Thesis Project Portfolio

Old Ivy Road Mixed-Use Development

(Technical Report)

Incorporation of Sustainable Infrastructure into Affordable Housing Developments

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

The Old Ivy Road Development Capstone project involved conceptualization and design of key components of a new housing development, including site, grading, stormwater, and traffic plans. The project addresses the complexity of designing and phasing a mixed-use housing development with spatial and design constraints. It analyzes how to manage the complexities and intricacies of such a design challenge. It is important for engineers to encourage designs aligned with their ethical views, hence our team's incorporation of affordable housing units. With both local and national affordable housing crises, designing and building homes for this cause is crucial. All people, regardless of income, age, or disability status, should have the right to shelter. Of the available affordable units, many are low quality and lack access to public services. Sustainable infrastructure is a technology that improves lives but is often avoided in affordable housing because of budgets and difficult problem solving. Sustainable infrastructure has the capability to increase housing quality, lifespan, and affordability through practices such as renewable energy. Just as people have the right to live affordably, one has the right to live comfortably in quality, accessible, and healthy housing, spearheaded by sustainable infrastructure.

This paper explores successful affordable housing developments chosen for their unique incorporation of sustainable infrastructure, problem-solving for specialized issues, and abundant publicly available information. Thomas Seager's "Sustainable Engineering Science" approach, emphasizing ethical awareness, adaptability and resilience, and cross disciplinary expertise, is used to select three developments. Additionally, it guides the analysis of each development's use of sustainable infrastructure to adapt to geographic, economic, or ethical issues. This approach was formulated to solve "Wicked Problems of Sustainability," which are complex and multifaceted issues resistant to simple solutions. The three cases chosen for this study were analyzed to extract the approaches that best aligned with the three components of the Sustainable Engineering Science approach. These strategies were then explored to find the case's shared objectives and broadened to suit a wider array of developments. This research sheds light on innovative techniques to incorporating sustainable infrastructure while staying within budget and builds an index of broad strategies to ensure economic and physical resilience. Common goals in each development were creating community, lowering the cost of living, improving quality of life, and mitigating the effects of climate change. By prioritizing these findings, policymakers, planners, engineers, and residents can pave the way for an equitable, sustainable, healthy, and resilient future. Compiling a resource of techniques that are applicable to a variety of circumstances weakens roadblocks facing sustainable infrastructure implementation into affordable housing. This research is a stepping-stone to not only making more environmentally conscious buildings, but to securing the basic human right of adequate, safe, and quality housing.