

The Social Construction of Reef-Safe Sunscreen Adoption in Hawai'i

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By

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1. Introduction

In 2018, Hawai'i passed SB2571, aka Act 104, which banned the sale of sunscreens and cosmetics containing specific ingredients, e.g., oxybenzone, octinoxate, avobenzone, and octocrylene (Hawaii State Legislature, 2018). These chemicals have been shown to contribute to coral bleaching—a process in which coral reefs lose their symbiotic algae, turning white and becoming more susceptible to disease and death. The law aimed to protect the state's marine ecosystems by removing these harmful ingredients from sunscreens sold in Hawai'i. However, the shift toward "reef-safe" sunscreen formulations was not driven by legislation alone.

The passage of this law was the culmination of efforts by various social groups, including environmental organizations, hotel chains, and retailers, all of which contributed to raising public awareness and shaping industry practices. Rather than simply reacting to new legal restrictions, sunscreen companies adapted their formulations in response to the values and concerns of these stakeholders. This broader sociotechnical change illustrates how industry shifts cannot be understood through legal mandates alone.

Since the enactment of Act 104, several other regions, including Palau, the U.S. Virgin Islands, Aruba, and parts of Mexico, have introduced similar bans on harmful sunscreen ingredients (Seemann, 2023). These areas have recognized the ecological damage associated with chemical sunscreens and have followed Hawaii's lead in implementing their restrictions.

While existing research often examines how different groups respond to environmental laws, there is a need to explore how stakeholder values actively shape the development of new technologies. This paper applies the Social Construction of Technology (SCOT) framework to analyze how various actors—including legislators, environmental advocates, businesses, and consumers—interacted to bring about the widespread adoption of reef-safe sunscreen.

Understanding this process offers insight into the ethical and societal dimensions of sustainability-driven product development. To conduct this analysis, I will look at statements made by sunscreen manufacturers, marketing campaigns, and hotel companies to understand how they view their role in the reef-safe sunscreen movement. I will then examine how consumers, journalists, and academic sources have felt the impacts of these stakeholders' efforts.

2. Literature Review

2.1 Current Scholarship

Current scholarship on reef-safe sunscreen often focuses on the intersection of environmental science and consumer behavior. Much research is done on providing scientific evidence linking chemical compounds to coral bleaching and reef degradation (Downs, 2019; Miller, 2021). This research has been instrumental in shaping public awareness and policy. However, the scientific community remains divided on the magnitude of the impact of sunscreen chemicals on coral reefs. In addition to scientific research, scholars have explored the role of consumer behavior in the adoption of reef-safe sunscreen. These studies are often done via surveys and examine the consumer's awareness and actual use of reef-safe sunscreen (Levine, 2019; Levine, 2020; Bergman, 2022; MOC Marine Institute, 2024).

2.2 Reef-Safe Sunscreen Consumer Awareness

Hawaii's transition to reef-safe sunscreen has been shaped by consumer awareness and the accessibility of compliant products. Ariell Levine's "*Sunscreen use and awareness of chemical toxicity among beachgoers in Hawaii prior to a ban on the sale of sunscreens containing ingredients found to be toxic to coral reef ecosystems*" study surveyed 1325 beach-goers at four popular beaches (two in Oahu and two in Hawaii Island). The survey period

was from September 2018 to March 2019, after Act 104 was passed, but before the ban's implementation in 2021. The study investigates four main topics.

1. "The prevalence of oxybenzone and octinoxate in sunscreens currently used in Hawaii."
2. The proportion of sunscreens being used in Hawaii that were purchased in Hawaii or outside of Hawaii
3. The factors influencing people's sunscreen choice
4. Public awareness of the harmful effects chemicals have on coral ecosystems, and their willingness to switch to "reef-safe" options.

The survey highlights a significant gap between awareness and behavior. The study found that approximately 32% of beach-goers were using sunscreens containing oxybenzone or octinoxate, despite 75% of respondents being aware of their harmful effects. The 54.2% that purchased their sunscreen in the state of Hawaii gives the impression that the sunscreen ban will have a substantial impact on sunscreen use in Hawaii, but there is still the other half of beachgoers that would have to be accounted for. Awareness levels varied significantly among demographics, with 92% of Hawaii residents knowledgeable about the issue compared to 64% of tourists. For the tourists who were aware, they learned about the ban at all stages, from outreach campaigns to signage at the beach, but many had already purchased non-compliant sunscreens.

Looking at consumer behavior, 42% of beachgoers cited high SPF as the reason they chose the sunscreen, while 25% of respondents considered the sunscreen's environmental toxicity. The study suggests that the lack of regulation on labeling reef-safe sunscreen contributes to further complications, as many products contain other harmful chemicals not covered by the 2018 ban.

