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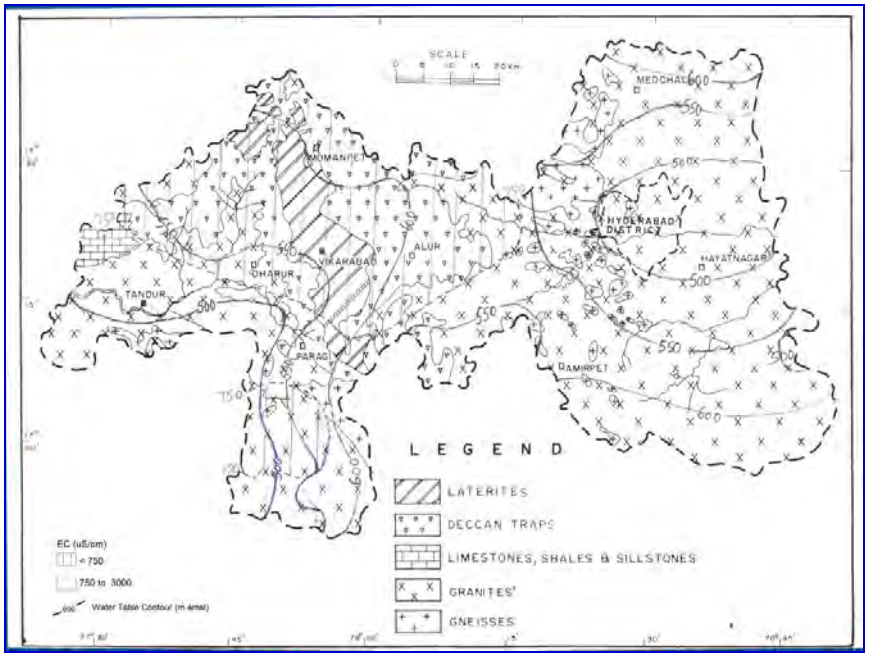
CENTRAL GROUND WATER BOARD
MINISTRY OF WATER RESOURCES
GOVERNMENT OF INDIA

GROUND WATER BROCHURE
RANGA REDDY DISTRICT, ANDHRA PRADESH



SOUTHERN REGION
HYDERABAD
September 2013

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MINISTRY OF WATER RESOURCES
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GROUND WATER BROCHURE
RANGA REDDY DISTRICT, ANDHRA PRADESH
(AAP-2012-13)

BY

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GROUND WATER BROCHURE
RANGA REDDY DISTRICT, ANDHRA PRADESH

CONTENTS

List of tables

.

List of figures

DISTRICT AT A GLANCE

1. General	
Location	North Latitude:16° 54' - 17°48' East Longitude:77° 21' - 78°51'
Geographical area (sq.km)	7493
Headquarters	Hyderabad
No. of revenue mandals	37
No. of revenue villages	870
Total Population (2011)	52,96,396
Decadal Growth Rate %(2001-10)	48.15
Population density (persons/sq.km)	707
Urban Population %	70
Rural Population %	30
Major rivers	Musi, Musa, Kagna, Manjeera
Soils	Red soils, Medium Black soils, Mixed soils
Agro climatic zone	Southern Telangana zone
2. Rainfall	
Normal annual rainfall	833 mm
Annual rainfall (2012)	988 mm
Cumulative departure from LPA	-64 %
3. Land use (2012) (Area in ha)	
Forest	73,075
Barren and uncultivated	27,084
Cultivable waste	18,910
Current fallows	1,49,181
Net area sown	234557
4. Irrigation (2012) (Area in ha)	
Canals	765
Tanks	2208
Dug wells	4325
Bore/Tube wells	68,499
Other Sources	1188
Net area irrigated(more than once)	76,985
Gross area irrigated	98,730
Major irrigation projects	None
Medium irrigation projects	Three
Minor Irrigation Sources	263(PWD) ; 1882 (PR Dept)
5. Geology	
	Granites, Gneisses, Limestones, Shales, Deccan Trap, Laterite Major aquifers - Weathered and fractured granites, basalts

