

Evaluating the Application of the Decision Support Tool

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➤ Background

- Global demand for water has greatly increased, requiring new sources of water
- The Decision Support Tool (DST) is a VBA-based treatment selection model for many source water types

➤ Objectives

- The tool: select the best treatment train with respect to economic & technical criteria while meeting beneficial reuse water quality requirements
- This project: evaluate the tool by testing different combinations of **water types, source water, flow rates, user technical criteria weighting and beneficial uses**

➤ Multi-Objective Optimization

- DST implements both economic and technical criteria
- User scores (0 to 5) and expert rankings (1 to 5) of technical criteria

➤ Objective Function: minimizes the weighted sum of all criteria while meeting all constraints

➤ Conclusions

- DST can effectively model treatment trains for many types of water
- Additional constraints, such as log removals of pathogens, are necessary in order to make tool more realistic

➤ Future Work – Additional Testing

- Multiple beneficial uses
- Multiple treatment trains

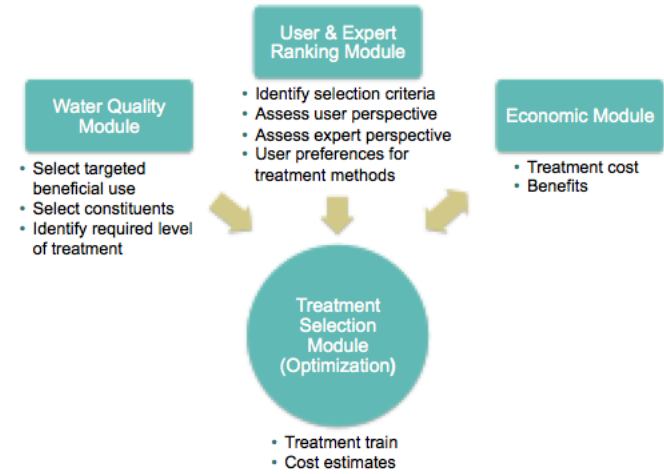


Figure 1: Conceptual structure of the interaction/flow of information between the four modules utilized by the DST for treatment selection

Table 1: Comparison of treatments for varied beneficial uses of CBM produced water at a flow rate of 1 MGD

Water Source	Beneficial Use	Treatment Train	Capital Cost (\$)	Constituents Requiring Treatment
Coal Bed Methane Produced Water: Raton Basin CO (TDS = 2209.16 ppm)	Potable	Air Stripping → Acid Cation IX (H) → (Ba) Precipitation – Media Filter → Tight NF → Chemical Disinfection → Evaporation Ponds → Brine Disposal	25,480,400	Aluminum, Arsenic (III), Benzene, Chloride, Cyanide, Ethylbenzene, Fluoride, Iron (II), Lead, Manganese, Rd 226+222+228
	Irrigation	Acid Cation IX (H) → (Ba) Precipitation – Media Filter → ED → Chemical Disinfection → Evaporation Ponds → Brine Disposal	24,698,700	Chloride, Fluoride, Iron (II), TDS (calc), Total Suspended Solids (TSS)