

Thesis Project Portfolio

Sustainable Redevelopment of Fashion Square Mall

(Technical Report)

Analysis of the Sociotechnical Effects of Urban Greening in Washington, D.C.

(STS Research Paper)

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Table of Contents

Sociotechnical Synthesis

Sustainable Redevelopment of Fashion Square Mall

Analysis of the Sociotechnical Effects of Urban Greening in Washington, D.C.

Prospectus

Sociotechnical Synthesis

Global climate change is causing cities to turn toward urban greening through incorporating green technology. As this greening occurs, it is important for engineers to recognize the positive and negative effects of the changes. This portfolio includes two projects that explore the idea of urban greening. The technical project explores urban greening from the design standpoint through a redesign of an unsustainable area, whereas the science, technology, and society (STS) project explores the effects of urban greening after implementation. Both projects address urban greening through the incorporation of stormwater green infrastructure into an urban area. The final deliverable for the technical project is a design report including recommendations for stormwater and site redesign, models demonstrating the current and projected stormwater trends, and plans for climate resiliency. Similarly, the STS project final deliverable is a paper that investigates the positive and negative benefits of urban greening on Washington, D.C.

The technical project explores the redesign the Fashion Square Mall parcel to make a multi-use community space that results in less stormwater runoff. One major aspect of the design is the incorporation of green infrastructure, for it has the ability to improve water quality, reduce peak flows, and reduce the urban heat island effect. Green infrastructure also encourages the human-nature connection known as biophilia and engages residents with the natural environment. The team chose to focus on redesigning the Fashion Square Mall parcel because of its current lack of stormwater management, abundance of impervious surface and economic underutilization. PCSWMM, i-Tree, and Virginia Runoff Reduction models were developed for the site to perform hydraulic, hydrologic, and environmental analyses. Lastly, a cost estimation and a climate change resiliency analysis were conducted. The collective changes to the site's

land cover achieved significant reductions in stormwater pollution, energy surrogate, and runoff volumes. These results demonstrate that stormwater management success can be achieved through land use changes that don't necessarily require costly infrastructure improvements. In addition, the site's transformation of underutilized commercial space creates opportunities for housing, recreation, energy production, transit, and community interaction.

Washington, D.C., along with other cities around the world, experiences increasing heat waves and storms as climate change continues to worsen. D.C. has set forth a sustainability plan that promotes a greener and better city by incorporating green technology. Though these green initiatives provide several benefits to the city in combatting climate change effects, they also negatively impact the society. These negative impacts come in the form of green gentrification where added green areas raise the value of a property and push out people of lower socioeconomic status. This STS paper analyzes how the presence of green technology affects the society of Washington, D.C. The wicked problem framework and the technological fix framework are used to analyze the effects of green technology and form coping strategies to lessen the negative impacts. The results of this paper will show that though there are benefits to the green technology, there are important drawbacks that need to be addressed. These drawbacks are addressed with possible strategies that can be implemented in the city to lessen the negative effects of green technology, but continue to benefit from the positive effects.

Working on both projects simultaneously introduces different perspectives that would not be present if the projects were done separately. Learning about the effects, both good and bad, of urban greening, helps with the design side of the technical project. Through gaining this knowledge, the team was able to better create a design that improved the stormwater management of the area, while also keeping the social aspects in mind. Likewise, learning about

the design side of a project gives more perspective for why certain designs have been done in the past. Even though they may have brought negative side effects, it is helpful to have an understanding of the original purpose of the designs from the technical side. If the projects were conducted separately, they would not be as well rounded. As an engineer, it is easy to overlook social aspects of a project as they are not always instant or as visible as technical results.