

RESEARCH FOR MAKE WAVES: A DIGITAL PRODUCT SOLUTION TO MARINE
SUSTAINABILITY AND PUBLIC POLICY ACTION

BY

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THESIS PROJECT

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ABSTRACT

This report is a formal compilation of the research, process, and creation of the website Make Waves. Make Waves is a digital media website that provides easily accessible information in the form of underrepresented voices and call-to-action opportunities for anyone interested in marine sustainability.

My thesis focuses on the intersection of marine sustainability, collective action, and public policy. To raise awareness regarding marine sustainability and oversight, Make Waves is a digital platform that presents palpable information regarding current marine issues and oversight. The guiding principle of Make Waves involves the discovery of diverse and underrepresented voices in the field of marine sustainability to allow users to form their own opinions on the oceans and sustainability. Through such knowledge, the website is designed to inspire action in the form of sending letters to elected officials, volunteering, and/or donating to reputable institutions. By highlighting the need for more representation within the marine space, Make Waves seeks to empathize with and empower a wide variety of users to take such action. Finally, Make Waves seeks to simplify often nebulous and inaccessible information, research, discussions, and negotiations regarding marine policy to present it in a clear, concise way. This digital product was presented at George Washington University's NEXT festival in April 2024.

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BACKGROUND INFORMATION

Recent years and research into marine sustainability have revealed to scientists globally that the issues of global warming, climate change, and pollution from economic development and industrialization harm oceans, seas, and marine wildlife. A number of unsafe behaviors and practices have been carried forth by industries and governments that have a detrimental effect on marine ecosystems.

For example, current overfishing practices affect the stock of fish which has a cascading effect on the overall marine food chain. According to the National Oceanic and Atmospheric Administration (NOAA)- out of 492 stocks, 355 have a known overfishing status where at least 24 are subjected to overfishing and 48 are overfished¹. This is not to mention certain fishing methods can harm natural habitats like in the case of the Gulf of Alaska, where unsafe fishing practices have caused the destruction of important habitats and ecosystems of ancient coral reefs, which serve as a backbone to a complicated system of marine life².

In the case of pollution, marine life has been continuously threatened by the onset of pesticides and chemicals, especially in the agricultural industry, that make their way into bodies of water. According to the UN Environment Programme, the destructive effects of plastic and oil pollution and industrialization have historically been the most destructive to vulnerable groups and developing communities³. This renders issues associated with marine sustainability as more than just a purely environmental issue but an environmental justice consideration. Unethical and unsustainable fishing practices brought forth by larger companies have often caused boundless harm to such coastal communities and threatened the livelihoods of local fishermen.

For the scope of this thesis, I mainly focus on marine sustainability and justice issues in the United States. The reason why the United States was selected as my central location is because the U.S. is a notable powerhouse on the global frontier of international environmental politics and thus is a primary region where it becomes crucial to address marine sustainability and environmental justice issues. However, current U.S. policy proceedings and lack of dissemination of epistemic education are not doing enough to protect marine life and fishing sustainability, especially in the context of climate change. For instance, the United States' unwillingness to ratify the United Nations Convention on the Law of the Seas (UNCLOS), an international agreement on how to govern and protect oceans- signals that there is much discussion to be had on a national level⁴. Therefore, Make Waves seeks to take an alternative approach to addressing marine sustainability issues by eliciting the use of technology. Through the use of technology, I seek to brainstorm creative product solutions to address this fundamental issue.

Change is often addressed through younger generations unwilling to tolerate a future directed by the status quo. It is also notable to include that increasingly so, technology and design are mediums that young people use in order to connect with each other and the world around them. Thus, utilizing user experience (UX) and user-centered design and thinking processes in order to create a medium used by this generation can be an effective method to gain public support for marine sustainability and policy change. This report and research are fundamentally guided by design and systems thinking principles and are divided into stages of empathizing, defining, ideating, prototyping, and testing. Now that this introduction has begun to

empathize with marine activists and a generation who cares about making change, I may begin to better define my thesis in more succinct terms.

