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LESS SALT. MORE WATER. MSSC Multi-State Salinity Coalition

THE Water Research FOUNDATION

WRF Project 5256: Regionalized or Integrated Solutions for Brine Management and Recovery

February 27, 2025

Utilities and industries are seeking implementable One Water solutions for brine management.

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Background

- Brine streams have long presented a challenge for public and private sector organizations
- Traditionally, facility owners in municipal and industrial sectors have individually tackled the management of brine streams via costly practices and technologies, using existing infrastructure, or avoidance.
- Brine streams and discharges are expected to increase.
- Brine is generated via various sources: water reuse, industrial wastewater, produced water, groundwater desalination processes
- Brine management linked to private industry sustainability goals, regulatory requirements, and energy infrastructure
- Reuse and desalination will require reverse osmosis and/or thermal technologies, which generate new brine streams

Key Definitions

ONE WATER: The concept of breaking down barriers across the water sector to encourage a holistic, integrated approach, looking at water as one resource—regardless of whether it is drinking water, wastewater, stormwater, reclaimed water, or source water.

INTEGRATED: A style of approach that address multiple purposes or benefits (i.e., management, treatment, and recovery of brine).

REGIONALIZED: More than one entity in a region taking a joint approach to brine management.

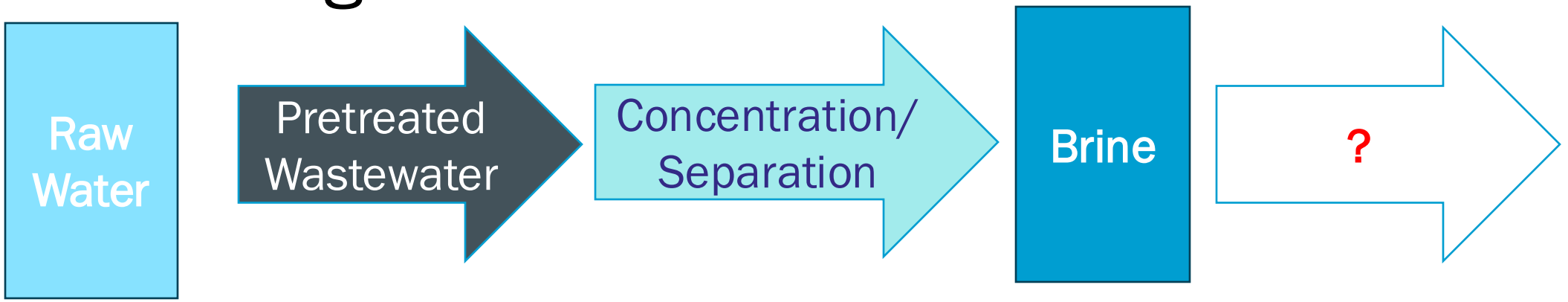
Research Objective

To develop practical and actionable planning guidance for regionalized or integrated brine management and recovery by examining leading approaches across sectors and regions and identifying key factors and considerations for implementation of such approaches.

Our Team

- **WRF Project Manager:** Sanjana Yagnambhatt
- **Principal Investigator:** Krystal Perez, PE, Industrial Water National Practice Lead
- **Co-Principal Investigator:** Lenise Marrero, PE, One Water Leader
- **Utility Partners:**
  - Eastern Municipal Water District
  - Los Angeles Sanitation and Environment
  - Denver Metro Water Recovery
  - City of Phoenix
  - Rancho California Water District
  - City of Buckeye

Brine Management Solutions



DISPOSAL

- Surface water discharge
- Marine discharge
- Municipal wastewater discharge
- Deep well injection
- Evaporation ponds
- Infiltration
- Crystallization
- Encapsulation

BENEFICIAL USE

- Infiltration
- Solar ponds
- Agricultural land application/irrigation
- Aquaculture
- Constructed salt marshes/wetlands
- Deicing
- Dust control

COMMERCIAL

- Salt separation
- Metals and mineral extraction

Brine Concentration Technologies must be balanced with regulatory requirements and management scenarios

