जल वर्ष 2007 Water Year 2007

स्वच्छ सुरक्षित जल – सुन्दर खुशहाल कल

CONSERVE WATER - SAVE LIFE

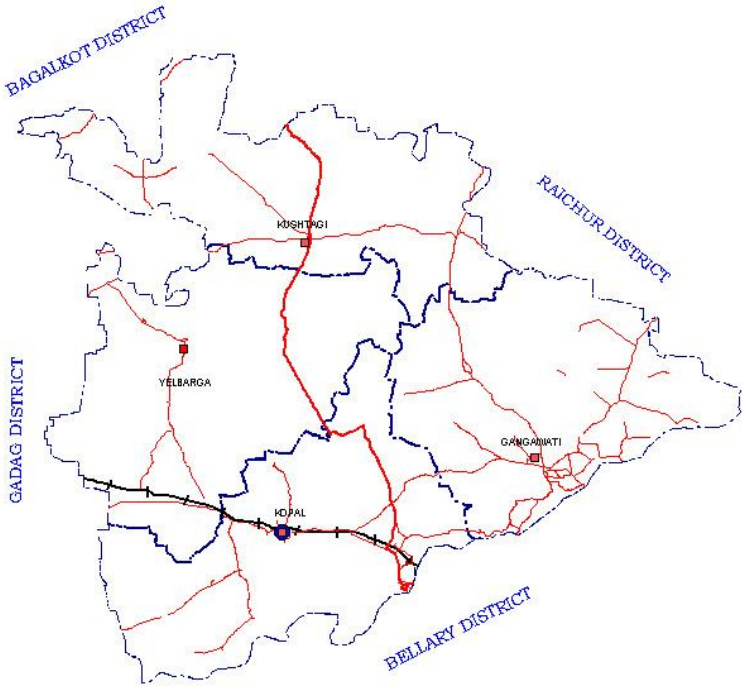
GOVERNMENT OF INDIA

MINISTRY OF WATER RESOURCES

CENTRAL GROUND WATER BOARD

GROUND WATER INFORMATION BOOKLET

KOPPAL DISTRICT, KARNATAKA



SOUTH WESTERN REGION

BANGALORE

FEBRUARY 2013

सुशील गुप्ता
अध्यक्ष
केन्द्रीय भूमि जल बोर्ड,
जल संसाधन मंत्रालय,
भारत सरकार,
भूजल भवन, एन एच. - 4,
फरीदाबाद.

Sushil Gupta
Chairman
Central Ground Water Board,
Ministry of Water Resources,
Government of India,
Bhujal Bhawan, NH-IV,
Faridabad.

FOREWORD

Groundwater is an essential component of the environment and economy. It sustains the flow in our rivers and plays an important role in maintaining the fragile ecosystems. The groundwater dependence of agrarian states like Karnataka is high. Recent studies indicate that 26 percent of the area of Karnataka State is under over exploited category and number of blocks is under critical category. In view of the growing concerns of sustainability of ground water sources, immediate attention is required to augment groundwater resources in stressed areas. Irrigated agriculture in the state is putting additional stress on the groundwater system and needs proper management of the resources.

Central Ground Water Board is providing all technical input for effective management of ground water resources in the state. The groundwater scenario compiled on administrative divisions gives a better perspective for planning various ground water management measures by local administrative bodies. With this objective, Central Ground Water Board is publishing the revised groundwater information booklet for all the districts of the state.

I do appreciate the efforts of Dr. K.Md.Najeeb, Regional Director and his fleet of dedicated Scientists of South Western Region, Bangalore for bringing out this booklet. I am sure these brochures will provide a portrait of the groundwater resources in each district for planning effective management measures by the administrators, planners and the stake holders.

Sushil Gupta

CHAIRMAN

PREFACE

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 30 districts of Karnataka state, of which six of the districts fall under farmers' distress category.

The Yadgir 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 Sri.N. Nagaraja, Scientist 'D', Central Ground Water Board, South Western Region, Bangalore. The figures were prepared by Sri. J.Sivaramakrishnan, Assistant Hydrogeologist. The efforts of Report processing section in finalizing and bringing out the report in this format are commendable.

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.

(Dr. K.Md. Najeeb)
Regional Director

KOPPAL DISTRICT AT A GLANCE

1	**GENERAL INFORMATIOM**	**STATISTICS**
	i) Geographical Area	5559 sq.km.
	ii) No. Of Taluks	4, Koppal, Kushtagi. Gangavati and Yelaburga.
	No of Hoblis/villages	20/628
	iii) Population (as on 2011 census)	1391292
	iv) Average Annual Rainfall	572 mm
2	**GEOMORPHOLOGY**	
	Major Physiographic Units	2
	Major Drainages	3
3	**LAND USE**	
	a) Forest Area (sq.km)	294.51
	b) Net Area Sown (sq.km)	3807.00
4	**MAJOR SOIL TYPES**	1. Black Cotton Soil 2. Red Soil 3. Red Sandy Soil
5	**Main crops grown in the district during 2009-10 (cropped area in hectares)**	
	Total pulses	74581
	Mulberry	173.80

