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Web Based Groundwater Information System for Farmers & Policy Makers of Amritsar and Jalandhar Districts, Punjab

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Abstract : Old Amritsar is one of the intensive agriculture districts of Punjab, supplying food grains to the entire country. It covers about 5000 sq Km and drained by two perennial rivers Ravi and Beas. It is composed of the recent deposits of Indo-Gangetic flood plains, which consist of alluvial sand, clay and loam. Majority of the soils are loamy or sandy loam consisting of a soil crust of varying depth. Groundwater depletion, water quality deterioration and water logging problems are the major concerns. Over the last four decades over-exploitation has been taking place through deeper tube wells and dug wells for extensive irrigation all over the central Punjab. Groundwater levels and groundwater quality being monitored since June 2007. Depth to Groundwater levels has been observed to have increased from 7.26 to 19.53m in the year 2007 to 8 to 23.23m in the during 2009. Groundwater has been depleting on an average 40 to 50cm/year. As regards groundwater quality High Nitrate and Heptachlor, Heptachlorepoxide–B, Aldrin, Diledrin, and GammaChlordane Pesticide concentrations have been detected in Groundwater. In some pockets high concentration of heavy metals has also been detected. High salinity and sodicity of the soils have led to decrease in agricultural productivity and increase in water logging. There is an urgent need for practising Sustainable Agriculture and improving groundwater resource management. For efficient management of the resource and to support taking related decisions, a web-based decision support system (DSS) has been developed based on standards from Open Geo-spatial Consortium (OGC). Information on aquifer susceptibility and suitability of groundwater for agriculture as well as for drinking purposes have been made accessible to the stakeholders. It helps download hydrogeological feature data and maps using Web Feature Service (WFS) and Web Map Service (WMS) specifications respectively. A faster updation of the feature data is feasible using the WFS from a field-based remote system. The framework developed in the research could be used to empower local people and local governments in sustainably managing soil and groundwater resources for Sustainable Agriculture.

