FROM DATA SCARCITY TO DECISION SUPPORT: A SCALEABLE FRAMEWORK FOR GROUNDWATER MANAGEMENT

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The keynote focuses on developing practical frameworks to improve groundwater management and support evidence-based water strategies in data-scarce environments, with particular emphasis on Lebanon (semi-arid MENA Regions). Building on previous work, the proposed approach integrates data, conceptual hydrogeological models, and numerical modeling to compensate for limited monitoring data while enhancing system understanding and decision-making. Rather than relying on benchmarked policies, the framework emphasizes the iterative refinement of hydrogeological conceptualization to reduce uncertainty and guide sustainable management interventions. The next phase scales these methodologies through a larger project, which investigates representative pilot sites across the Lebanese Water Establishments. These sites encompass a range of hydrogeological settings, management challenges, and levels of system complexity, providing a basis for testing and refining adaptable methodologies. This holistic framework aims to generate transferable approaches for groundwater assessment and management that can be progressively expanded from local pilot studies to regional and national applications, ultimately strengthening water resource planning under conditions of uncertainty.