

# WATER RESOURCES SECTION

## Innovative Geo-Synthetic Solutions – An Indian Perspective

TIRU KULKARNI AND M. VENKATRAMAN

*Garware-Wall Ropes Ltd., India*

### ABSTRACT

*While geo-synthetics have been used in the Western countries from the late 1970s onwards, in India, geo-synthetics started being used from the early 1990s. Since then, geo-synthetic usage has slowly spread to form an integral part of the country's infrastructure fabric. India's varied and rugged topography with young mountain ranges, deserts and a long and largely unstable coastline has presented several challenges to geo-synthetic manufacturers and applicators. It has also acted as a litmus test for devising innovative products and solutions customized towards these conditions.*

*This article highlights the pioneering role played by Garware-Wall Ropes Ltd in this journey of geo-synthetic usage in India. Garware has been active in the field of geo-synthetics in India since the early days of its usage in the 1990s, and has taken the lead in designing applying innovative products successfully. Starting off with the design of a geo-cellular structure made of polypropylene ropes, and continuing to the design and usage of polypropylene rope gabions in coastal and riverine environments; Garware has been the first to actually use a geo-composite product for erosion control, well before such composites became a by-word in the industry symbolizing multi-performance products. More recent product like saddle bags for anti-buoyancy applications in pipelines, wind barriers designed using high strength geo-textile, grout bags for sub-sea applications and low energy rock fall barriers for boulder arrestor applications, have continued this tradition of designing site-specific solutions rather than customizing standard products to suit all sites. This article chronicles the development, usage, and upgrades done in these solutions in India; and, in a sense, the Indian perspective of geo-synthetic development.*

*These products and solutions are now finding increasing usage and applicability in the Asia – Pacific region, wherein the concept of customization is finding increasing resonance with all stakeholders.*

**Keywords :** *innovative, geo-synthetic, solutions*

# Scour Prediction at the Control Structures Using Adaptive Neuro-Fuzzy Inference System

MOHAMMAD MUZZAMMIL AND JAVED ALAM

Aligarh Muslim University, Aligarh

## ABSTRACT

*An assessment of maximum scour depth with reasonable accuracy is a great importance for its proper planning, design and management. Most of the studies in the literature have*

# Assessment of Groundwater Quality in Baddi Catchment, Solan, Himachal Pradesh, India

R. SAINI, N.K. TULI AND G. KAUR

*Department of Geology, Panjab University, Chandigarh*

*National Institute of Hydrology,  
IGB-Groundwater Recharge, Solan*

G. KRISHAN

*Solan, India*



# Assessment of Groundwater Quality in Baddi Catchment, Solan, Himachal Pradesh, India

**R. SAINI, N.K. TULI AND G. KAUR**

*Department of Geology, Panjab University, Chandigarh, India*

**G. KRISHAN**

*National Institute of Hydrology, Roorkee, Uttarakhand, India  
IGB-Groundwater Resilience Project, BGS, United Kingdom*

## **ABSTRACT**

*Groundwater samples (18-54m depth) from 13 locations were collected and analyzed for major anions and cations. The analyzed hydro-chemical data formed the attribute database to identify hydro-geochemical processes occurring in the study area and its relation to groundwater quality. The water type in the study area is of Ca-Cl, Mg-Cl, Na-Cl, Ca- HCO<sub>3</sub>, Mg- HCO<sub>3</sub>, Na-HCO<sub>3</sub> type. It was found that the general hydro-geochemistry of groundwater in the study area is dominated by the processes such as carbonate weathering, ion-exchange, and dissolution. Thus, hydro-geochemistry of a region can be well understood using conventional graphical methods and this will help in consumptive use water resources management in the study area.*

**Keywords :** *Groundwater, Baddi, Himachal Pradesh, water quality, hydro-geochemistry*

# Large Scale Reclamation of Waterlogged Saline Soils in Chambal Command Area, Rajasthan

**C.M. TEJAWAT**

*Superintending Engineer cum Project Manager, Watershed Cell cum Data Centre, Kota, Rajasthan*

## **ABSTRACT**

*The Rajasthan Agricultural Drainage Research (RAJAD) Project aided by Canadian International Development Agency was introduced in 1992 to combat the problems of salinity and waterlogging in the Chambal Command Area (CCA), using the horizontal subsurface drainage (SSD) technology. A significant reduction in the crop yield in saline and waterlogged land compared to non-saline and non-waterlogged land in the Chambal Command Area was found. Sub Surface drainage was mainly provided to control water table depth at a pre-determined level; to allow enhanced root development of crops; to leach excess salts and prevent salt accumulation within the root zone at levels higher than the tolerance level of crops; and to provide enhanced soil trafficability during growing season.*

*Total 14,925 ha of SSD was installed in Chambal Command Area, using local equipment as well as imported drain laying equipment, and following the design criteria established on the basis of the test sites. Sub Surface Drainage (SSD) System installed in Chambal Command Area was monitored & has been found to have major positive impacts in alleviating soil salinity and waterlogging. The technology has been found cost effective.*