	Cotton	17514
	Sugarcane	945
	Sunflower	83434
	Groundnut	48093
	Total oil seeds	150090
	total vegetables	8785
	Wheat	11267
	Maize	41056
	Bajara	56210
	Total friuts	9113
6	**Area irrigated in hectares by different source (2009-10)**	
	Dug wells	0
	Bore wells	562
	Tanks	174
	Canals	37568
	Other Sources	240
	Lift Irrigation	1309
	Gross Area Irrigated	96019

	No .of Ground Water structures Domestic BW Piped water supply	4985 299	
7	**Number of ground water monitoring wells of cgwb (as on 31.03.2011)**		
	Dug wells	30	
	Piezometers	7	
10	**Predominant geological formations**	Peninsular gneissic complex consisting of Granites, Gneisses and Dharwar group consisting of schist's	
11	**Hydrogeology**		
	Major Water Bearing Formations	Weathered and fractured Granites, Gneisses and schists,	
	Premonsoon Depth to Water Level (2011)	1.910 to 12.200 mbgl	
	Postmonsoon Depth to Water Level (2006)	1.320 to 1355 mbgl	
	Long Term Water Level Trend (1997-2006)(in m per year)	Premonsoon mean2001-2010 waterwaterlvevel recorded	3.009m in ganagavathi taluk minimum to10.706m asa maximum in koppal taluk water levels is recorded

		Postmonsoon mean2001-2010waterlevelrecorded	1.272m ingangavati taluk as a minimum to9.539m maximum water levels is recordedin yelburgataluk
12	**GROUND WATER EXPLORATION BY CGWB AS ON MARCH 2007**		
	EW (Depth Range /Discharge range) 19	Depth – 40- 80m Discharge –0.1-7.6 lps	
	OW(Depth Range /Discharge range) 17	Depth - 11- 80 m	
	Transmissitivity (m^2/day)	0.2 to 900	
	Storitivity (S)	3.2 X 10^{-4} to 5.84 X 10^{-4}	
13	**Ground water quality**		
	Presence of chemical constituents more than permissible limits	Fluoride. Nitrates and TDS in few packets.	
	Type of water	Potable to Brakish	
14	**Dynamic ground water resources (2004) in ham**		
	Annual replenishable ground water resource	701.49	
	Net annual ground draft	337.80	
	Projected demand for Domestic and Industrial use up to 2025	60.48	
	Stage of ground water Development (%)	48.12	

15	**Water management training programmes organized**	On 13th and 14th November2003 WMTP programmewas onducted on "Artificial Recharge to GroundWater techniques" at Koppal town. There were about 120 participants.
16	**Efforts of artificial recharge and rainwater harvesting**	-
17	**Ground water control and regulation** No of OE Blocks No of Critical Blocks	Not Notified 3 (part) 1 (part)
18	**Major ground water problems and issues**	Rainfall is erratic, irregular and deficit, Application of traditional farming and irrigation methods, unscientific development of groundwater, Brackishness salinity of groundwater along the major river courses and command area's ,and nitrate, fluoride problems.

1.0 INTRODUCTION

The Koppal district came to existence on 1st April1998 by carving out of erst-while Raichur district of Karnataka with a geographical area of 5559 sq km, located in the northern part of the state with four taluks namely, Koppal, Yelburga Gangavati,and Kustagi. It lies between north latitudes 15°09' and 16° 01' and east longitudes 75° 46' and 76° 48'. It is one of the backward districts in the northern part of the state and situated in the old Hyderabad- Karnataka region. The district has 588 inhabited and 40 uninhabited villages with a total population of 1391292, as per 2011 census. The area falls in the Tugabhadra sub-basin of the Krishna basin. Tugabhadra river flows in the southern boundary of the districct in north –easterly direction. Koppal district is bordered by Bagalkot district in the north, Raichur in the east, Bellary in the south and Gadag district in the West.

1.1Administrative set-up

There are 594 inhabited villages and 4 town municipalites in the district. The administrative map of the district is presented in Fig-1 and the details are given in table 1.1 The district has been divided in to 4 taluks , namely Gangavathi, Koppal, Kustagi and Yelaburga. These four taluks are divided in to 20 hoblies consisting of 594 inhabited villages and 35 uninhabited villages thus making a total of total 629 revenue villages and 134 united grampachayaths. The details of the administrative divisions are shown in table1.1. Koppal district falls in North Dry Zone (Zone – III of Agro climatic Zones of Karnataka).

The total geographical area of the district is 5, 52,495 ha of which 3, 80,721 ha is cultivable area. The district has a total of 2, 08,478 farm families of which the number of small & marginal farmer is 1, 28,404 which accounts to 62% of farm families.

