DSS-H: Decision Support System—Hydrology

Neeranchal National Watershed Project under PMKSY of GoI

A World Bank funded project at Department of Land Resources, GoI

Department of Land Resources
Government of India - Ministry of Rural Development
(An ISO 9001:2008 Certified Department)

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DSS-H is a planning and monitoring tool to make the watershed development in India a science-based activity, leading to effective problem solving with improved efficiency

The Government of India has been implementing various watershed development programmes over the last 50 years. It has launched the **"Pradhan Mantri Krishi Sinchayee Yojana" (PMKSY)** with an objective of providing access to irrigation to every farm *'Har Khet ko Pani'* and efficient use of water *'Per Drop More Crop'*. One component of PMKSY is the Integrated Watershed Management Programme (IWMP), which is implemented by the Department of Land Resources (DoLR), Ministry of Rural Development (MoRD), and has now become the Watershed Development Component (WDC) of PMKSY.

Neeranchal National Watershed Project (NNWP)

The World Bank assisted NNWP was conceptualized to address through proof of concept, some of these emerging challenges that the existing IWMP framework was grappling with. The Project Development Objective of NNWP is *"to support the Watershed Development Component of the PMKSY (WDC-PMKSY) to improve incremental conservation outcomes and agricultural yields for communities in selected sites, and adoption of new processes and technologies into the broader programme in participating States".* Neeranchal is expected to positively influence the outcomes of the ongoing WDC-PMKSY through technical and financial support for better delivery and impacts through improved planning approaches, capacity building, coordination and convergence, and supportive research and development.

NNWP also supports institutional strengthening for improved service delivery through capacity building of implementing organisations, adoption of effective project management practices including processes and technologies at the National, State and District levels. As an important deliverable, NNWP will assist in scientific hydrological assessment and planning of watershed projects, through identification of water surplus and deficient areas, catchment prioritization, improved identification of water harvesting potential, planning for optimal water availability and use in rainfed areas and application of innovative tools for community water budgeting and management.

NNWP is being implemented in nine participating states i.e. Andhra Pradesh, Telangana, Chhattisgarh, Madhya Pradesh, Gujarat, Jharkhand, Maharashtra, Odisha and Rajasthan, and cover approximately 60 percent of the rainfed area of the country.

The project will contribute to improved watershed management activities in identified watersheds in two districts in each participating State, with each watershed of about 5,000 ha.
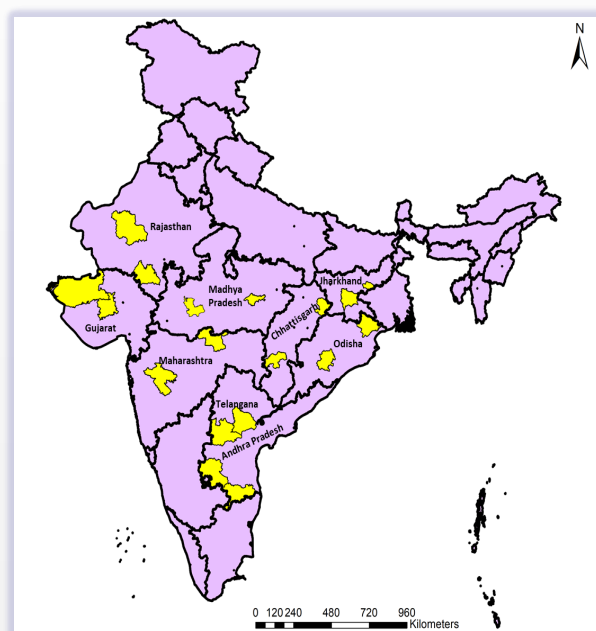
About DSS-H

DSS is a tool that helps decision makers by compiling useful information from a combination of raw data, documents and models to solve problems and make decisions. It presents data in such a way that users can make decisions more easily.

The DSS-H is intended to be a useful tool for planning of appropriate soil, land, crop and water-related interventions at the watershed scale. Once developed, DSS-H will be used by the SLNAs in "Neeranchal States" to derive hydrology-related information for use in preparation of the DPRs for their projects. DSS-H will also provide results and information regarding impact assessment of the watershed interventions, such as check dams, ponds, groundwater recharge structures, improvement in water use efficiency through appropriate crop and land management.
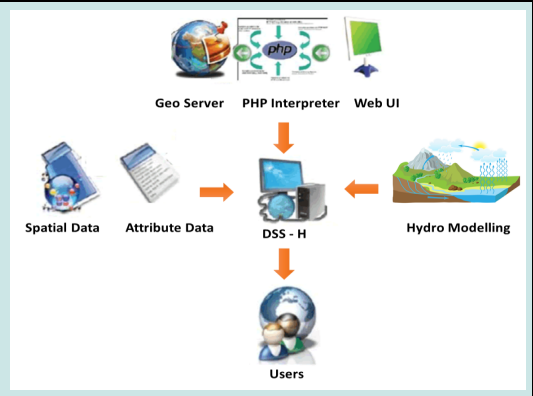
DSS-H will provide:

- **Suitable sites for water harvesting structures**
- **Selection of appropriate design**
- **Estimation of number of structures feasible**
- **Water availability from different sources**
- **Water demand for different uses**
- **Water balance**
- **Measures for addressing gap in water demand**
- **Impact assessment through various indices**

DSS-H Data and Results Visualization

DSS-H utilizes relevant data on meteorology, hydrology (surface water, groundwater, water quality), geomorphology, soil, irrigation, land use and land capability, crops and cropping practices, water demand, demographic, socio-economic, etc.	Thematic output from DSS-H is available in the form of maps, graphs, tables, reports. Hydrology modeling tools are used to derive the results under different modules of DSS-H, which are useful in preparation of DPRs, DIPs, etc.

