Decline in low-intensity rainfall reduces groundwater recharge in north India

Low-intensity rainfall provides maximum time for water to percolate and recharge the aquifer and so is favourable for groundwater in north India, says Vimal Mishra (left) | Photo Credit: Special Arrangement

Based on data collected between 1996 and 2016 from over 5,800 groundwater wells spread across India, researchers from Indian Institute of Technology (IIT) Gandhinagar have been able to find that rainfall intensity is “strongly” linked to groundwater recharge.

While low-intensity rainfall during summer monsoon is responsible for groundwater recharge in the case of India, particularly north-west and north-central India, high-intensity rainfall is a major driver for recharging groundwater in south India. The size of aquifers and the yield are much larger in north India compared with south India. The results were published in the journal *Geophysical Research Letters.*

Rainfall is classified as low-intensity if the amount is between 1-35 mm per day. High-intensity rainfall is characterised by rainfall in excess of 35 mm per day.

Nature of aquifers

A team of researchers led by Prof. Vimal Mishra from IIT Gandhinagar found that groundwater recharge with respect to intensity of precipitation in the three regions studied is related to the nature of the aquifers. While aquifers across north India, particularly in the Indo-Gangetic Plain, are characterised by alluvial soil, southern India is characterised by hard-rock aquifers.

Though specific yield of alluvial soil is higher than hard-rock aquifers, alluvial aquifers take longer time to get recharged in response to rainfall. “Low-intensity rainfall provides maximum time for water to percolate and recharge the aquifer and so is favourable for groundwater in north India,” says Prof. Mishra. “High-intensity rainfall mostly leads to surface run-off and doesn’t contribute much to groundwater recharge in north India.”

“In contrast, hard-rock and basaltic aquifers are seen in south India. Here, high-intensity rainfall contributes more to groundwater recharge than low-intensity rainfall in south India,” he says.

The researchers used groundwater level data available between 1996 and 2016 from over 5,800 wells and estimated the groundwater recharge for each well and for each year. Groundwater recharge estimation was done using water table fluctuation method by taking the groundwater table difference between pre-monsoon (May) and post-monsoon (November) months.

Total amount of rainfall received per year between 1951 and 2016 has declined in the Indo-Gangetic Plain, Maharashtra, parts of Tamil Nadu and Western Ghats. But specifically, the total rainfall contributed by low-intensity rainfall has significantly declined across India, with the maximum reduction seen in central India, Indo-Gangetic Plain and to a less extent in north-west India and south India.

In contrast, the total rainfall from high-intensity precipitation has increased in north-west India (Gujarat and Rajasthan), south India, West Bengal and Orissa. Kerala has witnessed a decline in both high- and low-intensity rainfall.

The study found the decline in groundwater recharge between 1996 and 2016 is strongly associated with decline in low-intensity rainfall in north-west and north-central India. At the same

time there is an increase in groundwater recharge in south India due to an increase in high-intensity rainfall.

Managing groundwater

“Our findings have implications on managing groundwater resources in India. Nature of rainfall supportive of groundwater recharge has changed in north India even as groundwater withdrawal for irrigation has been increasing to meet the demands of intensive agriculture. This has created an imbalance and has led to an unsustainable scenario for groundwater use for irrigation,” he says.

“Our study suggests that north India must make additional efforts (in the form of artificial groundwater recharge) to check the decline in groundwater table while also reducing groundwater withdrawal for irrigation. Both these measures have to be adopted simultaneously,” he adds.

The quadrivalent vaccine will have two A virus strains — H1N1 and H3N2 — and two B virus strains — Victoria and Yamagata

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