The district has an average annual rainfall of 572 mm. Soils are well drained red sandy loam to medium deep black soils. Total literacy percentage of the district is 55.02 with male literacy 69% and female literacy 40%.The district has two major irrigation projects namely, Tungabhadra & Hire hall Projects which irrigates 46,000 & 48,460 ha respectively. The district has 76% of the cultivable land under rain fed condition and 24% under irrigated condition. 36% of the net area are sown more than once which Leads to high cropping intensity of 137% (both rain-fed & irrigation).The Koppal District has 11,615 ha of land under horticulture crops which is 3% of the district area and 0.76% of the state. In the scenario of industry promotion the district has 3020 small and marginal industrial units of which 399 (13.00%) are based on agriculture are allied units. The district has 106 rice mills with a capacity of 34000 m.t. and provides employment to 1060 similarly 160 flour mills with capacity of 16 m.t. provides employment for 320,26 decorticators with a capacity of 32 m.t. provide employment to 80 people. There are 16 regulated markets; five in Yelburga taluk, 4 each in Gangavati & Koppal, 3 in Kustagi taluk. There are two cattle markets, one at Ginigera and another at Sriramnagar of

Gangavati taluk. The sheep market at Kukampalli in Koppal taluk assist agriculturists for their cattle and animal trading.

Table 1.1 showing administrative setup 2009-10

Taluk	Hoblies	Grampam chayaths	Inhabited villages	Un inhabited villages	Revenue villages
Gangavathi	8	38	148	9	157
Koppal	4	35	144	7	151
Kushtagi	4	38	164	13	177
Yelburga	4	33	138	6	144
Total	20	134	594	35	629

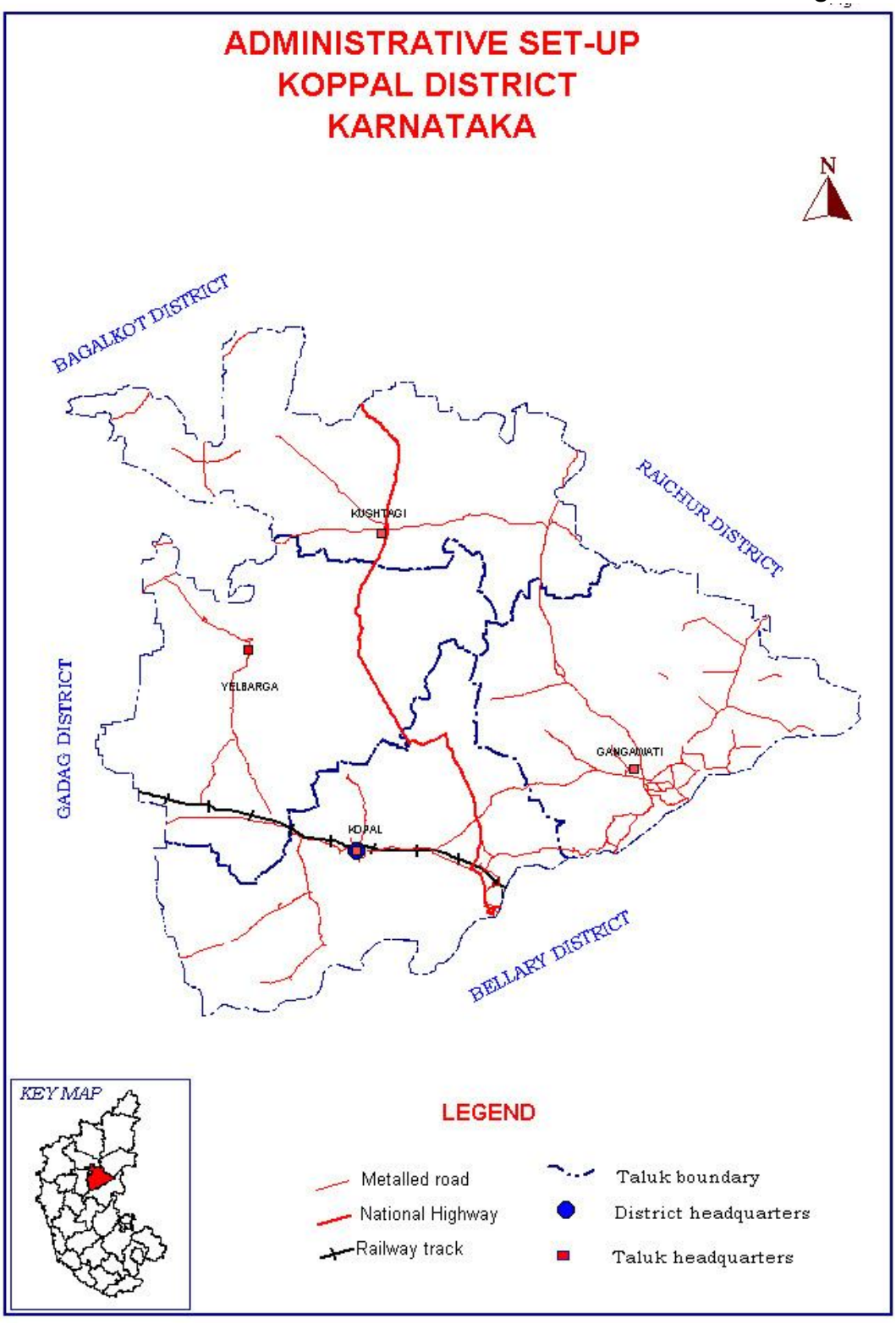
Source: web koppalnic.in

1.2 **Communication**:-

The district is having a good network of roads connecting neighboring taluks and districts. National Highway [NH-13] enters the taluk at Huligi from Hospet and leaves the taluk near Sulikeri and proceeds to Kustagi and further to Sholapur. The NH-13 is 15.60 kms from Koppal. The National Highway [NH-63] enters the taluk near Lakmapur of Yelburga taluk and joins NH-13 near Huligi. The NH-63 enters the district from Gadag. This highway joins the Coastal NH-17. The district is connected by broad gauge railway line, which enters the Koppal taluk from Gadag via. Yelburga taluk near Bhanapur village and passes through Koppal headquarter and leaves the taluk near Munirabad and proceeds to Hospet in Bellary district then further to Guntakal. The length of railway is 34kms in Koppal Taluka and 18 kms in Yelburga Taluka. The goods transport facility is also available from Koppal and Munirabad stations.

