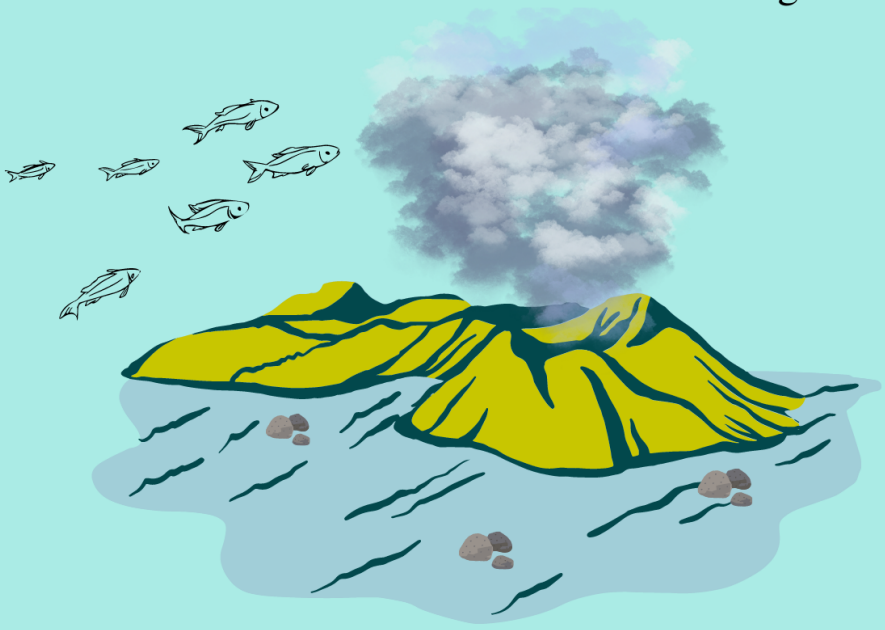
The Seabed Extraction Assessment System (SEAS)

A Private Solution to Seabed Mining



The Elisabeth Haub School of Law

Environmental Law and Policy Hack 2022 Submission

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We would also like to acknowledge the disproportionate effects deep sea mining may have on indigenous and local Pacific communities that rely on fishing to sustain and support their communities. Although the International Seabed Authority is setting forth regulations to mitigate the harm caused by deep sea mining, marine life may be severely affected by seabed operations, putting these communities' food sources directly at risk. We recognize the importance of the Pacific to indigenous people, and thus any discussion should take into account the voices and needs of their communities.

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Abstract

Deep sea mining is the extraction of polymetallic nodules and other precious metals from the abyssal seafloor, mid-ocean ridges, and hydrothermal vents; it is an alternative to ecologically damaging terrestrial mining. However, deep sea mining also has the potential to damage the oceanic ecosystem and affect both benthic and pelagic organisms in critical ecosystems, such as hydrothermal vents. Some ways deep sea mining companies can mitigate this damage are to conduct comprehensive Environmental Impact Assessments (EIAs) before engaging in mining and to limit deep sea mining to regions with lower biodiversity. The International Seabed Authority (ISA) currently sets standards for deep sea mining, however mining companies may fall short on complying with regulations.

We propose an independent monitoring system, the Seabed Extraction Assessment System (SEAS), to be administered by a new Non-Governmental Organization (NGO), the International Seabed Stewardship Council (ISSC), that assesses whether deep sea mining companies are complying with best-practice standards according to the ISA's regulations. We propose this NGO work alongside existing ISA governance to strengthen and refine standards of practice in the deep sea mining industry and to facilitate data sharing between deep sea mining companies and their prospective corporate clients.

Part I. Introduction

A. Background

For the global economy to fully shift away from fossil fuels to renewable energy, the demand for copper and rare earth elements could increase by 40%, the demand for nickel and cobalt could increase by 60-70%, and the demand for lithium could increase by 90%,[1] likely requiring significant production from the deep sea. The seafloor is a tantalizing metal resource because it contains more metal reserves than terrestrial resources which could greatly contribute to global demand.[2] However, deep sea mining is rife with ecological and ethical dilemmas.

Within the decade, metals mined from the seafloor will likely enter the global supply chain.[3] The metals will come from polymetallic nodules on the abyssal seafloor, polymetallic sulfides from hydrothermal vents, and cobalt crusts from mid-ocean ridges. Polymetallic nodules are potato-sized lumps of oxyhydroxides and manganese oxides containing valuable metals such as cobalt, copper, nickel, titanium, and rare earth elements coating the abyssal seafloor in some regions.[4] Polymetallic sulfides are metal deposits rich in sulfide, copper, gold, zinc, barium, lead, and silver found around hydrothermal vents.[5] Cobalt crusts form on seamounts and contain cobalt, manganese, copper, iron, nickel, and platinum.[6] Industries use these metals and rare earth

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[1] The Role of Critical Minerals in Clean Energy Transitions, Role Crit. Miner. Clean Energy Transit. (2021).
[2] James R. Hein, Andrea Koschinsky & Thomas Kuhn, *Deep-ocean polymetallic nodules as a resource for critical materials*, 1 Nat. Rev. Earth Environ. 158 (2020).
[3] World Economic Forum, *Deep-Sea Minerals : Why Manufacturers and Markets Should Engage Now*, (2021).
[4] Hein, Koschinsky, and Kuhn, *supra* note 2.
[5] Kathryn A. Miller et al., *An overview of deep sea mining including the current state of development, environmental impacts, and knowledge gaps*, 4 Front. Mar. Sci. (2018).
[6] *Id.*

elements in making batteries, solar panels, wind turbines, smartphones, jet engines, and much more.[7]

B. Governance

The International Seabed Authority (ISA), is an autonomous international organization that regulates deep sea mining under the auspices of the United Nations Convention on the Law of the Sea (UNCLOS).[8] Regulations set forth by the UNCLOS mandate the ISA to protect the deep sea from the most harmful effects of deep sea mining and create the rules and regulations that govern deep sea mining for the benefit of all humankind.[9] Deep sea mining is still in the exploratory phase; to date, the ISA has issued twenty-nine fifteen-year exploratory contracts for polymetallic nodules, polymetallic sulfides, and cobalt crusts.[10] The ISA expects extractive regulations to be finalized by 2023,[11] and at that point, deep sea mining companies will proceed with extraction.