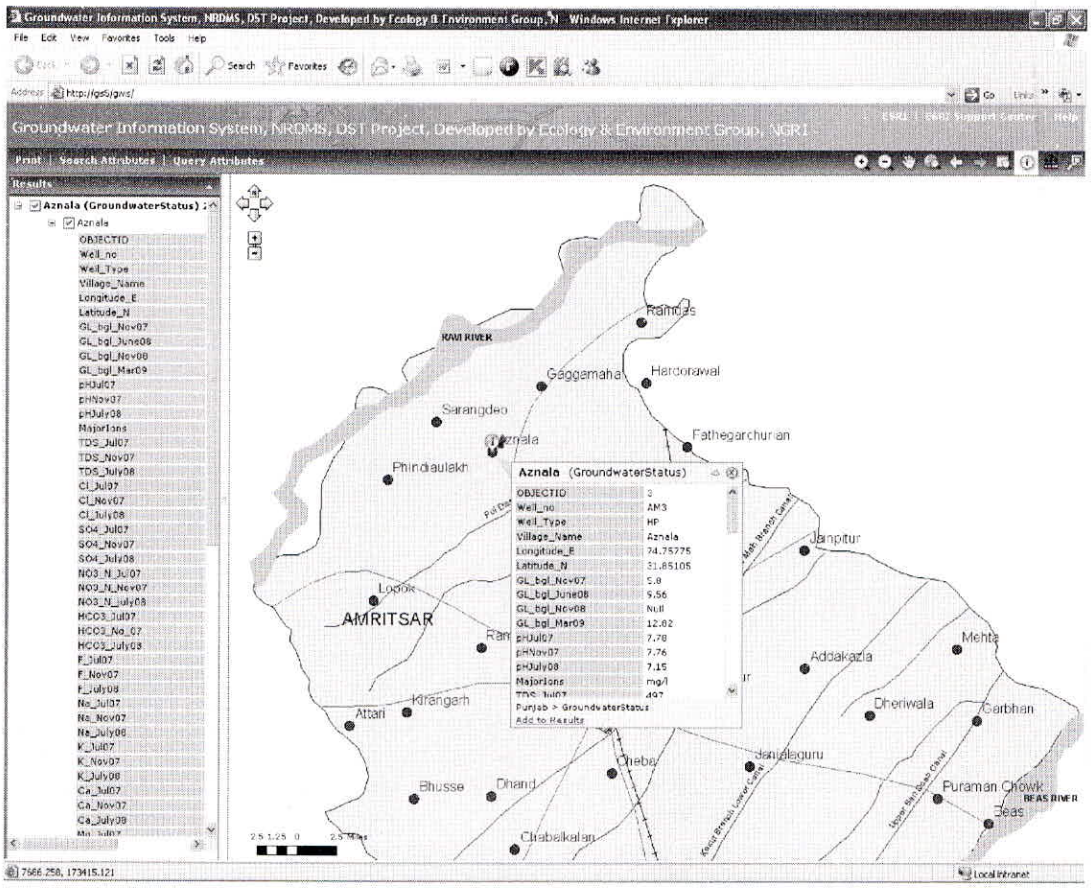
INTRODUCTION

On the Independence Day, August 15, 2009, Director, National Geophysical Research Institute, Hyderabad has released the Groundwater Information System for Farmers and Policymakers developed by Ecology and Environment Group. The information system has detailed groundwater level data, groundwater quality with regard to major ions and pesticide residues information. The Project has been supported as a pilot project in the country by NRDMS, Department of Science and Technology to provide the web site at all village Knowledge Centers in the districts. Agriculturally developed and over exploited groundwater irrigated central parts of Punjab viz., Old Amritsar and Jalandhar districts have been chosen for the study. The web page has been temporarily linked to NGRI website www.ngri.org.in . The main aim of the project is to bring information to the door step of farmers about the status of groundwater condition in a particular village regarding to at what depth the groundwater is available, whether it is of potable drinking water quality with respect to major ion concentrations and persistence of pesticide

residues. The tool is a general information system which can be accessed anywhere in the world.

