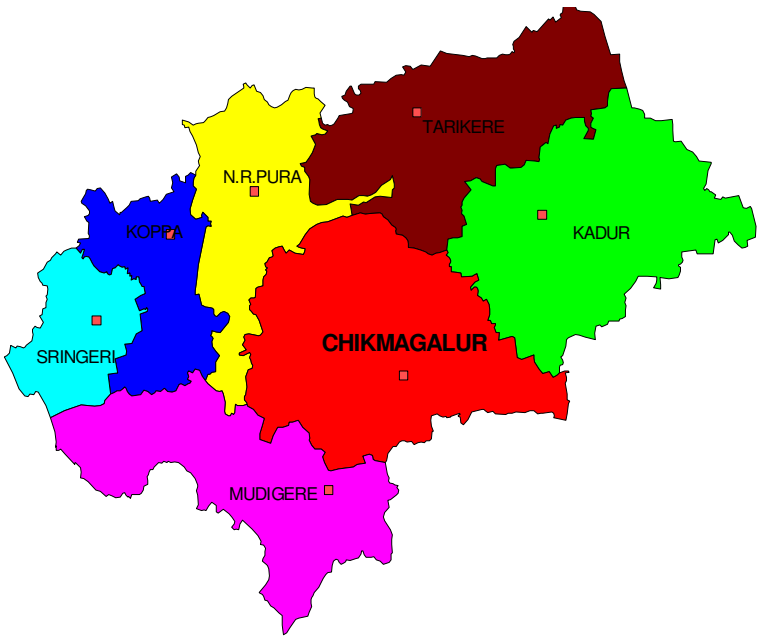
जल वर्ष 2007 Water Year 2007

स्वच्छ सुरक्षित जल – सुन्दर खुशहाल कल

CONSERVE WATER - SAVE LIFE

GOVERNMENT OF INDIA
MINISTRY OF WATER RESOURCES
CENTRAL GROUND WATER BOARD

GROUND WATER INFORMATION BOOKLET
CHIKMAGALUR DISTRICT, KARNATAKA



SOUTH WESTERN REGION
BANGALORE
AUGUST 2007

FOREWORD

Ground water contributes to about eighty percent of the drinking water requirements in the rural areas, fifty percent of the urban water requirements and more than fifty percent of the irrigation requirements of the nation. Central Ground Water Board has decided to bring out district level ground water information booklets highlighting the ground water scenario, its resource potential, quality aspects, recharge – discharge relationship, etc., for all the districts of the country. As part of this, Central Ground Water Board, South Western Region, Bangalore, is preparing such booklets for all the 27 districts of Karnataka state, of which six of the districts fall under farmers' distress category.

The Chikmagalur district Ground Water Information Booklet has been prepared based on the information available and data collected from various state and central government organisations by several hydro-scientists of Central Ground Water Board with utmost care and dedication. This booklet has been prepared by Shri S.N.Ramaiah, Scientist-D, under the guidance of Dr. K.Md. Najeeb, Superintending Hydrogeologist, Central Ground Water Board, South Western Region, Bangalore. I take this opportunity to congratulate them for the diligent and careful compilation and observation in the form of this booklet, which will certainly serve as a guiding document for further work and help the planners, administrators, hydrogeologists and engineers to plan the water resources management in a better way in the district.

Sd/-

(T.M.HUNSE)
Regional Director

CHICKMAGALUR DISTRICT AT A GLANCE

Sl. No.	Items	Statistics
1.	**General Information**	
	(i) Geographical area (sq. km.)	7201
	(ii) Administrative Division (as in 2005 - 06)	
	(a) Number of Taluks	7
	(b) Number of Panchayats/ Villages	226 Panchayats & 1117 Villages
	(iii) Population (as per 2001 Census)	11,40,905
	(iv) Average Annual Rainfall (mm)	1762
2.	**Geomorphology**	
	(i) Major physiographic units	Southern Malnad, Central Semi-Malnad & South eastern maidan area.
	(ii) Major Drainage	Krishna River
3.	**Land Use (sq. km.)**	
	(i) Forest area (ha)	200485
	(ii) Net area sown (ha)	286040
	(iii) Cultivable area (ha)	325899
4.	**Major soil types**	Red loamy & Red sandy soil (mainly) Hilly area soil & mixed red & black soil (occur in small areas)
5.	**Area under principal crops (as on 04-05)**	
6.	**Irrigation by different sources (Areas & Numbers of structures) (as per A.S.C.R. 2004 - 05)**	
	(i) Dug wells	358 ha
	(ii) Tube wells/ Bore wells	8505 ha
	(iii) Tanks / Ponds	9241 ha
	(iv) Canals	9444 ha
	(v) Other sources: Lift Irrigation Schemes/ Surface Flow Irrigation	9868 ha
	(vi) Net irrigated area	37416
	(vii) Gross irrigated area	
7.	**Number of ground water monitoring wells of Central Ground Water Board (as on 31.03.2007)**	
	(i) Dug wells	39
	(ii) Piezometers	7

8.	Predominant Geological Formations	Charnokite, gneisses & unclassified crystallines, slates, phyllites & schists.
9.	**Hydrogeology**	
	(i) Major water bearing formation	Gneiss & Schist (Fractured & weathered)
	(ii) Pre - monsoon depth to water level during May 2006 (in mbgl)	1.92 – 12.40
	(iii) Post – monsoon depth to water level during Nov. 2006 (in mbgl)	0.55 – 10.32
	(iv) Long term water level trend in 10 years (1997 – 2006) (a) Pre – monsoon; May 1997 – May 2006 (m/year) (b) Post – monsoon; Nov. 1997 – Nov. 2006 (m/year)	(a) In 17 NHS, water levels show rising trend in the range of 0.001 to 0.496m/year & in 13 NHS water levels show falling trend in the range of 0.023 to 0.814 m/year. (b) In 16 NHS, water levels show rising trend in the range of 0.007 to 0.120m/year. & in 17 NHS water levels show falling trend in the range of 0.004 to 0.93.2m/year
10.	**Ground water Exploration by Central Ground Water Board (as on 31.03.07)**	
	(i) Number of wells drilled (EW, OW, PZ, SH, Total)	30 – EW; 9 - OW
	(ii) Depth Range (mbgl)	60 – 265.21
	(iii) Discharge (litres per second)	0.45 – 11.16
	(iv) Storativity (S)	
	(v) Transmissivity (m^2/day)	0.11 - 108
11.	**Ground water quality**	
	(i) Presence of chemical constituents more than permissible limit	Nitrate (in very small area of Kadur taluk)
12.	**Dynamic Ground Water Resource (2004) (mcm)**	
	(i) Annual replenishable ground water resource	507
	(ii) Net Annual Ground Water Draft	233
	(iii) Projected demand for domestic & industrial uses upto 2025	45

