IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 2, Issue 1, December 2022
Impact Factor: 6.252

The Role of Soil in the Water Cycle: From Precipitation to Groundwater Recharge

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Abstract: *Soil constitutes a fundamental component of the hydrological cycle, serving as the primary interface between atmospheric precipitation and subsurface groundwater reserves. This chapter examines the multifaceted role of soil in governing water movement across terrestrial ecosystems, with particular emphasis on conditions prevailing in the Indian subcontinent. The processes of infiltration, percolation, soil moisture retention, surface runoff, and evapotranspiration are analysed in relation to soil texture, structure, organic matter content, and land use patterns. Detailed assessments of hydraulic conductivity, field capacity, and wilting point across major Indian soil types—including alluvial, black cotton (Vertisols), laterite, and red soils—are presented. The chapter further discusses the implications of urbanisation, agricultural intensification, and climate change for groundwater recharge dynamics. Findings underscore the critical necessity of sustainable soil management practices for preserving water security in India and globally.*

Keywords: Soil hydrology, water cycle, groundwater recharge, infiltration, evapotranspiration, Indian soils