GROUNDWATER MANAGEMENT STUDIES IN THE GONDWANAS OF WEST GODAVARY DISTRICT, A.P

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PROJECT SUMMARY

The upland of West Godavari District underlain by Gondwana sedimentary formations has witnessed rapid groundwater development and requires an assessment of groundwater balance for proper management of groundwater resources in the area. The main objectives of the project were:

- To assess the groundwater resources in the study area;
- To assess the quantum of groundwater draft from the aquifers; and
- To develop suitable management techniques for sustainable development of groundwater resources.

The study domain, with an area of about 1100 km^2 and located in the North Western part of West Godavari District, is bounded by Latitudes 16°41' and 17°07' N and Longitudes 80°55' and 81°17'E. Geologically, the study area is underlain by Eastern Ghat complex, Lower Gondwanas of Gadavari Valley Basin, Upper Gondwanas of Krishna-Godavari Coastal Basin, Deccan Traps, Tertiaries and recent alluvium. Gradual increase in groundwater development in the study area has lead to decline of water levels in dug wells and tube wells.

Groundwater budgeting and balance studies were carried out on the basis of norms recommended by the Groundwater Resource Estimation Committee (GEC), Govt. of India. The period extending from June 2000 to May 2001 was taken as the groundwater year. Groundwater recharge using rainfall infiltration method was estimated to be 136.42 MCM and by water table fluctuation method it was estimated to be 133 MCM. Recharge from other sources including reservoirs, tanks, canals, and irrigation water returns from both surface and groundwater irrigation was found to be about 228 MCM.

Groundwater draft in the year 2000 for irrigation purposes was about 974.74 MCM. Groundwater draft for domestic and livestock consumption was 22.14 MCM per year. The yields were found to decrease in 2002 due to declining water levels in the wells.

Groundwater balance in the study area shows overdraft ranging from 635.63 MCM to 863 MCM as per GEC norms depending on the recharge method adopted in water balance computations. But on taking the value of specific yield to be 0.16

(which pertains to Gondwanas of Godavari Valley), the overdraft is about 364.15 MCM. Taking into consideration the mined water during 1990-2000, the overdraft was estimated to be 704 MCM i.e. 70.4 MCM/year. The fact that for an overdraft of 364 MCM (as per the 0.16 specific yield factor), the mined zone is only 70.4 MCM indicates quick infiltration of most of the irrigation water. This situation shows the importance of the component of irrigation return flow because of the soil condition in the study area.

Total consumption of groundwater in the area is large mainly due to cultivation of water intensive crops like paddy and sugarcane. Due to quick infiltration of irrigation water during overland flow in the fields, the groundwater draft in the study area is found to be 2.85 times more than the actual requirement (342 MCM) of the crops in the area. It is suggested that the wet crops should be replaced with irrigated dry crops for proper management of the groundwater resource. Adopting modern micro-irrigation methods would further aid in reducing the draft and arrest further decline of the water table.

THE EFFECT OF WATERLOGGING AND INTENSIVE AGRICULTURE ON THE GROUNDWATER REGIME IN DELTAIC REGIONS

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PROJECT SUMMARY

The study has been carried out in order to study the effect of waterlogging and intensive agriculture on the groundwater regime in deltaic regions. The study area lies in the lower Godavari Deltaic basin with an area of 1657 km^2 covering parts of East and West Godavari Districts of Andhra Pradesh and bounded between Latitudes 16°20' and 16°45' N and Longitudes 81°43' and 82° 20' E. The area is known for cultivation of water intensive paddy crop apart from coconut plantation. Major source of irrigation is canal water of the three distributaries (Goutami, Vasista and Vainateyam) of the perennial River Godavari.

The measurement of depth to water levels during all seasons revealed that most of the area is waterlogged. To estimate the water logged area and its effect on groundwater, hydrogeological surveys were carried out and electrical conductivity measurements were made. To investigate the effect of intensive agriculture on groundwater, chemical analyses of 157 dug well water samples were carried out in accordance with standards given in APHA.