C. Ecological Impacts

The extent of the ecological impact of deep sea mining on the ocean is not fully understood; however, deep sea mining will exacerbate impacts on deep sea ecosystems, which are already stressed by the impacts of climate change.[12] Deep sea mining will likely destroy

[7] James R. Hein, Andrea Koschinsky & Thomas Kuhn, *Deep-ocean polymetallic nodules as a resource for critical materials*, 1 Nat. Rev. Earth Environ. 158 (2020).
[8] The International Seabed Authority, *About ISA*, https://www.isa.org.jm/about-isa.
[9] *Id.*
[10] Contractors for Seabed Exploration, (2019), https://www.isa.org.jm/documents-resources/publications.
[11] Elham Shabahat, *A Year In , Progress Is Slow in Development of the Deep-Sea Mining Code*, Hakai Mag. 1 (2022).
[12] Holly J. Niner et al., *Deep-sea mining with no net loss of biodiversity-an impossible aim*, 5 Front. Mar. Sci. (2018); Andrew K. Sweetman et al., *Major impacts of climate change on deep-sea benthic ecosystems*, 5 Elementa (2017).

benthic and midwater ecosystems.[13] On the seafloor, mining vehicles will remove benthic substrate, filter out the metals, and release toxic sediment plumes into the midwater column, impacting marine life for thousands of meters, both vertically and horizontally.[14] The deep sea provides important ecosystem services for humankind and the planet such as genetic resources and carbon sequestration.[15] Ecological impacts from deep sea mining will result in net biodiversity loss, removing unknown species before they can be discovered, and studies estimate that 91% of the species in the ocean are undiscovered.[16] Industries harvest deep sea genetic resources for pharmacological, industrial, and cosmetic purposes, including for cancer drugs and AIDS and herpes treatments.[17] Many of these drugs and industrial enzymes are worth millions of dollars,[18] and are enormously valuable in a societal context as life saving treatments. The extinction of undiscovered species represents a large potential monetary loss and the loss of potential life saving drugs.

In addition to providing genetic resources, deep sea ecosystems are important climate regulators; they sequester carbon, including from anthropogenic sources, and remineralize nutrients.[19] In part, benthic and midwater organisms carry out these processes by consuming sinking particulate organic carbon and bioturbating the seafloor, aiding in the remineralization of organic matter by carrying carbon and nutrients from the surface waters and burying them in the

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[13] Jeffrey C. Drazen et al., *Midwater ecosystems must be considered when evaluating environmental risks of deep-sea mining*, 117 Proc. Natl. Acad. Sci. U. S. A. 17455 (2020); Niner et al., *supra* note 12.
[14] Drazen et al., *supra* note 13; Niner et al., *supra* note 12.
[15] Niner et al., *supra* note 12.
[16] *Id.*; Camilo Mora et al., *How many species are there on earth and in the ocean?*, 9 PLoS Biol. 1 (2011).
[17] David Leary et al., *Marine genetic resources: A review of scientific and commercial interest*, 33 Mar. Policy 183 (2009).
[18] *Id.*
[19] Sweetman et al., *supra* note 12.

seafloor.[20] Deep sea mining ecological impacts will likely disturb carbon and nutrient cycling.[21] By interfering with basic ecosystem processes and killing marine life, deep sea mining will almost certainly impact carbon and nutrient cycling at least in the regions where deep sea mining occurs.[22]

D. Ethical Implications

The ethical impacts of deep sea mining include resource sharing with Small Island Developing States (SIDS) and the yet-unknown impacts of mining operations on fisheries, a vital component of the global blue economy and especially vital to SIDS. The UNCLOS mandates the ISA to withhold some particularly mineral-rich designated mining areas in trust for SIDS and other developing nations.[23] However, the New York Times released an exposé claiming the ISA released classified documents to The Metals Company, a deep sea mining company, that disclosed where the sites were located and to which countries they were promised.[24] The Metals Company has since contracted with two of those countries, Tonga and Nauru, to mine in their designated areas.[25] The Metals Company will share their profits with Tonga and Nauru; however, in the case of Tonga, they will only share $2 for every ton worth $800, or 0.25% of their profits.[26]

The impacts of deep sea mining on fisheries is still mostly unstudied, but researchers are concerned about potential impacts on both fisheries and the individuals who rely upon them.

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[20] *Id.*
[21] Mora et al., *supra* note 16.
[22] Drazen et al., *supra* note 13; Sweetman et al., *supra* note 12.
[23] The United Nations General Assembly, *United Nations Convention on the Law of the Sea*.
[24] Eric Lipton, *An Investigation Leads to the Bottom of the Pacific*, New York Times, 2022.
[25] New York Times, *deep sea mining Selected Documents 2022*, Document Cloud, http://www.deepseaminingoutofourdepth.org/about/ (last visited Oct 25, 2022).
[26] Natalie Kitroeff, *Promise and Peril at the Bottom of the Sea*, https://www.nytimes.com/2022/09/16/podcasts/the-daily/electric-cars-sea-mining-pacific-ocean.html.

Impacts from the sediment plumes on fisheries are possible due to downstream ecological impacts,[27] and Pacific Island communities are concerned about the impacts on nearshore fisheries if sediment plumes travel far enough; the area designated for mining is less than 500 kilometers from Hawai'i's territorial waters, approximately the length of the main Hawaiian Islands.[28] There is spatial overlap between tuna fisheries and mining operations in international waters; however, the impacts on tuna fisheries are unknown.[29] Although not a mining operation managed by the ISA, Cook Islanders worry about the impacts of a proposed deep sea mining operation in Marea Moana on local subsistence fisheries,[30] and as deep sea mining becomes more technologically feasible, countries may begin mining within their territorial waters. Modern legal management frameworks may not ascribe enough value to the traditional indigenous view of continuity between the land and the sea,[31] so deep sea mining management may unduly impact indigenous communities and developing nations without adequately fulfilling their needs.

E. A Private Governance Solution

To address the aforementioned issues, we propose the formation of the International Seabed Stewardship Council (ISSC), a Non-Governmental Organization (NGO) responsible for setting applicable standards of business practice in the deep sea mining industry via the Seabed

[27] Nautilus Minerals, *Environmental Impact Statement, Solwara 1 Project' Nautilus Minerals Niugini Limited, Main Report*, (2008).
[28] Brian Owens, *Keeping Track of Deep-Sea Mining*, Hakai Mag. 22 (2016).
[29] J. M.A. van der Grient & J. C. Drazen, *Potential spatial intersection between high-seas fisheries and deep-sea mining in international waters*, 129 Mar. Policy 104564 (2021).
[30] Rachel Reeves, *My Family's Pacific Island Home Is Grappling with Deep-Sea Mining*, Hakai Mag. 1 (2021).
[31] Virginie Tilot et al., *Traditional Dimensions of Seabed Resource Management in the Context of Deep Sea Mining in the Pacific: Learning From the Socio-Ecological Interconnectivity Between Island Communities and the Ocean Realm*, 8 Front. Mar. Sci. (2021).

