

Thesis Project Portfolio

Engineers in Action: Eswatini Suspended Bridge

(Technical Report)

Implementing Modular Houses in Honduras: A Sociotechnical Analysis

(STS Research Paper)

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Sociotechnical Synthesis

Infrastructure is an essential part of society, affecting almost every aspect of individuals' day-to-day life by providing the very structures that sustain them. Buildings dictate the lives and actions of the very individuals that use them, making structures quintessential for society's well-being. For this reason, the capstone project and STS research paper presented, analyze and tackle both the influence and impact a structure can have on a community. The capstone project focuses on the design of a footbridge over the Mtilane River for the community of Eswatini in Africa. The bridge will benefit almost 2000 individuals, providing a safe access to school year-round for around 1200 children. The bridge will also indirectly serve the two neighbor communities of Zombodze and Boyane and the people coming from Manzini, the capital city of Eswatini. The construction of this bridge will improve economic conditions for farmers and their families by providing a direct and stable access to the city's services. Seeing the significant impact that the bridge will have on the Eswatini community inspired the research paper introduced consequently. As an upcoming civil engineer graduate from Honduras, I wanted to explore how other infrastructures can positively impact the Honduran population. Therefore, the STS research analyzes how modular homes in Honduras will benefit the community.

Expanding on the capstone project mention above, Maphoveleni, Eswatini is in urgent need of a footbridge over the Mtilane River due to long periods of flooding which occur throughout the year. Over the past three years, six people have been injured attempting to cross the temporary log bridge currently in place. The log bridge does not have an adequate height relative to the top of the river; it has insufficient railings, lacks other safety features, and becomes very slippery when wet. Crossing the river is necessary in order for the community to access numerous educational, health, and economic resources. Children must cross the river

daily to attend school. During exam season, children are held at school for up to four weeks in order to ensure attendance, which puts a financial strain on the school and prevents the children from completing their chores at their homesteads. The community is primarily made up of agriculture and industrial workers, making it imperative that they cross the river to access local markets and work in the nearby city. The capstone team is tasked with developing a detailed design for a suspended cable footbridge to help provide year-round access to resources and services located across the Mtilane river from Zombodze and Boyane. There are seven desired objectives for the ultimate bridge design (listed in order of decreasing priority): safety, durability, serviceability, maintainability, constructability, economy, and aesthetics. Major components of the bridge design include a detailed drawing set (with plan, section, and profile views of the design), verified calculations of load capacity, geotechnical foundation analysis, hydrological erosion analysis, and more. In addition to the design of the bridge, the team is responsible for delivering an in-depth construction plan and schedule to provide guidance for the construction of the bridge in-country. This also includes material sourcing as well as a safety plan which will provide important safety measures and information pertinent during the construction, operation, and maintenance of the bridge.

As mentioned, inspired by the bridge of the community of Eswatini, I decided to base my research paper on my home town in Honduras. The research paper answers the question on how the implementation of modular houses in Honduras benefit the social and economic standards of the country's population. Honduras is the second poorest country in the Caribbean and Latin American Region, which makes it a suitable candidate to conduct this research study (The World Bank, 2021). Documentary research, auto-ethnography, and historical cases are used to gain insight about how providing safe, affordable, and secure modular housing will benefit the

socioeconomical standards of Honduras. This research will be analyzed using both technological determinism and technological fix frameworks to prove that a said technology, such as modular houses, can help drive society towards improvement and serve as a potential solution to several of the problems Honduras is currently facing. The final findings of the study should show how implementing modular homes will contribute to the reduction of unemployment, poverty, and crime rates, and consequently, in the long-term, lead to an increase in alphabetization rates, GDP and an improvement of the overall well-being of Honduras population. Ultimately, the findings of this study can potentially be replicated in other third world countries, which can provide the possibility for others to assess and take advantage of the benefits that modular housing can bring to their own community.

Even though the STS research paper and capstone project are not directly connected, working on both the project and paper simultaneously amounted to a better understanding and added value to the work of a civil engineer and their involvement within the community. Both projects demanded a profound study and assessment of the communities in which the infrastructure is going to be implemented. It is essential to be familiarized with each of the environments in order for the footbridge and modular homes to be successful projects. In the case of the footbridge, it required constant communication with Engineers in Action, the organization in charge of the bridge project, to be able to obtain the necessary information of the community in order for the design of the bridge to accomplish and meet the needs of people of Eswatini. My personal background as a citizen of Honduras, supported by research and access to unpublished data of a textile manufacturing company in Honduras, provided a well-rounded understanding of the situation of poverty in Honduras and the ways in which the implementation of modular homes can socioeconomically benefit the community. Overall, as a civil engineer, it

is essential to be aware and not lose sight of whom and what the projects are targeting, to ensure they can better the lives of those using them.

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