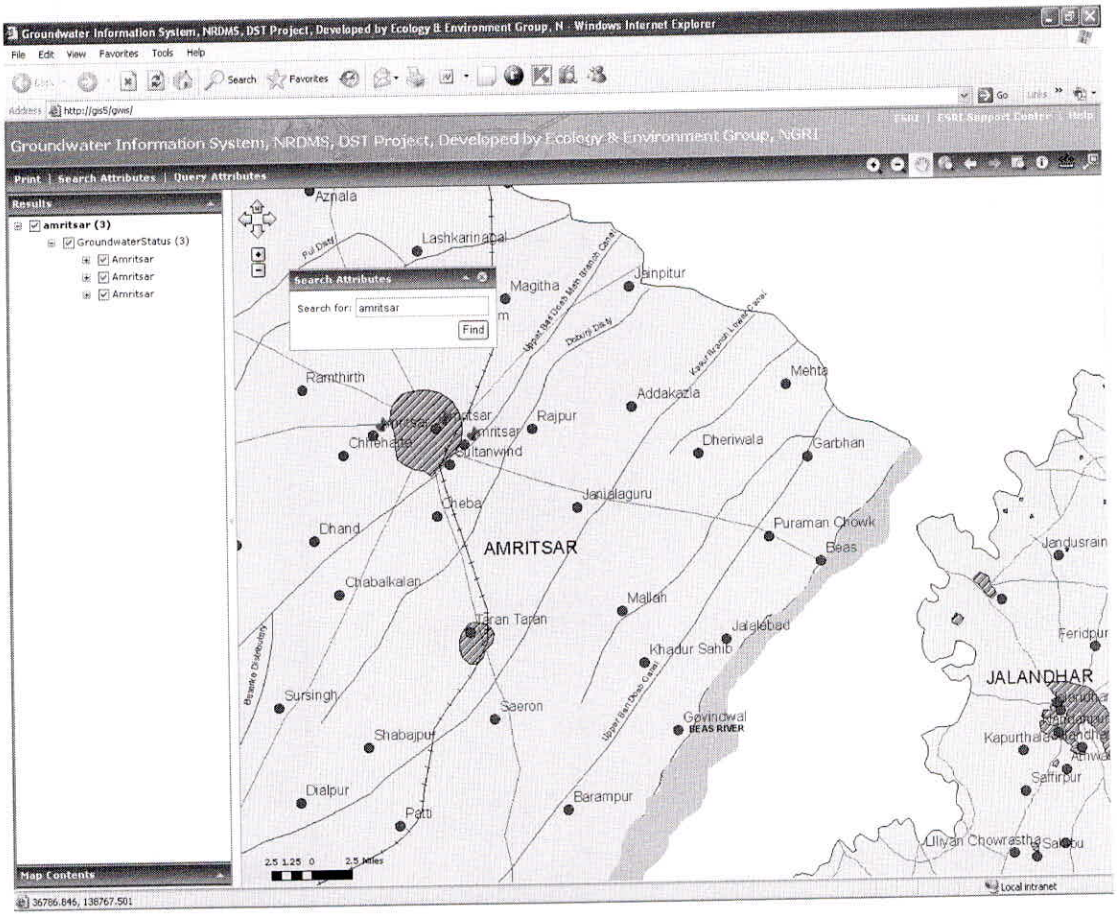
GROUNDWATER INFORMATION SYSTEM

The NGRI started collecting primary groundwater level and groundwater quality data at selected 120 observation wells in Amritsar and Jalandhar Districts sincein June 2007. The groundwater data has been collected during pre monsoon and post monsoon of 2007 & 2008. The website can be updated with forthcoming latest groundwater data sets as and when is readily available with line departments in the Punjab state. The web site can be accessed through Internet Explorer with District boundary maps of Old Amritsar and Jalandhar districts. After pressing second zooming option, the location of the observation wells with village names will be on display. After clicking the information Icon in the centre of an observation well all the available groundwater information will be displayed on two kinds of Windows, one right on the map itself as a pop of window and other on the left side information area of the map with an option of typing the village name in search Attribute. Once the village name in search attribute is typed the location will be shown with blinking arrow. Further with zooming option one can access directly the groundwater information of the well. The map publishing has been implemented using Arc GIS Server 9.3.1. The Web Server requires about 50 MB of space on the Machine for hosting groundwater data base in the two districts.



The larger purpose of the Groundwater Information System on the web site stands, makes available freely immense body of groundwater information that is of great relevance to day to day affairs of agriculture activities at Farm level as well as for planning developmental activities in various departments either at State or Centre. One can prepare their own print page. The website is dynamic in the sense it can be used as an interpretation tool for making comparison of various parameters through the two pop windows projected information in both the districts. If there are more than one well in a particular village all the wells information will pop up

The GWIS offers information on declining groundwater level year after year for past two years (which will soon be updated to 10 years) from across the districts. Metadata offered include historical groundwater levels, groundwater quality during 1990s. The information is ranging from mapping the canal network, location of hand pumps and agricultural wells in each village. As of now, the web site is specific to Amritsar and Jalandhar Districts, Punjab and is more useful to the society with regard to groundwater information, which is becoming stand alone reliable resource for agriculture production in the State. The web site will be horizontally expanded to Muktsar and Ludhiana districts, Punjab immediately and later to all districts in Punjab state to empower the aggressive farmers



participation in the second green revolution as envisaged by the Prime minister during the Independence Day Address. The site can be further updated with groundwater prospect maps of the districts available with National Remote Sensing Centre, ISRO, Hyderabad.

FUTURE OUTLOOK

The web site showcasing, a visual graphic format, the immense information that is available with state line departments dealing in groundwater resource management. In its present form, the GWIS is most user friendly accessible through Internet explorer. The web site is being improvised by the day. "In fact, the whole World today is involved in it's development, because we are constantly monitoring and updating the information with regard to groundwater status periodically and refining the information database with reliable details for further groundwater development and providing sustainable agriculture in the overexploited areas in the central parts of Punjab State. The website is adopting ISO/ OGC standards for providing geo-web services (WMS/ WFS). This could be adopted by CGWB/ SGWBs as a Standard methodology for managing groundwater data. For further details one may contact Director, NGRI, Hyderabad (director@ngri.org.in) or Director (psa@nic.in), NRDMS, NSDI, New Delhi.