Extraction Assessment System (SEAS), an assessment system focused on interactions between deep sea mining suppliers and their corporate buyers.

Part II. Outlining the SEAS – the Traffic Light System and Risk Factor Evaluation

A. The SEAS Database

The ISSC's primary purpose will be to formulate and manage the SEAS, a confidential database that gives corporate minerals buyers a data set regarding the ecological and ethical impacts of their suppliers' business practices in the form of an assessment rating system. Due to the nature of deep sea mining for major metals, corporate buyers and investors want readily accessible information about their metals' supply chains for transparency. Safely, equitably, and ethically sourced materials have a higher intrinsic value because of their social capital.[32] Corporate buy-in of assessment reports will also cause the SEAS to influence policy across not only certain political and legal levels in relation to the ISA, but within large corporations and their business management.

The SEAS' confidential database will provide a comprehensive portrait of the mining company, including organizations within the mining operation's value chain, such as suppliers, stakeholders, and clients of the company's deep sea mining operation. As investors and corporate buyers navigate sourcing, supply-chain details, and price point options, the extent of information needed by the companies can be vast, and therefore the SEAS will coordinate the organization of all data. The SEAS database's main page will present an expandable map with pinned locators showing hydrothermal vent systems and other deep sea biodiversity hotspots, shipping lanes, deep sea corals, the presence of turtles and whales, fisheries activities, and telecommunication

[32] Susan M. Harris, *Does sustainability sell? Market responses to sustainability certification*, 18 Manag. Environ. Qual. Int. J. 50 (2007).

cable lines, among other factors. In addition, it will contain a scale showing each risk factor's grade as assessed by the ISSC; a user will be able to click on each factor to view a full report detailing the analysis of the company's mining techniques (Appendix A).

The SEAS is built to aggregate large data sets across multiple parties to build new solutions that align mining operations, supply chain partners, stakeholders, and clients. Risk factors within the deep sea mining process will be evaluated and rated using a "traffic light" system. A green "grade" will equate to an ecologically sound practice with safe, equitable, and ethical mining standards, adherence to policy parameters and laws, and low environmental degradation and biodiversity damage; a yellow "grade" will indicate good to neutral ecological practices; and, a red "grade" will show a company participating in ecologically damaging practices within that risk factor. The standards applied to the companies' data will result from consultations with experts in the deep sea mining field and analyses of ISA regulations. The SEAS database will highlight suppliers' mining practices and show sustainable sourcing strategies to stakeholders and clients.

B. Risk Factors Assessed by the SEAS and Associated Data Framework

Risk factors assessed by the SEAS will be based on evaluated standards in the deep sea mining industry, demand from corporate buyers, as well as additional sustainability indicators developed by the ISSC. The ability to be responsive to data demands from corporate buyers will allow for specific requested data to be shared with companies like Tesla that require suppliers to cooperate with efforts in removing practices within their supply chain that do not align with their policies.[33] Investors and corporate buyers will be able to download and view data sets from key

[33] Tesla, Inc., *Tesla 2021 Impact Report*, https://www.tesla.com/ns_videos/2021-tesla-impact-report.pdf#page=4.

indicators. The proprietary indicators included in the SEAS report will include analyses based on benthic, pelagic, and surface-level impacts on the marine environment; impacts on other industries including fisheries, shipping and telecommunications; and ethical factors such as historic business practices of the mining company, resource sharing with the sponsoring developing country, and, whether company funding is derived from illegal sources. These indicators will contribute to the analysis of a variety of factors that companies may want to know about their suppliers (Table 1).

1. Environmental Indicators

The SEAS analysis will incorporate data acquired by the client from the mining company that elucidates the impacts of mining on the marine ecosystem and the communities that rely on it. The first, and perhaps most important, environmental indicator that will be included in the SEAS report is the Environmental Impact Assessment (EIA) the ISA requires mining companies to complete. The EIA is an important factor to consider in the SEAS analysis, as an EIA shows how the company's mining practices are likely to affect the marine environment.[34] Mining companies are required to conduct an EIA following the recommendations of the ISA's Legal and Technical Commission, as outlined in its "Recommendations for the guidance of contractors for the assessment of the possible environmental impacts arising from exploration for marine minerals in the Area."[35] The ISA recommends for the EIA to include conducting environmental baseline studies, monitoring the marine environment while conducting prospecting and

[34] Steiner, *supra* note 40.
[35] International Seabed Authority Legal and Technical Commission, *Recommendations for the guidance of contractors for the assessment of the possible environmental impacts arising from exploration for marine minerals in the Area*, ISBA/25/LTC/6/Rev.1 (2020), https://isa.org.jm/files/files/documents/26ltc-6-rev1-en_0.pdf.

exploration activities, and monitoring before and after the testing of mining components.[36] This assessment, when conducted thoroughly, generates data such as sediment disposal methods and location, toxicity of the sediment plume, and potential effects of noise and light pollution on deep-sea organisms. A comprehensive EIA gives companies a stronger idea of how their mining practices will affect the mining region, ensuring that unpredicted impacts do not occur. The SEAS analysis will check to confirm that the EIA has properly evaluated issues of concern such as sediment disposal, light and noise pollution, and other impacts on marine life. Practices such as improper sediment disposal create toxic plumes and increase the turbidity of the water.[37] Mining machinery emits noise and light pollution that affects the natural behavior of organisms and can interfere with echolocation.[38] Mining can also disrupt sedentary animals such as deep sea corals and highly mobile pelagic organisms such as turtles, whales, and sharks.[39] Therefore, inclusion of all of these potential impacts will be crucial in the SEAS assessment.

While the EIA is a helpful tool, the scientific community considers the recommended testing, the delay between the exploratory period and the mining action, and the lack of any clearance system to partake in exploration to be problematic.[40] In particular, there are concerns regarding the process by which the ISA approves companies' requests to conduct exploration – the ISA automatically approves those exploration requests because the EIA is produced after the initial exploration contract has been completed.[41] Therefore, the SEAS tool will assess the mining companies using their self-reported EIA as well as additional data about the seabed and

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[36] *Id.*
[37] Drazen et al., *supra* note 12.
[38] *Id.*
[39] Drazen et al., *supra* note 12.
[40] Sabine Christiansen, Stefan Bräger & Aline Jaeckel, *Evaluating the quality of environmental baselines for deep deep sea mining*, 9 Front. Mar. Sci. (2022), https://www.frontiersin.org/articles/10.3389/fmars.2022.898711 (last visited Oct 17, 2022).
[41] *Id.*

the pelagic environment. In addition to the EIA, the SEAS report will also analyze external data to ascertain potential additional impacts on the environment that may not have been captured by the EIA. One feature of the SEAS dashboard will be a map which reveals potential conflicts with other components of the marine ecosystem across different ecosystems. Potential conflicts with both benthic and pelagic animals will be included, such as likely interference with deep sea coral habitat, disturbance of benthic biodiversity hotspots, and overlap with pelagic turtle habitat and whale migration routes. This analysis will incorporate data data from a variety of sources including the Intergovernmental Oceanographic Commission's Ocean Biodiversity Information System (OBIS),[42] the National Oceanic and Atmospheric Administration (NOAA) Deep-Sea Coral Data Portal (DSCRTP),[43] the NOAA TurtleWatch tool,[44] the U.S. Animal Telemetry Network,[45] and peer-reviewed literature, among others. This will ensure that the data provided to corporate clients is comprehensive and verified by multiple sources.