	(iv) Stage of ground water development (%)	48
13.	**Awareness & Training activity**	
	(i) Mass awareness programmes organized	
	(a) Date	25.03.99
	(b) Place	Tangli village, Kadur taluk
	(ii) Water management Training Programmes organized	
	(a) Date	29.11.2006
	(b) Place	Zilla Panchayat Meeting Hall, Chikmagalur
14.	**Artificial recharge & rainwater harvesting**	
	(i) Projects completed by CGWB (No. & amount spent)	Nil
	(ii) Projects under technical guidance of CGWB	Nil
15.	**Ground water control & Regulation**	
	(i) Number of OE blocks	Nil
	(ii) Number of Critical blocks	1(Kadur taluk)
	(iii) Number of blocks notified	Nil

1.0 Introduction

In last three years (03-04 to 05-06) there were about fifty suicide cases of farmers reported in the district. Out of these, there were about 23 suicide cases, which were reported to be related to crop failures. With about 86% of the net sown areas in the district dependant on rains, failure of monsoon during the last three years has caused crop failure in big scale. The small farmers, who usually take loan at each time of sowing, were unable to repay the loan for last three to four years, because of the crop failures. Some farmers, because of this draught situation, have got into debt traps and forced to commit suicide in few extreme cases. Out of seven taluks in the district, 2 case of suicide has been reported in Koppa & N.R.Pura, 3 cases in Sringeri taluks, four cases in Kadur taluk, three cases in Mudigere taluk, seven from Chickmagalur taluk and nine cases from Tarikere taluk. Year wise data brings out the fact that, out of 23 suicide cases, ten cases were due to crop failures during 2003-04, eleven cases have been reported in the district during 2004-05, two cases of suicide during the year 2005- 06. In addition to this a total of 27 cases of farmers suicide are reported during 06-07 of which 9 are due to crop failure. As ground water development is still a low key affair in the district, with proper development of ground water, distress situation of the farmers can be lessen to some extent during the draught periods. Talukwise data of suicide of farmers due to crop failures from the year 2003 - 06 is furnished in Table-1.

Table 1. Taluk wise data on suicide of farmers

Sl no	Taluks	2003-04			2004-05			2005-06			Total		
		Total cases reported	Due to Crop loss	Due to other reasons	Total cases reported	Due to Crop loss	Due to other reasons	Total cases reported	Due to Crop	Due to other reasons	Total cases reported	Due to Crop loss	Due to other reasons
1	Kadur	9	2	7	5	2	3	0	0	0	14	4	10
2	Mudigere	3	2	1	2	1	1	2	0	2	7	3	4
3	Chickmagalur	2	1	1	7	5	2	1	1	0	10	7	3
4	Koppa	2	0	2	0	0	0	0	0	0	2	0	2
5	Tarikere	8	5	3	7	3	4	1	1	0	16	9	7
6	Sringeri												
7	NR Pura	0	0	0	1	0	1	0	0	0	1	0	1
	Total	**24**	**10**	**14**	**22**	**11**	**11**	**4**	**2**	**2**	**50**	**23**	**27**

*Source: Agricultural Commissioner, Govt. of Karnataka, Bangalore

The area of Chickmagalur district is 7201 sq.km. Administratively, the district is divided into seven taluks (Fig-1). The area of Chickmagalur district falls in Krishna basin. The mean annual rainfall in the district is 1762 mm. Rock formations of the district belong to Archaean age comprising gneiss and schist formation. Weathered, fractured and jointed zones of gneiss and schist formations serve as potential aquifers in the district (Fig-2). The ground water occurs under water table and semi confined conditions in the area.

The yield cum recuperation tests conducted on the exploratory wells show that the general specific capacity ranges from 10 to 38 lpm/m/dd. Transmissivity ranges from 0.11 to 108 m^2/day.

Quality of the ground water is found to be potable and suitable for domestic as well as for irrigation purposes. The presence of various chemical constituents fall within the permissible limits prescribed by the B.I.S. and WHO.

