# Assessing Impacts of Rainfall Patterns, Population Growth, and Sea Level Rise on Groundwater Supply in the Republic of Maldives

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**Abstract.** Groundwater resources of the Republic of the Maldives are threatened by a variety of factors including rising sea level, continued population growth, contamination from the land surface, pumping demands and variable future rainfall patterns. There is no adequate data to quantify groundwater resources of all islands with field measurement in Maldives. This study assesses future groundwater supply under future variable rainfall patterns with numeric modeling. Using a set of two-dimensional density-dependent groundwater flow models, transient lens thickness is estimated for a range of island sizes during 2011 to 2050, with time-dependent rainfall patterns provided by best-performing General Circulation Models for three distinct geographic regions. The lens patterns remain fairly stable over years. The results show that average lens thickness in all 3 regions of the Maldives during the latter 20 years (2030-2050) is slightly greater than during 2011-2030, indication mild increase in future available groundwater supply. However, this could be negated counting for significant pumping demand and sea-level rising. To provide estimates of total available groundwater volume, a calibrated three-dimensional SUTRA model is created for the biggest island of Maldives, Gan in Laammu Atoll. Groundwater water supply for Gan is assessed with effects of population growth, increasing pumping demands and sea-level rise under future scenarios from 2011 to 2050. Worst and best scenario are simulated in terms of sea-level rising and increasing pumping and their effected to freshwater lens are evaluated.