The air strip facility is available at Ginigera in Koppal taluk between Koppal and Munirabad is being used and managed at present by M/s MSPL. The airstrip can operate small planes with limited-seat capacity.

Fig. 1


ADMINISTRATIVE SET-UP
KOPPAL DISTRICT
KARNATAKA
N
BAGALKOT DISTRICT
RAICHUR DISTRICT
GADAG DISTRICT
BELLARY DISTRICT
KUSHTAGI
YELBARGA
GANGAVATI
KOPAL
KEY MAP
LEGEND
Metalled road
National Highway
Railway track
Taluk boundary
District headquarters
Taluk headquarters

1.3 Agriculture :

Agriculture in Koppal district is dependent upon rainfall, irrigation tanks, wells, streams etc. The major agricultural crops grown are Jawar, Bajra, Wheat, Maize, Paddy, Horsegram, Greengram, Cowpeas and the commercial crops are Groundnut, Till, Cotton, Niger seeds, Castor, Sunflower, Sugarcane etc. Agriculture in Gangavathi taluk is dependent mainly on Tungabhadra canal irrigation, rainfall, tanks, wells, streams etc. The major agricultural food crops grown are Paddy, Bengal gram, Bajra, Jower, Navane, Horsegram, Turdal, Greengram, Cowpeas, Maize and Wheat and the commercial crops are Sunflower, Groundnut, Till, Cotton, sugarcane, Castor, and Nigerseeds. The taluk grows two major varieties of Paddy, the IR-64 and the BPT-32054. Agriculture in Kustagi and Yelburga taluk is dependent mainly on rainfall, tanks, wells etc. The water table in the taluk is low and there is restriction for new borewells and the entire taluk is declared as grey area for agriculture.

1.3.1 Horticulture :

The district comes under northern dry zone and the climatological factors are very much suitable for growing the horticulture crops and now a days horticulture plays a prominent role in the local occupation. At present the district is having an area of about 14329 ha (2004) under horticulture. The important crops are fruit crops, vegetable crops, plantation crops, spices and flower crops. The major fruit crops includes pomegranates, grapes, mango, sapota, citrus, guava, papaya etc.

The major vegetable crops are leafy vegetables tomato, Onion, brinjal, gourd verities, gerkins, and so on, now days the district is known to be popular for seed production specially tomato seed production, Chilli seed production and also watermelon seed production by private companies with the help of local farmers and seed production is very much localized to the Yelburga taluka.

The crops like chilly, coconut, tamaried and corriender are the important and special crops. Oil palm is one of the major plantation crops of the Koppal taluk and the farmers of the district are know days planning to grow date palms as dry land fruit crop. Looking in to the floriculture in the district, jasmine, marigold, Rose and Sugandhraj are Important flower crops.

At the moment, pomegranate leads among the fruit crops ie., almost 30-35% of the district area, grapes 15-20% mango 20-30% and others 10-15%. The Kustagi taluk of the district is considered as Pomegranate export pocket. Mango is another important fruit crop in the district.

The farmers of the district are very much interested in adopting hi-tech horticulture such as green house cultivation of vegetables, growing flowers under controlled conditions, keeping high standards of export in mind. Water management practices, specially drip Irrigation and sprinkler Irrigation are important features of the district. Oil palm crops distributed at Kavalur, Hirebidnal, Hiresindogi and Irkalgad areas covers about 435 ha.

Sericulture

Koppal District in having limited Sericulture activity, many variety of mulberry are cultivated for this purpose.

1.4 Work carried out by CGWB

The central ground water board has carried out systematic Hydro geological surveys, Reappraisal Hydro geological surveys and Tungabhadra canal command area surveys during the period from1976 to 1979. Apart from this ground water exploration and ground water regime monitoring are being carried out.

1.5 Basin drainage

Tungabhadra is a perennial river formed by the union of two rivers, viz., the Tunga and the Bhadra, both of which rise at Gangamula in the Varaha Parvata of the Western Ghats. This is also a perennial river, very deep in certain places and almost unaffordable even in the dry season. very deep in certain places and . This river enters the district near Kesalapur village at the south-western tip of Koppal Taluk. The general slope of the land in the district being north-west to south-east, the Tungabhadra has a large number of rivulets and streams serving as tributaries. But none of these streams is of any great importance by itself and they generally go dry during the summer. There is Tungabhadra reservoir at Munirabad which is in the border of koppal taluk. The Tungabhadra is reputed as one of the important rivers of South India.