2. Industrial Indicators

Deep sea mining potentially conflicts with three other high seas industries: fisheries, telecommunications, and maritime shipping. The estimated value of fisheries in areas beyond national jurisdiction is $7.6 billion USD.[46] High seas fisheries are essential to the global food

[42] IOC UNESCO, *Ocean Biodiversity Information System*, https://ioc.unesco.org/our-work/ocean-biodiversity-information-system (last visited Oct 30, 2022).
[43] NOAA, *Deep-Sea Coral Data Portal*, https://deepseacoraldata.noaa.gov/ (last visited Oct 30, 2022).
[44] NOAA, *TurtleWatch*, NOAA (2021), https://www.fisheries.noaa.gov/resource/map/turtlewatch (last visited Oct 30, 2022).
[45] The U.S. Integrated Ocean Observing System (IOOS), *Animal Telemetry Network*, https://ioos.noaa.gov/project/atn/ (last visited Oct 30, 2022).
[46] Enric Sala et al., *The economics of fishing the high seas*, 4 Sci. Adv. (2018).

supply of protein, particularly in developing countries.[47] Initial analysis conducted by the University of Hawaii at Manoa demonstrated that mining is likely to affect high seas fisheries, particularly due to the discharge of the sediment plume, and these impacts may disproportionately affect developing countries and SIDS whose economies are dependent on the fishing industry.[48] The SEAS report will include a spatial analysis of potential overlap between fishing activity and the potential mining area using the latest available data on the geographic and temporal coverage of fisheries hotspots from Global Fishing Watch.[49] Telecommunications via submarine cables are an equally important industry; the global reliance on submarine cables for communication cannot be understated. For example, the latest estimates hypothesize that the Society for Worldwide Inter- bank Financial Telecommunications (SWIFT) transmits 15 million messages via deep sea telecommunications cables to more than 8300 banking organizations per day.[50] The SEAS report will also include potential disturbance of mining activities on these submarine cables.[51] Finally, mining operations entail procedures that could present significant impacts on the surrounding vessel traffic, particularly in regions with prolific traffic from cargo vessels. It will be critical to the global economy for mining industries not to disturb shipping lanes, as maritime transport is the backbone of international trade. As of 2018, shipping via cargo vessels accounted for over 70% of global trade by economic value and 80% of trade by

[47] M Barange et al., *Impacts of climate change on fisheries and aquaculture: synthesis of current knowledge, adaptation and mitigation options*, 654.
[48] van der Grient and Drazen, *supra* note 29.
[49] Global Fishing Watch, *Global Fishing Watch Map*, Global Fishing Watch, https://globalfishingwatch.org/ (last visited Oct 30, 2022).
[50] Douglas Burnett, Tara Davenport & Robert Beckman, Introduction. Why Submarine Cables? (2014), https://brill.com/view/book/edcoll/9789004260337/B9789004260337_002.xml (last visited Oct 30, 2022).
[51] *Id.*

volume.[52] The SEAS will also factor in shipping lane traffic using spatial data from the Marine Vessel Traffic database.[53]

3. Ethical Indicators

In addition to describing potential environmental impacts, the SEAS report will also investigate whether mining companies use an ethical approach to operations. Mining companies are contracted with countries who allow them to mine in their designated areas; in exchange, the companies are expected to share their profits with the countries.[54] The SEAS report will include an analysis of the legal contract between the mining company and the sponsoring country. Once deep sea mining begins, future analyses will include a breakdown of the mining company's track record, i.e. whether companies have a record of sharing profits equitably. Additionally, the SEAS report will include an investigation into whether mining companies are involved in illegal activity at any tier of supply chain operations. This is especially important because mining companies may have cross-border associations and illicit activities may be present due to the multinational operations of many companies. The high seas, and the companies that operate therein, are host to a suite of illegal activities such as drug smuggling, human trafficking, and piracy.[55] Our report will reveal whether mining companies are affiliated with or receiving funds from any such activities. Another ethical factor analyzed will be whether a mining operation

[52] Review of Maritime Transport 2018, (2018), https://unctad.org/system/files/official-document/rmt2018_en.pdf (last visited Oct 30, 2022).
[53] Maritime Traffic, *Container Tracker*, https://www.marinevesseltraffic.com (last visited Oct 30, 2022).
[54] Kitroeff, *supra* note 26; Richard Steiner, *Independent Review of the Environmental Impact Statement for the proposed Nautilus Minerals Solwara 1 Seabed Mining Project, Papua New Guinea*, (2009), http://www.deepseaminingoutofourdepth.org/wp-content/uploads/Steiner-Independent-review-DSM1.pdf.
[55] The High Seas – Unregulated and Under Attack: A Factsheet for Parliamentarians, 5.

lobbies the ISA; ISA regulations are set forth by the Member States of the ISA,[56] but seabed companies located within Member States may aim to lobby for certain regulations. Together, these data sources will serve as the baseline for the SEAS assessment and ultimately the company's final rating.