Fig-1

ADMINISTRATIVE SET-UP
CHIKMAGALUR DISTRICT
KARNATAKA

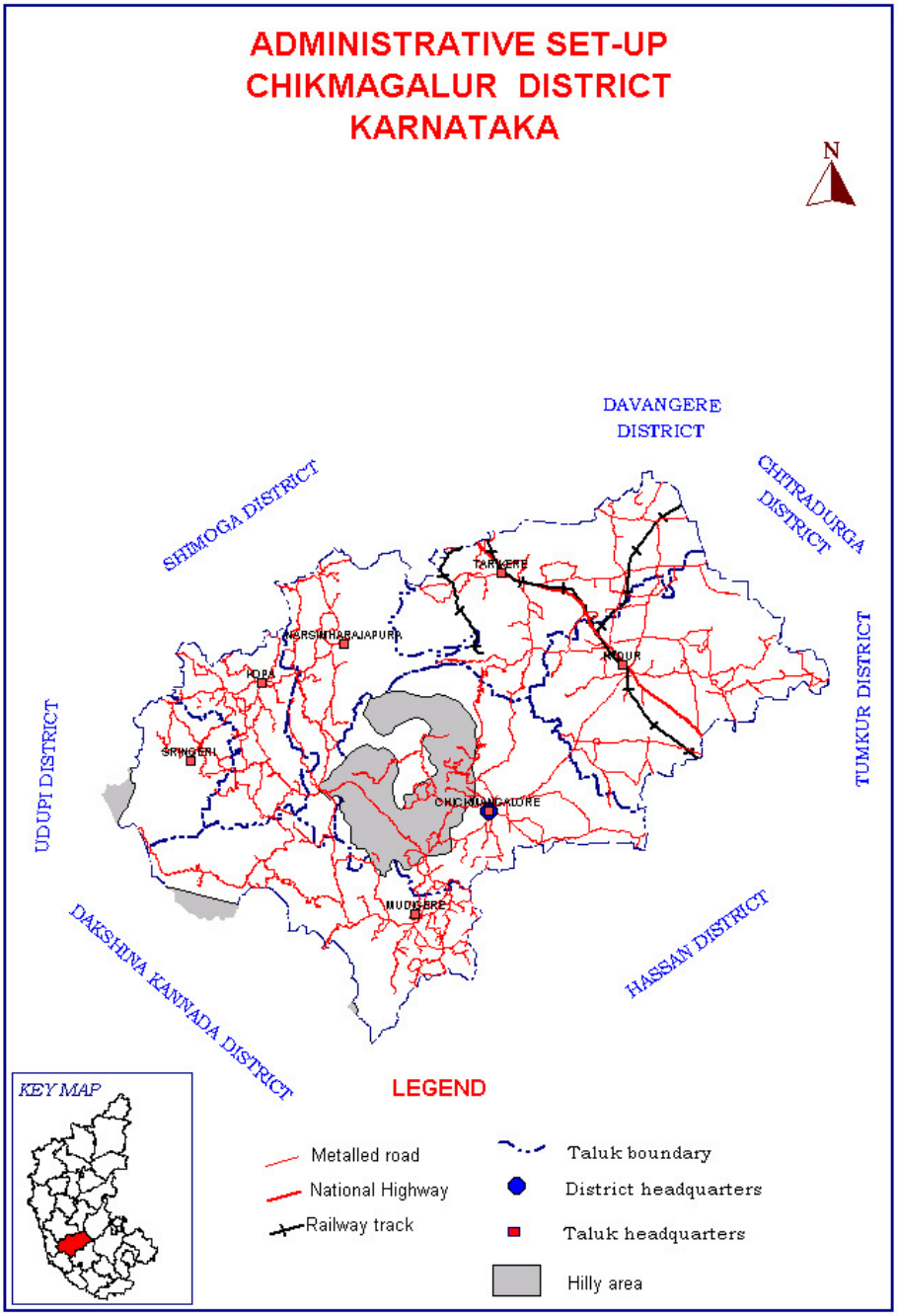
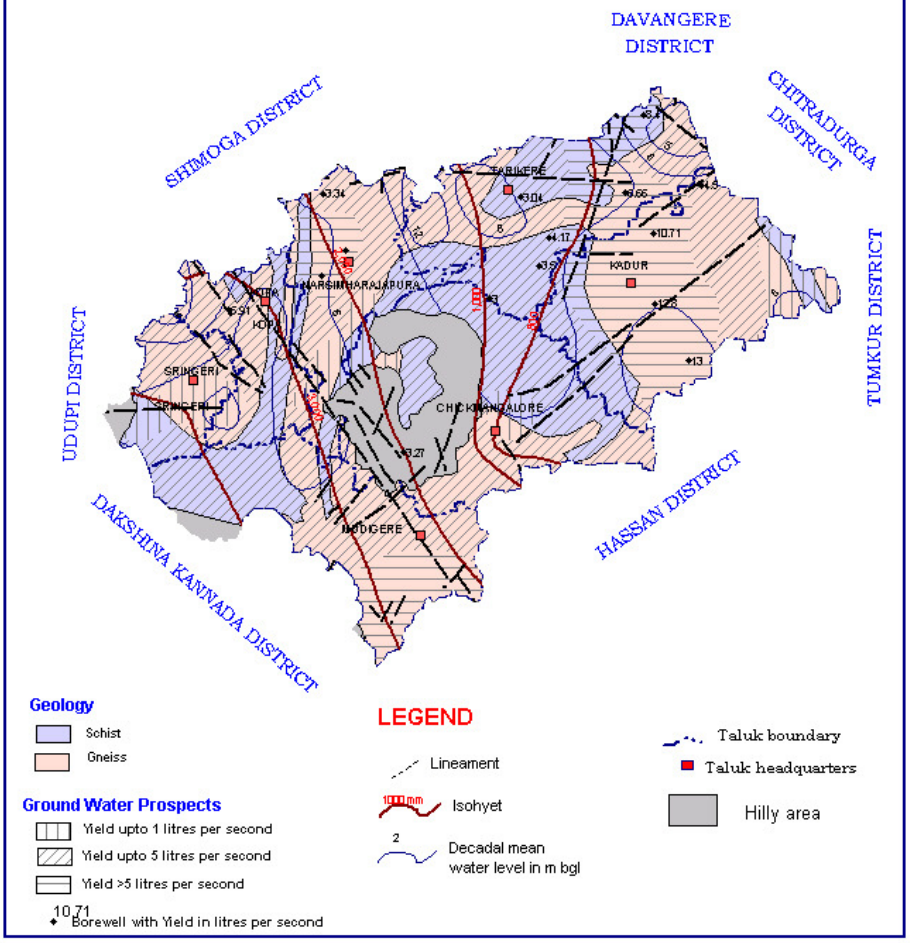


Fig-2

HYDROGEOLOGY
CHIKMAGALUR DISTRICT
KARNATAKA



Geology

- Schist
- Gneiss

Ground Water Prospects

- Yield upto 1 litres per second
- Yield upto 5 litres per second
- Yield >5 litres per second
- 10.71 Borewell with Yield in litres per second

LEGEND

- Lineament
- 1000mm Isohyet
- 2 Decadal mean water level in m bgl
- Taluk boundary
- Taluk headquarters
- Hilly area

2.0 Rainfall

The mean annual rainfall of the district is 1762 mm. Kadur taluk receives the lowest rainfall of 620 mm, whereas Sringeri taluk receives the highest rainfall in the district amounting to 3773 mm. The rainfall data for the year 1996-2005 for all the seven stations is presented in Table-2.

Table.2: Annual and mean annual rainfall for Chickmagalur district.

		Annual Rainfall (mm) Chikmagalur district							
Year	Year	Chikmagalur	Kadur	Koppa	Mudigere	NRPura	Sringeri	Tarikere	Dist. Ave
1996		877.0	605.0	2520.0	1743.0	1292.0	3440.0	699.0	1596.6
1997		991.0	879.0	3446.0	2471.0	1766.0	4479.0	874.0	2129.4
1998		920.7	664.9	2824.0	1906.5	1691.8	3731.2	949.6	1812.7
1999		896.8	754.8	3153.6	2109.8	1790.1	4512.5	1062.2	2040.0
2000		1028.3	623.1	2835.2	2434.0	1504.6	3559.6	899.8	1840.7
2001		679.0	407.0	2200.0	1875.0	1055.0	3499.0	641.0	1479.4
2002		717.0	559.0	2053.0	1671.0	1059.0	3368.0	657.0	1440.6
2003		525.0	460.0	1876.0	1616.0	1025.0	3413.0	817.0	1390.3
2004		855.0	636.0	2614.0	2575.0	1361.0	3755.0	911.0	1815.3
2005		965.0	614.0	2885.0	3327.0	1694.0	3975.0	1063.0	2074.7
	Ave	845.5	620.3	2640.7	2172.8	1423.9	3773.2	857.4	1762.0

3.0 Geomorphology & Soil Type

The major soil type in the district comprises of red loamy & sandy soil. However, hilly area soil and mixed red & black soil are also found to occur in small areas in the central and northeastern part respectively.

4.0 Ground Water Scenario

Ground water in the district occurs under water table and semi confined conditions. Weathered, fractured and jointed gneiss and schist serve as potential aquifers in the district. As reported during earlier Hydrogeological surveys in the area the ground water development was mainly through dug wells. Now the ground water development in the area is through dug wells and bore wells. The ground water development is in large-scale compared to earlier years. This is mainly due to liberal financing by various banks for agricultural development.

