

Great Expectations: Can Seaweed Aquaculture Be Scaled Up For Climate Mitigation?



Anna Rose Marion
Supervised by Dr. Jenny Goldstein
Department of Environment & Sustainability and Anthropology
Cornell University, Ithaca, NY 14850



Introduction

- ❖ Macroalgae (i.e. seaweed) represents a new frontier for climate mitigation that is in line with the UN's Sustainable Development goals and may have the potential to promote opportunities in Southeast Asia.
- ❖ Progress beyond laboratory scale is slow, but many are looking to seaweed for its ability to generate a diversity of biofuel types and sequester carbon dioxide (Griffiths et al. 711).
- ❖ Seaweed biofuel could be integrated into current energy systems, and seaweeds absorb considerable amounts of carbon, potentially storing it (though the long-term sequestration capacity is currently unknown).
- ❖ Perhaps the most central question to any study of the potential use of seaweed for climate mitigation is whether or not cultivation can be scaled up feasibly and equitably.
- ❖ I investigated the sociopolitical and technological potential and obstacles of using macroalgae for biofuel and carbon emissions sequestration in the Philippines.
- ❖ More work needs to be done to understand the social ramifications of current ecological and technological proposals
- ❖ We may be blind to how hype is involved in conversations around an energy transition that scales up seaweed cultivation, coastal monitoring, and blue carbon, affecting smallholders and industry stakeholders



Figure 2. Lines of seaweed at a seaweed farm in Cogtong Bay.



Figure 3. The ropes last for about 3 years, and the straws to tie the seaweed on last for about 1 year.