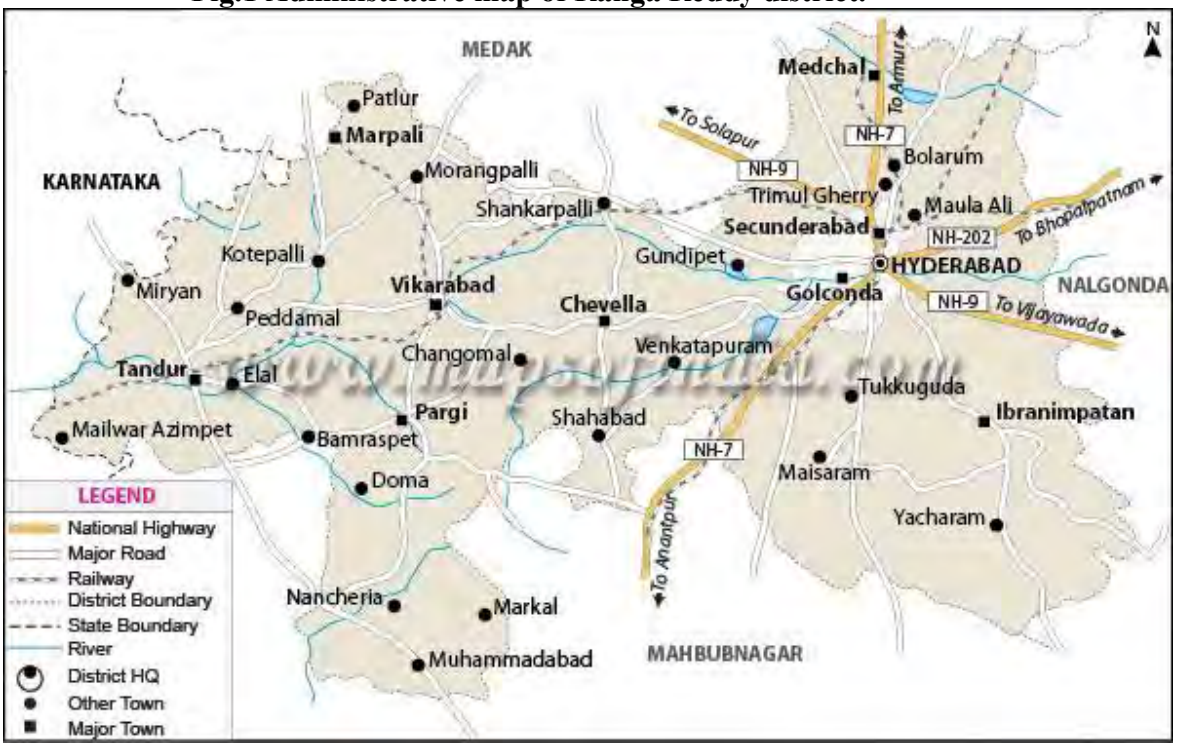
6. G**round water monitoring**	
No. of Dugwells	24
No. of Piezometers	60
Depth to water level (Pre-monsoon-2012) Min-max	1.40 – 33.50 m bgl
Depth to water level (Postmonsoon-2012) Min-max	0.20 – 28.32 m bgl
Water Level Fluctuation (Pre – Post)	0.18 – 20.27 m (Rise)
7. Ground water resources	
Net ground water availability	62199 ham
Gross annual draft	46136 ham
Balance resource	17195 ham
Stage of ground water development	74 %
8. Chemical quality	
E C (micro Siemens/cm at 25°C)	550-1790
Chloride (mg/l)	16-314
Fluoride (mg/l)	0.25-3.60
Nitrate (mg/l)	3-220

GROUND WATER BROCHURE
RANGA REDDY DISTRICT, ANDHRA PRADESH

1. INTRODUCTION

Ranga Reddy district is located in the western part of Andhra Pradesh with its headquarters located at Hyderabad. The district lies between North latitudes 16° 54'- 17°48' and between East longitudes 77° 21'- 78°51'. The district is divided into three revenue divisions, 37 mandals and 870 revenue villages. The district is bounded in the north by Medak district, in the east by Nalgonda district, in the south by Mahabubnagar district and on the west by Karnataka state (Fig.1). The geographical area of the district is 7493 sq.km with a population (2011) of 52, 96,396 lakhs. The population density which was 54 persons per sq.km during 1901 has risen to 707 persons per sq.km. Out of the total geographical area of 7, 49,300 ha, 73,075 ha of land is covered by forests. Similarly, barren and uncultivable land is 27,084 ha and land put to non-agricultural use is 1, 49,181 ha. The total net area sown is 2, 34,557 ha. The Administrative map of Ranga Reddy district is presented in the Fig.1. Paddy, groundnut, jowar, and maize are some of the important crops.

Fig.1 Administrative map of Ranga Reddy district.



2. RAINFALL AND CLIMATE

The average annual rainfall of the district is 833 mm, which ranges from nil rainfall in January and December to 190 mm in July. July is the wettest months of the year. The mean seasonal rainfall distribution is 652 mm in southwest monsoon (June-September), 114 mm in northeast monsoon (Oct-Dec), 4 mm rainfall in Winter (Jan-Feb) and 63 mm in summer (March – May). The percentage distribution of rainfall, season-wise, is 78.3% in southwest monsoon, 13.7 % in northeast monsoon, 0.5 percentage in winter and 7.6 % in summer. The mean monthly rainfall distribution is given in Fig. 2

The annual and seasonal rainfall distribution with its departure from mean along with percentage distribution year-wise is given in Table.1. The data is presented in Fig.2. The annual rainfall ranges from 516 mm in 2011 to 1110 mm in 2010. The annual rainfall departure ranges from -38 % in 2011 to 33 % in 2010. The southwest monsoon rainfall contributes about 78 % of annual rainfall. It ranges from 428 mm in 2002 to 927 mm in 2010. The year 2002 and 2011 experienced drought conditions in the district as the annual rainfall recorded in these two years is 27 % and 38% less than the long period average (LPA) respectively. The cumulative departure of annual rainfall from LPA is presented in Fig.3. It indicates that, the rainfall departure as on 2011 is negative i.e. -64%, showing rainfall deficit. The peak temperature recorded in the year 2010 was 40.9^{o} C in the month of April and the lowest temperature of 15.1^{o} C was recorded in December. Relative humidity of 46% and 85% was observed in April and September respectively. The annual rainfall during 2012 is 988 mm.

