Point-of-Use Water Treatment Device
(Technical Report)

Theory of Technological Politics and the Disparity in Access to Improved Water Sources
(STS Research Paper)

An Undergraduate Thesis Portfolio

Presented to the Faculty of the
School of Engineering and Applied Science
University of Virginia, Charlottesville, Virginia

In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science in Electrical and Computer Engineering

By

Kathryn Wason

May 1, 2020

Table of Contents

Socio-technical Synthesis: Point-of-Use Treatment Device and Inadequate Access to Water

My technical work and my STS research are connected primarily through the idea of insufficient and inequitable water distribution in South Africa. Many rural South Africans lack access to an improved drinking water source, which leaves individuals vulnerable to the effects of waterborne diseases. The two works differ in the way they explore the water distribution and access to an improved source of water. My technical work focuses on the development of a new point-of-use (POU) water treatment technology that allows households to treat water in their own home shortly before consumption, whereas my research explores the ways that power relations have shaped which areas, urban or rural, have access to a piped water supply. So, while my technical work and my STS research approach water inequalities in South Africa from different angles, the theme of lack of access to improved drinking water sources is consistent across both projects.

For my technical work, my team designed a new POU water treatment technology for households in Limpopo Province, South Africa. POU water treatment technologies are an effective solution to combat waterborne illnesses and are employed in many households around the world. The device releases a controlled number of silver ions into 10 L of stored household water through the use of an MSP430 microcontroller. The target concentration of ions delivered for the prototype is 50 μg/L, which is half of the EPA guideline. The goal of the device is to provide households in low-resource settings with a mechanism to effectively disinfect untreated water.

My STS research also explores access to safe drinking water, but from a different angle. My research focuses on the way in which the distribution and operation of water delivery systems advantage the urban wealthy white communities and disenfranchise the poor rural black

communities in South Africa. I employ Langdon Winner's Theory of Technological Politics to reveal how the access to water and the benefits of its use privilege those with access to land and political and economic power. My claim is that the water delivery technology not only performs technical work, but it performs significant political and social work, as it functions to advantage certain people based on a variety of demographics. My paper explores this idea and discusses how social presences rather than technological limitations advantage certain citizens and prevent others from receiving adequate water services. The goal of my research is to create awareness of the political and social divide between those who can afford and have access to water distribution networks and those who do not.

Working on both projects at the same time has allowed me to not only create a technical solution to improve access to clean drinking water, but it has also enabled me to analyze the social consequences and political implications water distribution systems have on certain people based on socioeconomic status and geographic locations. My technical work allowed me to develop a viable solution for providing clean water to rural communities, which helped me establish background for my research paper. Similarly, my STS research allowed me to see the significant social, political, and economic factors that play a part in the quality of and access to water in South Africa. Both projects allowed me to explore the inequalities of water distribution from different angles and realize that a technical solution alone will not resolve the problem. Without realizing the capability of technology to shape power relations, equality of water distribution will not be attainable.