Themes & maps: Thematic layers; maps of location, drainage, geomorphology, soil, soil health, landuse, land capability, DEM, crops, structures, sampling sites,..

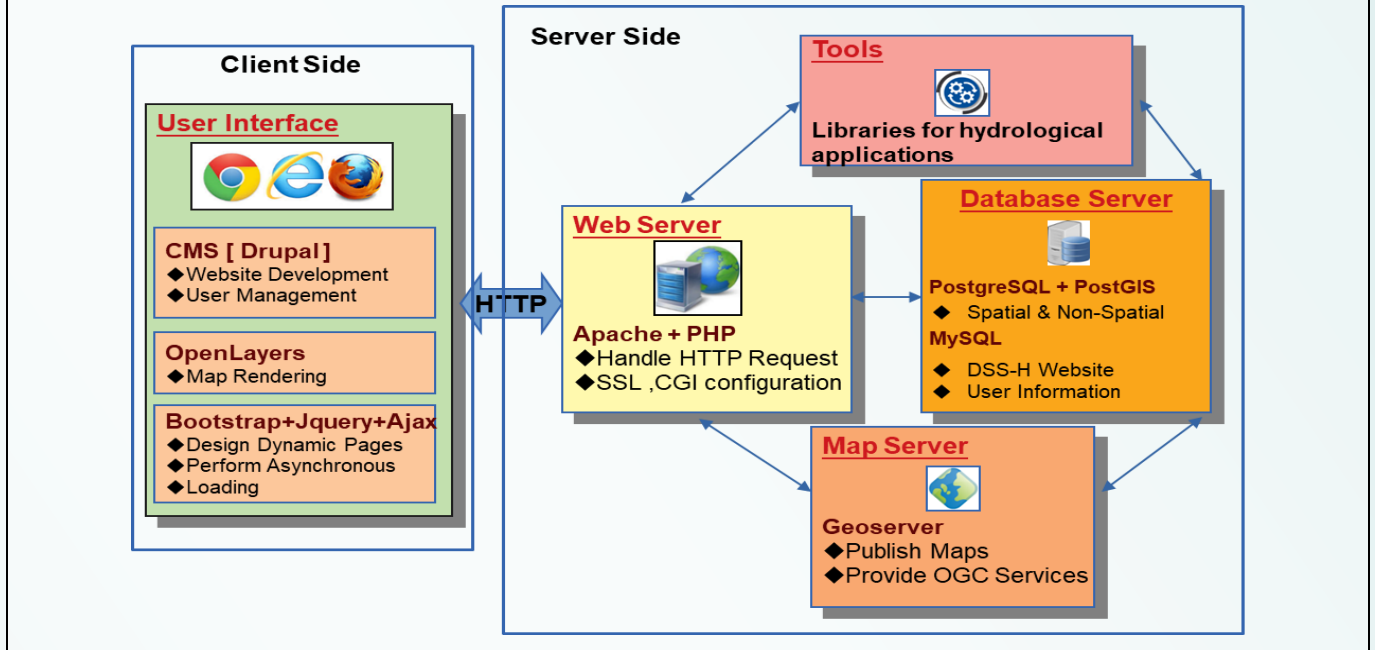**Tables:** Spatial, non-spatial data tables, time series, probability distribution tables

Graphs: Graphs for tables (input data and results)

Geotagged Structures: Soil and water conservation and groundwater recharge structures.

DSS Queries: Watershed specific queries/ answers on water availability, water demand, environment and livelihood, impact assessment

Metadata: Information regarding data

DSS-H Architecture

Client Side

User Interface

CMS [Drupal]
◆ Website Development
◆ User Management

OpenLayers
◆ Map Rendering

Bootstrap+Jquery+Ajax
◆ Design Dynamic Pages
◆ Perform Asynchronous
◆ Loading

HTTP

Server Side

Tools
Libraries for hydrological applications

Web Server
Apache + PHP
◆ Handle HTTP Request
◆ SSL ,CGI configuration

Database Server
PostgreSQL + PostGIS
◆ Spatial & Non-Spatial
MySQL
◆ DSS-H Website
◆ User Information

Map Server
Geoserver
◆ Publish Maps
◆ Provide OGC Services

Modules of DSS-H

**DSS-Hydrology** for Neeranchal National Watershed Project

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Objective of DSS-Hydrology

The overall objective is to support DoLR and States to develop and pilot decision-support systems (DSS-H) to facilitate improved returns from watershed management through assessment of investment options, site selection and prioritization. Prioritization relates to soil and water conservation measures including landuse practices at sub-watershed level that can then be downscaled to guide micro-watershed level planning.