This report highlights consumer awareness and discusses how sunscreen manufacturers, policymakers, and advocates can play a role in increasing awareness about reef-safe sunscreens. To enforce regulations properly, consumer education, market accessibility, and transparent marketing practices are needed. However, this paper did not touch on how sunscreen manufacturers have strived to change since the passage of Act 104 and how they have responded to both regulatory pressure and consumer demand.

2.3 Tourism Industry's Response to Act 104

While Hawaii's Act 104 primarily targets consumers and retailers, it has significant implications for the tourism industry, particularly for hotels that have previously sold or provided these products. Although hotel patrons may still bring sunscreens containing non-reef-safe ingredients from home, some establishments have taken a more proactive approach to promoting the use of reef-safe sunscreen.

Christine Bergman's *Influencing Hotel Patrons to Use Reef-Safe Sunscreen* explores the role of the hospitality industry in encouraging environmentally responsible behavior. Using a novel conceptual framework, the study identifies social attitudes, personal capabilities, and contextual factors as the primary motivators for individuals to use reef-safe sunscreen. Bergman suggests that hotels can adopt pro-environmental business practices by implementing educational campaigns, offering free-use reef-safe sunscreen stations with their amenities, or initiating trade-in programs for guests who did not bring reef-safe alternatives (Bergman, 2022). While this research provides valuable insights into consumer behavior and hotel sustainability initiatives, it does not address how their values influence sunscreen manufacturers. Bergman's paper was written after the passage of Act 104 and frames the tourism industry's response as a reaction to Act 104 rather than an active driver of change. The article overlooks the possibility for the

tourism industry to play a more proactive role in shaping industry practices and consumer behavior.

2.4 Identifying the Research Gap

While hotel hospitality and consumer habits studies provide valuable insights into the adoption of reef-safe sunscreen in Hawai'i, they fail to address aspects of this socio-technical transition. First, neither study examines how sunscreen manufacturers have responded to Act 104 or how their practices have evolved in response to regulatory pressure and consumer demand. Current scholarship often adopts a technological determinist perspective, assuming that sunscreen companies reformulate their products solely in response to regulations from legal entities. However, the technological determinist perspective overlooks the influence of consumers, industry trends, and stakeholder-driven initiatives on sunscreen companies.

3. Conceptual Framework

The Social Construction of Technology (SCOT) framework, introduced by Trevor Pinch and Wiebe Bijker, provides a constructive way to analyze how different social groups influenced the development and adoption of reef-safe sunscreen following the passage of Act 104. SCOT is an approach that examines how technological development is shaped by the interactions of various social groups, each with their interests, values, and interpretations of the technology in question. Unlike deterministic models that view technology as evolving in a linear, objective manner, SCOT highlights the role of social processes and individuals in shaping technology.

SCOT deals with relevant social groups, or stakeholders, each of which assigns different meanings and priorities to a given technology. According to Pinch and Bijker, technologies exhibit interpretive flexibility, which means that the distinct concerns and interests of different stakeholders can shape the technological design process. Over time, as negotiations and

iterations occur, technological design reaches a state of closure, where stakeholder tensions are resolved, and a dominant form of technology emerges (Pinch and Bijker, 1984). SCOT as a social framework can illuminate technologies across a wide variety of industries and how disciplines are socially constructed.

My analysis will examine how different social groups influenced the development and adoption of reef-safe sunscreen following the passage of Act 104. First, I will examine environmental advocacy groups and their values regarding sunscreen design. Then, I will examine the tourism industry's involvement in the passage of Act 104. Finally, I will examine how these stakeholder groups have affected sunscreen manufacturers and their market in Hawai'i.

4. Analysis

4.1 Environmental Advocacy Groups

Environmental advocacy groups played a pivotal role in influencing the sunscreen industry and consumer behavior. These organizations raised awareness about the harmful effects of chemical sunscreens on marine ecosystems, particularly coral reefs. One major advocacy effort came from the Haereticus Environmental Laboratory (HEL), which conducted scientific research demonstrating the damaging effects of oxybenzone and octinoxate on coral reefs (Downs, 2016). The studies on oxybenzone and octinoxate effects provided substantial evidence that these chemicals contribute to coral bleaching and reef degradation, helping to establish a scientific basis for regulatory action. Dr. Craig Downs, a researcher at HEL, was a prominent advocate for eliminating both oxybenzone and octinoxate ingredients from Hawai'i's waters.

HEL created the Protect Land + Sea (PL+S) certification for sunscreen brands to obtain. The PL+S certification is earned after testing products to ensure no chemicals appear on the HEL

LIST, a list of chemicals that are pollutants in aquatic environments and wildlife (Stream2Sea, 2023). The PL+S certification and others like the Friend of the Sea certification allow sunscreen manufacturers to voluntarily take steps to have their products tested and certified. Putting the initiative within the manufacturer's hands helps them build a sense of responsibility to their customers and the overall product.