4.1 Hydrogeology

a) Chickmagalur Taluk

Most of the area in Chikmagalur taluk is covered by schist followed by gneissic rock formation in southern part of the taluk. Weathered, fractured and jointed schist and gneiss serve as potential aquifers in the area (Fig-2). Depth of weathered zone ranges from 6.80 to 14.25 m bgl. Pre-monsoon depth to water level during the year 2006 (Fig-4) ranges from 4.22 to 10.24 m bgl, post-monsoon DTW (Fig-5) ranges from 2.26 to 7.78 m bgl and seasonal water level fluctuation ranges from 0.99 to 7.31 m. Based on water level data of the National hydrograph stations (Fig-3) located in the taluk (long term water level trend 1996 to 2005), it is observed that hydrograph of Handi is showing rising trend at the rate of 0.18 m/year during premonsoon and falling at the rate of 0.03m/year during post monsoon. The hydrographs of Magadi and Vasthare

Fig-3

DRAINAGE & HYDROGRAPH MONITORING STATIONS
CHIKMAGALUR URBAN, KARNATAKA

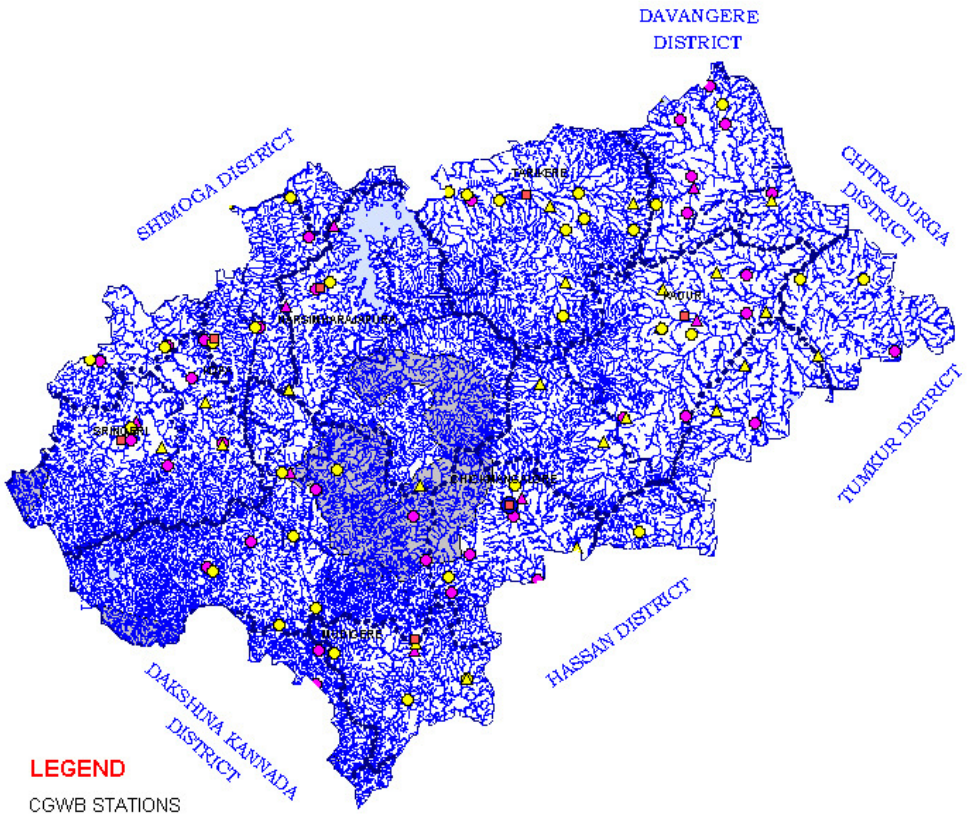
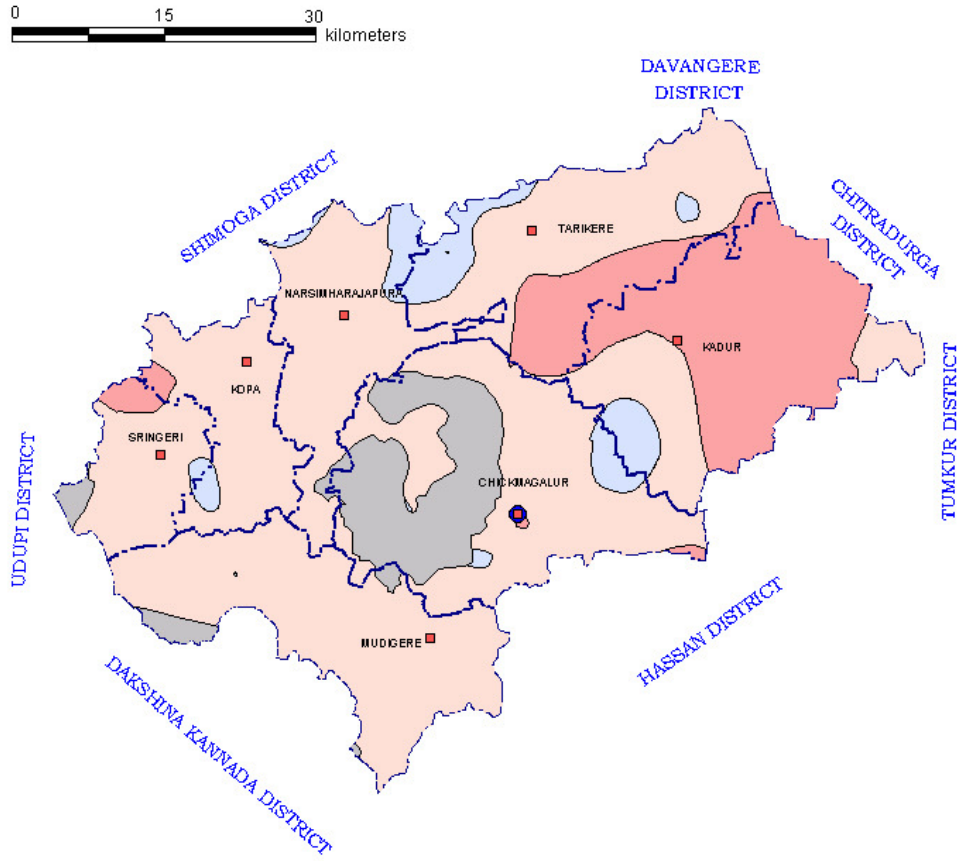


Fig 4

DEPTH TO WATER LEVEL PRE-MONSOON (MAY-2006)

