



REGIONAL SUITABILITY ASSESSMENT FOR UNDERGROUND TAMING OF FLOODS FOR IRRIGATION

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A Geographic Information System based methodology was developed to identify suitable areas in the Ganges River Basin for managed aquifer recharge (MAR) as part of the “Underground Taming of Floods for Irrigation” (UTFI) project. A composite-index based on drainage density, flood frequency, flood mortality and distribution, extreme rainfall events, land use, population density, geology, slope, soil, groundwater level, aquifer transmissivity and economic loss due to floods, was developed. The suitability map, developed using this index, indicated that out of 43% of the inner Ganges Basin that is routinely subjected to floods, 68% of the area has either ‘very high’ or ‘high’ suitability for UTFI. This method was validated with secondary data and ground truthing from ten catchments in the Ramganga basin located within the Upper Ganga in Uttar Pradesh, India. A hydrological model (SWAT), groundwater model (MODFLOW) and flood inundation model (HEC-RAS) were applied to the Ramganga basin (~19,000 km²) to understand the baseline hydrologic regime, and to test scenarios with distributed MAR interventions. The most promising scenario involved the introduction of a distributed network of MAR structures across the basin that used excess basin runoff for recharge. Results indicated that the groundwater levels gradually improved after a 5-year period, resulting in a reversal of groundwater depletion trend and a groundwater elevation increase by 7m. In addition, such scenario also resulted in a reduction in basin net outflow and cumulative outflow, leading to a reduction in flood damage. Results further indicated that peak flow reductions resulted in lowering the magnitude (i.e. return period, inundated area) of current floods. For instance, a 20% reduction in peak flows at the outlet of the basin converted a 15-year flood peak to an approximately 8-year flood peak, a 5-year peak to 3-years and a 2-year peak to just above a year.