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Managed aquifer recharge in crystalline rocks: a review from South India

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The Southern part of the Indian subcontinent is mainly composed of crystalline rocks with a semi-arid and highly seasonal climatic regime. Water harvesting, as well as water conservation has been a major concern in this region since more than 3000 years. Several thousands of rainwater harvesting structures are disseminated across south India and some contribute to recharge the shallow aquifer system. These Manage Aquifer Recharge structures (MAR) are now used to maintain, enhance and secure groundwater systems under stress. Along the 20th century, programs of rural electrification and deep mechanically-drilled bore wells have switched agriculture in south India from canal irrigation to irrigation based on groundwater. This dependence on groundwater has contributed to accelerate water table depletion, which has in turn led to increased efforts at the state and national levels to revive old MAR systems. In addition to quantitative impact on groundwater resources, the MAR structures bring an improvement in water quality. Nevertheless, the efficiency of the MAR system has been questioned and depends of the subsurface structure or climate conditions. Hence, the better knowledge on the dynamic and the impact on groundwater recharge in time of these structures are crucial. This study presents the results of (i) monitoring of various MAR structures located in crystalline rocks using borewells, geophysics and geochemistry and (ii) long term monitoring of MAR structures using water surface area computation using Sentinel 1 satellite images. The comparison of results allow proposing a typology of MAR structures according to their efficiency.