



# Innovative Water Desalination Systems for Urban Gardens in Dakar: A Cost-Benefit Analysis

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## Abstract

Urban gardening in Dakar faces severe water scarcity due to limited freshwater supplies. A systematic literature review using academic databases, focusing on recent studies from Senegal and beyond. Desalination systems have demonstrated varying levels of success, with some achieving a net positive return on investment (ROI) of up to 25% after six years. Innovative desalination technologies show promise for sustainable urban agriculture in Dakar, though further research is needed to optimise system performance and cost-effectiveness. Investigate the scalability and long-term sustainability of selected systems before implementation. Model estimation used  $\hat{\theta} = \underset{\theta}{\operatorname{argmin}} \{ \sum_{i=1}^n (y_i - f(\theta; \xi_i))^2 + \lambda \|\theta\|_2^2 \}$ , with performance evaluated using out-of-sample error.

**Keywords:** African geography, desalination technology, sustainable water management, urban sustainability, green infrastructure, cost-benefit analysis, renewable energy integration

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