Table. 1 Rainfall distribution in Ranga Reddy district

Sl No	District	YEAR	ANNUAL	SWM	NEM	WINTER	SUMMER	SWM (%)	NEM (%)	WINTER(%)	SUMMER(%)	DEP FROM LPA(%)
1	RANGA REDDY	1999	632.0	505.0	38.0	3.0	86.0	79.91	6.01	0.47	13.61	-24
2		2000	906.0	780.0	36.0	20.0	70.0	86.09	3.97	2.21	7.73	9
3		2001	787.2	538.0	189.2	8.0	52.0	68.34	24.03	1.02	6.61	-5
4		2002	609.9	428.2	124.0	11.7	46.0	70.21	20.33	1.92	7.54	-27
5		2003	801.7	677.7	83.0	2.0	39.0	84.53	10.35	0.25	4.86	-4
6		2004	729.1	496.9	103.7	29.6	98.9	68.15	14.22	4.06	13.56	-12
7		2005	1101.3	832.8	162.3	25.9	80.3	75.62	14.74	2.35	7.29	32
8		2006	776.8	533.1	44.1	0.0	199.6	68.63	5.68	0.00	25.70	-7
9		2007	664.4	554.8	60.2	0.1	49.3	83.50	9.06	0.02	7.42	-20
10		2008	884.1	627.7	49.0	27.8	179.6	71.00	5.54	3.14	20.31	6
11		2009	778.8	608.2	114.2	0.0	56.4	78.09	14.66	0.00	7.24	-7
12		2010	1110.4	926.6	135.9	12.8	35.1	83.45	12.24	1.15	3.16	33
13		2011	516.1	430.2	22.6	6.9	56.4	83.36	4.38	1.34	10.93	-38
Long Period Average			**832.6**	**651.9**	**113.8**	**4.0**	**62.9**	**78.30**	**13.66**	**0.48**	**7.56**	

Source: Indian Meteorological Department And Directorate Of Economics And Statistics

Fig. 2 Monthly rainfall distribution and LPA, Ranga Reddy district

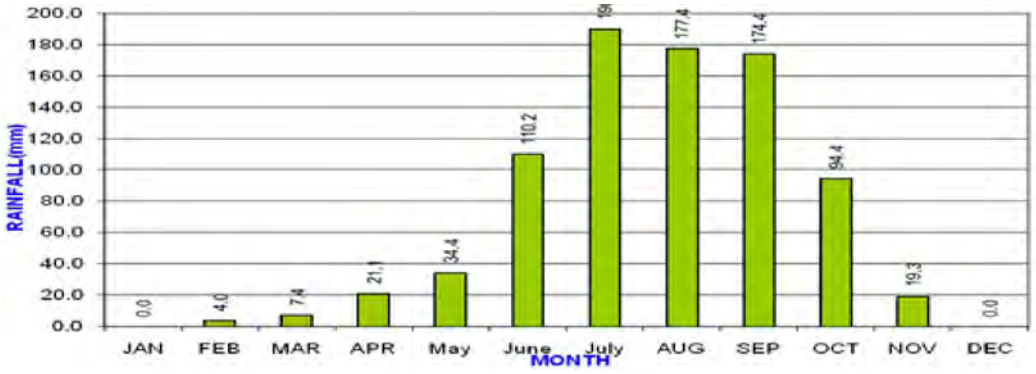
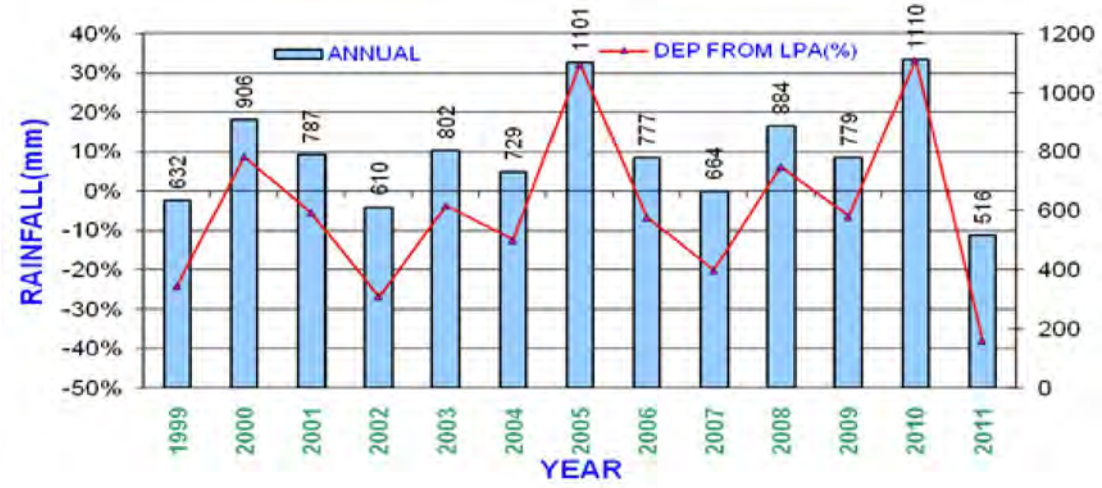


Fig. 3 Annual rainfall and RF departure from LPA, Ranga Reddy district



3. GEOMORPHOLOGY

The present day landforms in the district are the products of different geomorphic processes such as erosion, deposition, crustal movements coupled with climatic changes operating on the surface. The specific geomorphic groups are (i) Residual hills (ii) Plateau (Deccan traps) (iii) Pediment Inselberg complex (iv) Pediplain and (v) Flood plain.

i) Residual Hills: These geomorphic forms occur as massive hills comprising of forest areas in Kulakacherla, Manchal and in Yacharam mandals with a maximum elevation of 691 m amsl. The residual hills occurring around Ghatkesar, Shamirpet and Rajendernagar mandals , the soil cover is thin and devoid of vegetation except with low trees, thorny bushes and shrubs. Other forms in the area include Mesa/Butt, having flat topped hills comprising of laterite and basalts.
ii) Plateau (Deccan traps): This geomorphic unit is characterized by elevated uplands with steep slope and dissected by deep and narrow valleys occupied by different flows.

iii) Pediment Inselberg Complex: Pediment inselberg complex is a gently undulating plain abounding with a number of small hills, mounds, tors etc.

iv) Pediplain: Pediplains are characterized by flat or gentle sloping surface which is the end product of coalescence of several pediments at the foot of hill slopes. Pediplains are characterized by the vast area of low lying flat terrain with gentle slopes covered by red brown and black clayey soils ranging in thickness from 20 cm to 60 cm.

v) Flood plain: Alluvial deposits occur along major river courses mostly derived from catchments, transported and deposited.