The district is part of Krishna basin also. The main streams draining the area are Maskinala, Ilkal-nadi and Hirenala which are Ephemeral in nature with dendritic to sub-enteric drainage pattern. The drainage density varies from 1.4 to7.0kms/sq.km. The drainage map is presented as Fig-2.

1.6 Land use

About 69% of the area in the district is the net sown area during 2009-10 and forest occupy about 5.3%. Total land not available and out for cultivation is about10%. Area like non agricultural land is7% and barren land is about4%. Other -cultivable waste land is about 0.5 % . The details of land use are shown in table-2.

Fig. 2

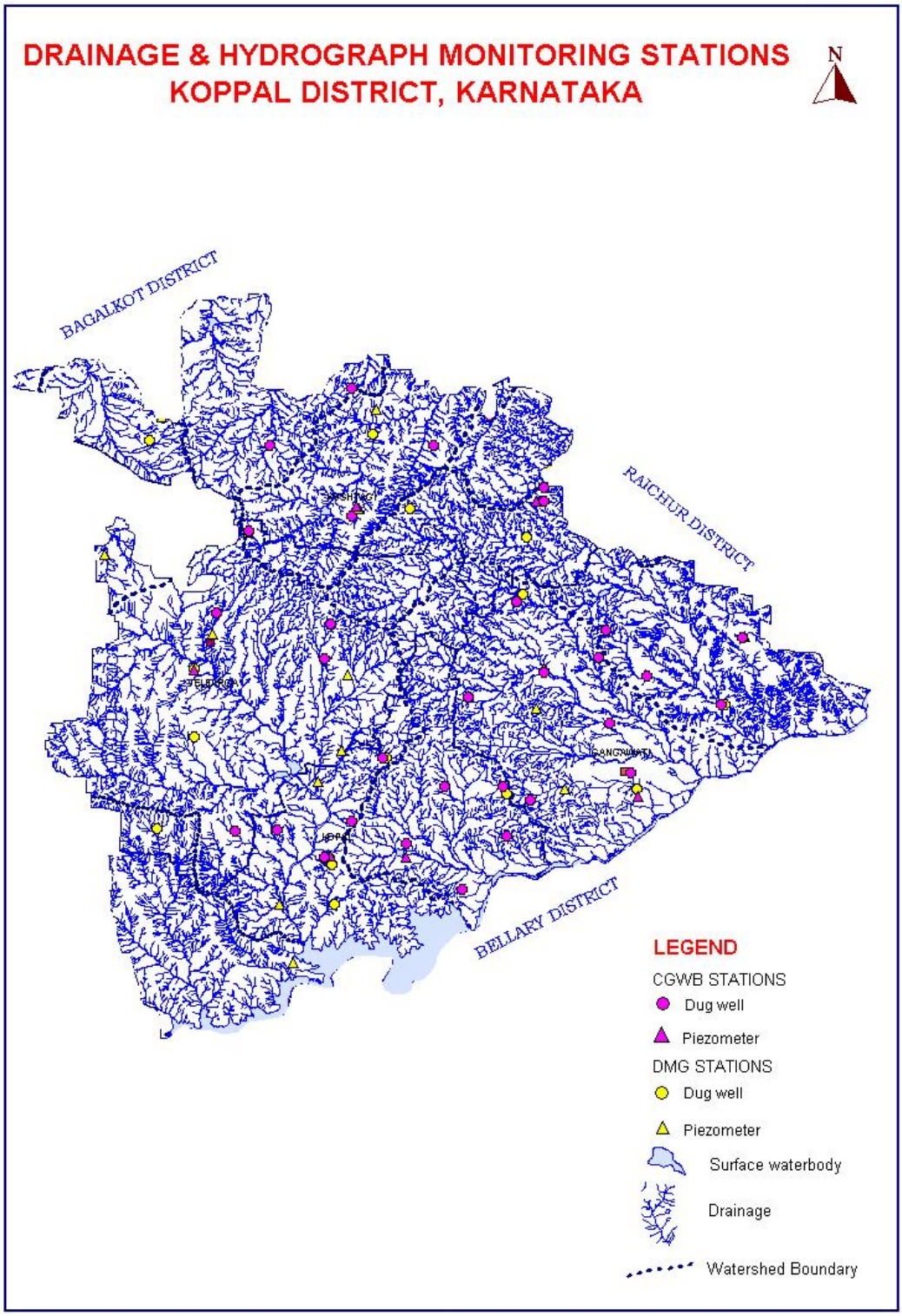

DRAINAGE & HYDROGRAPH MONITORING STATIONS
KOPPAL DISTRICT, KARNATAKA
N
BAGALKOT DISTRICT
RAICHUR DISTRICT
BELLARY DISTRICT
KOPPAL
GANGAVATI
LEGEND
CGWB STATIONS
Dug well
Piezometer
DMG STATIONS
Dug well
Piezometer
Surface waterbody
Drainage
Watershed Boundary

Table-2 showing land utilization in Koppal district 2009-10 (in hectares)