The nitrate concentrations were found to range between 0.001 mg/l to 0.21mg/l, which is within potable limits. The phosphate concentrations for most of the well samples were nearer to 1 ppm. Such high concentrations of phosphate in groundwater are due to utilization of urea and other fertilizers. High concentrations of potassium in 60% of area, nitrate in 12% and phosphate in 10% of the area were observed in groundwater at shallow levels at several places in Godavari Delta. Low concentrations of these constituents at medium and deep levels and comparatively high concentrations at shallow levels at several places may be attributed to anthropogenic activities particularly extensive use of fertilizers and pesticides by farmers due to which nitrate, phosphate and potassium ions get leached and eventually reach the water table.

Based upon the water level observations in the Godavari Delta, it was evident that 1456 km^2 of the region is experiencing water logging condition. Excessive irrigation, flat topography, high rainfall (annual rainfall 1200 mm), low groundwater utilization are the factors responsible for the waterlogged conditions. High TDS values were also recorded in these water logged areas. In absence of any remedial measures, water logging in these areas may have adverse effect on the crop

yields. Water logging may be controlled by adopting suitable measures to reduce the recharge and increase the discharge from the problem area.

Various measures by which the above can be achieved are control of surface drainage in the area, provision of an efficient surface-drainage system, improving subsurface drainage, increase in groundwater pumpage, planning and adoption of rational agricultural practices, lining of canals and water courses, and adopting judicious water management practices.

IMPACT OF URBANIZATION ON GROUND WATER – A STUDY FROM JAIPUR CITY AND ITS HINTERLAND

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PROJECT SUMMARY

Jaipur, popularly known as the pink city of Indian Union, is the 7th most populated city in the country. The city is undergoing extensive urbanization which is affecting the quality and quantity of groundwater in Jaipur as well as in the adjoining areas. To understand the impact of urbanization on the valuable groundwater resources in the region, the main objectives of the project were:

- To assess impact of urbanization on the water resources and quality of the water.
- To identify pollutant source and mobility, and delineation of groundwater zones affected by pollutants particularly by nitrate and fluoride.
- To identify measures for harvesting the rainwater to augment availability of water resources.

The study area falls between the Latitudes 26°45' N to 27°05' N and Longitudes 75°35' E to 76°00' E covering an area of 1526 km^2. In the year 1970, the city area was 31.25 km^2 which expanded to 220.50 km^2 in the year 2001 leading to a drastic change in the pattern of land use.

The good groundwater prospective zones are the valley fills (shallow, moderate and deep) and alluvial plain. The moderate groundwater prospective zones are gullies and pediments, while the poor groundwater prospective zones are sand dunes, inselbergs, residual hills, denudational hills, structural hills and linear ridges. Except for the central part of the city, the area is suitable for bore-well construction.

Investigations revealed that groundwater development in the area has increased from 152.73% in 1998 to 255.01% in 2002. Static groundwater reserves have decreased from 5942.59 MCM in 1998 to 5837.28 MCM in 2002. Rechargeable open space has decreased from 41.6% in 1970 to 11.2% in 2001. Runoff was found to increase from 131.21 MCM in 1970 to 241.98 MCM in 2001.

The high fluoride in the groundwater in the south-western, southern and south-eastern part may be due to shallow groundwater table, basinal bed rock topography, shallow bed rock depth and mica-schist and granite-gniessic rocks.

It is recommended that there is an urgent need for proper maintenance of sewerage system of the city area. Because of high density of population and shallow

water table in Rajmal Talav area, Brahmpuri, Hawamahal, Chandpole area, the concentration of nitrate was found to be beyond the permissible limit. Also, there is urgent need to harvest the rain water so that the artificial recharge of groundwater can replenish the groundwater. The total run-off in the city area is 90.93 MCM/year. This run-off should be stored by making suitable rainwater harvesting sites. The obstacle sand dunes area and the pediment parts of the hills should be afforested so that waste land can be utilized for resource generation. Mass awareness programme should be undertaken at grass root level for conservation of both quantity and quality of water resources.