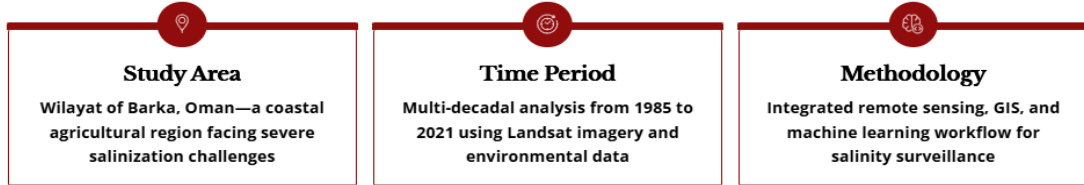




This Research Project is funded: Ministry of Agriculture, Fisheries and Water Resources

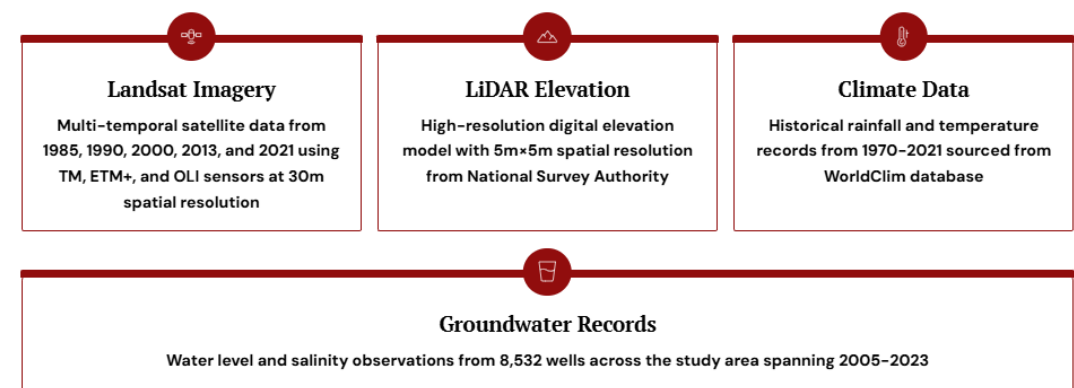
Research Overview



