

Economic, Social, and Environmental Sustainability in the Charlottesville Built Environment

Awareness of the Environmental Impact of Fast Fashion in Generation Z

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Introduction

Voltaire, a great mind of the Enlightenment period, is credited with the saying “the best is the enemy of the good” (Patel, 2017). This phrase refers to humanity’s constant pursuit of knowledge and advancement, a drive so constant and all-consuming that there is often little room left for questioning. However, when one steps back to examine the systems of everyday life, the flaws are clear. This prospectus details two topics, a technical project examining material use in the built environment of Charlottesville, Virginia and a science, technology, and societal (STS) analysis of Generation Z’s perception of environmental impact of the fast fashion industry. These seemingly disparate projects are connected by the common motivation of examining cases where social, economic, and environmental sustainability cannot easily coexist. The technical project will examine concrete downcycling for use as aggregate in novel concrete, with the aim of reducing the carbon footprint of densifying the city. The STS project will examine the impact of fast fashion on the environment and the perception of that environmental impact in a generation that is too young to remember a fashion industry without fast fashion. Both projects will investigate the importance of promoting environmental sustainability, as well as noting barriers to implementation.

Technical Project

My technical capstone project is focusing on the built environment of Charlottesville, Virginia and analyzing how the new zoning plan will impact social, economic, and environmental sustainability. This project was organized through Dr. James Groves’ Sustainable Design Thinking course sequence, which is cross-listed as an engineering and a global sustainability course. The team consists of a global studies major, an architecture student, and two undeclared second year students in the College of Arts and Sciences. The rest of the team

will be analyzing the effect of the zoning plan of Charlottesville, aimed at densifying the city, on social and economic sustainability. Mainly, these aspects of the project will investigate the city's claims that this plan provides for improved racial equity and affordable housing. The new zoning plan does not include any single-family zoning, and many areas with single-family homes are poised to shift to medium-density housing. This change will result in demolition and new construction.

Recycling and reusing materials are vital for enacting a circular economy. As the human population continues to grow, many single-family homes will be demolished to erect dense housing that will lessen the reliance on personal vehicles, which emit dangerous byproducts of combustion. There are many barriers to reuse and recycling in the construction field, chief among them cost. There is a tradeoff between economic and environmental sustainability because it is expensive and time consuming to carefully tear down buildings and preserve materials. For example, Careful deconstruction aiming to preserve materials can increase demolition costs by 20% (Guy et. al. 2000). However, landfilling building materials wastes the energy and engineering expertise that went into those materials. Over 10% of the nearly 40% of global carbon emissions associated with buildings comes from the materials and construction process. Recycling and reusing building materials can drastically reduce global emissions, but it will not be a widespread practice until it is required by law or economically viable.

The first step of recycling many materials is to disassemble into the original materials used to make the material. Some building materials, such as steel, can be infinitely recycled. Concrete is the second most used material in the world, surpassed only by water. As the world continues to develop, more and more concrete will be consumed. This presents an issue, as concrete cannot be separated into its constituent materials. The most common form of reuse for

concrete is to downcycle it as aggregate material. However, only a portion of aggregate can be replaced with pebbled concrete (Blander, 2019). The focus of this research will be to improve the environmental impact of novel crystalline calcium silicate (CCS) concrete by utilizing downcycled concrete samples as aggregate. CCS concrete is more environmentally friendly than traditional Ordinary Portland Cement (OPC) because it is processed at lower temperatures. Additionally, OPC strengthens through hydration, which consumes high volumes of water. Conversely, the strengthening mechanism of CCS cements is carbonation, leading to the environmental benefit of carbon capture and storage (Plattenberger, 2019). I hypothesize that ground concrete used as aggregate will have an increased surface area, increasing the carbon sequestration potential.

Reuse and recycling of building materials is an important step to promoting a circular economy. As Charlottesville reckons with citizens' calls for increased affordable housing, existing structures will be torn down to densify the city. Building materials, chief among them concrete, contribute significantly to the total emissions of buildings, and landfilling materials is not a permanent solution to this issue. Improving the environmental outlook of concrete will help to promote environmental sustainability in Charlottesville, while my group works to address social and economic sustainability.