HOW MIGHT WE

Every strong UX-centered design begins with asking a “How Might We” question that sets the groundwork for how the problem space may be addressed. As such, I present the following question:

How might we devise a solution to garner public support and passion for marine sustainability that can in turn urge policymakers to make more actionable, encompassing, and urgent changes for marine sustainability?

PROBLEM SPACE ANALYSIS

There are several gaps in marine sustainability between the general public, scientists, institutions, and policymakers. The sustainability of seafood can be difficult to recognize commercially. Those in academia often have different interests and motivations than those in government and marine management. Thus, there are often difficulties in trying to communicate, present, and defend marine research while simultaneously rendering it palpable to different audiences.

Solutions to combat climate change in the context of the oceans are often difficult to reach a consensus without the dissemination and discussion of diverse marine-related topics. These include issues regarding aquaculture, geo-engineering, ocean fertilization, and many more. Since it is difficult to foster collective action between different groups- the overall marine policy landscape is difficult to navigate, inefficient, and slow.

Policy surrounding marine sustainability often takes years to form and implement and is never all-encompassing of everyone's best interests due to a lack of discussion and support or silence. The oceans are a shared resource of many, and government plans lie incomplete and unmoving to include the voices of people who care.

THESIS STATEMENT

My thesis aims to empathize with marine enthusiasts and anyone with an interest in ocean stewardship in order to collect and leverage marine sustainability solutions that aspire for change and action.

Through plentiful research, design thinking, and constant prototyping- I hope to create a digital product that addresses the problems surrounding marine sustainability and create a system to take actionable effort to combat causes such as overfishing, loss of habitats, and unsustainable marine practices.

The aim and scope of my project are threefold as demarcated through education, impact, and illustration. In regard to education, I seek to provide and disseminate organized sources that capture relevant and current information regarding marine sustainability and environmental justice. For this application to achieve impact, I aspire to create a simple system to send reports and feedback to government agencies and advocacy groups in order to inspire and urge change. Finally, in an attempt to flip the narrative on marine sustainability and environmental issues, I will illustrate my application in a manner that demonstrates the beauty of the oceans and presents sustainability solutions as a promising path towards cleaner waters and marine life.

TARGET DEMOGRAPHICS

The target users consist of a two-fold audience, with a potential future user with further development. The first target user consists of members of the general public who are at least somewhat open and interested in marine sustainability topics. Think of it like those who believe in recycling, and who wish to continue their impact but do not know where to begin. The second target user consists of scientists and members of academia who wish to include their research, passions, and expertise in the public understanding of marine sustainability.

METHODOLOGY

As previously discussed, this capstone focuses on utilizing design thinking methodologies and qualitative/quantitative research methods to explore the problem space and analyze the effectiveness of this digital platform. Enumerated below are the main stages of the design thinking process along with relevant steps conducted at each phase:

1. During the “Discovery Phase”, I delved into understanding the core issues and landscape that comprise marine sustainability and its relationship to vulnerable communities
2. For the “Define Phase”, I devised various objectives and synthesized user information into concise goals and plans revolving around marine sustainability and activism.
3. As part of the “Develop Stage”, I created mood boards, conducted competitive analysis, and rapidly iterated through a series of prototypes that were continuously met with ample user testing.
4. To orchestrate my “Deliver Stage”, I reinforced my product design through beta and A/B testing. This thesis was also presented to over 1000 members of the Washington D.C. community during the opening night of the George Washington University NEXT festival in April 2024.

The research methodologies presented in this report represent a wide toolset. For instance, I conducted generative interviews as my first research method to speak firsthand with experts in the field and synthesize the general thoughts and findings of experts. As such, these generative interviews sought to explore the matrix of marine sustainability, field players, and

policy work. I formally interviewed approximately nine experts in the field whose expertise ranged from marine academia, ocean sustainability policy advisors, fishery experts, and members of local coastal communities who work directly in the marine environment.

The second research technique I conducted was independent research which largely consisted of reading through articles that showcased underrepresented voices in the field and scientific research that described ocean climate change action plans, negotiations on marine law and oversight, and current efforts regarding marine sustainability. These forms of multimedia took a variety of forms through academic papers, NGO articles, books, podcasts, and documentaries. The final research method I utilized was Google Surveys to understand and qualify the viewpoints of the general public in regard to marine sustainability, activism, and climate change.