Historical Agricultural Significance



Data Sources and Integration



Methodology

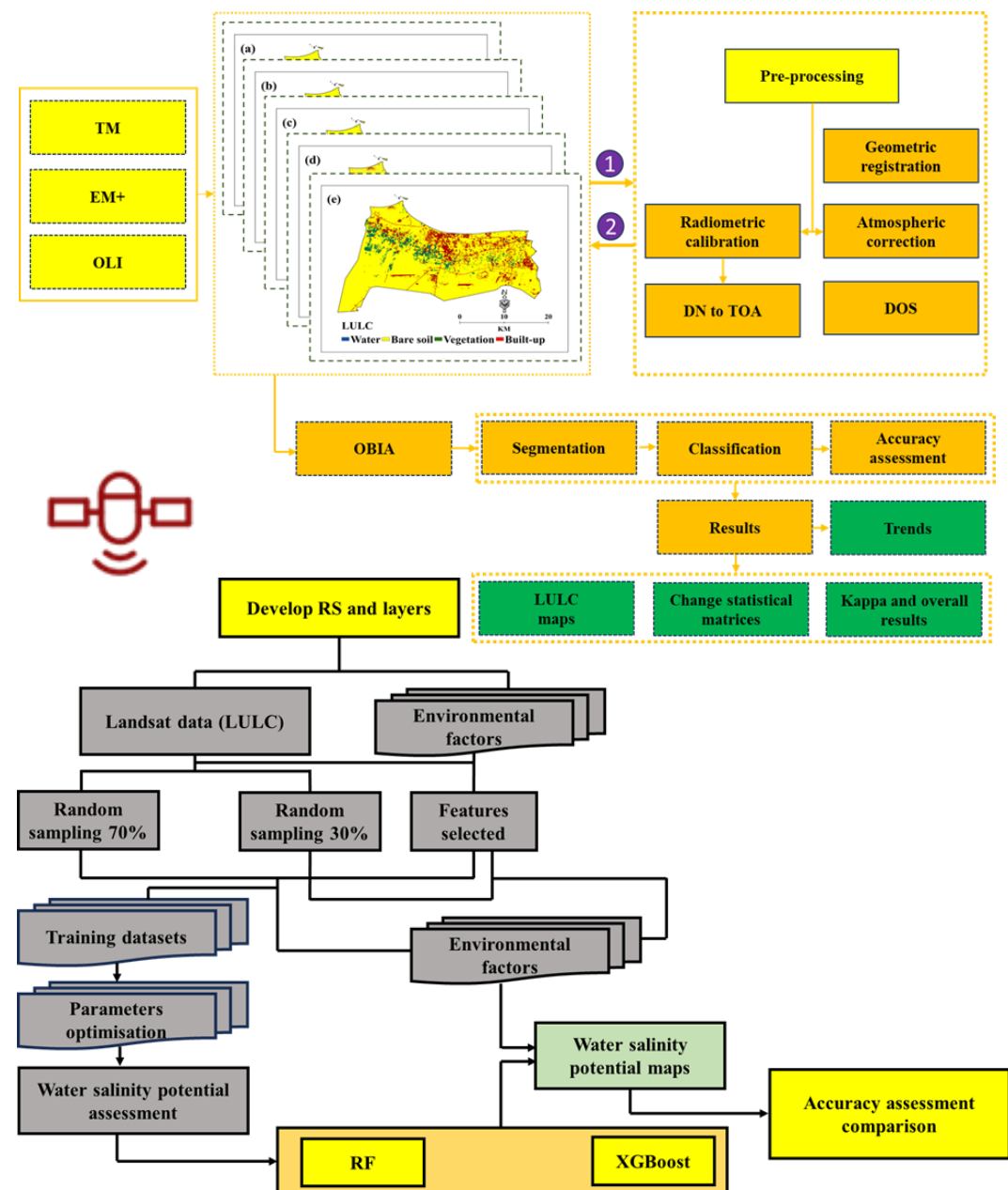
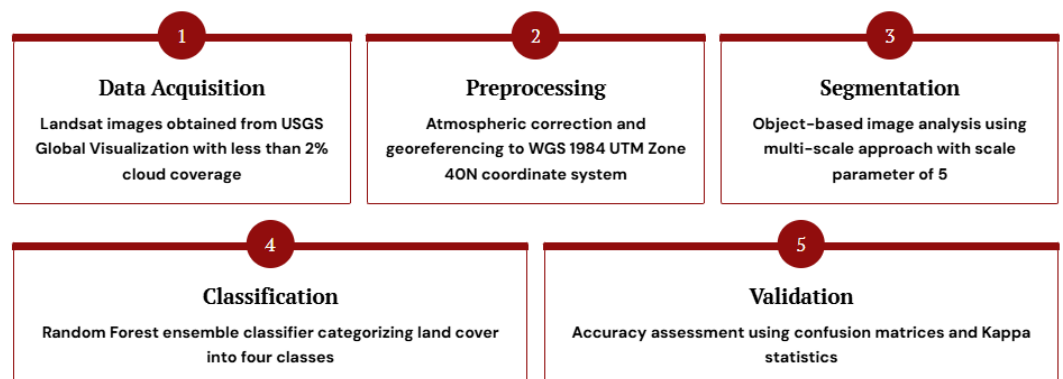
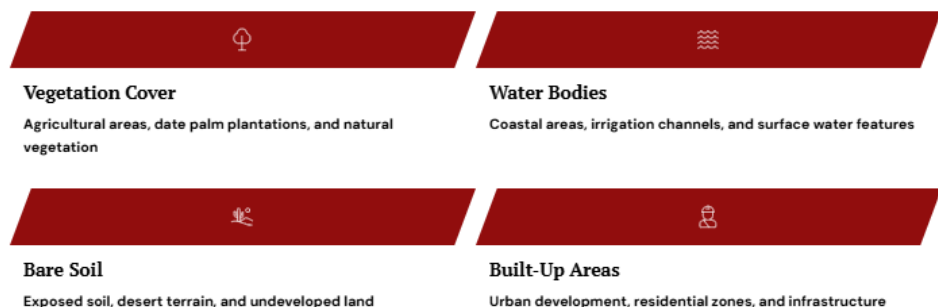


