

**Hydroponic Crop Cultivation (HCC) for Food Security in Small Island Developing States**  
(Technical Report)

**An Analysis of the Cheonggye River Restoration Project Using the Theory of Technological  
Politics**  
(STS Research Paper)

An Undergraduate Thesis Portfolio

Presented to the Faculty of the  
School of Engineering and Applied Science  
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Bachelor of Science in Civil and Environmental Engineering

By

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## **Sociotechnical Synthesis: Environmental Gentrification and Hydroponic Farming**

Both my thesis and technical work are focused on environmental technologies. Although they are not focused on the same technology, working on both at the same time has helped me understand the social and environmental implications of environmental technologies.

Environmental technologies are technologies that conserve, monitor, or reduce harm to the environment. By exploring both the environmental and social impacts of two different environmental technologies, I was able to reach a deeper understanding of the ways in which humans and the environment are affected by environmental technology.

My technical work focused on improving the environmental technology of hydroponics to increase its resilience during hurricanes in Small Island Developing States (SIDS). SIDS experience long hurricane seasons and local agriculture lands can be devastated by the storms. As storms increase in intensity and frequency due to climate change, it is becoming more important for farmers to find a way to protect their crops. My team and I worked to design a hydroponic system that could be used by farmers on SIDS to protect their crops from high wind and flooding conditions brought by storms. We designed an easily collapsible design so that the crops can be brought inside during a storm situation. The hydroponic system has pest netting to negate the need for pesticides, a closed loop water system that uses a rain barrel to collect the input water, and a solar power system to power the water pumps. This hydroponic unit allows farmers to keep their crops safe during storms, as well as have less of an impact on the environment than traditional agriculture. This environmental technology improves not only the farmers lives but also the environment.

My thesis work is focused on the social implications of utilizing the environmental technology of river restoration. River restoration uses a variety of environmental engineering

techniques that rehabilitate damaged streams. By rehabilitating damaged streams, their natural benefits to the environment return. However, as I discuss in my thesis, in the case of the Cheonggye River Restoration Project in Seoul, South Korea, there were also gentrification impacts due to this restoration project. While the positive environmental goals of the project were successful, there were also many people of low socioeconomic status who were displaced due to rising land prices. The goal of my research is to encourage environmental engineers to consider the social impacts that their technologies can have before implementing them.

By working on these two projects simultaneously, both projects were improved. Due to my thesis work, I was forced to think more seriously about the social impacts of the technology that I was improving in my technical work. I was more vigilant about speaking with contacts in the SIDS that we were working with in order to make sure that the technology would be useful for them and not have negative impacts. In summary, by working on both of these projects simultaneously I was able to explore environmental technologies through the lens of both the environment and society in order to reach a deeper understanding of the impacts of environmental technologies.