RESEARCH FINDINGS:

Generative interviews produced a variety of insights into the key issues and problem matrix of marine sustainability, public policy in the United States, and spaces for change.

Detailed below are some such key findings:

Interview #1: Eesha Rangani, Marine Biology Graduate Student at the University of Southern California

Eesha is currently studying deep sea worms and ocean microbiology and their role in the carbon cycle at USC, where she understands their role in sequestering carbon. Since joining graduate school, she has experienced a growing interest in climate science and policy. Scientific expertise has demonstrated that oceans act like a buffer against climate change. Carbon dioxide from the atmosphere is absorbed by the water. Various microorganisms and plankton use this carbon for various processes. Furthermore, the deep sea environment, a region relatively unexplored, remains an avenue for mining minerals that can be used to make batteries that can be used to develop a number of green technologies and a sustainable future. However, much research still needs to be done about the deep sea, which remains a relatively unexplored terrain, and without proper scientific research- it is not advisable to throw off the balance of these ecosystems. Her work in marine sustainability activism has involved advocating against such deep-sea mining. She also claims, “As someone in academia, we aren’t taught a lot about science communication, so [I am] trying to find a good way to talk about this science to people and reach this message to people” when discussing marine sustainability and advocacy. She points to

groups such as the Sustainable Ocean Alliance, a group of young leaders from around the world, and the Deep Ocean Stewardship Initiative (DOSI) which are a group of scientists who create briefs and reports on deep sea mining and what the consequences would be.

Her analysis of what different governments and agencies are enlisting as methods to combat climate change is numerous. She cites geoengineering as an artificial means to turn climate change and ocean fertilization as a method involving pumping iron into the ocean for plankton to absorb more carbon from the atmosphere. However, it is notable to state that plankton bloom would kill a lot of the other species and impact other biodiversity since they would use a lot of oxygen in this scientific process. Another notable green technology that remains a contentious issue revolves around aquaculture, a sustainable way to fish. In such aquaculture fish farms, plentiful medicine and antibiotics are placed to reduce disease in the population. Nevertheless, this is an avenue for antibacterial resistance to emerge, which may find its way up the food chain to people, and communities thus become more resistant to antibiotics. While several proposed scientific solutions have been published, Eesha cites that talking to people and communicating with them about caring is an ideal starting point to creating marine stewards.

Interview #2: Shana Miller, Project Director, International Fisheries Conservation at The Ocean Foundation

Shana's work at the Ocean Foundation, a non-profit that considers sustainable resilience, revolves around developing science-based strategies on international species, especially in

international waters. As a result, she works with governments and develops communication skills with fishermen and other groups- serving as a liaison between different user groups. Her insight from working with international fisheries prescribes that it takes 10 years to get into any sort of big conservation win. In the United States, it takes even longer for policy to pass which can be a very frustrating and inefficient process. The process includes submitting a proposal, and bodies can vote with a majority vote to pass it. However, there exist numerous opportunities to block such legislation such as election cycles that create short-term election turnarounds. As such, sustainability often does not fit from an economic perspective. She referred to ideas of portraying oceans and marine life as a magical space, especially with the aid of material like nature documentaries and motivating the public to have firsthand experience with oceans and aquariums. She also cited managing fisheries and fish stocks with strong scientific expertise and research and harnessing technology to better manage and oversee harvest strategies. As to climate change, rising global temperatures affect current marine ecosystems in the distribution and production of species. While scientists still do not know how the full process plays out, global warming will affect different species in various ways and create an overall impact on marine species. Thus, it is up to the public, academia, and policymakers to create more resilient systems as a means to mitigate climate change trends.