View Detail
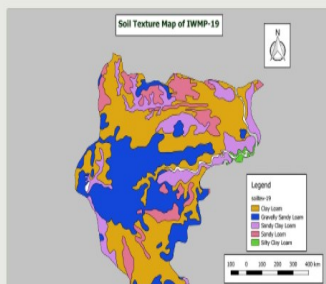
PLANNING

Planning for drinking water, livestock, industry and crops, Database generation, Design storage estimation, Water Demand estimation, water balance estimation, pre project Water use efficiency, crop productivity/production and soil health condition
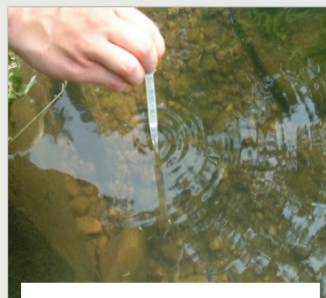
View More

SITES AND STRUCTURES

Identification of suitable site for water harvesting structures, selecting appropriate structures for water conservation, soil conservation, Ground water recharge, catchment and command area of structures, estimation of number of structures feasible in the watershed.

View More

IMPACT ASSESSMENT

Estimation of runoff with change in Land Use, computation of water quality Index, NDVI and NDWI, estimation of change in ground water table, soil moisture and soil erosion, post project crop production and water use efficiency, social vulnerability analysis

View More
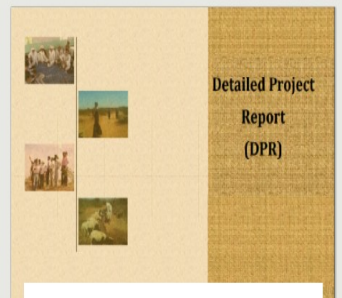
DPR INPUTS

The DSS-H will provide the basic project information, geography and geohydrology of watershed, socio-economic profile of watershed, drinking water requirement, detail of crop area and yield, ground water table information in the watershed area

View More

SELECT STUDY AREA

DSS-H Tools

Many tools are included in DSS-H for computation of hydrological parameters and various indices required for impact assessment. These tools are for computation of Runoff, ET, Ground Water Recharge, Soil Loss, Crop Water Requirement, Water Quality Index, Soil Moisture Index, Water Poverty Index, Watershed Sustainability Index, Watershed Performance Index, Livelihood Vulnerability Index.

«	Planning	Sites and Structures	Impact Assessment	»

WQI Drinking

List	Legend	Table	Help

2017

id	Site	PH	TDS	DO	EC	Turbidity	Alkalinity	Cl
1	S1	7.24	65	11.1	147.5	0.24	77.13	14
2	S2	3.16	90	5.6	136.6	4.7	67.34	10
3	S3	10.8	69	14.6	191.5	1.6	45.67	12
4	S4	4.6	40	12.2	110	3.4	34.5	20
5	S5	3.4	45	12.2	34.4	2.3	45.5	12

id	Site	WQI Drinking	Suitability
1	S1	72.615908562661	Good
2	S2	217.42373436712	Very Poor
3	S3	2342.5418567342	Unsuitable
4	S4	2399.4045386147	Unsuitable
5	S5	999.62172585569	Unsuitable

DSS-Hydrology for Neeranchal National Watershed Project

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Sample State >> Sample District >> Sample Watershed

Data Visualization	Planning	Sites and Structures	Impact Assessment	DPR Inputs	Map

«	WQI_Drinking	WQI_Irrigation	Soil Moisture Index	Water Poverty Index	Watershed Perf	»

List	Legend	Table	Help

n	hwsw	tp	literates	hapl	wa	wc	change_fa	index
0164	15743	196464	147950	20988	102.15	43.3	41.3	3.63
8424	11994	223808	163346	24039	103.62	54.47	54.5	2.75
2432	14444	190396	127839	13326	66.73	60.54	90	1.66
0112	10333	134433	122433	14311	61.7	50.2	23	2.1
8112	11321	151363	110131	11332	72.1	24.4	41	4.5

Access Component Score	Capacity Component Score	Use Component Score	Environment Component Score	Water Poverty Index	Status
39.2	63.78	44.71	72.6	60.47	Good
24.77	61.31	40.49	55	52.52	Better
34.04	49.27	30.99	33.2	47.26	Better
25.76	63.38	26.39	42	49.52	Better
29.7	51.25	61.13	90	59	Better

Features of DSS-H

Interactive	Web based
Flexible	Thin Client based
Modular	Geo-visualization
User friendly interface	Built with free and open source technologies

DSS-H developed by:

National Institute of Hydrology (NIH) is a premier Research and Development organization under the MoWR, RD & GR, (Government of India). The main objective of NIH is to undertake, aid, promote and coordinate systematic and scientific work on all aspects of hydrology and water resources.

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