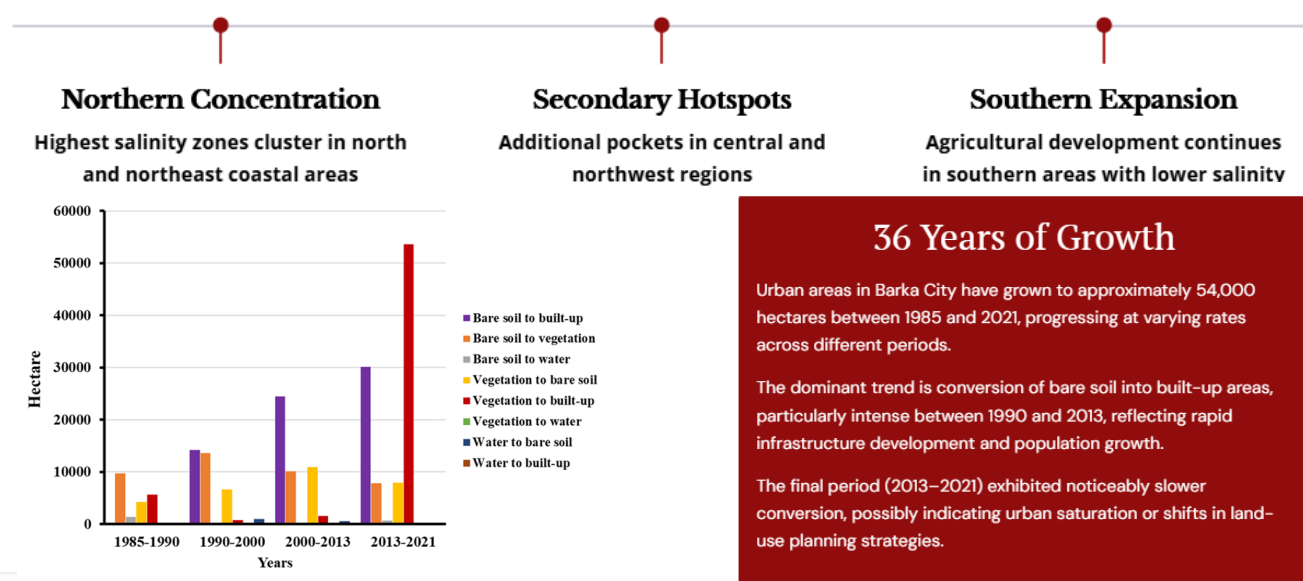
Image Processing Pipeline



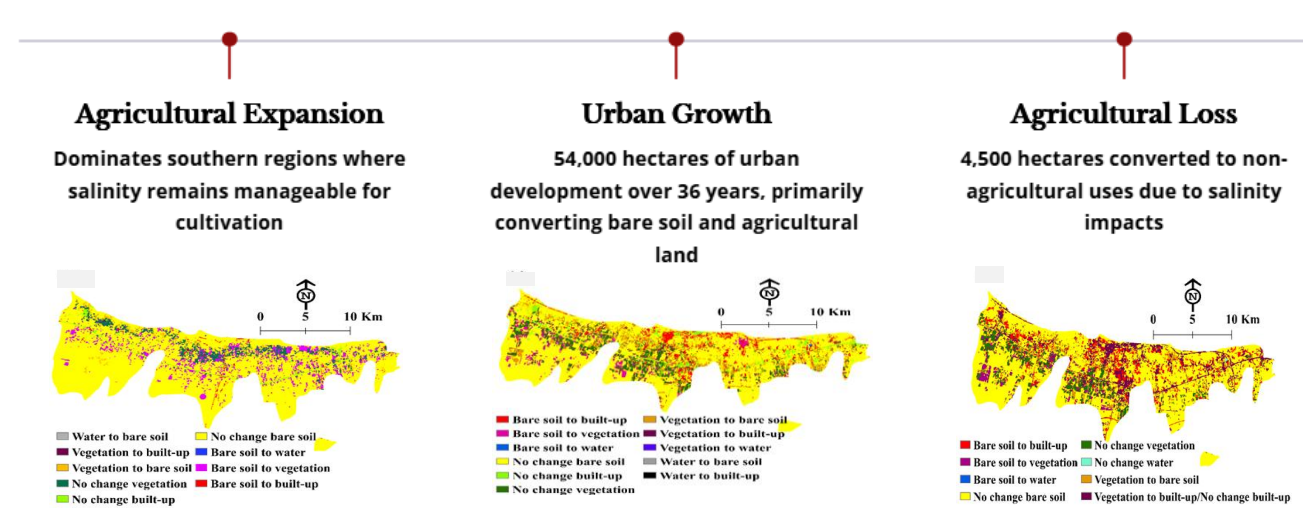