Taluk	geographical area	Forest	Non agricultural	Barren	Cultivable waste	Net Area sown	Permanent Pasture
Gangavathi	132131	14482	7680	4651	560	80950	7193
Koppal	136755	10779	20401	6790	430	90043	1486
Kustagi	135779	4110	7626	2361	811	02424	3898
Yelburga	147830	80	3163	2825	767	107124	2098
Total	552495	29451	38870	16627	2568	380541	14675

Source: web koppal nic.in

2.0 RAIN FALL AND CLIMATE

Koppal district experiences a semi-arid type climate characterized by hot summer and low rainfall. It is cool and pleasant during major part of the year except during the summer months of March to middle of June. The coldest period is December to January minimum temperatures reaches up to 16°C and maximum reaches upto 45°C during hot summer. The district is characterized by dryness for the major part of the year because of less rainfall. The annual normal rain fall is 571.92 mm and normally rain commences in June and continues up to November. Heavy rainfall during the months of September and October contributed by the south west monsoon forms 65% of the annual rainfall and the district gets about 46 rainy days in a year. In general, rainfall decreases from west to east. The climate of the district is very hot and dry. Hot season starts from middle of the February to end of May. Southwest monsoon ranges from June to end of September. Cold season is from December to middle of February. The taluk wise long term average rainfall is given in table 2.1 and distict as well as taluk wise rainfall during the year 2011 is given in table 2.2.

Table2.1 taluk-wise longterm average rainfall data (m.m)

Sl. No	Taluk	Total Number of working stations	Normal rainfall (1941-1990)	Actual average rainfall(m.m) (2009)	Actual average rainfall(days) (2009)
11	Gangavathi	9	9588	948	37
2	Koppal	8	1590	917	42
3	KUSHTAGI	6	562	913	46
4	YELBURGA	7	597	902	46
5	TOTAL	30	584.3	921	46

Source: web, koppalnic.in

TALUK WISE RAINFALL FOR THE YEAR 2011, KOPPALA DISTRICT, KARNATAKA													
DISTRICTS/ TALUKS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	ANNUAL
	Rainfall (mm)												
KOPPALA	**0**	**0**	**1**	**48**	**59**	**44**	**128**	**99**	**39**	**33**	**2**	**0**	**453**
GANGAVATHI	0	0	1	76	82	64	107	58	45	54	7	0	494
KOPPALA	0	0	1	45	30	20	217	193	42	17	2	0	567
KUSHTAGI	0	0	1	40	64	51	101	82	22	36	0	0	397
YELBURGA	0	0	0	32	58	42	87	62	47	25	0	0	353

3.0 GEOMORPHOLOGY AND SOIL TYPES

The district, moderately plain with shallow troughs and mounds of granite hills appears to have a rugged topography. The highest peaks are found at Hanumasagar with an elevation of 728mts, at Ginigera with 622mts , and at Benekal with 697mts. above mean sea level. The average elevation of the district is about 500mts amsl. The main streams draining the district are Maskinala, Hirehalla, Ilkalnadi and their small tributaries which are of ephemeral in nature draining into Tungabhadra reservoir. The general drainage density varies from 1.2-7.0kms/sq.km

Soils are the weathering product of parent rock. The district is characterized by large stretch of barren plains covered with black soils. This may be the weathering product of biotite schist, amphibolite, or hornblende. Black cotton soil is seen in schistose, gneissic and granite terrain. Nalas are generally filled with loose sand,and kanker mixed grey sandy soil.

4.0 GROUND WATER SCENARIO

4.1 Hydrogeology

The district is mainly underlain by gneisses, granites and schists. The hard rock does not have any primary porosity. However, weathering, fracturing, joints and tectonic features like folds and faults develop secondary porosity and permeability in these rocks which stores and yield water to the wells. The main source of recharge is precipitation and weathered thickness is reported upto 20m bgl. In general, ground water available in the weathered zone is under phreatic condition and under confined to semi-confined conditions in the jointed and fractured formations. Ground water is being developed through dug wells, dug cum bore wells and bore wells. Dug wells are commonly used for irrigation as well as for domestic purposes. Its depth ranges from 1.7m mbgl to 15.7m mbgl. Pink granite is more susceptible to weathering than gray granite. So, pink granite form good aquifer than gray granite. In granite gneisses the yield of the wells reported are in the range of 4-100m^3/day in dug wells, and in dug cum bore wells it

ranges between 28.8-42.3 m^3 withstanding pumping of 4-5hr/day and the specific capacity ranges between 35.0-240.5m^3/day/m. The wells taping schistose formation is poor yielding compared to granite and gneiss formations. The alluvium is found along major nala courses as thin lenses with thickness up to 8m mbgl. The diameter of dug wells are 3.5 to 5.0 m and the specific capacity reported is between 230 to 533 m^3/day/m. The bore wells drilled by farmers as well as government agencies for domestic and irrigation purposes have depth in the range of 40-70m and the yield of such wells ranges from less than 1 lps to 7.6 lps. The promising zone is between 30 and 60mbgl. The Central Ground Water Board in the district is maintaining 33 net work stations, which are being monitored four times in a year ie January, May (pre monsoon), August and November (post monsoon). The hydrogeological map of the district is presented as fig.3.

