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The present study explores sustainable solutions for providing safe drinking water in an area currently served only by groundwater. Groundwater development here has reached criticality and is contaminated with fluoride and uranium. As there are only a few small seasonal streams in the area, roof-water harvesting and utilization of tank/lake water are tested as alternative approaches for drinking water supply. The study area is in the Chikkaballapura district of eastern Karnataka, India, where the average annual rainfall is 700 mm. The quantity of roof water that can be harvested from the built structures in the study area can adequately meet the drinking water requirements, although not the entire domestic water needs. A nearly perennial lake located in the upper reaches of the micro-watershed stores 301 million litres of water that needs only routine filtration and chlorination. This study shows that sustainable water management practices such as roof-water harvesting and lake water utilization can replace the contaminated groundwater for drinking purposes.

Keywords: Drinking water, perennial lakes, polluted groundwater, roof-water harvesting, sustainable solutions.

A major problem for more than three billion rural residents across the world is access to safe water for drinking and domestic purposes[1]. A sustainable approach to supplying safe water should meet the requirements both in quantity and quality. In India, 0.9 billion people out of a total population of 1.4 billion, i.e. 64% of the population live in rural regions, and most of them are affected by a lack of access to safe drinking water[2]. The rural drinking water requirements of the country are being managed under the Jal Jeevan Mission (JJM) of the Government of India (GoI). Eighty-five per cent of the public water supply is met by groundwater. Also, groundwater in large tracts of India is affected by geogenic or anthropogenic pollution[3]. To supply safe drinking water, several approaches are in practice. In villages facing health issues due to groundwater pollution and in the command areas of irrigation or multi-purpose projects, surface water supply from canals is being implemented. Reverse osmosis (RO) units have been installed in thousands of villages where groundwater is contaminated. These approaches have limitations: (i) surface water does not always reach remote villages in the command areas, and (ii) RO processing results in the expulsion of enormous amounts of wastewater, which is more contaminated than the water that has been treated and returned to the ground[4].

Therefore, there is a need to adopt more sustainable approach(es) to meet the drinking water requirements in such villages. In this study, we provide a sustainable solution for drinking water supply in a Gram Panchayat in eastern Karnataka, India. This case study relates to the Ganjigunte Gram Panchayat, which consists of 18 villages in the Chikkaballapura district of eastern Karnataka. The area is in a water-stressed zone where groundwater exploitation has exceeded the quantum of recharge[3]. Groundwater samples from 16 borewells which supply drinking water to the 18 villages in this Gram Panchayat are found to contain high amounts of uranium going up to 3000 μg/l, which is far greater than the World Health Organization (WHO) or Atomic Energy Regulatory Board (AERB) recommended limits for drinking water[5,6]. Additionally, in nearly 50% of the borewells, the amount of fluoride in groundwater also exceeds the permissible limit of 1.5 mg/l (Table 1)[7]. After identifying the quality issues associated with groundwater and the unsatisfactory performance of RO intervention[4], we have examined the feasibility of roof-water harvesting and using lake water for providing a safe and sustainable drinking water supply in this Gram Panchayat. The quantity of water available by roof-water harvesting and from nearby perennial lakes in the proximity is estimated in the study. The quality of water in the lakes has been evaluated to decipher whether it is possible to use it for drinking after routine treatment, as commonly adopted in municipal water supplies.

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