Land Cover Classification Categories



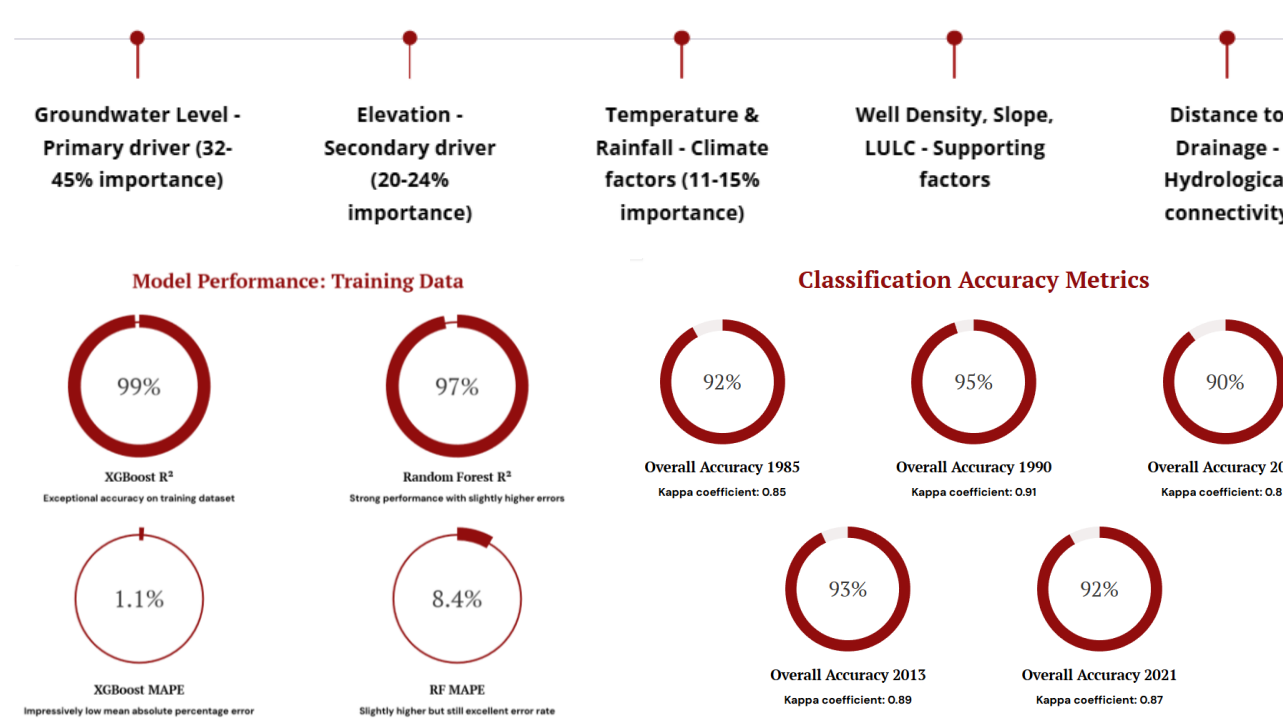
Key Findings: Spatial Patterns