CHIKMAGALUR DISTRICT, KARNATAKA



LEGEND

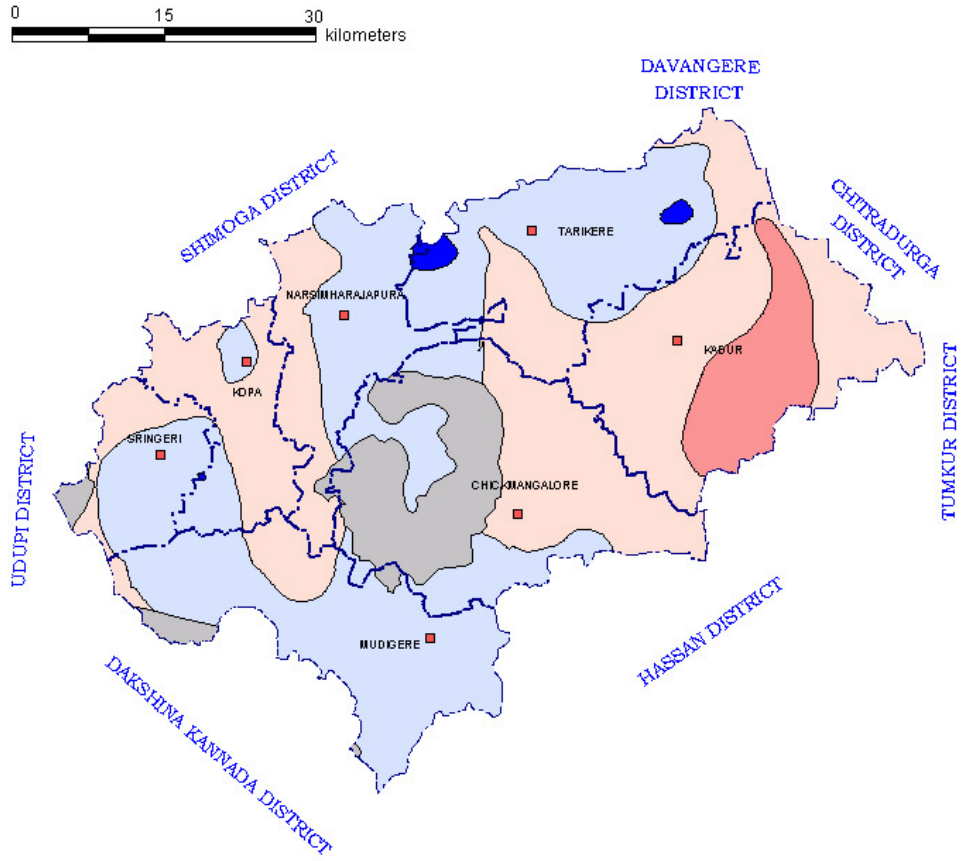
Depth to Water Level (m bgl)

- < 2
- 2 - 5
- 5 - 10
- 10 - 20

Fig.5

DEPTH TO WATER LEVEL POST-MONSOON (NOVEMBER-2006)

CHIKMAGALUR DISTRICT, KARNATAKA



LEGEND

Depth to Water Level (m bgl)

- < 2
- 2 - 5
- 5 - 10
- 10 - 20

are showing the falling trend during both pre and post monsoon period at the rate of 0.06,0.16 and 0.35,0.30 m/year respectively. Pumping tests on shallow aquifers conducted in the area during hydrogeological surveys shows that specific capacity varies from 8.80 to 398 lpm/mdd.

b) Kadur taluk

Nearly 80% of the area in Kadur taluk is covered by gneissic rock formation and schist occupies rest of the area. Ground water occurs under water table as well as in semi-confined condition. Weathered, fractured and jointed gneiss and schist serves as potential aquifers in the area. Depth of weathering in the area ranges from 5.51 to16.10 m bgl. Pre - monsoon DTW (Fig-4) in the area ranges from 5.0 to 15.09 m bgl, Post monsoon DTW (Fig-5) ranges from 2.05 to 12.98 m bgl with a seasonal water level fluctuation ranging from 2.04 to 5.30m. Based on water level data of the National hydrograph stations (Fig-3) located in the taluk (long term water level trend 1996 to 2005), it is observed that hydrograph of Sakrepatna is showing falling trend during both pre and postmonsson period at the rate of 0.19 and 0.03 m/year. Pumping tests on shallow aquifers conducted in the area during hydrogeological surveys shows that specific capacity varies from 7.3 to 71 lpm/mdd.

c) Koppa Taluk

Western part of the area in Koppa taluk is covered by gneiss and central and northern part of the taluk occupied by schist formation. Fractured and jointed gneiss and schist serves as potential aquifers in the area. Depth of weathered zone ranges from 7.15 to 11.05 m bgl. Pre-monsoon depth to water level during the year 2006 (Fig-4) ranges from 5.45 to 9.72 m bgl, post-monsoon DTW (Fig-5) ranges from 5.50 to 6.40 m bgl and seasonal water level fluctuation ranges from 0.05 to 3.68 m. Based on water level data of the National hydrograph stations located(Fig-3) in the taluk (long term water level trend 1996 to 2005), it is observed that both hydrographs of Hariharapura and Koppa are showing rising trend during premonsoon and Post monsoon period at the rate of 0.08,0.05 and 0.05,0.18 m/year respectively. Pumping tests on shallow aquifers conducted in the area during hydrogeological surveys shows that specific capacity varies from 9.10 to 65 lpm/mdd.

d) Mudigere Taluk

Nearly 60% of the area in Mudigere talk is covered by gneiss and rest of the area is occupied by schist formation. Weathered fractured and jointed gneiss and schist serves as potential aquifers in the area. Depth of weathered zone ranges from 7.95 to 12.20 m bgl. Pre-monsoon depth to water level during the year 2006 (Fig-4) ranges from 4.99 to 9.63 m bgl, post-monsoon DTW (Fig-5) ranges from 2.18 to 6.43 m bgl and seasonal water level fluctuation ranges from 0.80 to 3.68 m. Based on water level data of the National hydrograph stations located (Fig-3) in the taluk (long term water level trend 1996 to 2005), it is observed that the two hydrographs of Kalasa and Mudigere are showing rising trend during premonsoon and Post monsoon period at the rate of 0.23,0.16 and 0.10,0.11m/year respectively. The hydrograph of Bhavikere shows falling trend during premonsoon at the rate of 0.17 m/year. Pumping tests on shallow aquifers conducted in the area during hydrogeological surveys shows that specific capacity varies from 8.5 to 398 lpm/mdd.

e) N.R.Pura Taluk

Nearly 90% of the area in N.R.Pura taluk is covered by gneiss and rest of the area is occupied by schist formation. Weathered fractured and jointed gneiss and schist serves as potential aquifers in the area. Depth of weathered zone ranges from 10.68 to 13.41m bgl. Pre-monsoon depth to water level during the year 2006 (Fig-4) ranges

from 5.67 to 9.01 m bgl, post-monsoon DTW (Fig-5) ranges from 2.37 to 5.33 m bgl and seasonal water level fluctuation ranges from 2.02 to 3.30 m. Based on water level data of the National hydrograph stations (Fig-3) located in the taluk (long term water level trend 1996 to 2005), it is observed that the hydrograph of N.R.pura is showing rising rising trend during pre monsoon and Post monsoon period at the rate of 0.11and 0.12 m/year

f) Sringeri taluk

Nearly 70% of the area in Sringeri taluk is covered by gneiss and rest of the area is occupied by schist formation. Weathered, fractured and jointed gneiss and schist serves as potential aquifers in the area. Depth of weathered zone ranges from 7.17 to 15.20 m bgl. Pre-monsoon depth to water level during the year 2006 (Fig-4) ranges from 4.37 to 12.40 m bgl, post-monsoon DTW (Fig-5) ranges from 1.88 top 9.30 m bgl and seasonal water level fluctuation ranges from 0.46 to 3.14 m. Based on water level data of the National hydrograph stations (Fig-3) located in the taluk (long term water level trend 1996 to 2005), it is observed that the hydrograph of Sringeri is showing falling trend during pre- monsoon period and more or less rising trend during post monsoon period (at the rate of 0.02 and 0.018 m/year).

