

Technoeconomic Assessment of Brine Valorization from Brackish Water Desalination



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Challenge

Desalination at inland brackish groundwater treatment plants is currently limited by high costs of concentrate management and disposal. With current methods, 5-25% of the feed is disposed of as concentrate, with 98% of disposal using conventional methods (i.e. no byproduct recovery).¹ The levelized cost of water (LCOW) for current plants in operation ranges from \$0.42-1.5/m³.² This project aims to assess the technical and economic feasibility of industrial ecosystems to desalinate brackish groundwater and supply existing and potential markets for clean concentrate or other bulk constituents from the brine. Specific project goals include: 1) Developing location specific byproduct revenue models using market assessments, and 2) Creating treatment train schemas in WaterTAP for treatment and valorization of brackish groundwater and establish pipe parity cost and performance targets for brackish groundwater treatment.

Research Approach

The project will consist of two objectives. The first objective is to develop a geospatially resolved market assessment that identifies existing and potential markets for bulk constituents by pairing brine composition and expected volumes with market data on building materials, fertilizer, road salts, and chemicals, including caustic soda and hydrochloric acid. This objective will be deeply integrated with industry needs and perspectives through a stakeholder board. The second objective will be to conceptualize and develop process models for brackish groundwater treatment and valorization and perform an economic and life cycle assessment of the proposed treatment trains (WaterTAP with PHREEQC or other electrolyte modeling software). The stakeholder board will also provide feedback on the results and usability of the models developed in the second objective. The interactions between tasks are shown in Figure 1.

RESEARCH PARTNERS

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Impact

If successful, this project will enhance pipe parity for treatment of brackish groundwater (500-10,000 mg/L TDS) in inland regions by decreasing the LCOW and creating a more resilient and accessible water supply. Further, circular management of the resources used and produced in the desalination process will improve pipe parity metrics including access and resiliency by increasing potable water supplies in lower-precipitation climate scenarios and reducing dependence on outside supply chains for water-constrained inland communities.

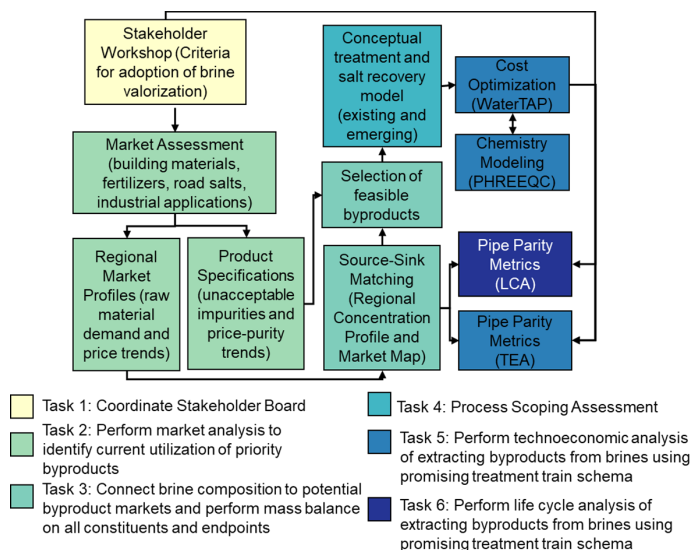


Figure 1. Project task schematic

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