

Development of a decision framework for the designing and implementation of a sustainable underground water storage system

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Abstract

Managed Aquifer Recharge (MAR) in the form of Aquifer Storage and Recovery (ASR) systems are being applied for numerous water augmentation projects both in developed and developing countries. Given the onset of Climate Change and its influence on weather patterns and land use, it has been acknowledged the utilization of this technology will be ever increasing. This technique like all others does have its drawbacks or disadvantages, whereby to overcome these drawbacks or disadvantages it is recommended that logical planning process be followed.

In this study, we developed a decision framework known as “Decision framework for the planning, designing, construction/testing and implementation of subsurface water storage system” to further standardize the planning and design process of subsurface water storage system to increase the probability of having a successful ASR/ASTR project. The formulation of this framework was based on earlier frameworks, guidelines, published papers and technical reports which were compiled into a data collection database. The database of which consider both qualitative and quantitative aspect for example recharge objectives, site location, water chemistry of the native, source and recovered water, aquifer characteristics(hydraulic conductivity, transmissivity, porosity), injection/pumping rate, ecological constraints, societal restrictions, regulatory restrictions etc. The assimilation of these factors into a singular framework will benefit the broad spectrum of stakeholder as it maps the chronological order under which ASR project should be undertaken highlighting at each stage the feasibility of the project. The final stage of which should result in fully operational ASR system.

The framework was applied to two case studies and through the application of a modified ASR site selection suitability index (Brown et al., 2005) a score was derived to identify the performance of each site. A high score of which meant a maximize chance of success given the reduce presence of project constraints.

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