4.0 DRAINAGE

The district is drained by the river Musi. The reservoirs Osmansagar and Himayatsagar are constructed across rivers Musi and Musa respectively. These reservoirs supply drinking water to Hyderabad and Secunderabad cities. Kagna river originates in Vikarabad mandal and drains Vikarabad and Tandur areas. All the streams are ephemeral in nature. Dendritic pattern of drainage is seen in Kagna catchment area where granitic rocks are exposed. Trellis type of drainage is observed in Musi catchment area. The drainage density varies from 0.4 to 4.0 km/sq.km.

5.0 IRRIGATION

The chief sources of irrigation in the district are tanks, wells and canals. The major irrigation projects are nil and three medium irrigation projects have been completed (Kotepally vagu, Jutepally and Lakhapur projects) creating registered Ayacut of 13927 acres, while 11797 acres has been utilized.

6.0 GEOLOGY

The district is underlain by various geological formations like Archaean granites and gneisses, Proterozoic Bhima series and the younger Deccan traps. The Archaean crystalline rocks occupy nearly three fourths of the district comprising older metamorphic rocks, peninsular gneissic complex (migmatites) and younger intrusive rocks. Intrusive of dolerite dyke are common in the area.

The upper pretoerozoic sediments of Bhima group comprising of limestones and shales occur in the western most corner of the district, NW of Kotepally. The shale beds show intercalations of limestone. The basaltic flows of the Deccan Traps cover either the Bhima sediments or the granitoids around Vikarabad, Tandur and Parigi. The thickness of each flow varies from 15 to 20 m. Intra-trappean beds are thin and comprise conglomerates, chert and sandstone. The thickness of infra-trappeans varies from 0.5 to 8 m and these are fossiliferous. A series of WNW – ESE trending faults are seen in the southeastern part of the area.

7.0 HYDROGEOLOGY

The map depicting hydrogeological conditions in the district is presented in Fig.3. Depth and yield ranges of wells constructed by CGWB in basalts and granitic formations are furnished in the Table-2.

Fig.3 : Hydrogeology of Ranga Reddy district, A.P

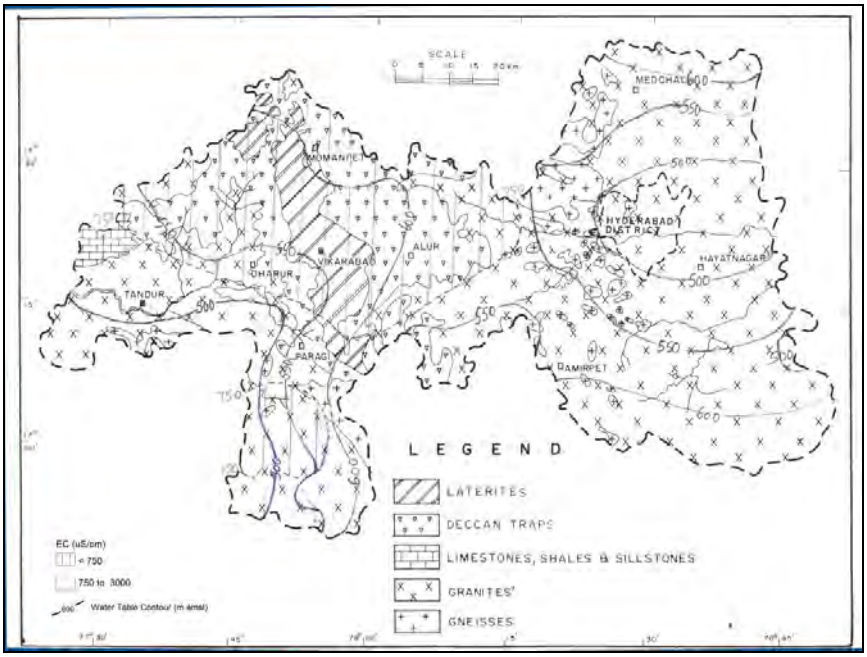


Table-2 Depth range and yield ranges in basalts and granitic terrain

Depth Range (m)	No. of EW			Yield Range(lps)	Basalts	Granites
	Basalts	Granites				
20 – 30	0	1				
30 – 40	1	20		1 – 3	8	18
40 – 50	2	15		3 – 5	1	2
50 – 60	4	4		>5	4	2
60 – 70	6	2				
70 – 100	14	2				
100 – 150	5	1				
150 - 200	2	0				

7.1 Depth to water level

Ground water levels are monitored from a network of 84 observation wells, four times in a year spread all over the district. The depth to water levels observed during pre-monsoon (2011) season are between 1.4-33.50m. Deeper water levels of >10 m bgl are recorded in the Central, North Eastern and South Eastern parts of the area. The depth to water levels observed during post-monsoon (2012) are between 0.20-28.32. The depth to Water level during the pre and post monsoon period (2012) is shown in the Figs.4 &5**.** The water level fluctuation between the pre and post monsoon are shown in the Fig.6.