g) Tarikere taluk

Nearly 50% of the area in Tarikere taluk is covered by gneiss and rest of the area is occupied by schist formation. Weathered, fractured and jointed gneiss and schist serves as potential aquifers in the area. Depth of weathered zone ranges from 6.85 to 20.7 m bgl. Pre-monsoon depth to water level during the year 2006 (Fig-4) ranges from 1.92 to10.94 m bgl, post-monsoon DTW (Fig-5) ranges from 1.37 to 5.60 m bgl and seasonal water level fluctuation ranges from 0.55 to 1.67 m. Based on water level data of the National hydrograph stations located in the taluk (long term water level trend 1996 to 2005), it is observed that the hydrograph of Lakkavalli is showing falling trend during both pre and Post monsoon period at the rate of 0.06 and 0.0.01 m/year. The hydrographs of Shivane and Bukkambudi show rising trend during premonsoon period at the rate of 0.36 and 0.33 m/year and falling trend during post monsoon period at the rate of 0.55 and 0.18 m/year.

4.2 Ground Water Resources

The resource estimation and categorization is carried out as per the recommendations of 'Ground Water Estimation Methodology – 97 ' (GEM – 97) considering water shed as a unit. Water shed and hydrological boundaries do not match with the administrative boundaries. As a result, different parts of taluk fall in different watersheds having different stages of ground water development and categorization. However, for administrative convenience talukwise data is preferred. Hence, talukwise resource and average stage of development is computed on prorata basis from watershed data and presented in table 3.

A perusal of Table-3, indicates that net annual ground water availability for the district is 48556 ham, gross ground water draft is 23330 ham and ground water balance available for further ground water development is 23964 ham.

Koppa, Mudigere, N.R. Pura and Sringeri taluks are safe for ground water development whereas Chkmagalur are partly safe as they have semicritical and over exploited pockets respectively. Kadur taluk is Partly Critical (Fig7).

Table 3: Groundwater Resource and Stage of Development of Chikmagalur District, Karnataka State as on March 2004														
TALUK	Recharge from rainfall during monsoon season (HAM)	Recharge from other sources during monsoon season (HAM)	Recharge from rainfall during non-monsoon season (HAM)	Recharge from other sources during non-monsoon season (HAM)	Annual replenishable GW Resource(HAM)	Natural discharge during non-monsoon season(HAM)	Net Ground water Availability (HAM)	Irrigation draft (HAM)	Domestic and industrial draft (HAM)	Total annual ground water draft (HAM)	Projected domestic and industrial draft 2025 (HAM)	Ground water availability for future irrigation** (HAM)	Stage of development (%)	Catagorisation
2	3	4	5	6	7	8	9	10	11	12	13	14	15	
CHIKMAGALUR	3937	2301	2007	507	8752	435	8317	3317	480	3798	668	4329	46	SAFE(P)
KADUR	4983	1587	2314	1168	10059	495	9564	7983	476	8465	665	879	89	Semicritical(P)
KOPPA	1415	1239	451	99	3200	159	3041	289	153	441	201	2558	15	SAFE
MUDIGERE	3758	906	1118	187	5972	297	5675	1291	1018	2303	1397	2994	41	SAFE
N.R. PURA	2723	1849	580	302	5449	246	5204	519	198	717	273	4422	14	SAFE
SRINGERI	704	777	526	35	2041	101	1939	180	111	291	151	1612	15	SAFE
TARIKERE	5834	4392	1484	3584	15294	479	14816	6508	806	7315	1129	7169	49	SAFE(P)
TOTAL	**23355**	**13051**	**8481**	**5882**	**50768**	**2212**	**48556**	**20087**	**3243**	**23330**	**4485**	**23964**	**48**	
	Criteria for catagorisation of taluks- (I) Full- Entire taluka falling under a particular category, (II) Partial (P) - >50% of the area of the taluka falling under a categoty, (III) Partial (P-I) where non of the category is having more than 50% area (As per figure7)													

4.3 Ground Water Quality

Ground water quality in the wells tapping weathered and fractured crystalline formations is generally good and suitable for drinking as well as for irrigation purposes. The electrical conductivity (EC) of ground water varies from 100 to 3000 micromhos/cm at 25ºC (Fig-6). EC of more than 2000 µs /cm occurs along Kadur-Tarikere boarder and in the southeastern parts of Kadur taluk.Fluoride concentration in ground water in the district is less than 1 mg/l. Nitrate concentration of more than permissible limit occurs along the boarder of Chikmagalur-Kadur taluks and in north eastern parts of Kadur and Tarikere taluks.