Conservation organizations collaborated heavily with scientists like Dr. Craig Downs to turn these scientific results of oxybenzone and octinoxate contributing to coral bleaching into political action. The Surfrider Foundation and Sustainable Coastlines Hawai'i, an organization dedicated to protecting Hawai'i's marine environments, launched public education campaigns to inform consumers about the environmental impact of chemical sunscreens (Day, 2018). Their "Ocean Friendly Sunscreens" campaign included beach cleanups, educational workshops, and partnerships with local retailers and businesses to promote reef-safe sunscreen. The "Ocean Friendly Sunscreens" marketing initiative not only increased public awareness but also created a sense of urgency around the issue, compelling consumers to seek out safer alternatives. By framing reef-safe sunscreen as both an environmental and public health issue, advocacy groups successfully aligned the interests of diverse stakeholders, from marine biologists to everyday beachgoers.

The impact of these advocacy efforts is evident in Hawai'i's legislative response, as lawmakers cited environmental research and public concern when drafting Act 104. However, beyond policy, these groups have shaped consumer expectations, prompting sunscreen manufacturers to reformulate their products to align with environmental values. Their efforts illustrate how advocacy organizations can bridge the gap between science and policy, translating complex research into legislation. Through SCOT's lens of interpretive flexibility, these groups

assigned a meaning of reef-safe sunscreen as not just a consumer product, but as a tool for environmental conservation, highlighting the importance to the public of consumer activism.

4.2 Tourism Industry

The tourism industry in Hawai'i had a vested interest in preserving the state's marine ecosystems, given their appeal to tourists and their importance to the local economy. Hotels, resorts, and tour operators recognized that coral reef degradation could reduce the appeal of Hawai'i as a travel destination, potentially harming the industry's long-term sustainability. In 2018, Aqua-Aston Hospitality (AAH), a prominent hotel management company in Hawai'i, launched a public awareness initiative, called #ForOurReef, to build awareness about sunscreen ingredients contributing to coral bleaching. They hosted meetings about the importance of reef-safe sunscreen with other members of the travel industry. They also invited community leaders to meet and collaborate in furthering this cause.



Figure 1: Raw Elements Sunscreen Dispenser at an AAH property for PR & Advertising

Initiatives were developed to install reef-safe sunscreen dispensers and provide samples with educational information to hotel guests and community events. AAH also partnered with sunscreen manufacturers like Raw Elements Sunscreen to boost businesses that comply with Act 104 (see figure 1 above). AHH also partnered with other companies and industries like Hawaiian Airlines and the Waikiki Aquarium to promote the importance of reef-safe sunscreen. Their initiatives were so well received and impactful that they won a Silver Honor in Environment and Sustainability in 2019 from the Shorty Social Good Awards, which focus on achievements in advertising and digital work (Shorty Awards, 2019). The Silver Honor in Environment and

Sustainability award signifies that not only were their efforts made, but they were received and heard by those outside of just the company. The Shorty Social Good Awards is an international award competition that recognizes multiple social change initiatives every year.

Other hotels and resorts followed suit, implementing similar programs to encourage the use of reef-safe sunscreen. In June 2022, the Four Seasons Resort Maui at Wailea announced a collaboration with Project Reef. The Four Seasons Resort Maui offered guests complimentary mineral-based sunscreens and educational materials about coral reef conservation (Four Seasons, 2022). The complimentary reef-safe sunscreen product initiatives not only demonstrated the industry's commitment to sustainability but created consumer appeal for businesses that prioritize environmental responsibility.

The tourism industry increases the demand for reef-safe sunscreen as hotels (like the Four Seasons and Aqua-Ashton Hospitality properties) are purchasing large quantities of reef-safe sunscreen for their guests, and companies have a financial incentive to develop and market products that meet these standards. The hotels' increased demand for reef-safe sunscreen illustrates how economic considerations can drive technological change, as manufacturers sought to capitalize on the growing demand for eco-friendly sunscreens.

From a SCOT perspective, the tourism industry represents another relevant social group that influences the development of reef-safe sunscreen. By framing coral reef health as essential to their business model, hotels and resorts helped to normalize the use of reef-safe sunscreen and create market-compliant products. The industry's efforts also highlight the importance of aligning economic incentives with environmental goals, as businesses recognize that sustainability could have a moral appeal to consumers and that tourists to the island have the means to spend money to comply with regulations, giving the company a competitive advantage.