Depth to waterlevels

Pre monsoon depth to water level during 2011

As shown in fig-4 the water level is recorded in the range of 1.82 m to 12.26 m in the district . In general, western part of the district occupies water level in the range of 5-10m whereas, easteren part of gangavati and small patches of kushtagi taluk shows water levels in the range of 2 to 5m. Some parts of kushtagi, yelburga and koppal taluks occupies water levels in the range of 0-2m.

Post monsoon depth to water level during 2011

As shown in fig-5 the water level ranges from 0.82 m to 13.55 m. during the post monsoon period. The water levels deeper in the western part of the district. Shallowest water levels are observed in the south eastern part of the district during this season. Most of the area in the Yelburga taluk shows deeper water levels. .

Long term water level mean

Premonsoon long term water level mean for the period between 2001-2010 is available for 15 National hydrograph stations in the district. It is ranges 1.272 m minimum and9.539m maximum water level. Details are shown infig6

4.2 Results of ground water exploration byCGWB has drilled 19 exploratory and 17 observation wells so far under its ground water exploration programme. The depth range of these wells range between 11.00 to 80.00 m and discharge of theses wells ranges between 0.01 to 7.6 lps. The storitivity of the aquifers encountered ranges between 3.2 X 10^{-4} and 5.6 X 10^{-4} and transmissivity values ranges between 0.2 and 900 m^2 per day.

Fig 3

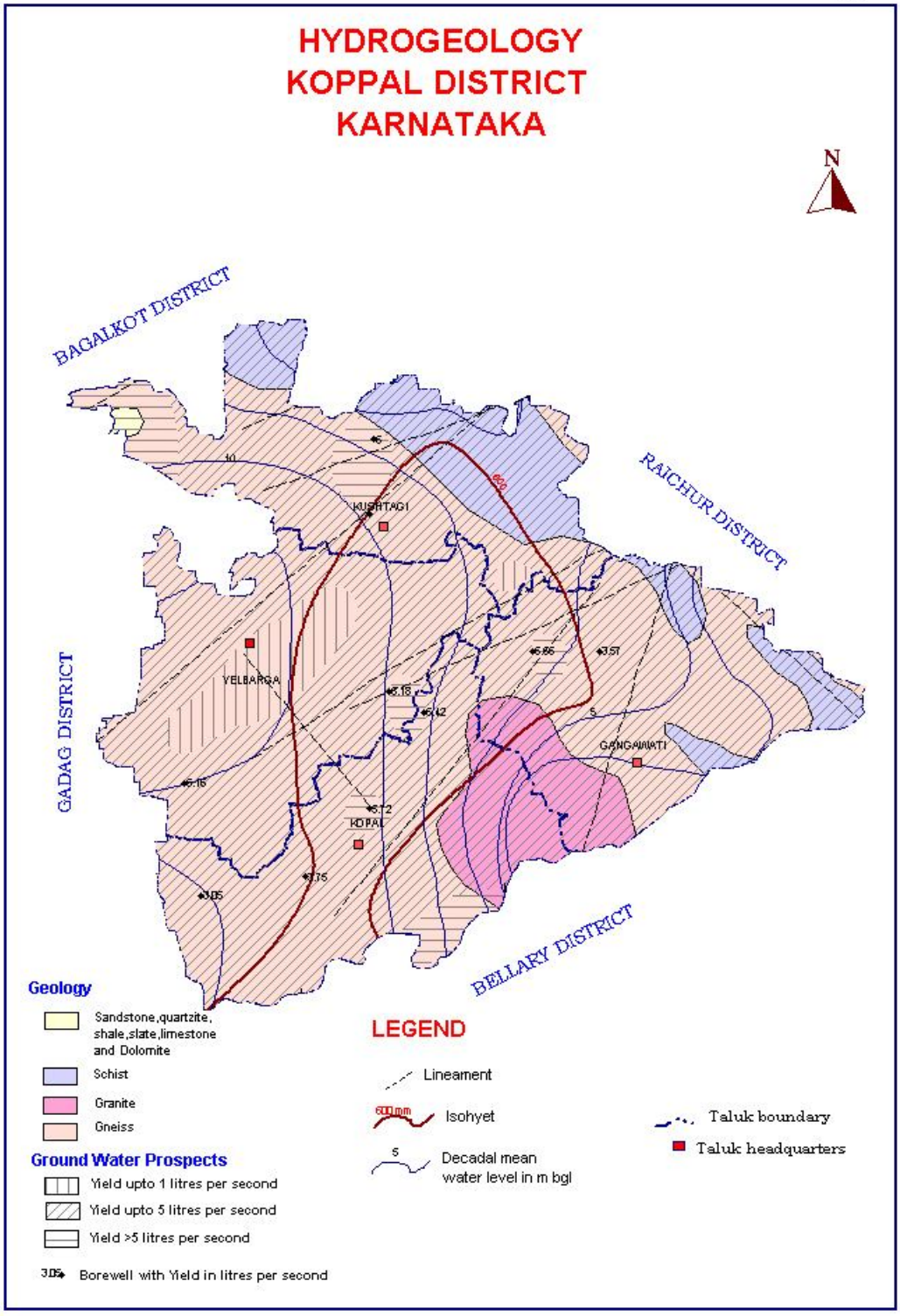

HYDROGEOLOGY
KOPPAL DISTRICT
KARNATAKA
N
BAGALKOT DISTRICT
RAICHUR DISTRICT
GADAG DISTRICT
BELLARY DISTRICT
KUSHTAGI
YELBARGA
KOPAL
GANGAWATI
Geology
Sandstone,quartzite, shale,slate,limestone and Dolomite
Schist
Granite
Gneiss
Ground Water Prospects
Yield upto 1 litres per second
Yield upto 5 litres per second
Yield >5 litres per second
Borewell with Yield in litres per second
LEGEND
Lineament
Isohyet
Decadal mean water level in m bgl
Taluk boundary
Taluk headquarters

Fig.4.