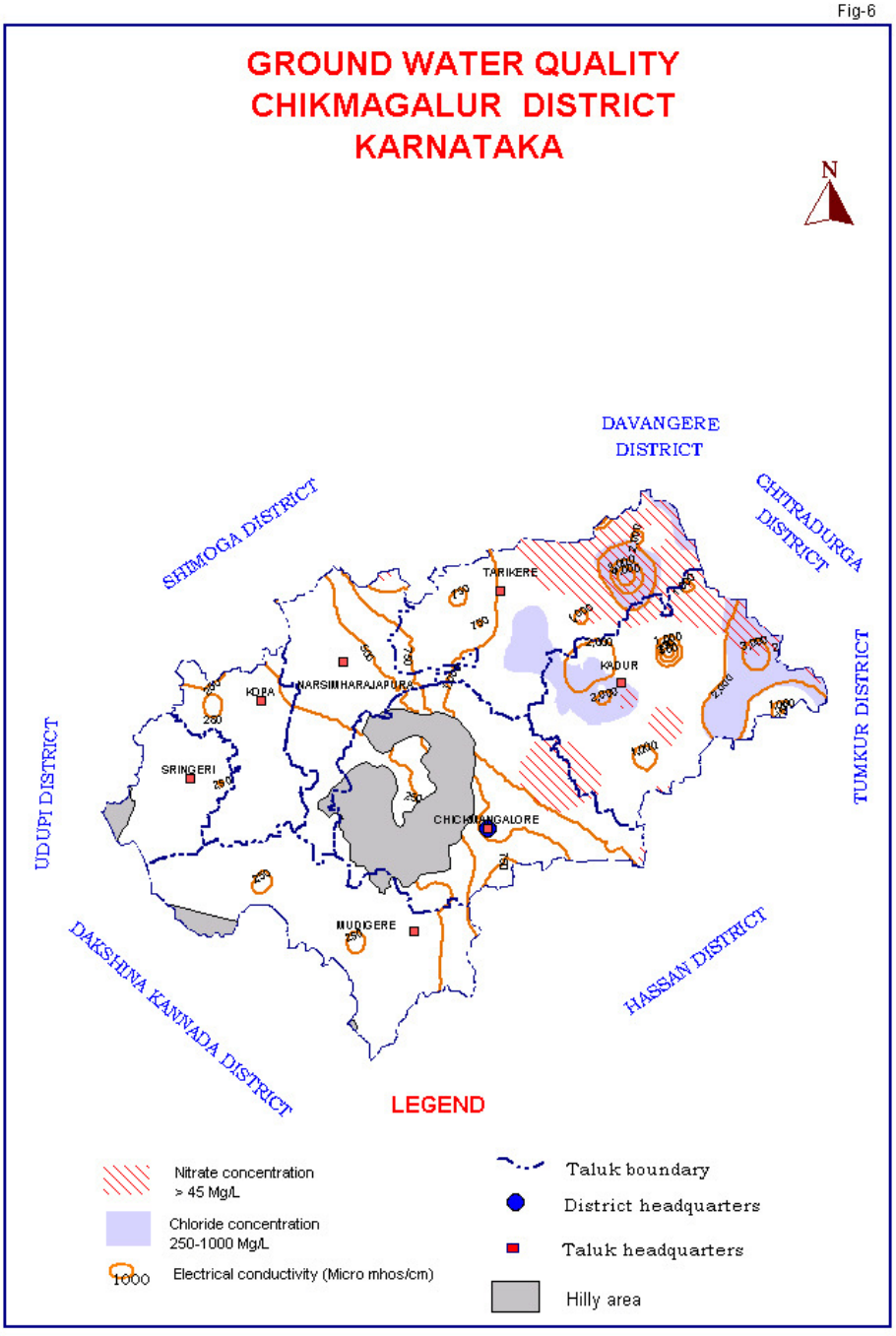
4.4 Status of Ground Water Development

Owing to the hilly and undulating terrain condition, the uneven distribution of aquifers, the financial constraints of the marginal farmers and the non-availability of cultivable land, the ground water development is in low pace in the district. The farmers with small acreage of land depend mainly on the rainwater and water available in the shallow wells. The abstraction structures, dug-wells and bore wells constructed/existing are mainly tapping the aquifers within depth range 5.55 to 20.70 mbgl and 75 to 200mbgl respectively. The major ground water developmental activities are concentrated in the valley regions, along the banks of rivers/streams and a moderate development found in the undulating land/plateau. The sustained yield of wells recorded from negligible to maximum of 65m^3/day. The ground water extraction for irrigation is practiced through shallow abstraction structures (dug well) and bore wells, found all over the area in the district. Owing to the steep and undulating terrain with large subsurface flow condition, the irrigation is practiced only in the valley region. Out of the net sown area of 286040 ha (2004-05) and irrigated area of 37416 ha, only 8863 ha (record-2004-05) of land comes under irrigation through ground water. Keeping in view of the available cultivable wasteland and unused annual utilizable ground water resource availability and marginal growth rate in agricultural sector, there is a need to develop the wastelands to bring under ground water irrigation specially in Koppa, Mudigere, N.R.Pura and Sringeri taluks. A marginal area taken up for ground water developments in the upstream areas would improve the agricultural production.

5.0 Ground Water Management Strategy

A proper groundwater resource management strategy is essential to make most economical, efficient and judicious use of ground water and achieve a sustainable ground water resources development. Inculcating the water users on the ground water potentialities in different terrain conditions and its judicious use is essential. Conjunctive use of ground water and surface water can improve this unfavourable scenario. In view of the ever-growing population and subsequent demand for groundwater for various developmental activities, it is suggested to adopt unconventional means to artificially recharge the ground water in the water level depleting areas specially in eastern part of Chickmagalur, Kadur and Tarikere taluks where the areas fall in semi critical to critical category to facilitate the increased ground water availability to the down stream areas. Since, the water management is an integral part of environmental management and ecological stability it should be looked holistically. The development of water supply model should be resource based and the whole problem be tackled in its totality particularly from the point of view of total supply and ever growing demand for the precious natural resources.

Fig-6


GROUND WATER QUALITY
CHIKMAGALUR DISTRICT
KARNATAKA
N
DAVANGERE DISTRICT
SHIMOGA DISTRICT
CHITRADURGA DISTRICT
TUMKUR DISTRICT
UDUPI DISTRICT
DAKSHINA KANNADA DISTRICT
HASSAN DISTRICT
TARIKERE
KADUR
KOPA
NARSIMHARAJAPURA
SRINGERI
CHIKMAGALORE
MUDIGERE
LEGEND
Nitrate concentration > 45 Mg/L
Chloride concentration 250-1000 Mg/L
1000 Electrical conductivity (Micro mhos/cm)
Taluk boundary
District headquarters
Taluk headquarters
Hilly area

5.1 Ground Water Development

The ground water development is on large scale in eastern part of Chickmagalur, Kadur and Tarikere taluks through structures like dug wells and bore wells. This is mainly due to the liberal financing by various banks for agricultural development. In other four taluks namely Koppa, Mudigere, N.R.Pura and Sringeri taluks, there is vast scope for further ground water development as the entire area in these taluks is falling in safe category (Table-3, Fig-7). The ground water can be developed by sinking bore wells in hydrogelogically favorable areas. The sites for drilling bore wells should be selected on sound scientific principles (based on hydrogeological and geophysical surveys).

