Thesis Project Portfolio

LiDAR-based Water Level Detector for Smart City Applications

(Technical Report)

Investigating the Effects of Cultural Differences on Climate Solutions in Vietnam

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

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Spring, 2024

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Sociotechnical Synthesis

Vietnam is facing a climate crisis. As more communities are destroyed by floods, communities are forcibly displaced. They lose their livelihoods that depended on the water-adjacent areas they once lived in – fishing, rice farming, and many other traditions can no longer be supported in these new urban areas. As countries that are most vulnerable to climate change are those that contribute the least to carbon emissions, this is an injustice that requires global action.

My capstone project attempts to fight the immediate risks, creating an early warning system to warn communities of floods before they occur, allowing time for adequate preparation. I am developing LiDAR-based sensors to measure water levels throughout the country. These sensors will collect water levels and other weather data, and transmit them through the LoRAWAN network to my project's database. Then, our machine learning team will use it to predict flood risks across Vietnam.

It is important to consider the social dimensions of any solution deployed in Vietnam due to traditional dependence of Vietnamese communities on surrounding waterways. Solutions that physically alter the flow of water could harm the livelihoods of surrounding communities. For example, rerouting water from rice fields (that need water) will harm agricultural outputs. As such, solutions must allow themselves to be dictated by the local community, as they will be most familiar with the possible consequences, and are the main stakeholders of their effects. The community's perspectives will be most crucial in determining the effectiveness of any solution.

Because of this, I will analyze the social effects of these technologies through the lens of Social Construction of Technology, a framework focusing on the social dimension's effects on the design and iteration of engineering solutions.

In order to understand sentiments of Vietnamese communities, I scraped *vnexpress.net*, a major news site from Vietnam, on searches related to floods and climate, and performed thematic coding on all words in all corresponding articles. By evaluating the most used words in these articles, I was able to gain an understanding of the sentiments of Vietnamese media on the climate change fight. The most commonly used words will reflect the biggest recurring concerns and focuses of the Vietnamese population on climate-related disasters.

The findings from this undergraduate thesis will help researchers understand how communities react to the implementation of new solutions, while the technical developments provide communities with a powerful tool to anticipate flood disasters ahead of time, allowing time for preparation and evacuation, and saving lives. This research will certainly be considered in the further development and deployment of our sensors.