Interview #3: Adrian Castillo, UCSD Scripps Institute of Oceanography, CUNY Graduate Student

Adrian's work at a Parasitology lab looks at parasites affecting the behavior of California fish brains and Otoliths, which are growth rings that are hosted in fishes. Through a study of the

chemistry and microbiology of these marine creatures, much can be learned about the growth in the history of these organisms. His further research involves working with coral, to understand how deep-sea environments have been shaped across centuries. Certain coral species are thus available to act as a reliable proxy for microchemical analysis to better understand environments in the deep sea. He cited regions such as the deep sea as deeply unexplored and emphasized a certain optimism about continuously learning more. For instance, CUNY's work in studying fjords in Chile has given insight into technology such as aquaculture. While aquaculture can provide spaces of contained growth through close monitoring of marine stocks, it also produces a lot of waste in the form of blooms that can affect surrounding environments. As such, regions such as marine protected areas serve as important petri dishes for scientific exploration and it has readily become more urgent to preserve these ecosystems. As previously attributed by the UNCLOS negotiations, Adrian cited the ocean as a shared heritage of mankind, whose ownership belongs not to a single nation³. As such, the dynamic between politics, governments, and scientists is a nebulous system where several considerations and opinions loom during any decision-making process. Rigorous peer-review processes also exist on the international stage when it comes to creating any sort of mutual understanding when discussing policy. Therefore, amplifying the voices of scientist activists and citizen scientists can play an important role since such individuals are required to wear many hats in such a cross-disciplinary field. He particularly attributed the lack of diversity within the scientific community, where there is a growing understanding that those often represented in academia come from privileged backgrounds. As such, it becomes the job of activists to bridge the gap between demographics not found in science, especially in the context of Western science. Current frustrations in the field also include overengineering problems getting caught up in technical aspects rather than actual actions, and

difficulty in translating findings into management language. Scholars in academia also strive to cite the role of indigenous and native communities in their role in marine sustainability. This is in special association with spaces that still remain largely unexplored, such as the deep sea. Native communities have years of expertise in understanding the connectivity between different natural environments and have strong roots in traditional knowledge that contrasts to Western science. Such knowledge stems from generations of people who have had intimate relationships over the course of millennia. As such, their knowledge should be presented and taken into consideration while discussing solutions.

Suggestions on how to administer action include a change in culture and philosophy through education, getting society excited about the ocean, and presenting multiple perspectives. He also cites that it has historically been wealthy communities and industries who have caused the most amount of damage, a perspective introduced by leaders in global environmental politics such as Chasek et al⁵.

Interview #4: Katie O'Donnell, Illegal Fishing and Transparency Analyst Oceana Staff

Katie prescribes her work in illegal fishing and transparency on the data team as a means to study and oversee fishing stocks. More specifically, the fishery transparency campaign helps tackle federal policy by ensuring that seafood is traceable from sea to plate, and human rights in the field. Her current frustrations with progress include the slow speed of progress and difficulty in finding solutions that work for everyone, including members of the industry who wield great amounts of power. Particularly, this emphasizes having underrepresented groups, who have

historically not been part of the policy process, to be included throughout the discussion and not merely in the final negotiation. When it comes to transparency in the marine field, she cites vessel transparency, expanding public data sets, and electronic monitoring policies for safety at sea especially on large industrial fleets. Challenges from industry have underscored the slow policy development- so it is a viable alternative to consider grassroots organization and starting with communities that are most impacted by marine issues to understand where they are at and their current knowledge space. Climate issues and marine pollution affect all communities, whether or not they are directly positioned near the coasts- and as such, it is important for the public to become more aware of such issues so they may take action for effective change. As such, Katie suggests that the public ask questions become curious about how marine ecosystems work, and access various resources and guides to become more educated.

Interview #5: Erica Ferrer- University of California, Santa Cruz, Department of Ecology & Evolutionary Biology, Doctor of Philosophy

Erica's knowledge revolves around work in fisheries ecology, conservation, marine ecology, and fisheries management through her time at academic institutions such as the University of California, Santa Cruz, and the University of California, San Diego¹¹. She cites the study of the production and effect of domoic acid in Dungeness crabs and their impact on neurotransmitters. Marine pollution in the form of algae blooms, and marine life that becomes stressed due to environmental events such as heat waves, is especially notable in the production and release of domoic acid in waters. The spread of such domoic acid is said to cause problems in fisheries as such neurotoxins make their way through the food chain, even affecting sea lions