5.2 Water Conservation and Artificial Recharge

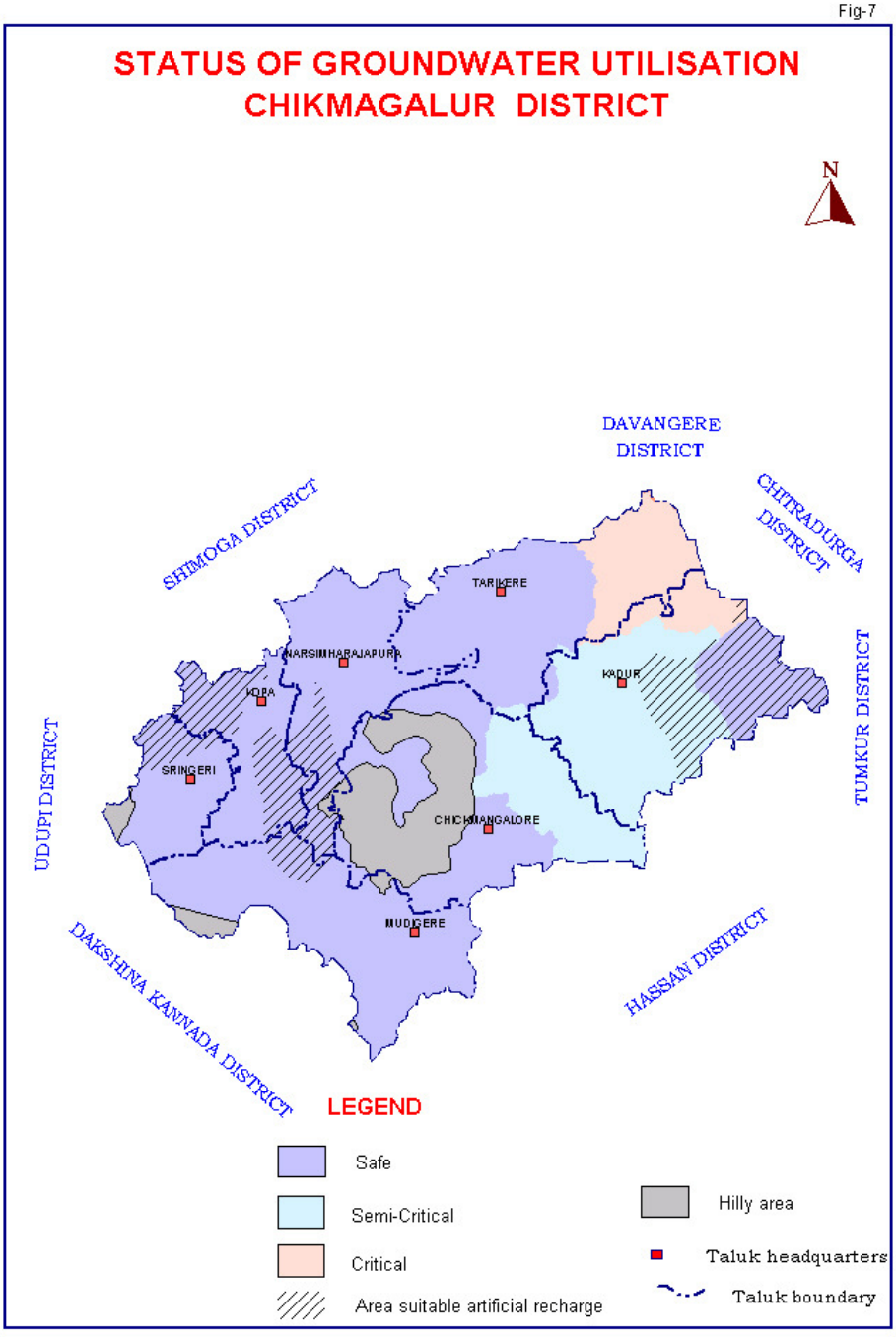
Because of deforestation and bringing more and more grass covered areas for other activities during recent times, the natural way of recharging of dynamic reserves of ground water has reduced considerably. Most of the rains falling on the surface of the land flow out of the area immediately as surface run off, causing floods and soil erosion. By constructing suitable structures the contact time of this flowing water with the land is increased or the flow is arrested for some time.

By studying the nature of geological formations, slope of the land, depth of weathering, depth to water level and availability of land and water source for the artificial recharge structures, different types of artificial structures are recommended and shown in the map. The plain lands on eastern parts of the district covering the areas in Chickmagalur , Kadur and Tarikere taluks, suitable artificial recharge structures (Fig-7) like Check dams, Nalabunds, Sub-surface dykes, Percolation tanks, and point recharge structures like recharging through existing borewells/ dugwells and recharge pits can be done. The areas in the other four taluks namely Koppa, Mudigere, N.R.Pura and Sringeri taluks the artificial recharge structures are not feasible because of this area receives high annual rainfall to the tune of 1500 to 3000mm,more over the area in all these four taluks falls in safe category. The base flow available in the streams and rivers during non-monsoon season (December to April) in these taluks may be arrested through construction of vented dams (Kholhapur type veirs) at suitable sites. This water can be used for either water supply to town and villages in the area or for lift irrigation.

6.0 Awareness & Training activity

Mass awareness programme (under AAP 98-99) was conducted at Tangli village in Kadur taluk, Chikmagalur district on 25.03.99 in the premises of primary health unit, Tangli village, to educate the people on the utilization of ground water, conservation and prevention of pollution. The meeting was well attended by the local state Govt. authorities and local farmers. Pamphlets giving the details and objectives of ' Ground Water Authority' in Kannada and English were distributed. In general, activities of CGWB, importance of ground water, its qualities, general measures of conserving it, role of farmers in achieving these objectives and activities of CGWB under exploration programme in Kadur taluk were discussed during the awareness programme. Shri. Mohammed Saifulla, Tehsildar, Kadur taluk, was the chief guest of the programme.

Fig-7


STATUS OF GROUNDWATER UTILISATION
CHIKMAGALUR DISTRICT
N
DAVANGERE DISTRICT
CHITRADURGA DISTRICT
SHIMOGA DISTRICT
TUMKUR DISTRICT
UDUPI DISTRICT
DAKSHINA KANNADA DISTRICT
HASSAN DISTRICT
TARIKERE
NARSIMHARAJAPURA
KOPA
KADUR
SRINGERI
CHICKMANGALORE
MUDIGERE
LEGEND
Safe
Semi-Critical
Critical
Area suitable artificial recharge
Hilly area
Taluk headquarters
Taluk boundary

Training Programme on Ground Water Management was organized during 28.11.2006 to 29.11.2006 at Zilla Panchayat Meeting Hall, Chikmagalur. The training programme was organized as a nation wide programme for officers of different departments attached to Zilla Panchayat, NGOs', representatives of farmers and Education Institutions etc., The curriculum of the training programme included water management, ground water conservation, artificial recharge techniques, water quality and its effects on human health, geophysical studies, role of women in water management etc. A Field visit was also planned under the programme covering the area where artificial recharge structures have been constructed. Sri Nilaya Mitash, IAS, Deputy Commissioner, Chikmagalur was the chief guest. Sri K.R. Druvakumar, President, Zilla Panchayat, Chikmagalur presided over the inaugural function and inaugurated the training programme on 28.11.2006. Various scientific aspects of ground water, detailed studies of rainfall pattern and documentaries were presented in the training programme. Certificates were distributed to the trainees after completion of the programme.

8.0 Recommendations

Considering the prevailing scenario of the groundwater resources and development the following recommendations are made for the optimum drawl with sustainable development ground water resources in the district.

1. There is vast scope for further ground water development in Koppa, Mudigere, N.R.Pura and Sringeri taluks, as the area in all these taluks falls in safe category. Ground water can be developed through construction of additional ground water structures like bore wells.
2. Eastern part of Chikmagalur, central, South-western part of Kadur taluk falls under semi critical category and eastern part of Tarikere taluk falls under critical category. Here ground water withdrawal is to be minimised. Farmers should adopt micro irrigation system like sprinkler and drip irrigation system, so that more area can be brought under ground water irrigation with the same draft and crop yield will be more. Artificial recharge structures like Check dams, Nala bunds, Sub- surface dykes, percolation tanks, contour trenches and contour bunds are to be constructed at suitable sites for ground water recharge.
3. All most all areas in Koppa, Mudigere, N.R.Pura and Sringeri are hilly and the rain fall is also high (1500to 3000 mm). There is no scope for construction of artificial recharge structures because unsaturated aquifers get recharged during South-West monsoon rains.
4. Lot of base flow is available in the streams and rivers of these four taluks during non-monsoon period (December to April), this base flow can be harvested by construction of vented dams at suitable places.
5. The water retained in these vented dams can be utilised for domestic water supply to villages and towns located in the area as the villages and towns located in the area faces acute shortage of drinking water during April and May. The water retained in vented dams can also be utilised for lift irrigation.