight-amazon-fires-idUSKCN1VD19T> [<https://perma.cc/Z5PL-YNJX>].

¹²⁶ Somini Sengupta, *U.N. Climate Talks End with Few Commitments and a ‘Lost’ Opportunity*, N.Y. TIMES (Dec. 15, 2019), <https://www.nytimes.com/2019/12/15/climate/cop25-un-climate-talks-madrid.html?searchResultPosition=2> [<https://perma.cc/9HWV-46AA>].

¹²⁷ *Id.*

more ambitious targets for reducing greenhouse gas emissions.”¹²⁸ The Vice President of the World Resources Institute, Helen Mountford, noted that big emitters were not present or were actively obstructive.¹²⁹ Some countries that blocked big issues were the United States, Australia, and Brazil; other countries, like China and India, did not participate in more ambitious targets, but rather, they settled for small targets.¹³⁰ Setting obtainable but small goals is not the point of the Paris Agreement. The world was meant to band together and set ambitious goals to decrease carbon dioxide emissions.¹³¹ However, the world is so addicted to fossil fuels that most countries will not be able to meet their goals by 2030 with or without the United States as a participant in the Agreement.¹³² Other than the world’s addiction to fossil fuels, there are many more reasons why the Paris Agreement is failing that must be analyzed in order to have an effective ban on chemical sunscreen.

B. The Failure of the Paris Agreement

In December 2019, former President Trump began the process of leaving the Paris Agreement.¹³³ He was unable to remove the United States any earlier than November 2019 because a “cooling off” period was implemented into the agreement where no member could leave the agreement until three years after it went into force.¹³⁴ Some are hopeful that a withdrawal by the United States will not derail countries working hard to decrease their carbon impact;¹³⁵ others fear that countries will not take the Agreement seriously without one of the world’s top megapolluters.¹³⁶ The ramifications of the departure of the United States are yet to be seen.¹³⁷

¹²⁸ *Id.*

¹²⁹ *Id.*

¹³⁰ *Id.*

¹³¹ Mendonça, *supra* note 125.

¹³² *Id.*

¹³³ Beeler, *supra* note 116.

¹³⁴ *Id.*

¹³⁵ Jessica F. Green, *Trump Is Officially Withdrawing from the Paris Climate Agreement. That Won't Change Much.*, WASH. POST (Oct. 30, 2019, 3:00 AM), <https://www.washingtonpost.com/politics/2019/10/30/trumps-officially-withdrawing-paris-climate-agreement-that-wont-change-much> [<https://perma.cc/5H6F-LKQN>].

¹³⁶ Thomas C. Frohlich & Liz Blossom, *These Countries Produce the Most CO₂ Emissions*, USA TODAY (July 14, 2019, 1:59 p.m.), <https://www.usatoday.com/story/money/2019/07/14/china-us-countries-that-produce-the-most-co-2-emissions/39548763> [<https://perma.cc/U6X5-WRSX>].

¹³⁷ *See* Green, *supra* note 135.

Since former President Trump decided to leave the Agreement, individual states are trying to combat this decision by having state carbon reduction goals, but this still may not be enough to close the gap of carbon emissions released by the United States.¹³⁸ The gap is especially substantial because the United States is one of the worst emitters in the world¹³⁹ and emits the world's second largest amount of carbon dioxide (CO₂).¹⁴⁰ Clearly, the United States is not doing much to curb emissions of CO₂, and, as mentioned, the leadership of the United States matters.¹⁴¹ The role of the United States was one of the things that led to the success of the Montreal Protocol, and it would potentially lead to success for a ban on chemical sunscreen.