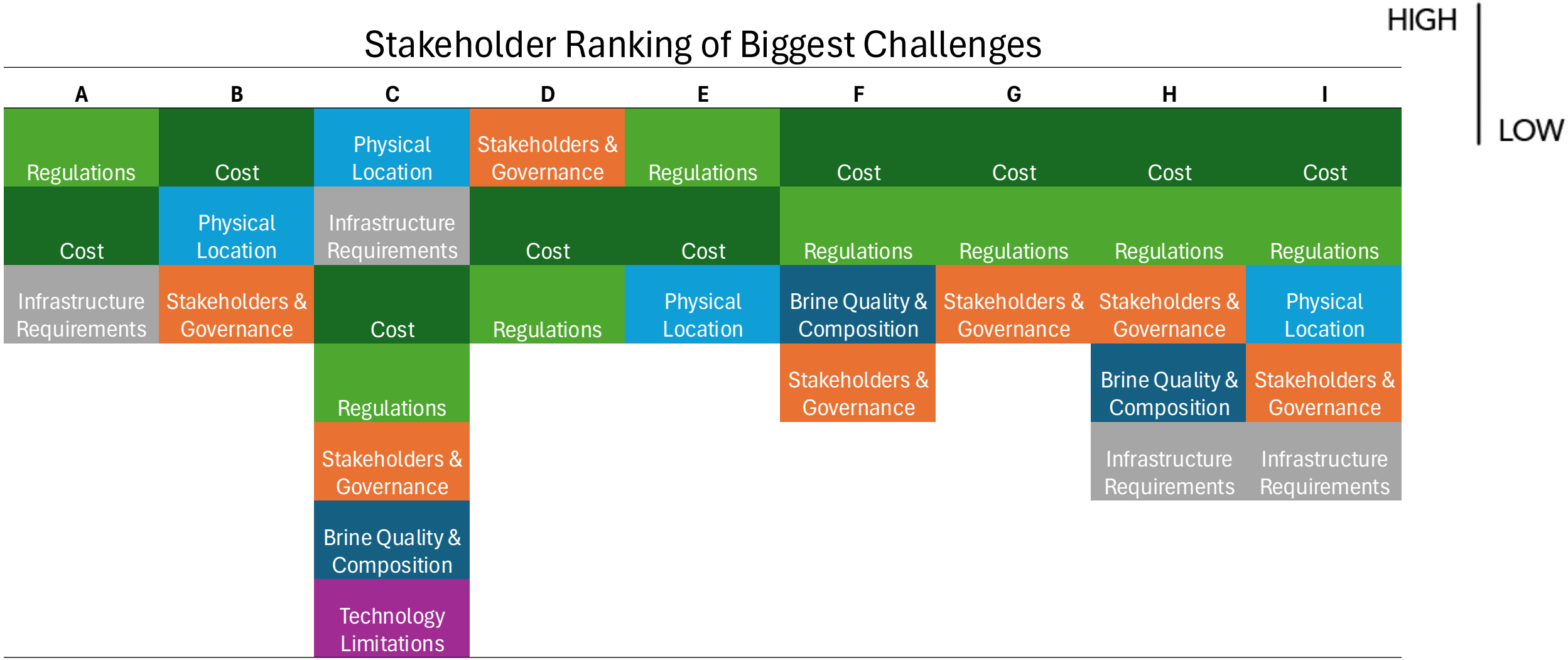
TASK 1		TASK 2	TASK 3	TASK 4
LITERATURE REVIEW to identify key factors across sectors for the implementation of regional or integrated brine management	INTERVIEWS with partners and anonymous contributors to help identify key challenges, opportunities, and plausible One Water scenarios	FRAMEWORK DEVELOPMENT to guide stakeholders towards meaningful brine management solutions	CASE STUDY WORKSHOPS & DEMONSTRATIONS to provide a deeper dive into factors relevant to regional solutions and the framework development	GUIDANCE DOCUMENT & WEBCAST that synthesize results and create an actionable implementation plan

When you think about key factors associated with regionalized brine management, what comes to mind?

Size of region	Spatial distribution	Cost	Treatment methods	Goals of entities	Volumes
Environmental Regulations	Longevity of projects	Capacity	Resource recovery	Elevations	Disposal Options
Quality	Reuse opportunities	Revenue	Economy of scale	Location	Stakeholders
Regulatory Uncertainty	Holistic Solutions	Regional Limitations	Operations Management	Collaboration	Regional Forecasting & Trends

What do you think the biggest challenges are for your organization in pursuing regionalized brine management?

Stakeholder Ranking of Biggest Challenges



How do we encourage more public-private partnerships in brine management?

- Policy and regulatory support
- Financial incentives
- Knowledge sharing platforms
- Contracting
- Public awareness and engagement
- Demonstration projects
- Need to break the mold of PPP, change structure
- Start with terminology and education and align with objectives
- Shift the narrative from waste to One Water enabler

Key Brine Management Factors and Considerations

GENERATION SCENARIOS
- Sources
- Quantity and Quality

MANAGEMENT SCENARIOS
- Disposal
- Commercial
- Beneficial Use

LOCATION
- Geographic Region
- Disposal/ Discharge Points
- Trucking/ Conveyance Needs

REGULATIONS
- Volumetric Limitations
- Quality Limitations
- Regulatory Requirements

PARTNERSHIP AGREEMENTS
- Institutional
- Legal
- Financial

VOLUME REDUCTION TECHNOLOGIES
- Availability
- Cost
- Feasibility

RECOVERY STRATEGIES/ TECHNOLOGIES
- Salt separation
- Resource extraction

RESEARCH AND INNOVATION
- Potential emerging technologies
- State of technology development
- Technology confirmation / piloting

Evolution of Challenges and Opportunities through a One Water Lens

- Identification of co-benefits
- Cost-sharing approaches/mechanisms
- Communication channels and stakeholder engagement
- Institutional agreements
- Policy changes/development
- Regulatory challenges and opportunities
- Leveraging of resources

Framework Development

A Repeatable and Adaptable Process to Select Implementable Regionalized Brine Management Solutions

Thank you

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