When you see the claim “Reef Safe” or “Reef Friendly” on a product, you may assume that the ingredients studied and shown to harm reefs are not in the formula. What’s important to realize here is that **avoiding these two ingredients does not guarantee the absence of any other ingredient with a detrimental effect on the environment.**

Figure 2: Babo Botanicals' decision statement to stop labeling their sunscreen as reef-safe.

Some critics argue that regulatory policies like Act 104 are ineffective because they create loopholes where companies market products as “reef-safe” despite containing harmful chemicals (see figure 2 above). Critics like Babo Botanicals bring into question the extent of harmful chemicals in marine life, who makes the regulatory decisions, and when is there enough surveillance. Others claim that industry self-regulation is sufficient and that legislative and outsider intervention is unnecessary (Brown, 2023). Some scientists challenge the coral bleaching claim. Dr. Michelle Wong, a science communicator and cosmetic chemist, states that “there isn’t any solid evidence of sunscreens having caused harm to coral reefs” (Wong, 2018). SCOT allows for the social interpretation of each technology, which all depends on someone's perspective. While these points highlight valid concerns, consumer-driven lawsuits and growing market trends indicate a shift in consumer priorities toward genuinely reef-safe products.

The passage of Act 104 and the growing demand for reef-safe sunscreen prompted significant changes in the sunscreen industry. Manufacturers faced pressure to reformulate their products, removing harmful chemicals while maintaining product efficacy and consumer appeal. The litigious process brought challenges as companies had to navigate regulatory requirements, consumer expectations, and technical limitations. In response to Act 104, the company Surface Sunscreens published an explainer with the statement “[Surface Sunscreens is] committed to producing sunscreen products that are safe for the environment and effective for our customers. In response to the passage of Hawai'i Act 104, we have worked hard to create products that meet

the requirement of the legislation” (Surface Sunscreens, 2023). Surface Sunscreens state that their “commitment to the environment goes beyond meeting the requirements of Hawai’i Act 104” and give examples of actions taken to reduce their carbon footprint. Without influences from environmental and consumer-related stakeholders, there would be no motivation for sunscreen companies to take marketing initiatives directly addressing marine life concerns..

However, the transition to reef-safe sunscreen was not seamless for all manufacturers. Some companies faced criticism for misleading marketing claims, as products labeled “reef-friendly” or “reef-safe” were found to contain ingredients that were not banned, but still harmful to marine ecosystems. On May 2, 2024, Bloomberg Law reported a class action suit filed in the state of New York against Target Corporation. Target was accused of deceptive marketing its brand Up & Up as “reef-conscious” while containing avobenzone, homosalate, octocrylene, and octisalate (Watwe, 2024). Target was falsely advertising to their consumers without the proper disclaimers and feeding on the ignorance of their consumers. In tandem, Walmart was also named in a class action for labeling its sunscreen as ‘reef-friendly’ when it contains the same harmful ingredients listed in the target suit (O’Brien, 2024). These lawsuits show that the consumer’s interpretation of reef-friendly related marketing has an impact on their behavior. Many consumers care about the environmental harm many ingredients pose to marine environments, not just in Hawai’i, which is why false advertisement has such severe consequences and calls for litigation. The Lyon Firm, an Ohio-based law firm, has an entire page related to “Deceptively Marketed Marine Safe Sunscreen” and offers its services to file deceptive marketing lawsuits to those who seek assistance (Lyon Firm, 2024). “Sunscreen brands and retailers are responding to shoppers’ interest” states Monica Brown, as online search volume has

increased relating to the term ‘reef-safe’ (Brown, 2023). Consumers care about the ingredients within their products; marketing practices play a major role in consumer consumption.

5. Conclusion

The adoption of reef-safe sunscreen in Hawai’i shows how technological and market transformations emerge from the interaction of legal, social, and economic forces. While the passage of Act 104 provided a regulatory foundation for change, it was the collective efforts of environmental advocacy groups, the tourism industry, and consumers that drove the widespread adoption of reef-safe sunscreen. This case study underscores the importance of obtaining stakeholder buy-in for sustainability initiatives, highlighting how consumer demand and industry adoption contribute to environmental policymaking. SCOT provides a framework to analyze movements like the reef-safe sunscreen movement as relevant social groups advocated for a change in a technology’s design.

Looking ahead, the lessons learned from Hawai’i’s transition to reef-safe sunscreen can inform sustainability initiatives in other places and industries. The success of increased regulatory initiatives for reef-safe efforts demonstrates the power of stakeholder-driven change and the importance of aligning regulatory frameworks with consumer values and industry practices. Future research could explore how similar regulatory changes impact other industries and whether stakeholder-driven adoption models can be applied to other environmental issues within marine life. As many communities continue to mitigate and prevent the consequences of climate change, Hawaii’s reef-safe sunscreen initiatives serve as a powerful reminder of what can be achieved when diverse groups come together.

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