Fig.4

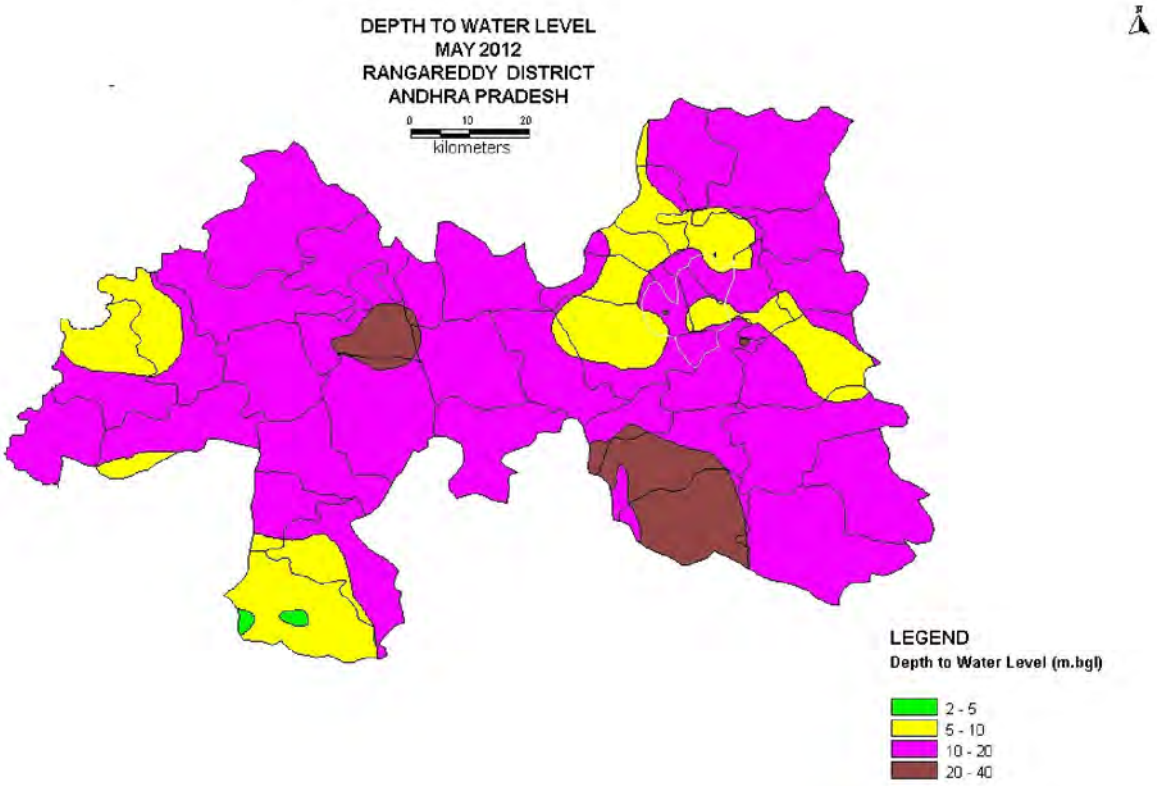

DEPTH TO WATER LEVEL
MAY 2012
RANGAREDDY DISTRICT
ANDHRA PRADESH
0 10 20
kilometers
LEGEND
Depth to Water Level (m.bgl)
2 - 5
5 - 10
10 - 20
20 - 40