Risk factor	Data needed from supplier	External data
Environmental Impact Assessment	Mining company's self-reported EIA	ISA EIA Provisions[57]
Turtle Habitat	Location(s) of mining operations throughout the water column	NOAA TurtleWatch[58], U.S. Animal Telemetry Network[59]
Whale Migration Route	Location(s) of mining operations throughout the water column	NOAA Whale Watch[60], U.S. Animal Telemetry Network[61]
Benthic Biodiversity Hotspot	Mining company's physical mining location(s) on the seafloor	InterRidge Vents Database ver. 3.4[62], U.S. Animal Telemetry Network[63], NOAA Deep-Sea Coral Data Portal (DSCRTP)[64]
Pelagic Biodiversity Hotspot	Mining company's operational data on factors such as location of mining activity, operation's daily production, type of mining equipment, size of the sediment plume, predicted spatial scope of mining operations	Intergovernmental Oceanographic Commission's Ocean Biodiversity Information System (OBIS)[65], U.S. Animal Telemetry Network[66]

[56] The International Seabed Authority, *supra* note 8.
[57] International Seabed Authority Legal and Technical Commission, *supra* note 35.
[58] NOAA, *supra* note 44.
[59] The U.S. Integrated Ocean Observing System (IOOS), *supra* note 45.
[60] NOAA, *WhaleWatch*, NOAA (2022), https://www.fisheries.noaa.gov/west-coast/marine-mammal-protection/whalewatch (last visited Oct 30, 2022).
[61] The U.S. Integrated Ocean Observing System (IOOS), *supra* note 45.
[62] Beaulieu, Stace E & Szafrański, Kamil M, *InterRidge Global Database of Active Submarine Hydrothermal Vent Fields Version 3.4*, (2020), https://doi.pangaea.de/10.1594/PANGAEA.917894 (last visited Oct 30, 2022).
[63] The U.S. Integrated Ocean Observing System (IOOS), *supra* note 45.
[64] NOAA, *supra* note 43.
[65] IOC UNESCO, *supra* note 42.
[66] The U.S. Integrated Ocean Observing System (IOOS), *supra* note 45.

Fisheries Interference	Mining company's operational data on factors such as location of mining activity, operation's daily production, type of mining equipment, size of the sediment plume, predicted spatial scope of mining operations	Global Fishing Watch[67], Fisheries Management Information System[68], Regional Fisheries Management Organization reports, Watson[69]
Telecommunications Cables Interference	Mining company's physical mining location(s) on the seafloor	The International Cable Protection Committee, Submarine Cable Map[70]
Shipping Lane Interference	Physical location of ship(s) at the surface	Marine Traffic Container Tracker[71]
Resource Sharing with the Partner Developing Country	Benefit sharing documents between the mining company and host nation	ISA regulations, financial documents of the host nations
Funding Source	Copy of tax reports and funding source balance reports	Financial statements from donors to verify funds
Lobbying the ISA	Self-reported ISA engagements	ISA meeting reports and minutes, consultations with ISA staff

Table 1. Examples of risk factors that would be assessed, the rationale for the chosen risk factors, data needed from the client to assess the risk factor and external data needed to validate the assessment. Environmental factors are green, industrial factors are blue, and ethical factors are red.

C. How Sharing with the Client Will Work

When a client, the minerals buyer, solicits a SEAS report from the ISSC, the team will analyze the extraction company's practices based on the aforementioned "traffic light" system and generate a report. This report will be initially produced annually at the onset of trade relations, with mid-year reviews for behavioral modification in terms of enhancement of

[67] Global Fishing Watch, *supra* note 49.
[68] Fishing Wisconsin, *Fisheries Management Information System*, Wisconsin Department of Natural Resources, https://dnr.wisconsin.gov/topic/Fishing/data/infosystem.html.
[69] Reg A. Watson, *A database of global marine commercial, small-scale, illegal and unreported fisheries catch 1950-2014*, 4 Sci. Data 1 (2017).
[70] Submarine Cable Map, Submarine Cable Map, https://www.submarinecablemap.com/ (last visited Oct 30, 2022).
[71] Maritime Traffic, *supra* note 53.

operational best practices. This report will be the hallmark of the SEAS program and the primary focus of the ISSC's regulatory influence. The document will include the analysis of the aforementioned risk factors, data visualizations, and the final rating of the extraction company. Due to the commercially sensitive nature of the analysis, the report will be disseminated via an online confidential server which the client can access via a unique password for enhanced security. The database strategically ensures supply chain transparency to the client while protecting confidentiality of the analytics of the supplier.

The system will be easily navigable, with EIA reporting, additional data analysis, and traffic light scorecard results available to internal stakeholders and companies soliciting information. The SEAS's confidential database will process business-sensitive metadata throughout all lifecycle stages and, due to the commercially sensitive nature of the data, the processed report will be marked as confidential and handled as such. As an added service to the client, members of the ISSC will also offer to meet with the client to review the report and its findings. From there, the client may use the report as a part of their decision-making process as they see fit. The findings in the report will not, however, obligate the client to make a particular decision based on the mining company's final rating.

D. How Companies Will Use the SEAS

Using the assessment reports provided to them, investors and corporate buyers will be able to make informed future decisions by adjusting inventory and soft and hard sales decisions required to meet their specific long-term ecological targets and company missions, and by working with their existing suppliers to improve mining techniques and move towards more sustainable practices. Depending on where along the color gradient mining operations and

suppliers lie, corporate buyers can make informed decisions about what mining companies to use as their suppliers. Mining operations will be incentivized to adjust their practices towards being more sustainable, which in turn will encourage buyers to use those mining companies as their suppliers. This dashboard will improve policy and cost-beneficial decisions for investors and corporate buyers by organizing readily accessible data at buyers' fingertips to allow them to make informed decisions about their suppliers and by establishing how various mining companies and suppliers of precious metals aggregate against each other and industry standards.

Part III. Rationale for the Adoption of a Third Party Assessment System

Environmentally concerned consumers and investors are watching deep sea mining and the ISA closely. In fact, some major metals consumers have already pledged not to use deep sea mined metals. BMW, Google, Samsung, SDI, and Volvo have pledged a moratorium on deep sea mined minerals in their supply chains.[72] Scientists and many large organizations, such as Conservation International, the Deep Sea Mining Campaign, Greenpeace, Pacific Network on Globalization, and the Sustainable Ocean Alliance, have called for a moratorium on deep sea mining until more research is done on the impacts.[73] However, a complete moratorium on deep sea mining would limit metals sources to terrestrial mining, which has its own set of serious environmental and humanitarian issues, and could limit the global supply of metals necessary for the transition to renewable energy at a time when transition is vital.[74]

Buyers are becoming increasingly more sustainably minded and may want more information about their metals supply chains and their investors, and consumers may require

[72] The Role of Critical Minerals in Clean Energy Transitions, Role Crit. Miner. Clean Energy Transit. (2021).
[73] Deep Sea Mining Campaign, http://www.deepseaminingoutofourdepth.org/about/; World Economic Forum, *supra* note 3.
[74] The Role of Critical Minerals in Clean Energy Transitions, *supra* note 72.

increasing accountability from these deep sea mining companies. Each of these factors can be further addressed by the adoption of a third-party assessment system to serve as the bridge between suppliers of metals and buyers.

