

Thesis Project Portfolio

Point-of-Use Water Treatment: MadiDrop+ and Copper Mesh

(Technical Report)

**United States Investment into Sub-Saharan African Development: A Technological
Barrier?**

(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, 2022

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Executive Summary

The STS research paper and technical capstone report contained in this portfolio are closely related as both analyze some form of the relationships behind international aid. The capstone research explores a point-of-use (POU) water treatment method, the MadiDrop+, that is meant to be used in developing communities to reduce waterborne illnesses. The STS research is similar in that it analyzes the role of technologies, such as the MadiDrop+, as actors within Sub-Saharan Africa. This STS research may illuminate ways in which technologies create barriers to effective humanitarian aid, enabling the MadiDrop+ to adapt and avoid these barriers.

The point-of-use capstone project with Professor James A. Smith explores novel water treatment methods using copper and silver ions to eliminate contaminants. The MadiDrop+ requires a method of delivery that also contains a 10-gram copper mesh; and in designing this delivery method, the capstone undergoes an experimental process to evaluate the efficacy of these methods. The process tests if a double-layered mesh setup is feasibly able to release the necessary amount of copper ions for water treatment. If proven successful, future projects can design a 3D model that encapsulates both the MadiDrop+ and the copper mesh. A model could then be employed by Silvihere Technologies Incorporated and benefit thousands by helping to purify household water for those in need.

The subject of the STS research paper is an investigation of technologies role in international aid from the United States. This paper explores American technology-based aid provided to Sub-Saharan Africa, and the role this plays in international competition against the Chinese government as both nations seek to gain regional influence. The principal question being studied in this research is: how does technology impact U.S. aid in Sub-Saharan Africa? For this research, network analysis is applied alongside the framework of Actor Network Theory. The network analysis enables the understanding of the dynamic relationship behind U.S. aid in Sub-Saharan Africa and what that means for the geopolitical stage. With greater understanding of this

relationship, one can use the information to develop new ways to refine or advance U.S. international policy regarding international aid to garner greater influence. This topic seeks to identify the struggles between human interaction that are centered around technology sharing, use, and development.

Having now completed both projects, the greatest takeaway is the gained depth of knowledge regarding how organizations, people, nations, and many other actors seek to improve the lives of others and interact together. The ability to bring powerful technologies into a society and completely revolutionize how life is lived within said society is incredible. However, working with the MadiDrop+ in tandem with the STS research, reveals how technology can impact the success of an aid project. Taking this knowledge, and applying it to the MadiDrop+ research, the team was able to make design changes that best accommodate beneficiaries to ensure seamless integration between technologies and users. This accommodation means identifying potential cultural divides between donors and recipients that could have been overlooked in the technology design process.