Fig.5

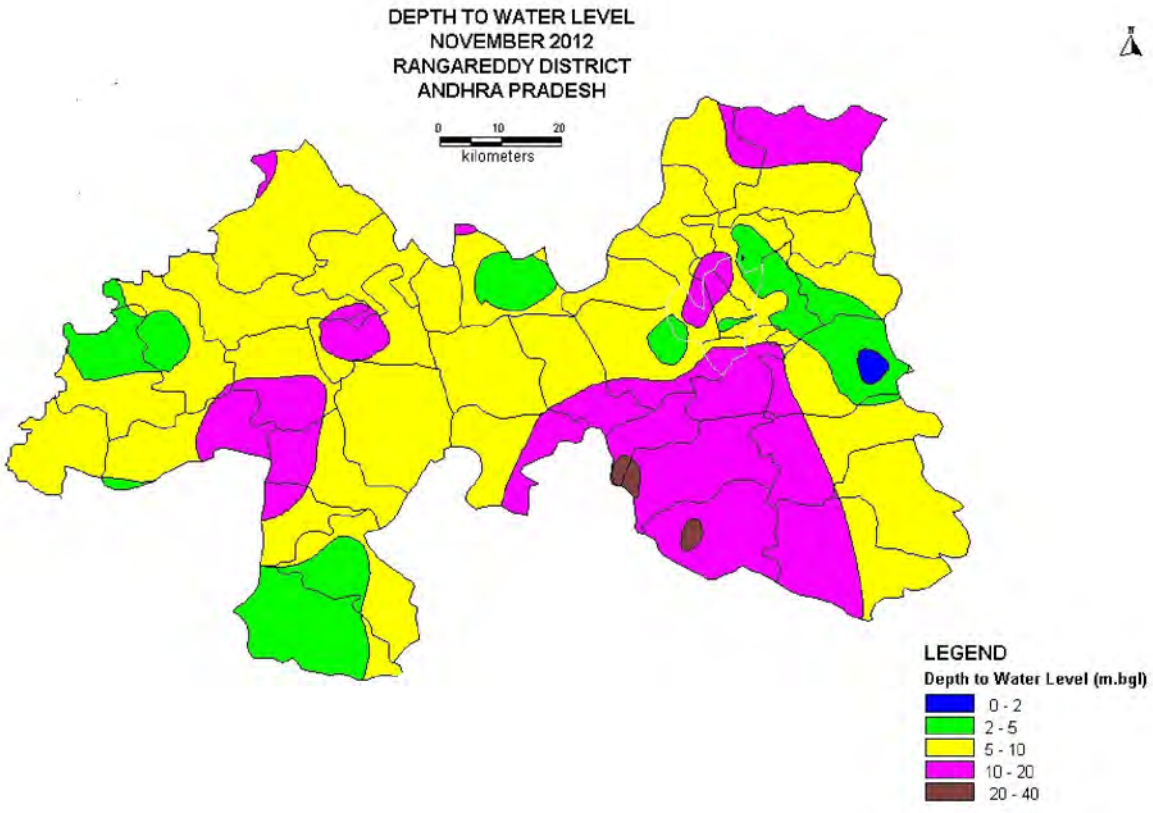
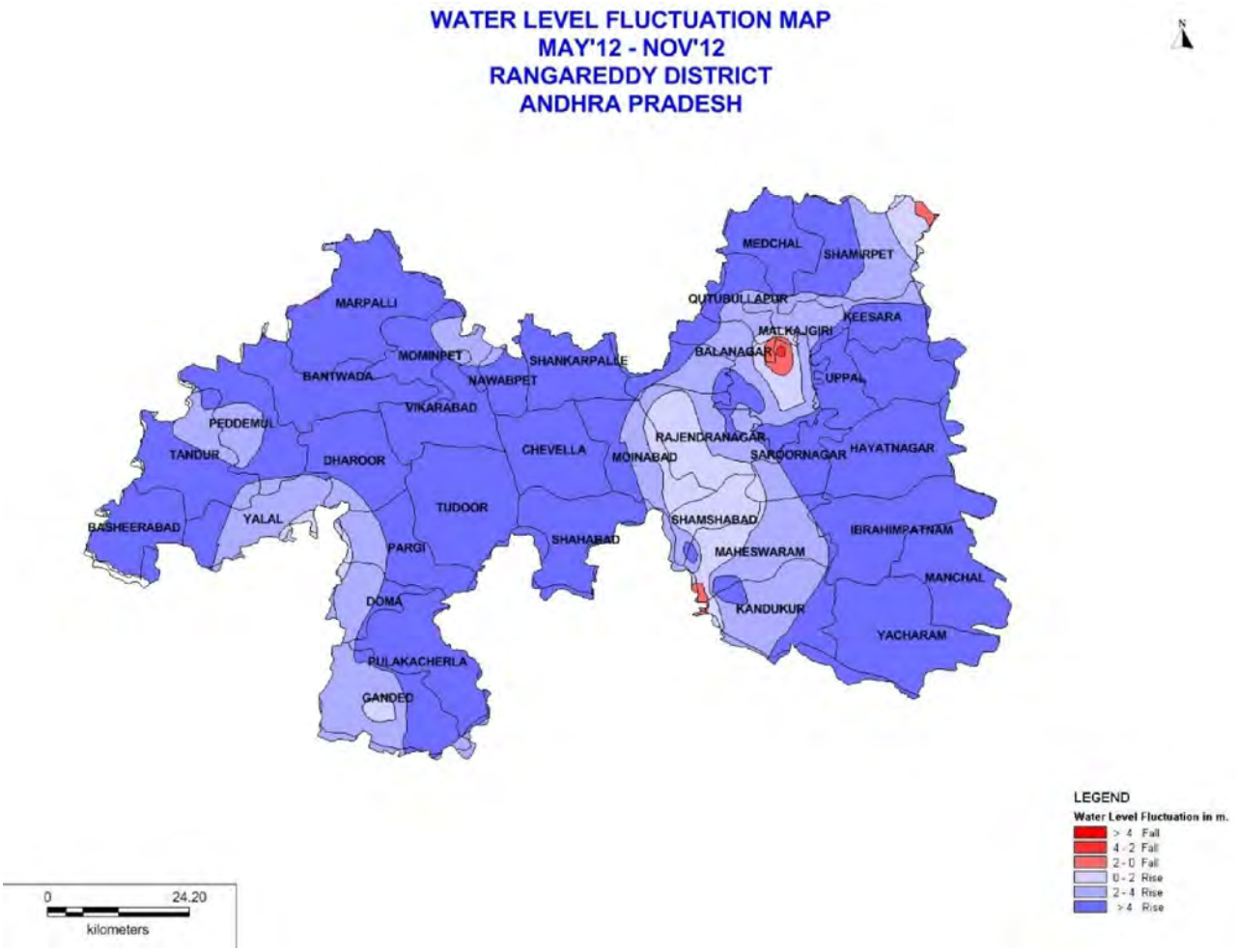

DEPTH TO WATER LEVEL
NOVEMBER 2012
RANGAREDDY DISTRICT
ANDHRA PRADESH
0 10 20
kilometers
LEGEND
Depth to Water Level (m.bgl)
0 - 2
2 - 5
5 - 10
10 - 20
20 - 40

