**Thesis Portfolio**

# The Intersection of Public Utilities and Private Ownership in Stormwater Management: A Case Study of Localized Flooding in Charlottesville, VA

(Technical Report)

# Public Perception and Influence on Implementation of Climate Change Technologies

(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, 2020

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## Sociotechnical Synthesis

Due to anthropogenic activities, the problem of climate change has become more prominent, requiring responses on not only local levels but also global levels. The STS research and technical project both relate to the problem of climate change and ways to keep the public safe from its effects. The STS portion concentrates on the global effects of geoengineering technologies as a way to combat climate change and how the public may react to their usage, while the technical project focuses on a local response to reduce flooding that has intensified due to climate change. In both projects, any implementation requires the support and cooperation of relevant stakeholders such as property owners or policy makers. However, these stakeholders currently do not see climate change as a top priority as the perceived risks do not directly affect their lives, limiting efforts to reduce negative impacts. Ultimately, the cause of flooding at the local site is climate change, and since geoengineering has the potential to curb climate change, exploring whether or not the public will accept the new technologies can lend important information on how infrastructure engineers should approach flooding strategies in local cases.

The technical project investigates flood mitigation strategies for flood-prone urban areas. Flooding events are expected to increase due to climate change, forcing cities across the country to implement flood mitigation strategies in order to ensure the safety and health of their residents. While the utility services of Charlottesville are ready to provide resources and recommendations to private property owners, the costs and current incentives of fixing problem areas are not enticing enough. Problems generated downstream do not directly influence upstream owners; hence, there is little motivation for these owners to take any course of action. This scenario is illustrated at a site at St. Claire Avenue in Charlottesville. The technical project observes and analyzes different potential solutions to develop recommendations that will result

in less flooding at this site. Using EPA's SWMM model, three different best management practices (BMPs) are analyzed by their costs and effectiveness in reducing runoff to the downstream site. While diverting the runoff from the upstream property is important, other factors such as social and cost factors are considered in picking a final solution for alleviating flooding at the site.

The potential complications from climate change in the future necessitate consideration of new technologies and innovations. Recently, scientists have been developing geoengineering technologies which propose drastic measures to deliberately manipulate the climate in order to combat climate change. Because the technologies could affect not just one area but the entire globe, public perceptions of risks is a major obstacle of steps towards implementation. The STS paper focuses on the question of how public perception of risks of climate change influences the use of geoengineering as well as predict public reaction to any use of these technologies. By analyzing historical case studies and policy analysis through the lens of the risk society framework, the factors that influence public risk perceptions and relevant stakeholders can be identified. Right now, much of the public acknowledges increasing concerns and impacts of climate change, but do not perceive any immediate risk to themselves. Ultimately, risk perceptions and urgency are associated with public participation in solutions, so investigating the effects of risks between social groups can help determine drivers for engagement in geoengineering implementation. While the public may be initially hesitant over such large impact technologies, these perceptions may be the final factor in changing the current path of climate change.

Implementing climate change mitigation strategies, whether it be on a large or small scale, requires the cooperation of the stakeholders. While geoengineering and BMPs are vastly

different in the scales of their effects, they address a similar problem and demonstrate the importance of risk perception. By working on both projects simultaneously, the similarities in how the public reacts to perceived risks from climate change are easily identified. Looking at both projects reinforces the notion that unless public risk perception increases, little change will occur. In the case of geoengineering technologies, current low risk perception has hindered any movement towards their implementation or global climate mitigation strategies, while in the case of the local BMPs, there is little incentive to implement any changes because upstream owners perceive no direct risks to themselves. The parallels drawn between these two different ways of reacting to climate change give insight on the effect of risk perception on cooperation and action.