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Hydrological framework of over exploited multiaquifer system of a part of Gujarat India for sustainability

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The area covered by Banaskantha, Gandhinagar, Sabarkantha and Mahesana districts in the Gujarat State of India is designated as North Gujarat Region in this paper for convenience of reference. This Region is underlain by a multi-aquifer system, with prolific yields but the excessive groundwater pumping over many years has resulted in de-watering of a substantial aquifer thickness and reduction in pressure heads. The over- exploitation of groundwater has resulted in conspicuous decline in water levels and agriculture production has been seriously affected . The detrimental effects of over- exploitation of groundwater i.e., decline in water levels have not only added to the capital cost of construction of the tube wells and the energy bill but have also added to annual cost of maintenance of tube wells. During 50's , the tube wells were drilled between 60 and 100 m and their water levels ranged between 10 and 15 m bgl. These tube wells have also gone out of use. The tube wells being drilled now are between 250 and 300m depth with the water levels ranging between 80 to more than 120 m bgl. In fact because of economic factor, farmers are largely growing the cash crops in the area and are taking high risks in construction of the deep tube wells even with a reduced life span due to lowering in water levels and consequent reduction in discharge, higher and higher maintenance cost. Large financial investments made in construction of tube wells need to be protected from implied hazards of over exploitation of ground water.

The adoption of high yielding crops for boosting the agricultural production and the impetus in rural electrification has resulted in substantial increase in ground water pumping. Earlier through conventional open well with discharge 4-6 m3/hr. an area of 0.4 to 0.6 ha could be irrigated. Now with energisation of open wells and construction

of deep tubewells the average ground water abstraction rates have gone as high as 90 to 112 m3/hr. with command areas ranging from 40 to 60 ha.

The present paper describes the hydrogeological framework of the multi-aquifer system and outlines a multi-disciplinary approach including measures for control of ground water development, induced recharge and management through changes in cropping pattern and irrigation practices to address the situation.