

Thesis Project Portfolio

The Design of a Desalination Plant in New Orleans, Louisiana

(Technical Report)

Water, Society, and Technology: A Inquiry into New Orleans' Desalination Plant

(STS Research Paper)

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Executive Summary

Water scarcity and salinity issues are pressing challenges that threaten urban centers and agricultural domains worldwide. This study introduces a dual approach combining a technical initiative for a desalination plant in New Orleans and a socio-technical analysis focusing on its broader implications on society. The technical research develops a feasible solution to water scarcity by proposing the construction of a desalination plant in New Orleans, aiming to convert seawater into tap water. The STS research, on the other hand, examines the socio-environmental impacts of brine waste, a byproduct of desalination, and explores innovative solutions for its reuse in agriculture. These two projects interlink by exploring how technological solutions can address complex sociotechnical challenges-balancing technical feasibility with social acceptance and environmental sustainability.

The technical report proposes the design of a desalination plant capable of producing 10 million gallons of potable water daily, serving approximately 54,000 residents daily, to address the pressing water crisis in New Orleans caused by saltwater intrusion into the Mississippi River. The solution involves advanced water treatment processes designed to meet the water quality standards while minimizing environmental impact. This project not only addresses the immediate water scarcity but also incorporates innovative brine management techniques to produce fertilizer and rock salt, thereby turning a waste byproduct into valuable resources. The plant's strategic location near the Gulf of Mexico enables direct access to seawater, optimizing the logistics and operational efficiency of the desalination process.

The results indicate that the proposed desalination plant can effectively meet the daily water demands of 54,000 residents, with the potential to scale up. The discussion focuses on the economic viability, showing promising internal rates of return and net present values, suggesting that the plant is not only a technical solution but also a financially sustainable investment. The

environmental analysis highlights innovative approaches to brine management, which mitigate the potential negative impacts on marine ecosystems.

The STS research explores the socio-technical challenges of implementing desalination technology in a culturally rich yet environmentally sensitive area like New Orleans. The research question addresses how brine waste from desalination could be repurposed to benefit agricultural sectors, thereby turning an environmental challenge into an opportunity for sustainable development. The study is guided by technological momentum theory, considering how once a technology is embedded in society, its trajectory can become self-reinforcing. This perspective is vital for understanding potential resistance or acceptance of new technologies.

Evidence from case studies and empirical research supports the viability of using desalination brine in agricultural applications, potentially reducing the environmental footprint of traditional fertilizer methods. The conclusions drawn from the STS study emphasize the importance of integrating technical solutions with socio-economic and environmental considerations to ensure the sustainability and acceptance of desalination technologies in community settings.

Both the technical and STS research components illustrate the balance required to implement technologically advanced solutions in socially and environmentally responsible ways. The desalination project in New Orleans exemplifies how engineering can intersect with societal values, promoting sustainability while addressing immediate human needs. By addressing the immediate needs for potable water through technical innovations and tackling long-term sustainability through socio-technical research, this project not only solves an urgent problem but also contributes to the broader discourse on sustainable development in engineering practices.