Not only did former President Trump want to remove the United States from the Paris Agreement but he actively repealed Obama-era national environmental regulations and tried to limit how much individual states set their own regulations.¹⁴² Because of former President Trump's refusal to acknowledge scientific evidence supporting human-caused climate change, individual states are trying to battle his actions.¹⁴³ For example, California and New York have set their own goals for lessening their impact on climate change.¹⁴⁴ New York passed a statewide initiative, the Climate Leadership and Community Protection Act, that promotes renewable energy programs and establishes a goal of decreasing state emissions by a whopping 85% by 2050.¹⁴⁵

However, as the United States is a large country (in terms of GDP, size, and population), we cannot be so divided on an issue so pressing on the international stage.¹⁴⁶ As states are currently attempting to achieve goals stated in the Agreement in a piecemeal fashion, we are failing to reach our goals.¹⁴⁷ The work of the individual states does not help because states' goals have helped the United States reach only two-thirds of its goal of emission reductions.¹⁴⁸ Therefore, the United States must work as one country.

¹³⁸ *Id.*

¹³⁹ *Id.*

¹⁴⁰ Frohlich & Blossom, *supra* note 136.

¹⁴¹ *See supra* pp. 110–11.

¹⁴² Green, *supra* note 135.

¹⁴³ *Id.*

¹⁴⁴ *Id.*

¹⁴⁵ S.B. 6599, 2019 Leg., Reg. Sess. (N.Y. 2019).

¹⁴⁶ Green, *supra* note 135.

¹⁴⁷ *Id.*

¹⁴⁸ *Id.*

Similarly, while it is admirable that local areas are trying to tackle the international problem of coral reef damage by sunscreen, local bans on chemical sunscreen are simply not enough. Local bans are a good start in order to get the information to the masses and initiate scientific studies to support bans, but it will not eradicate the damage. This is evidenced by the Paris Agreement, where states are trying to keep up with the Agreement but are failing because the United States has withdrawn.

Without the unity of the United States and the unity of the European Union, the world cannot work as one to solve environmental problems. This is why the Paris Agreement is failing, but an international ban on sunscreen does not have to have these problems because sunscreen is not as immense of an issue as decreasing carbon dioxide levels in the atmosphere, and some countries will not be affected one way or another with a ban on chemical sunscreen. But if we build hard guidelines, stringent sanctions, and little latitude for loopholes for the ban—similar to the Montreal Protocol—then the world can successfully ban sunscreen with oxybenzone, octinoxate, and octocrylene.

IV APPLICATION OF PREVIOUS INTERNATIONAL AGREEMENTS TO A SUNSCREEN BAN

To form a successful international environmental ban, following the framework provided by previous bans is instrumental for a successful ban. Additionally, there are a number of similarities between the Montreal Protocol and a ban on chemical sunscreen, which means that in order to have a successful ban on chemical sunscreen the agreement must mirror the Montreal Protocol.¹⁴⁹

However, unlike the Paris Agreement, there needs to be strong penalties in place that will actually be initiated if there is a violator of the agreement. Second, penalties are useless if there is not a functioning monitoring system. While there is room for discussion on what a functioning monitoring system might look like, whatever makes it the most effective with the current technology will more than likely be sufficient. As was seen in the Montreal Protocol, international

¹⁴⁹ It is important to note that while a ban on chemical sunscreen will help alleviate some of the damage to coral reefs, chemical sunscreen is not the only reason coral reefs are dying. Coral bleaching has also been linked to carbon dioxide in the atmosphere, ocean acidification, and climate change. See O. Hoegh-Guldberg et al., *Coral Reefs Under Rapid Climate Change and Ocean Acidification*, 318 *SCI.* 1737 (2007).

compliance is key to a successful agreement, and one of the most important nations that must comply is the United States. However, as of now, the United States is behind the European Union in the movement to ban sunscreen with oxybenzone, octinoxate, and octocrylene.

CONCLUSION

In order to form a successful international ban on chemical sunscreen, we must start strong and be vigilant. The Montreal Protocol has provided an excellent framework on which a new environmental ban should be based. However, this is not the only tool for future bans. We should also examine unsuccessful agreements, like the Paris Agreement, to prevent repeating similar mistakes in a new international ban. While international environmental bans seem daunting, there is a large chance that this ban will be successful because of similarities between chemical sunscreen and CFCs banned in the Montreal Protocol. Moreover, without a ban to protect coral reefs, the future of our beaches, fisheries, and economies are in jeopardy. Therefore, the time has come for the world to join together and ban chemical sunscreen for the sake of our sensitive coral reefs.