National Seminar on Water & Culture, Hampi,Bellary Dist.

June 25-27,2007

PALAEOCHANNELS AS GROUNDWATER STORAGE –A PROMISING OPTION TO COPE UP WITH HYDROHAZARD IN RAJASTHAN, INDIA

A.K.Sinha, Department of Geology, University of Rajasthan, Jaipur-302004,INDIA
e-mail: sinhaaa@sancharnet.in

ABSTRACT

Background

Provision of sufficient storage capacity under growing water demands and increasing climatic variability is one of the main concerns for water managers in the coming decades . It is expected that a multiple of the present storage capacity may be needed during immediate futures years from now . Storage of substantial amount of water can either be above ground ,in reservoir behind dams or subsurface in aquifers . The subsurface storage is considered to be highly ecofriendly and possibly a sustainable means to meet any emergency situation under hydrological extremes resulting due to climate variability particularly in arid to semiarid region

Paleoachannel as an Aquifer

Palaeochannels are remnants of stream channels cut in older rocks/sediments and filled by younger overlying sediments, representing the distribution of valley systems as these existed at a given geological time in the past (Bates & Jackson, 1980).

The Studies and informations gained through interdisciplinary sources and techniques such as ancient literatures ,geological, hydrological , Archeological , palaeoclimatological and Remote Sensing and allied geophysical techniques reveals that today's palaeochannels are the relict of the past integrated river system which now became disorganized and extinct due to tectonic and geomorphic activities; climatic vicissitudes ; and possibly due to anthropogenic activities as well. It constitutes high potential Aquifer particularly in arid to semiarid region.

Hydro hazard in Rajasthan

Rajasthan is the most water deficient State of the country. It has 10.4% of the country's area but only 1% of its water resources in the form of annual rainfall. The Aravalli range of mountains, which divide the state into two different sets of physiographic regions. The trans-Aravalli region is known as "Great Indian Thar Desert", while the Sis-Aravalli region comprises of eastern plains and southeastern pathar. The desert occupies about 60% area of the State with 40% population and is characterized by extremely low and erratic rainfall. The eastern and southeastern region covers only 40% are with 60% inhabitants. The unique geographical situation and distinct physiographic condition of the State is such that it received the last residual share of monsoon

rainfall from both the sides viz. the Bay of Bengal and southwest monsoon. A good part of it is absorbed in dry soils, thus restricting the surface runoff. Normally water absorbed in the zone of aeration should recharge the groundwater but it does not reach upto the zone of saturation, thus leaving comparatively a small part of potable water that can be used for drinking or agriculture purpose. The surface water resources in the region are mainly confined to south and southeast part of the State. There is no perennial river except Chambal and Mahi (AISLUS 1990). The region has to depend upon its share of water from inter state river basin and rainwater availability is through seasonal rivers during the monsoon. Deficient rainfall and consequent scarcity of surface water has led to heavy dependence on groundwater, the resources of which are also meager. It is therefore, imperative that new sources of groundwater are identified to sustain the increasing demand for water in the region and meet the hydrohazard situations arising out of recurrent occurrence of drought , Flood caused due to storm water, and waterlogging due to seepage from canal .

Review of literature reveals that neotectonic activity in the Quaternary period caused disorganization of natural drainage in Rajasthan, which led to disappearance of some of the then existing river and also change in courses of some others. Earlier workers(Bakliwal et al 1991) from GSI have identified buried courses of Saraswati and its tributaries and Yamuna respectively in parts of Rajasthan. Location of erstwhile drainage system that can now be identified, as buried channels could be a useful contribution towards augmenting the groundwater resources, as these channels constitute excellent aquifers.

Palaeochannel in Western India

Various agencies including NRSA, CAZRI , SRSAC(1999) with the help of remote sensing tools have picked up the signatures of the palaeochannels in western India particularly in state of Rajasthan and Gujarat .To delineate buried channels for targeting groundwater zones, remote-sensing technology provides reliable ground information in various spectral bands that are sensitive to land forms, vegetation cover etc. Spectral signatures obtained from different sensors can be analyzed using various tools and algorithms for mapping of buried channels. Further, the remotely sensed data has also been used for tracing the buried drainage system, as it is able to provide data in various intervals of electromagnetic spectrum capable of recording special variation in electromagnetic radiation coming from the earth surface. The buried channels that may thus be identified can be explored for their water potential through geophysical and drilling methods.

Case Study – Palaeochannel's as an Aquifer

The remote sensing study supplemented by hydrogeological study (sinha et al 2002) and Resistivity Survey cariied out by author and his team mates has identified Palaeochannels in the semiarid to arid regions of Rajasthan, India which was found to have favourable geohydrological conditions showing good potentiality to recharge by rain water harvesting techniques as well as imported water through canal and its distributories quite economically and environmental friendly way.. The recharge would not only further augment the ground water availability in the region which may be used to mitigate the adverse impacts of the drought but may also rejuvenate the lost river and decaying ephemeral riverine features leading to regeneration of the deranged and fragile ecological system. The case study shows that the Anokhi burried channel is not only having potable quality of groundwater resource but also provide comparatively higher yield from the wells located on the channel . Findings of

Hydrogeological and geophysical study supports the presence of good aquifer in Anokhi buried channel .

Conclusion

Palaeochannels are such riverine geospheric features which harbored great human civilization in the past and have potentiality to help survive the present part of human civilization thriving in the arid to semiarid regions all over the globe if this geospheric feature is properly identified ,understood and managed properly.

The palaeodrainage are being convincingly looked upon as possible reservoir of ground water with vast storage capacity. There is need to identify and to establish the storage potentialities of this features particularly in such regions where groundwater/water emergency situations are anticipated and frequented . The artificial recharge of Palaeochannels to its full capacity may provide adequate long term storage of Groundwater which may be used to mitigate the impact of drought, Flash Flood due to storm water and lean /non supply of water through canal / transboundary aquifer/ river thus reducing the un sustainability during emergency situations to the minimum .

Reference

.All India Soil and Land Use Survey (1990). Watershed Atlas of India, Ministry of Agriculture and Co-operation IARI campus New Delhi

Bates Robert L. and Jackson, Julia A., Editors (1980). Glossary of Geology, American Geological Institute, Falls Church, Virginia.

Geol. Survey of India (2000). Seismotectonic Atlas of India and its Environs Published by Director general GSI

Oldham, C. F. (1893). The Sarasvati and the lost river of Indian desert. Jour. Royal. Asiatic Society (NS), v. 34., pp. 49-76

Ramasamy, S.M., Bakliwal, P.C. and Verma, R.P. (1991). Remote sensing and river migration in Western India, Int. Journ. of Remote Sensing, No.12: pp. 2597-2609.

Sinha etal (2002 Palaeochannel and their recharge as DroughtProofing Measure : Study And Experiences From Rajasthan, Western India Proceeding of ***International Conference on*** Drought Mitigation and Prevention of Land Desertification ,held at Bled, Slovenia, 21-25 April 2002

State Remote Sensing Applications Centre and Ground Water Department, Jodhpur (1999). Ground Water Atlas of Rajasthan

"The Vedic Saraswati River System" CAZARI Research Heighlights 1934 – 84

Tiwari, O.N. (1992). Fallibility of palaeochannels as groundwater potential zones in a part of Thar desert. Journal Geological Society of India, Vol. 40, July, 1992, pp. 70-75.

Sabins, Floyd F. (1996). Remote Sensing Principles and Interpretation. Third Edition, W.H. Freeman and Company, New York, 494 p.