Fig.6



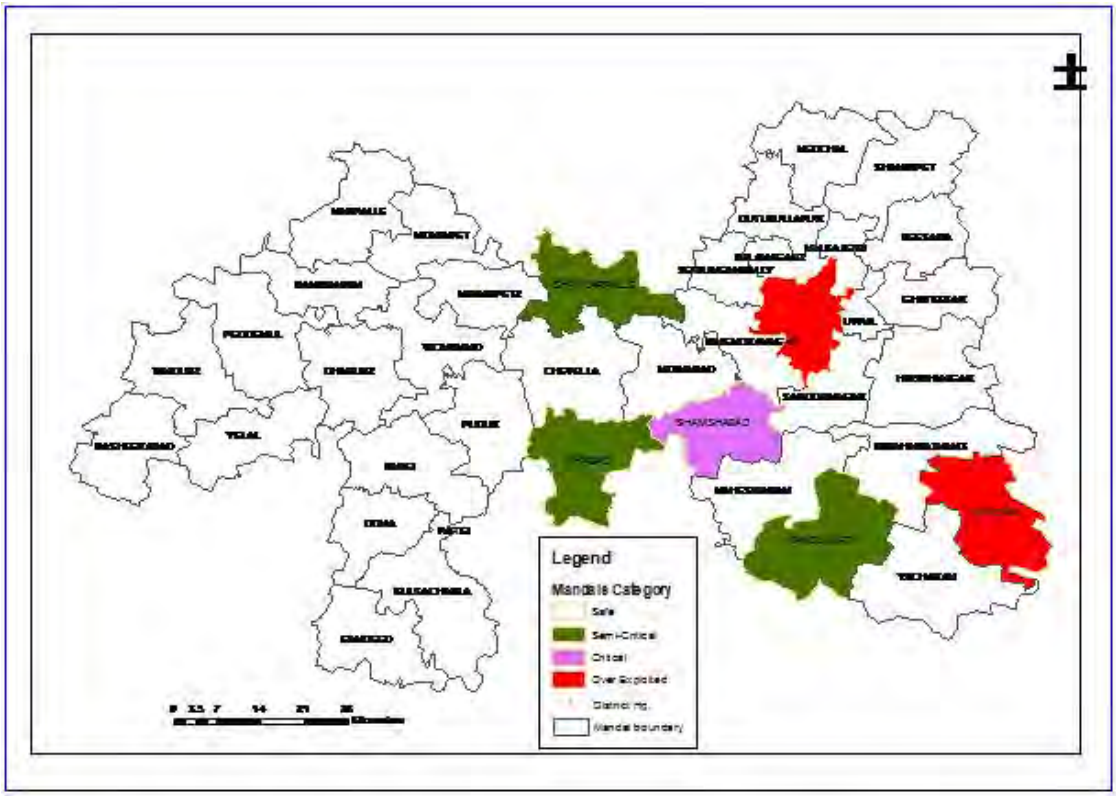
8. GROUND WATER RESOURCES

Based on the Ground Water Estimation Committee (GEC 97) norms, ground water assessment was done in 2008-09. The mandal-wise categorization of Ranga Reddy district is presented in the Table-3 The total ground water resources available in the district are 62,199 Ham. The ground water annual draft is 46,136 Ham and the balance ground water resource available for irrigation being 17195 Ham. The overall stage of ground water development in the district is 74%, and falls under safe category. Based on the ground water resource estimation, 1 mandal has been classified as Over-Exploited (OE), 4 mandals as Semi Critical and rest of mandals as Safe. The Mandal wise categorization in respect of ground water development is presented in the Fig.7

Table-3: Mandal Wise Categorization of Ranga Reddy District, Andhra Pradesh [GEC-2008-09]

Sl.No.	Mandal	C/ NC/ T	Stage of ground water develop ment [%]	Pre-monsoon		Post monsoon		Category [safe/ semi critical/ Critical/ Over exploited]
				Water level trend cm/yr	Is there a significant decline [YES/NO]	Water level trend cm/yr	Is there a significant decline [YES/NO]	
1	Balanagar	NC	16	-37.8	No	-27.1	No	Safe
2	Bantwaram	NC	62	-15.7	No	-17.1	No	Safe
3	Basheerabad	NC	34	-42.1	No	-56.9	No	Safe
4	Chevella	NC	62	-131.3	No	-179.9	No	Safe
5	Dharur	NC	55	-86.8	No	-47.5	No	Safe
6	Doma	NC	67	4.9	No	-26.4	No	Safe
7	Gandeed	NC	67	-59.0	No	-57.3	No	Safe
8	Ghatkesar	NC	38	-5.4	No	-53.1	No	Safe
9	Hayathnagar	NC	52	-37.9	No	-58.3	No	Safe
10	Ibrahimpatnam	NC	86	-78.2	No	7.9	No	Safe
11	Kandukur	NC	71	34.6	Yes	-41.1	No	Semi-Critical
12	Keesara	NC	63	-5.4	No	-53.1	No	Safe
13	Kulakcherla	NC	67	-59.0	No	-57.3	No	Safe
14	Maheshwaram	NC	83	-14.3	No	1.3	No	Safe
15	Malkajgiri	NC	24	-5.4	No	-53.1	No	Safe
16	Manchal	NC	78	-78.2	No	7.9	No	Safe
17	Marpally	NC	60	-37.3	No	-13.1	No	Safe
18	Medchal	NC	101	20.5	Yes	38.5	Yes	Over Exploited
19	Moinabad	NC	67	-103.7	No	-221.6	No	Safe
20	Mominpet	NC	73	8.9	No	-28.5	No	Safe
21	Nawabpet	NC	60	-5.03	No	-95.77	No	Safe
22	Pargi	NC	74	15.16	Yes	2.73	No	Semi-Critical
23	Peddamul	NC	68	-7.57	No	-6.71	No	Safe
24	Pudur	NC	43	-131.3	No	-179.9	No	Safe
25	Quthubullapur	NC	49	-37.79	No	-9.57	No	Safe
26	Rajendranagar	NC	33	-131.3	No	-179.9	No	Safe
27	Saroornagar	NC	24	-37.9	No	-58.3	No	Safe
28	Serilingampally	NC	18	-37.9	No	-27.1	No	Safe
29	Shabad	NC	86	15.4	Yes	-11.3	No	Semi-Critical
30	Shamirpet	NC	76	-4.2	No	-178.7	No	Safe
31	Shamshabad	NC	93	98.9	Yes	96.6	Yes	Critical
32	Shankarpally	NC	89	15.4	Yes	-11.3	No	Semi-Critical
33	Tandur	NC	32	-29.3	No	-20.9	No	Safe
34	Uppal	NC	27	-5.4	No	-53.1	No	Safe
35	Vikarabad	NC	42	-17.8	No	-11.9	No	Safe
36	Yacharam	NC	65	-142.2	No	-155.2	No	Safe
37	Yalal	NC	57	-12.0	No	-30.0	No	Safe

