Project Proposal for Master of Science and Environmental Management

1. Ocean Substitutes: A Socio-Environmental Policy Analysis of the Proposed Vegetable-based Plastics and Cellular-Based Aquaculture

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3. Description of Project(s)a. This project is proposed within the context of the United Nations Sustainable Development Goal 14 to Protect the Oceans. Two of Goal 14’s targets have received significant global attention. Target 14.1 calls for States by 2025 to prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris. The indicator for this target is floating plastic debris density. Target 14.2 calls upon States in part to end overfishing by 2020. Both of these targets are very ambitious and there are a variety of regulatory approaches by which States might be able to achieve these targets. Private industry has offered at least two potentially “disruptive” technologies that have been promoted by businesses that could contribute to reducing plastic debris and overfishing: vegetable -based plastics made from wheat, corn, and beet sugars and cellular-based aquaculture. Because both of these technologies are quite new, it is unclear what regulatory frameworks might apply to these technologies if they were to be scaled up. An important research question is whether the two technologies of bioplastics and cellular aquaculture, if operating at scale, are as environmentally and socially promising as they seem on paper. The purpose of this project is to understand whether governments should mandate any environmental or social safeguards in relation to these two innovations.

b. Objectives.

Review literature to collect information about bioplastics and the potential environmental and social challenges associated with scaling up bioplastics e.g. sourcing of feedstock for plant-based bioplastics could be problematic if there is competition over land use.

Review law and regulations for three major markets: US, EU, and China to determine whether there are any laws and regulations associated with bioplastic manufacturing and recycling.

Create an assessment tool to measure whether vegetable based plastics are a “sustainable” substitute for existing plastics. This assessment will only focus on social and environmental impacts associated with vegetable based plastics. It will not focus on economic costs.

Review literature to collect information about cellular based aquaculture and any potential environmental and social challenges associated with scaling up cellular based aquaculture e.g. biosafety concerns.

Review law and regulations around existing aquaculture and alternative protein manufacturing (Beyond Beef) to determine what regulatory structure applies to cellular based aquaculture.

Create an assessment tool to measure whether particular cellular based aquaculture proposals provide a “sustainable” opportunity to reduce fishing pressures on ocean resources. This assessment will only focus on social and environmental impacts associated with vegetable based plastics. It will not focus on economic costs.

c. Significance. The global community through Sustainable Development Goal 14 has committed to protect ocean resources. Progress has been slow and this study will offer important policy insights as to whether the proposed vegetable-based plastic technologies and the cellular-based aquaculture qualify as sustainable technologies. This work is important because it may provide important enterprises for investment. The target audience will be academics and policymakers. Depending on the outcome of the project, this project might be useful for investors to explain the social and environmental risks associated with investments.

d. The problem of marine plastic debris and overfishing are global problems. Both of these problems have been perpetuated by excess consumption. In the case of plastic debris, the problem is compounded by large-scale production of single-use plastics and inadequate waste disposal system. Most of the recent efforts to tackle single-use plastics has focused on understanding the extent of the problem, improving waste collection/disposal and reducing the amount of plastic in circulation through, for example, plastic bag bans. In the case of overfishing, there has been increasing focus placed on traceability of catch but this innovation has only begun to have an impact on global supply chains.

Current strategies to reduce overfishing and plastic waste have generally had more success in the more affluent Global North. Some of the attempts to reduce environmental problems in the Global North have exacerbated problems in the Global South with for example transport of plastic wastes from countries such as the United States to Malaysia for unmonitored reprocessing.

Innovations like cellular based aquaculture are needed but any new “solution” needs to be evaluated for not just its short-term gains but its potential long-term costs.

e. Deliverables. The goal for this project would be to produce an article weighing in on the potential for the two proposed innovations to meet the SDG 14 on protecting the Ocean. I would work with the student towards a publication for a peer-reviewed journal such as Marine Policy.

4. Project Funding. Depending on whether start-up funds are available in Fall 2020, I would like to provide support for a student research assistant.

5. Supporting Materials

The plastic substitutes are described here <https://www.theguardian.com/environment/2020/may/16/the-end-of-plastic-new-plant-based-bottles-will-degrade-in-a-year?utm_term=RWRpdG9yaWFsX0dyZWVuTGlnaHQtMjAwNTIw&utm_source=esp&utm_medium=Email&CMP=greenlight_email&utm_campaign=GreenLight>

Cellular-based aquaculture is described here <https://www.frontiersin.org/articles/10.3389/fsufs.2019.00043/full>