Produced Water and Concentrate Management Optimization

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Motivation

Nearly 2.4 billion gallons of produced water are generated daily from oil and gas (O&G) production processes. The high cost of desalination and transportation of water have limited produce water utilization outside of enhanced oil recovery (EOR). Given the scale of this water resource, and the importance of lowering impacts of O&G activities on surface and groundwater resources, near-term solutions are needed to enable produced water treatment and utilization without causing new environmental damages.

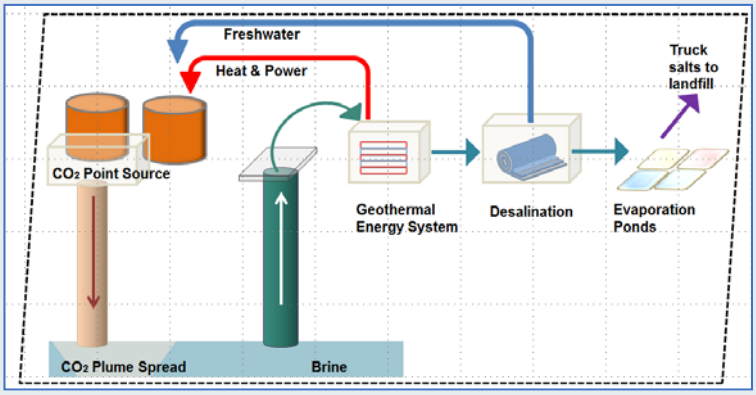

Figure 1: Conceptual diagram of carbon dioxide capture and sequestration , brine extraction, and management process train.

Technological Challenges

There is extensive research aimed at lowering the cost and impacts of desalination for ocean and brackish groundwater treatment (as well as for geothermal energy, mineral and rare earth metal recovery) but approaches for optimizing and evaluating these techniques and their combinations for O&G field conditions is lacking.

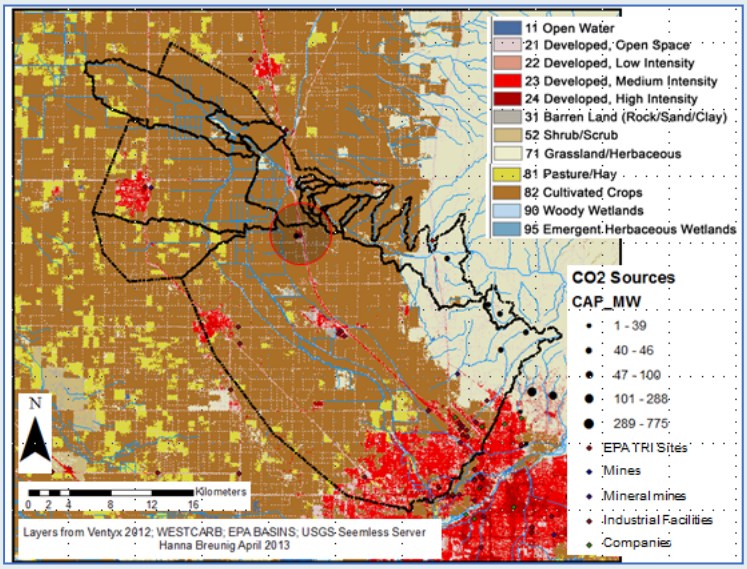

Figure 2: Map of water flowlines and industry locations within the focus area Kimberlina CA power plant (circled in red). Our approach allows local sources of pollution and stresses on ecosystems, communities, and infrastructure to be estimated and compared with the marginal changes contributed from newly introduced brine management systems.

Research

This research seeks to identify sustainable cost-effective resource and energy recovery management strategies for brine and brackish water. Existing techno-economic analysis (TEA) and life-cycle assessment (LCA) frameworks for brine volume minimization and value creation systems associated with carbon dioxide capture and sequestration are adapted to conditions expected for desalination and produced water projects.

The analysis framework is unique in its ability to capture spatial heterogeneity in key parameters like geologic formation temperatures, brine compositions, local sensitive ecosystems and populations, and regional energy and product markets. Developing robust decision support tools will support more holistic evaluation of potential projects at a specific location.

References

Breunig H.M. et al. “Regional evaluation of brine management for geologic carbon sequestration” *Int. J. GHG Control* **2013**, 14, 39-48.

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