Fig. 7: Mandal- wise categorization in respect of ground water development



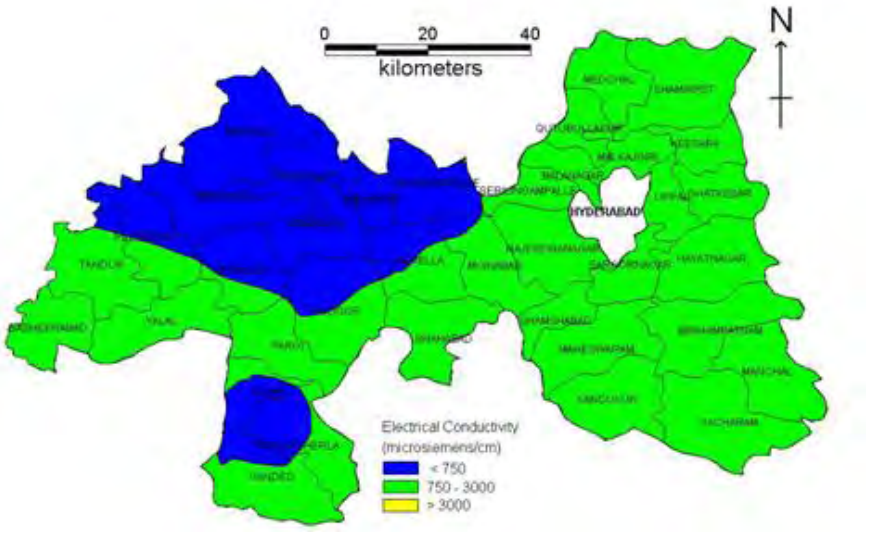
9. GROUND WATER QUALITY

The ground water in the district is in general suitable for both domestic and irrigation purposes. The Electrical Conductivity ranges from 550 to 1790 micro Siemens/cm at 25°C. Distribution of EC is shown in shown in Fig.8. Fluoride concentration in some areas of the district is more than permissible limit and ranges from 0.25-3.6 mg/l. Range of Chemical Constituents in Ground water (Pre-monsoon, 2012) of Ranga Reddy district in given in Table-4.

Table. 4. Range of Chemical Constituents in Ground water of Ranga Reddy District

Chemical Constituents	Basalts		Granites		Piezometer wells	
	Min.	Max.	Min.	Max.	Min.	Max.
pH	7.1	7.8	7.1	8.9	6.93	8.7
EC (µS/cm at 25°C)	483	1220	311	4000	445	7220
Total hardness as Ca CO_3 (mg/l)	206	807	213	1760	85	3180
Ca (mg/l)	8	84	8	265	24	680
Mg (mg/l)	1.0	49	2	208	6.1	360
Na (mg/l)	12	236	2	382	12	552
K (mg/l)	Nil	40	Nil	15	Trace	19
CO_3(mg/l)	--	--	--	--	Nil	6
HCO_3 (mg/l)	79	668	67	586	116	664
Cl (mg/l)	11	245	11	915	18	1844
SO_4 (mg/l)	2	46	1	576	Nil	624
NO_3 (mg/l)	1	48	1	248	2	576
F (mg/l)	0.2	2.7	0.32	2.6	0.27	5.68

Fig.8 Distribution of Electrical Conductivity in Ground Water – Ranga Reddy District
(Pre monsoon 2012)



10. 0 GROUND WATER DEVELOPMENT

The district is mainly dependent on ground water for its irrigation and domestic needs. Ground water development is through deep bore wells in the non-command areas and through dug wells and shallow bores in other areas. The wells yield low during summer months.

11.0 GROUND WATER RELATED ISSUES AND PROBLEMS

Ground water pollution in Ranga Reddy district is mainly by industrial and human activities.

12.0 CONCLUSIONS

1. It is seen from the exploration data that most of the potential zones were encountered within the depth range of 70-150 m and beyond this depth, potential fractures through occur, but rare.

2. Conjunctive use practices have to be adopted in the command area by utilizing both surface and ground water resources. Ground water potential zones in the command area are to be identified and developed. Ground water development through bore wells can be restricted to 70-120 m

3. Large-scale artificial recharge structures need to be constructed in the non-command areas and over-exploited mandals and corpus fund has to be created to maintain those structures.

4. Exploring the possibilities of diversion of surface water through canals/pipes for filling up of existing dried up tanks in over-exploited mandals.

5. Rainwater harvesting structures like contour bunding, check dams, percolation tanks, farm ponds are already in vogue. The construction of the artificial recharge structures should be taken up on the watershed basis and designed for 50 % of non-committed run-off so as to not to deprive the downstream watersheds.

6. It is important to take up artificial recharge structures based on topography, soil, slope, surface run-off of available and hydrogeological conditions rather than target oriented in achieving the numbers. A technical team consisting of Scientists, Engineers, and Bureaucrats should monitor the structures on regular basis.

7. In safe mandals, the artificial recharge to ground water should go hand-in-hand with ground water development further development of ground water should be restricted upto a depth of 100 m to avoid failures of bore wells.

8. Further ground water development through bore wells has to be avoided by strictly implementing APWALTA Act in the villages that are categorized as OE villages. However, ground water development in villages / mandals falling in safe to semi-critical/critical category can be developed on scientific lines. Roof Top harvesting both in urban and rural areas should be made mandatory to enhance the ground water resources.