A major incentive for deep sea mining companies to adopt an assessment system and use a third-party regulatory body is to comply with developing perceptions by corporate buyers and consumers about environmentally certified products. Companies that meet environmental standards are often more favorably viewed by the public and by prospective buyers. For example, in the seafood industry, consumer demand for sustainably sourced products has grown in recent decades.[75] This growth led to industry-driven initiatives and regulations surrounding fisheries management, as well as the development of NGOs like the Marine Stewardship Council that monitor the sustainability of fisheries.[76] The ISSC would work in a similar manner; consumer demand for sustainably sourced metals may reasonably be expected to grow as companies begin to enter into the exploitation phase of deep sea mining and to mine for commercial sale. Therefore, the implementation of a comprehensive assessment system will allow companies to meet this demand by pressuring them to comply with more sustainable mining practices.

Consumer demand may also serve to increase company profits. A study on the market response to sustainably certified companies and products showed that consumers are willing to pay more for eco-friendly products and tend to support sustainable companies more, even when that results in a slight price increase.[77] Corporate buyers and consumers will view deep sea mining companies that try to comply with best practices in the seabed industry in a more

[75] Oleksandr A. Byelashov & Mark E. Griffin, *Fish In, Fish Out: Perception of Sustainability and Contribution to Public Health*, 39 Fisheries 531 (2014).
[76] *Lars H. Gulbrandsen, The emergence and effectiveness of the Marine Stewardship Council, 33 Mar. Policy 654 (2009).*
[77] Harris, *supra* note 32.

favorable light, allowing for an increase in sales and profit. Additionally, electric vehicle companies that label themselves as eco-friendly and have committed to eco-initiatives want suppliers committed to those same initiatives to maintain an environmentally friendly image. In its 2021 impact report, Tesla expressed that environmental and governance reporting should serve as a measure of a company's impact on the surrounding environment.[78] Tesla envisions a program championed by rating agencies, among other organizations, that analyzes real-world data from companies so that individual investors can choose to support companies that prioritize positive environmental change.[79]

Long-term visibility and environmental outlook of deep sea mining practices is an essential component that these companies purchasing minerals evaluate.[80] Private certification schemes and assessment systems have grown throughout recent decades as a form of non-state regulation.[81] Often, these systems fill in the gaps of existing legislation or offer more specific guidelines for companies to meet.[82] These assessment systems extend beyond self-regulatory governance by using an independent agency to verify compliance with a certain set of standards.[83] The key features of this form of private regulation are that state sovereignty does not enforce any of the assessments or certifications and that the authority of the system is driven by the market's supply chain.[84] Assessment and certification systems can take many forms, targeting both public consumers and potential corporate purchasers of products and materials that represent themselves as eco-friendly companies.

[78] Tesla, Inc., *supra* note 33.
[79] *Id.*
[80] The Role of Critical Minerals in Clean Energy Transitions, *supra* note 72.
[81] Gulbrandsen, *supra* note 76.
[82] *Id.*
[83] *Id.*
[84] Benjamin Cashore & Graeme Auld, *The United States' Race to Certify Sustainable Forestry: Non-State Environmental Governance and the Competition for Policy-Making Authority*, 5 Bus. Polit. 1076 (2004).

Part IV. Approaches and Effectiveness of Private Assessment Systems

A. Assessment Systems and the Theory of Indirect Reciprocity

Assessment systems are sets of measures that collect and analyze data within a certain industry to describe how industry actors compare to each other based on set guidelines. Assessment systems are successful based on the theory of indirect reciprocity, a mechanism of encouraging cooperation based on observation and individual reputations.[85] Indirect reciprocity assumes that people observe and assess each other, and that they use this information to decide what behavior is "good" or "bad," and then conform to the perceived good behavior.[86] Assessment systems within industry put this theory into practice by analyzing company data and practices based on a given set of standards and assessing how a company falls in compliance with those standards. Retailers can gauge whether they want to work with a particular company based on the assessment, and companies that fail to comply with the standards sufficiently are incentivized to change their practices to better comply to maintain a professional connection with their retailers.

B. Approaches to Private Assessment Systems – The Business-to-Business Model

There are two main models of assessment system: the business-to-consumer model and the business-to-business model, which conveys information to potential wholesale buyers, such as retailers, to help those buyers decide who to purchase from.[87] The business-to-business model

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[85] Olof Leimar & Peter Hammerstein, *Evolution of cooperation through indirect reciprocity*, 268 Proc. R. Soc. Lond. B Biol. Sci. 745 (2001).
[86] *Id.*
[87] Vilde Steiro Amundsen & Tonje Cecilie Osmundsen, *Becoming certified, becoming sustainable? Improvements from aquaculture certification schemes as experienced by those certified*, 119 Mar. Policy 104097 (2020).

of assessment system is widespread within various industries, such as forestry and fisheries, and is used by retailers to make informed sourcing decisions.[88] The primary sub-categories of the business-to-business model are industry-driven schemes, in which the industry itself forms and maintains its own standards, and the third-party scheme, in which a third-party auditor sets and evaluates standards. Retailers often set their own standards in an industry-driven assessment scheme, and the data and information given by the supplier to the corporate buyer are confidential due to the commercially sensitive nature of the information.[89] An issue with the industry-driven scheme when analyzing environmental effects of industry is that the regulations that the industry sets are less comprehensive than those recommended by experts in the field. For example, a study in Brazil examining a mining assessment system led by a mining company found that the system neither identified a vision for the future, nor proposed any goals for sustainability.[90] An alternative form of business-to-business model to the industry-driven scheme is the implementation of a third-party auditor that monitors the relations and communications between businesses. The aquaculture sector has implemented both the industry-driven and third-party forms of the business-to-business model for decades, usually setting standards related to quality rather than sustainability.[91] In recent years, this model has expanded to serve other purposes, such as allowing companies to meet sustainability goals and standards.[92]

Companies that market themselves as sustainable or eco-friendly benefit from the business-to-business model by ensuring that their suppliers provide sustainably-sourced material

[88] Cashore and Auld, *supra* note 84; Amundsen and Osmundsen, *supra* note 87.
[89] Sally Washington & Lahsen Ababouch, *Private standards and certification in fisheries and aquaculture: current practice and emerging issues*, (2011).
[90] Ana Ceci Mota, Emílio Lèbre La Rovere & Alberto Fonseca, *Industry-Driven and Civil Society-Driven Strategic Environmental Assessments in the Iron Mining And Smelting Complex of Coromba, Brazil*, 16 J. Environ. Assess. Policy Manag. 1450010 (2014).
[91] Washington and Ababouch, *supra* note 89.
[92] Amundsen and Osmundsen, *supra* note 87.