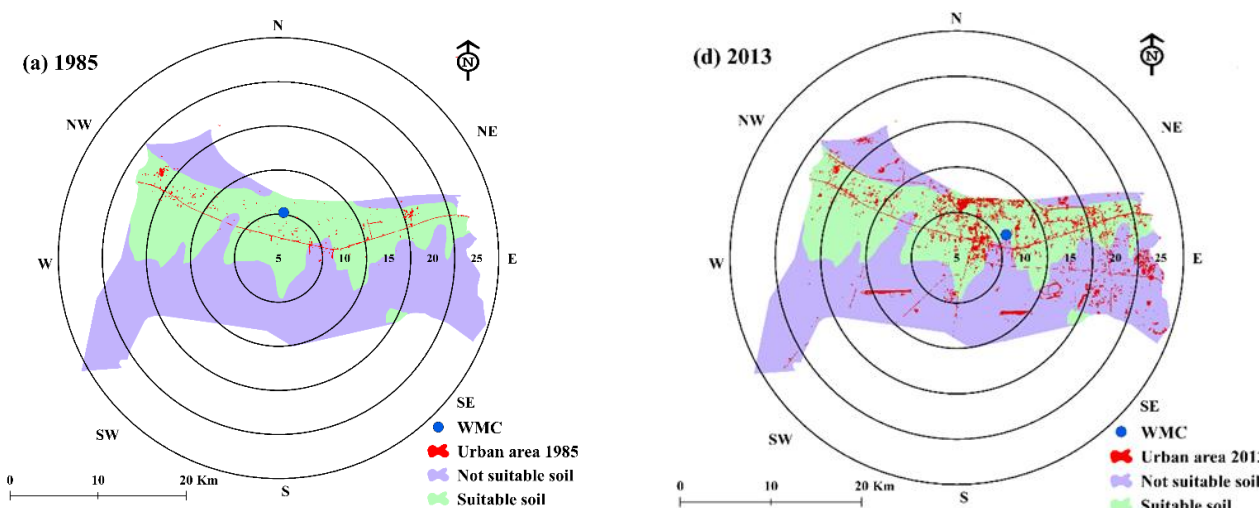
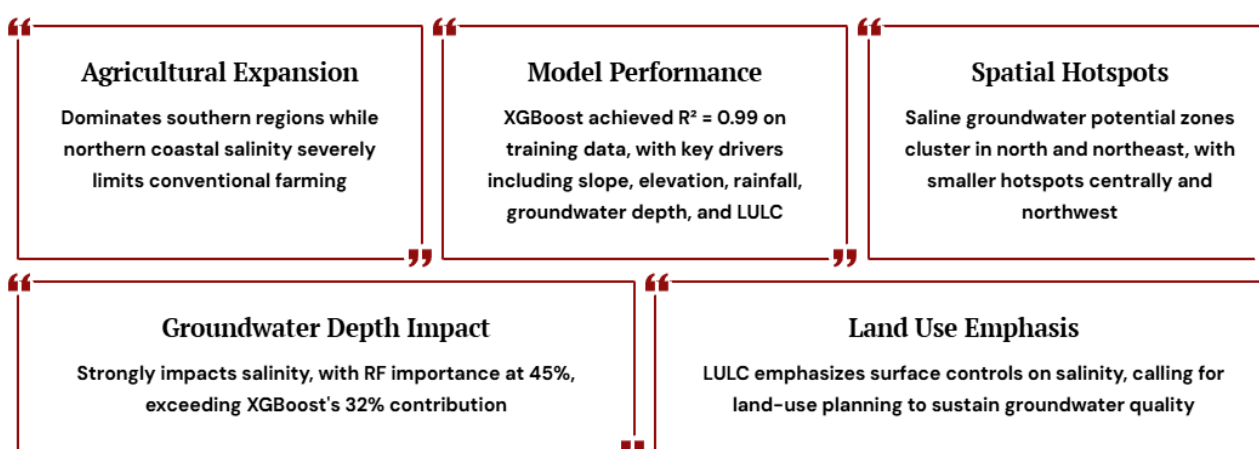
Key Findings: Land Use Changes