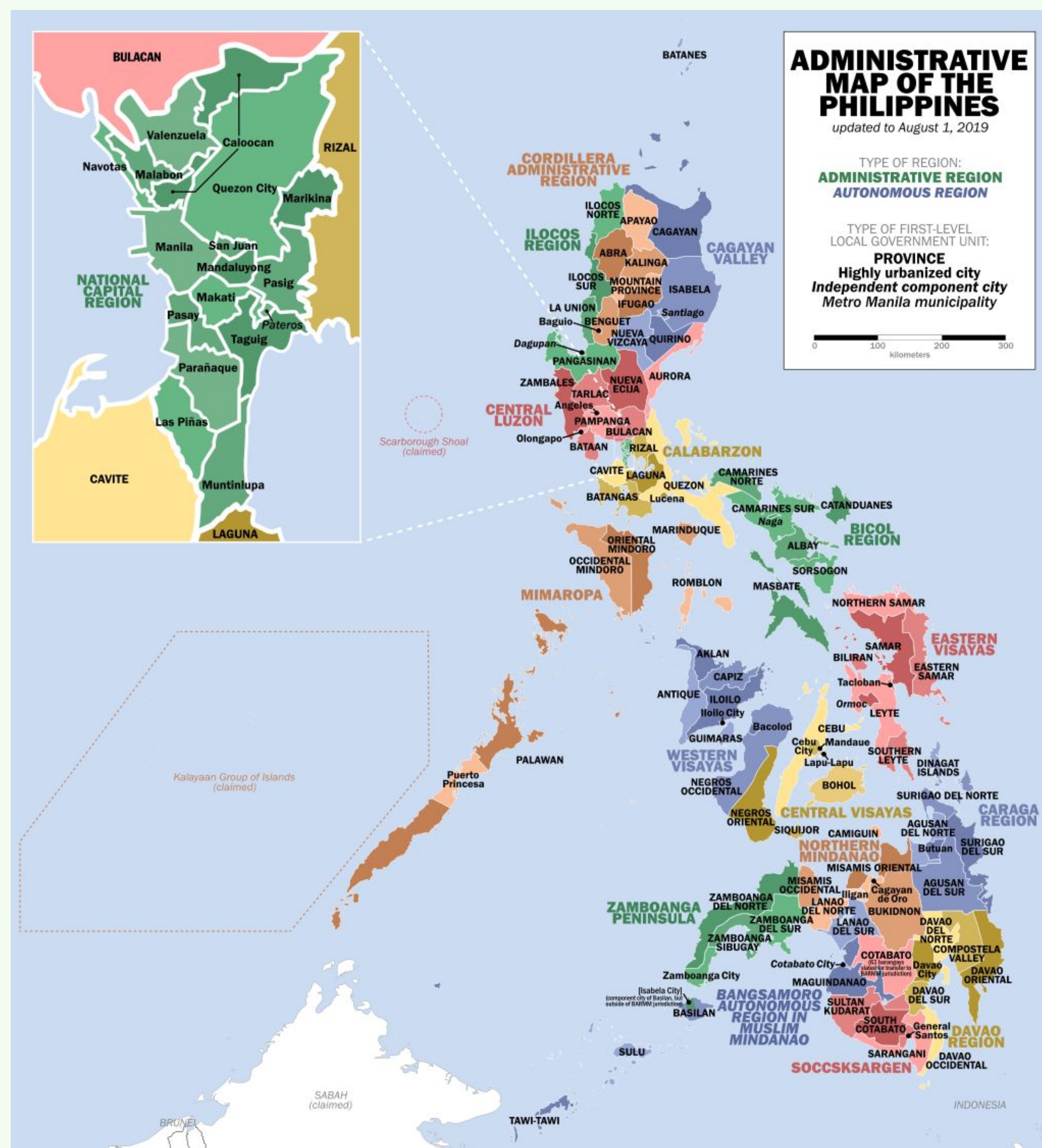


Figure 1. Administrative map of the Philippines.



Figure 4. Harvesting seaweed at farm in Handumon barangay.

Methods

- ❖ I conducted a literature review during the summer of 2023 to understand the technological and cultural potential of looking toward macroalgae for climate mitigation in the Philippines.
- ❖ I studied issues, such as seaweed and marine ecology, seaweed production, the political ecology of the seaweed trade and climate solutions, the sociology of expectations and hype, microbiology, deep learning, and remote sensing.

Discussion

- ❖ More work needs to be done to understand the social ramifications of ecological and technological proposals for seaweed innovation and expansion.
- ❖ Rather than blinding ourselves with a fetishization of technical solutions that may lead to outsized expectations without a positive chance of follow-through, we need to understand how the justice impacts of climate mitigation unfold across different contexts and at different spatial scales.
- ❖ Macro-, meso-, and micro-scale interactions and the struggle for vertical integration of the seaweed industry should make us consider whether there is any tension between the promotion of seaweed cultivation as a smallholder livelihood strategy that promotes community cohesion and wellbeing and large-scale industrial cultivation.
- ❖ Further understanding the complex sociocultural, political, ecological, and economic ramifications of scaling up algal mitigation and adaptation strategies will require engaging in empirical research in multiple sites.

Acknowledgements

I would like to thank Dr. Jenny Goldstein for her support over the course of this project and Jose Guridi for his guidance in creating this poster. I would also like to thank the Laidlaw Foundation for giving me the opportunity and the funding to complete this project.

References

- ❖ Bennett, N. J. In *Political Seas: Engaging with Political Ecology in the Ocean and Coastal Environment*. *Coast Manage* 47, 67–87 (2019). <https://www.tandfonline.com/doi/abs/10.1080/08920753.2019.1540905?journalCode=ucmg20>.
- ❖ Buschmann, A. H. *et al.* Seaweed production: overview of the global state of exploitation, farming and emerging research activity. *Eur J Phycol* 52, 391–406 (2017). <https://www.tandfonline.com/doi/full/10.1080/09670262.2017.1365175>.
- ❖ Chopin, T. & Tacon, A. G. J. Importance of Seaweeds and Extractive Species in Global Aquaculture Production. *Rev Fish Sci Aquac* 29, 139–148 (2021). <https://www.tandfonline.com/doi/abs/10.1080/23308249.2020.1810626?journalCode=brfs21>.
- ❖ Griffiths, G., Hossain, A. K., Sharma, V. & Duraisamy, G. Key Targets for Improving Algal Biofuel Production. *Clean Technologies* 3, 711–742 (2021). <https://www.mdpi.com/2571-8797/3/4/43>.
- ❖ Figures 2-5: Mai Ichihara, July 2023