STS Project

When my mom would take her five kids shopping for clothing in the early aughts, she was very confused over the prices, as they seemed far too low. When she was growing up, clothing was expensive and designed to last through multiple seasons. However, the fashion industry experienced a paradigm shift at the beginning of the twenty-first century, as companies switched from releasing one set of clothing every season to releasing multiple collections to drive up

profits. This paradigm shift resulted in cheaper clothing that was not designed to last, as much of fast fashion is dedicated to following trends. The clothing only needs to last as long as the trend, leading to poorly made garments (Diantari, 2021). This was spurred by new fashion brands such as ZARA and H&M, companies that specialized in cheap, fast manufacturing of trendy clothing. These retailers have seen sales continue to rise, but there is an environmental catastrophe brewing within this seemingly benign industry (Jang 2012).

Close to 90% of all clothing sold in the United States is primarily composed of cotton or polyester. Polyester fabric is derived from oil and cotton fabric requires high volumes of water and pesticides to grow. Additionally, textile dyeing produces further environmental harm, as untreated wastewater from dyes is often discharged into local water systems, polluting the natural environment with heavy metals and other toxicants. However, the environmental impact of clothing does not stop at the production. The fast fashion industry has contributed to skyrocketing amounts of textile waste, with some estimates showing that the average American consumer throws away approximately 80 pounds of textiles annually, making up around 5% of landfill space. However, many spent textiles enter the second-hand clothing market. Roughly half a million tons of secondhand clothing are exported to the developing world annually.

Clothing that does not sell in second-hand markets overseas often becomes solid waste outside of landfills, which can have adverse environmental and health effects (Bick, 2018). Further, textiles have an incredibly high carbon footprint, rivaling aluminum for generating the most greenhouse gases per unit of material. The fashion industry was responsible for 8% of global carbon dioxide emissions, and one fifth of that was from shoe production alone. These emissions numbers do not consider the emissions associated with transporting garments to retail environments and laundering (Diantari, 2021).

I want to analyze the perceptions of fast fashion among different generations of Americans from different backgrounds. Many people do not consider the ramifications of their clothing purchases beyond the exchange of money for goods, but I would like to analyze how Generation Z particularly perceives their consumption of fashion. I want to study this generation specifically because fast fashion has been the norm for the entire life of many young people, and the generation's purchasing power is only projected to increase in coming years, spurring much attention from advertisers (Raynor, 2021). I will use an Actor-Network Theory (ANT) approach to analyze how Generation Z interacts with the fast fashion industry as consumers. Through elucidating the network that exists between suppliers and consumers of fashion goods, I hope to gain more insight into the general public's awareness of this phenomenon (Latour, 1996).

I plan to conduct interviews on people of all ages, but I will focus most of my interviews on members of my generation. I would like to talk to people of diverse backgrounds that participate in different aspects of the fashion industry, including fast fashion, sustainable fashion, and secondhand clothing. To bolster my understanding of this topic from the industry perspective, I would like to try to interview someone that works in the fashion industry to hear their thoughts on fast fashion. In the interviews, I hope to inspect the perceptions towards "greenwashing" and other advertising methods to further understand how my generation interacts with the fashion industry. Greenwashing refers to the corporate strategy of claiming environmental sustainability without changing their product and is very common in the fashion industry (Bick 2018).

Conclusion

As humans continue to feel the effects of climate change, there needs to be a shift in prioritization to environmental over economic sustainability. The two projects proposed in the prospectus both aim to accomplish this, with the technical portion aiming at reducing the

embodied energy and greenhouse gas emissions associated with residential buildings and the STS project examining how the fast fashion industry creates waste and the societal and technological advancements that have led to this system, as well as awareness in younger generations. While economic sustainability is vital for preserving the quality of human life, it is imperative that humanity take major, concrete steps towards reversing the harm that centuries of industrialization has done.

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