and take steps to ensure that their business practices are not environmentally destructive. The SEAS aims to primarily implement a business-to-business model system due to its ability to influence internal company practices based on retailer-supplier relationships; however, unlike certain systems that remain entirely industry-driven, the SEAS incorporates the usage of an independent NGO, the ISSC, responsible for setting and assessing applicable standards in the deep sea mining industry to create a balance between industry needs and expert recommendations. While business-to-consumer models place pressure on companies from outside sources, the business-to-business model more effectively implements internal change in both the corporate buyers and their suppliers.[93]

C. Effectiveness of Private Assessment Systems

For private assessment schemes to be effective, organizations setting the standards must consider both the environmental implications of the standards as well as the economic goals of the sector of interest. Companies are more willing to support more flexible schemes, such as assessment systems, as opposed to strict certification schemes.[94] Companies prefer flexible assessment systems because assessment systems allow companies a greater range of options for implementing environmentally sustainable practices.[95] It is therefore important to consider the economic needs of the companies to ensure that industry actors are more willing to comply with the SEAS standards. To most effectively implement the SEAS, the ISSC must ensure that the system mitigates key environmental issues, causes behavioral changes in the company's processes, and becomes accepted by stakeholders through a direct market influence.[96]

[93] *Id.*
[94] Cashore and Auld, *supra* note 84.
[95] *Id.*
[96] Rasmus Tröster & Michael Hiete, *Success of voluntary sustainability certification schemes – A comprehensive review*, 196 J. Clean. Prod. 1034 (2018).

Behavioral change within companies' practices is one of the most significant results of private assessment systems. Changes in internal procedures result from certification schemes because the steps towards certification are incorporated in the daily activities of the company.[97] Many companies also establish new positions or departments that focus on the environmental awareness of their business practices.[98] This causes the expansion of beneficial changes throughout the company and the embedding of environmentally sustainable practices into the core of companies participating in voluntary assessment schemes. In this case, the SEAS seeks to influence deep sea mining companies to engage in behavioral change beyond what ISA regulations set forth, and encourages a greater level of communication and transparency between purchasers of polymetallic nodules and their suppliers.

Private assessment systems additionally serve as precursors to government regulation. Oftentimes, an NGO or other independent agency implements a voluntary regulatory program, and governmental policy follows soon after. For instance, the first dolphin safe labeling system was devised by the Earth Island Institute, a conservation organization in the United States.[99] Subsequently, in 1990, the United States government. created its own dolphin safe labeling system under the Dolphin Protection Consumer Information Act.[100] The creation of the Marine Stewardship Council also prompted the Nordic Council of Ministers to form a Nordic project group to create and assess sustainable fisheries standards.[101] Private assessment systems are, therefore, influential in not only changing private behavior and attitude, but also in prompting subsequent governmental action. The ISSC and the factors analyzed by the SEAS will thus help

[97] Amundsen and Osmundsen, *supra* note 87.
[98] *Id.*
[99] Gulbrandsen, *supra* note 76.
[100] Dolphin Protection Consumer Information Act, 16 U.S.C. § 1385 (1990).
[101] Gulbrandsen, *supra* note 76.

to guide future regulations set forth by the ISA and build upon the existing and future standards imposed by the ISA.

D. How the SEAS Would Supplement ISA Regulations

The ISA manages deep sea mining practices by companies contracted with Member States of UNCLOS; the SEAS will not replace the function of the ISA, but rather act like a third-party certifier that goes above ISA regulation and considers market drivers, such as consumer preferences. Private assessment systems either fill in regulatory gaps where public regulation does not exist or strengthen and refine regulations based on the interests of certain third parties, like environmental activist organizations.[102] In this case, the SEAS will fill regulatory gaps by imposing standards of practice in geographical regions where the ISA has not drafted regulatory standards; the SEAS will additionally build upon existing ISA regulation that requires an EIA from mining companies by imposing stricter standards that companies must meet to be awarded a green "grade." When stakeholders and buyers support the system, it becomes *de facto* mandatory by increasing the pressure on companies to meet the standards imposed.[103] That then translates into private guidelines serving a substitutionary purpose for public regulation.[104]

One way in which the SEAS standards will supplement ISA regulations is by expanding existing regulation in the CCZ to areas where there is no ISA regulation, like other areas in the Pacific, Atlantic, and Indian Oceans. The ISA adopted a set of Exploration Regulations for exploratory expeditions by deep sea mining companies in the Pacific.[105] These serve to guide

[102] Tröster and Hiete, *supra* note 96; Washington and Ababouch, *supra* note 89.
[103] Amundsen and Osmundsen, *supra* note 87.
[104] Washington and Ababouch, *supra* note 89.
[105] Aline Jaeckel, *An Environmental Management Strategy for the International Seabed Authority? The Legal Basis*, 30 Int. J. Mar. Coast. Law 93 (2015).

companies when conducting scientific explorations about the effects and potential impacts of deep sea mining in their prospective mining zones.[106] But with rising demand for metals, companies with exploratory contracts that expired in 2016 are increasingly putting pressure on the ISA to complete its regulations for the exploitation phase of mining.[107] In 2012, the ISA adopted the Environmental Management Plan (EMP) for the CCZ in the central Pacific, which barred mining activities within certain areas in this region of particular ecological importance.[108] However, the reach of this plan thus far only extends to the CCZ, even though contracts have been granted to companies to explore other areas of the Pacific, Indian, and Atlantic Oceans.[109] The ISSC would supplement the work of the ISA in areas where regulation does not yet exist by assessing whether companies extend best-practice management beyond areas where ISA-imposed standards exist.

Additionally, the SEAS standards would build upon ISA EIA regulations to ensure that both the benthic and pelagic analyses of EIAs are comprehensive because, under ISA regulations, companies are falling short on analyzing the effects of deep sea mining on pelagic species. Companies are obligated to conduct EIAs under the UNCLOS.[110] The Nautilus Minerals Solwara 1 deep sea mining project off the coast of Papua New Guinea completed and submitted an EIA as part of its operations.[111] However, a lack of clear and specific regulation regarding what is required to be analyzed in the EIA led to shortcomings in the EIA of Nautilus.[112] Nautilus included extensive information about the deep-sea benthic communities in the EIA; however, no

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[106] *Id.*
[107] *Id.*
[108] International Seabed Authority Legal and Technical Commission, *Environmental Management Plan for the Clarion-Clipperton Zone*, ISBA/17/LTC/7 (2011).
[109] Jaeckel, *supra* note 105.
[110] LOSC, Articles 165(2)(d), (f), (h), 206.
[111] Steiner, *supra* note 54.
[112] *Id.*

study was conducted on the pelagic system that would be impacted above the proposed mining site.[113] A comprehensive analysis of both the benthic and pelagic systems is necessary, as sediment dispersal into the water column adversely affects pelagic fish species. There was also a failure to adequately analyze other risks, including sediment disposal, toxicity of the sediment plume, and potential effects of noise and light pollution on deep-sea organisms.[114] The failure to analyze important environmental implications in an EIS exacerbates the problem of inadequate scientific knowledge and leads to companies potentially causing unpredicted harm to the oceanic ecosystem. The SEAS would independently analyze the thoroughness and scientific grounding of each EIS, bridging the gap between the requirements of UNCLOS and the information truly needed to effectively analyze potential impacts of the mining processes.

