

Thesis Project Portfolio

**Quantifying the Economic Impact of the Grand Ethiopian Renaissance Dam on the Nile
River Basin**
(Technical Report)

**Indigenous People's Water Rights in the Colorado River Basin in the Face of Climate
Change**
(STS Research Paper)

An Undergraduate Thesis

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Charles Lucas Bass

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Department of Engineering Systems and Environment

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Sociotechnical Synthesis

As climate change alters water availability for communities across the world, a better understanding of water as a political object and the effects of water access across economic sectors can allow for improved management of water resources globally. The STS research paper and the technical report are both centered around water resources and provide insight into how water can be viewed as a fundamental human right. Insights from the Lower Nile River Basin and the Colorado River Basin both incorporate climate change effects, most notably precipitation changes, where drought conditions can lead to economic dampening. By creating more resilient approaches and protocols for water resource management at both the international and state-level, a more positive economic future for entire communities can be achieved. Water access is an issue that has social and technological dimensions, where regulations regarding how much water can be used for agriculture and the efficiency of hydropower production from a dam have second-order effects that must be taken into account when planning for a more uncertain climate.

A research team from the University of Virginia during 2021-2022 analyzed the economic impact of the Grand Ethiopian Renaissance Dam (GERD) on the Nile River, where changes in water security, land use, agriculture, hydropower, and economic benefit were all quantified. The countries of Egypt, Sudan, and Ethiopia were the focus of the research conducted in the technical report. The issue of water access and power production associated with the dam in these countries also has geopolitical implications, where improper dam management and filling rates for the GERD has the potential to increase water stress in downstream countries, particularly Egypt. Furthermore, although the dam is projected to generate hydropower for over

65 million Ethiopian citizens, the management practices of the dam are uncertain, which makes it difficult to model downstream effects on variables such as agriculture across time.

Analysis of indigenous people's water rights in the Colorado River Basin due to climate change effects was done using science, technology, and society-centered frameworks. With the water rights of certain tribal groups at risk due to worsening flows along the Colorado River, better understanding of economic, social, and environmental impacts associated with water access for these tribes can help promote more integrated water management strategies throughout the region. Also, by viewing water as a political object and determining the ways in which the Colorado River can be used to model how humans interact with nature, the futures of these tribal groups will be safeguarded.

The technical report and STS research paper both illuminate the importance of water resource equity in the face of climate change and with the development of new technologies such as dams. As drought conditions worsen in both the Lower Nile River and Colorado River Basins, mapping of how both social and economic variables interact across stakeholder groups will provide an opportunity to create a more sustainable future.