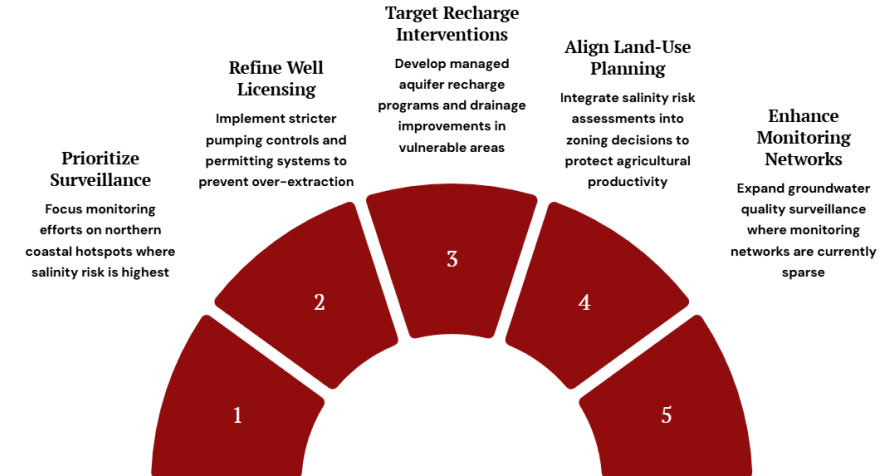
Key Findings: Environmental Drivers



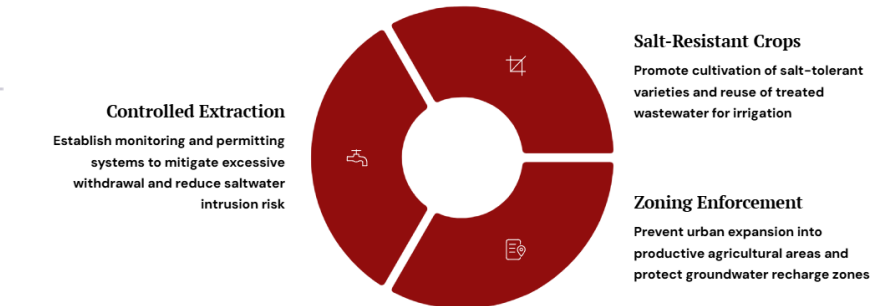
Key Research Findings



Policy Recommendations



Practical Implementation Strategies



Urban Growth Challenges

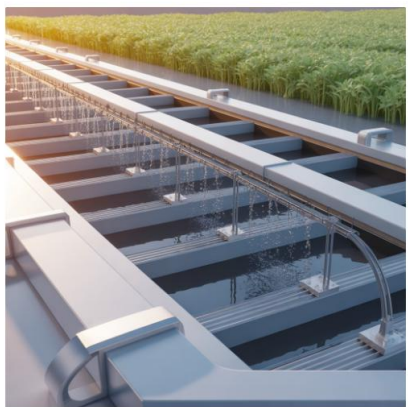
Competing Pressures
Urban growth in Barka creates conflicts over land use and environmental problems. Converting farmland to residential and commercial uses threatens local food supply and reduces cultural value of farming. Urban spread puts pressure on limited water resources, leading to groundwater loss and saltwater risks. Breaking up natural areas and adding hard surfaces increases water runoff, raises flood risks, and weakens ecosystem resilience.

Environmental Consequences



Implications for Water Management

Sustainable Strategies
Precise spatial predictions of groundwater salinity are vital for devising sustainable irrigation plans, pinpointing areas susceptible to salinization, and assisting policymakers in crafting water management strategies that adapt to climate changes. The slightly better performance of XGBoost indicates it might be more adept at creating dependable prediction frameworks in semi-arid regions where groundwater salinity is affected by complex hydrogeological and human factors.



Future Research Directions



Conclusions

This study demonstrates the power of integrating remote sensing, GIS, and machine learning to assess groundwater salinity in arid regions. The XGBoost and Random Forest models achieved exceptional predictive accuracy, with groundwater level, elevation, and climatic variables emerging as the most influential predictors. The path forward requires coordinated action across monitoring, policy, technology, and community engagement to ensure sustainable groundwater management in the face of intensifying hydroclimatic pressures.

Acknowledgments & Contact