Part V. Next Steps and Conclusion

Private regulatory standards in the deep sea mining industry will allow for a more environmentally conscious transition away from terrestrial mining. The goal of the SEAS is to provide transparency to mineral buyers searching for a sustainable mineral supplier and ultimately create an incentive for risk management and mitigation throughout the mineral extraction process. This system will operate parallel to the ISA's governance structures in order to refine and strengthen existing ISA regulation.

To promote the successful implementation of the SEAS, our team's goal is to consult directly with delegates of ISA Member States. By working with the ISA directly, we will maximize synergy among the landscape of mineral regulation and sustainability assessments. We also hope to present our concept at international ocean policy conferences such as the UN

[113] *Id.*
[114] *Id.*

Ocean Conference and the Our Ocean Conference. Finally, we plan to host an on-campus event to raise awareness amongst the University of Miami community about deep sea mining and its potential implications.

We are aware that adverse effects on the seabed and the marine life it sustains disproportionately affect indigenous and local Pacific communities who rely on fishing to sustain their livelihoods. Common food fishes and other migratory species may become contaminated by heavy metals suspended in the water column, and the health of communities across the Pacific could be affected as a result.[115] The Alliance of Solwara Warriors consists of indigenous communities across the Soloman and Bismarck Seas that have come together to call for a halt to deep sea mining.[116] Their message is clear: if deep sea mining proceeds without an understanding of the potential environmental impacts, Pacific Islanders stand to lose their source of food security and their cultural connection with the Pacific.[117] The Alliance of Solwara Warriors aims to educate communities across the Pacific region and internationally about the potential harmful effects of deep sea mining.[118] Award money from this competition would first go towards costs associated with discussing our proposal with ISA delegates and market professionals to understand the risk factors that they consider and trends in consumer demand. Next, any remainder would go towards hosting a campus awareness event and a donation to the Alliance of Solwara Warriors to support their mission of educating communities about deep sea mining.

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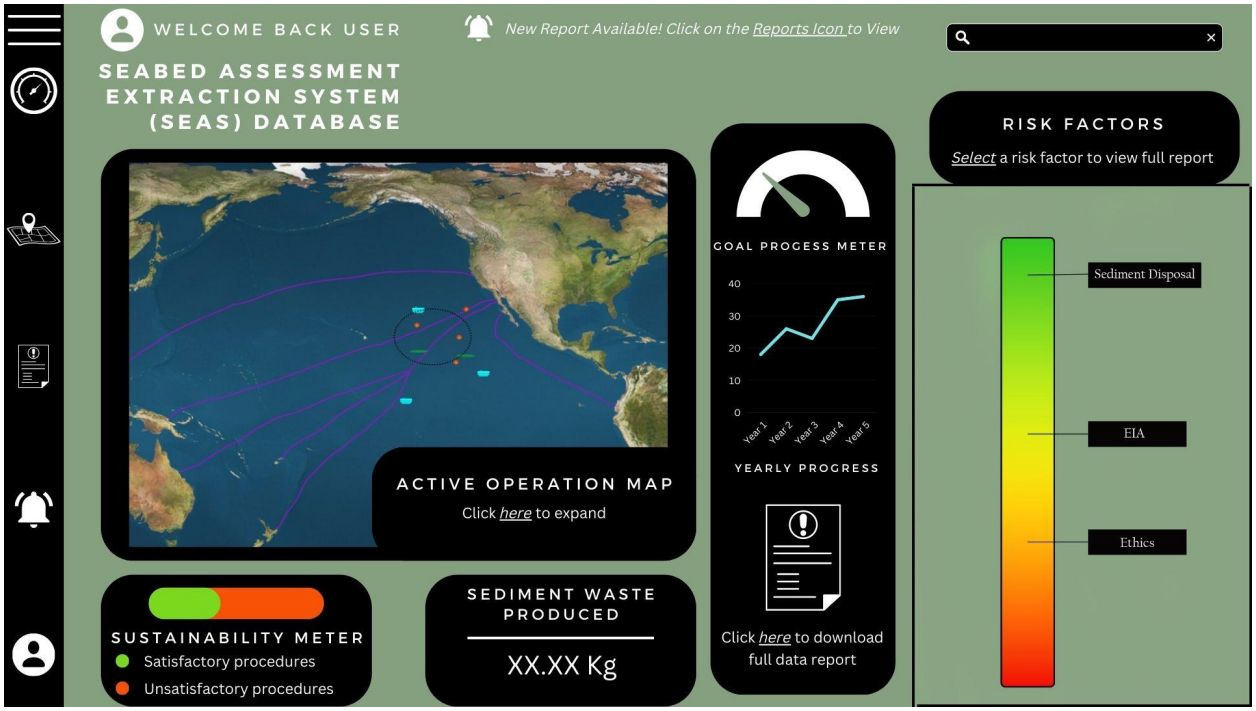
[115] Tina Hunter & Madeline Taylor, *Deep Sea Bed Mining in the South Pacific: A background paper*, https://www.international-arbitration-attorney.com/wp-content/uploads/arbitrationDeep-Sea-Bed-Mining-in-the-South-Pacific.pdf.
[116] Jonathan Mesulam & Nat Lowrey, *Alliance of the Solwara Warriors: Our culture, our heritage, our future*.
[117] *Id.*
[118] *Id.*

Appendices

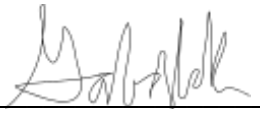
Appendix A: The SEAS Dashboard Home Page Model



Certification Statement

We hereby certify that the brief for the University of Miami School of Law Policy Hack Team is the product of the undersigned. We further certify that the undersigned have read the Competition Rules and that this brief complies with these Rules.

Date: October 27, 2022

Team Member Gabriella Berman 

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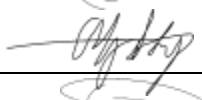
Team Member Alyssa Huffman 

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