and marine mammals. While the effects of climate change are demonstrated through the study of such Dungeness crabs, Erica cites that there is still a large gap between our understanding of climate change and the ocean. Such research and studies are especially crucial for small-scale fisheries, who are repeatedly marginalized and are not invited to speak at the local or international level. Oftentimes, it is difficult for scientists to communicate at large environmental negotiations due to a difference in background. To garner political favor, there is a high level of diplomacy and interpersonal respect that must be demonstrated for scientists to receive credibility. In regards to issues within the field of marine science and sustainability, Erica cites the voices of young people, marginalized communities, economically disenfranchised groups, and those who do not speak the dominant language (often English) are often not represented on national and international levels. With negotiations such as the Conference of the Parties (COP), everyone's voice should be heard since the decisions made then have widespread and long-lasting effects on diverse audiences. As for whether remedial or preventative measures should be taken in regard to climate change, often there needs to be a triage conducted by these differing groups.

In regards to fisheries, the general public may or may not know the difference between fishing and overfishing. Not all fishing should be seen as overfishing and fishing itself is not inherently a bad thing, as certain advocacy groups may argue. Such views are often extremely privileged world views and lack proper data collection and presentation to push certain agendas. Thus, turning towards systems set forth by small-scale and local fisheries is bound to give one an insight into how to maintain sustainability practices. Critics have also cited aquaculture as a fishery solution that gets a bad reputation. However, horror stories in aquaculture can also be regarded as the exception and not the rule. Small-scale aquaculture and mariculture have been

proven to be successful and sustainable especially when hosted alongside natural marine ecosystems.

Regarding various advocacy groups, non-profit organizations, and government agencies- it is important to consider that different groups often have different interests. Thus, looking at various groups as a whole and being able to gather opinions based on their viewpoints and publications is an important step in becoming a marine advocate.

ANALYSIS AND FINDINGS

Research and synthesis of various interviews, allowed me to generate a comprehensive analysis of pain points and opportunities in the marine sustainability and policy spaces. Issues of marine sustainability and climate change are constantly displayed as complicated, but that does not imply that there are no systems and solutions that can be created in this field. In doing so, it is possible to flip the narrative and storytelling of marine sustainability and present the space as a place of growth and opportunity in terms of green finance, sustainable technology, and policy changes that represent numerous stakeholders. Thus my project seeks to create a space for conversation and education presented by different stakeholders and groups interested in the field of marine sustainability. First, diverse voices should be presented as a means to bring historically knowledgeable groups together. This can be especially demonstrated through the context of speaking with indigenous and native communities. For decades, their expertise in marine ecosystems has served to showcase how communities can use natural resources in a sustainable way. Thus, their vast knowledge can be seen as an integral part of the sustainability conversation and Indigenous communities despite being vastly underrepresented in all forms of academia and government.

Through articles such as “Centering Native American and Indigenous Voices in Ocean Conservation”⁶, “Traditional Kumeyaay Tule-Boat Launch Highlights California’s Indigenous Ocean Culture”⁷, “Pathways to Justice, Equity, Diversity, and Inclusion in Marine Science and Conservation”⁸, “How community and Indigenous efforts contribute to protecting our oceans”⁹, “Indigenous-Led Marine Conservation Should be the Future of Our Movement”¹⁰, Make Waves attempts to honor these communities and let their voices be heard to a larger audience. Experts

who serve as liaisons between industry, local fishermen, and communities also bring up the point that directly uplifting the voices of coastal fishers is crucial. As such, Make Waves calls upon work written about and by local fishing communities such as “A Guide to Sustainable Practices in Commercial Fishing”¹¹, “Women mobilize for their rights as artisanal fishers”¹², “As climate change and high costs plague Alaska’s fisheries, fewer young people take up the trade”¹³, “How The Magnuson-Stevens Act Shaped Hawaii’s Fishing Industry”¹⁴, to demonstrate their fieldwork and thoughts about sustainability. When it comes to fishing in general, certain groups may call upon drastic measures that seem to imply all fishing is overfishing, such as work put forth in the documentary *Seaspiracy*¹⁵. Without putting forth multiple viewpoints and analyses into small-scale fisheries, the general public is often confronted with unrealistic lifestyle changes to fully support marine sustainability. However, reputable institutions and groups such as the Monterey Bay Aquarium¹⁶ and the National Oceanic and Atmospheric Administration (NOAA) have put forth seafood sustainability guides¹⁷.

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