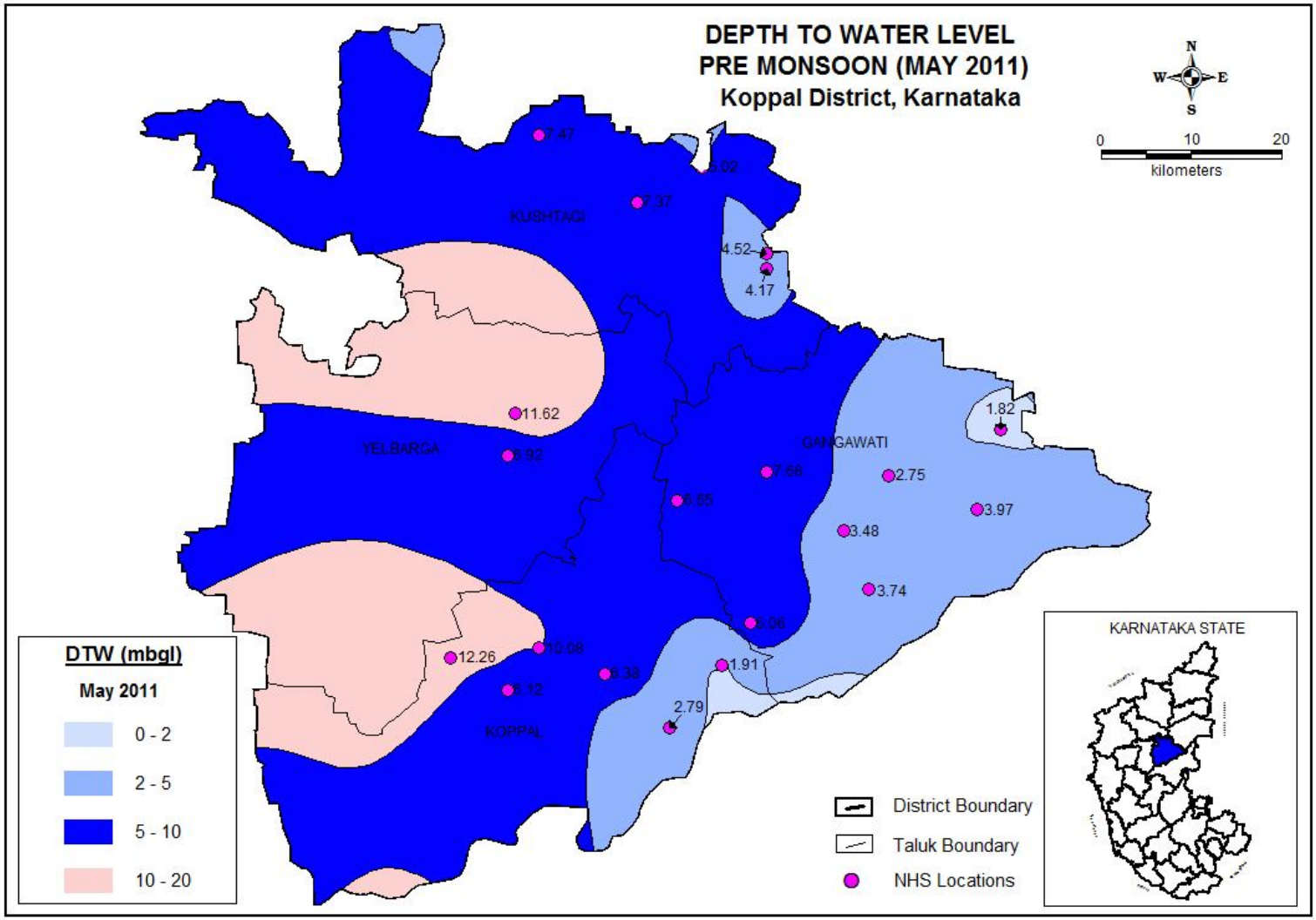

DEPTH TO WATER LEVEL
PRE MONSOON (MAY 2011)
Koppal District, Karnataka
N
W
E
S
0
10
20
kilometers
KUSHTAGI
YELBARGA
GANGAWATI
KOPPAL
7.47
7.37
4.52
4.17
11.62
1.82
2.75
3.97
3.48
3.74
12.26
10.08
1.91
2.79
DTW (mbgl)
May 2011
0 - 2
2 - 5
5 - 10
10 - 20
District Boundary
Taluk Boundary
NHS Locations
KARNATAKA STATE

Fig. 5

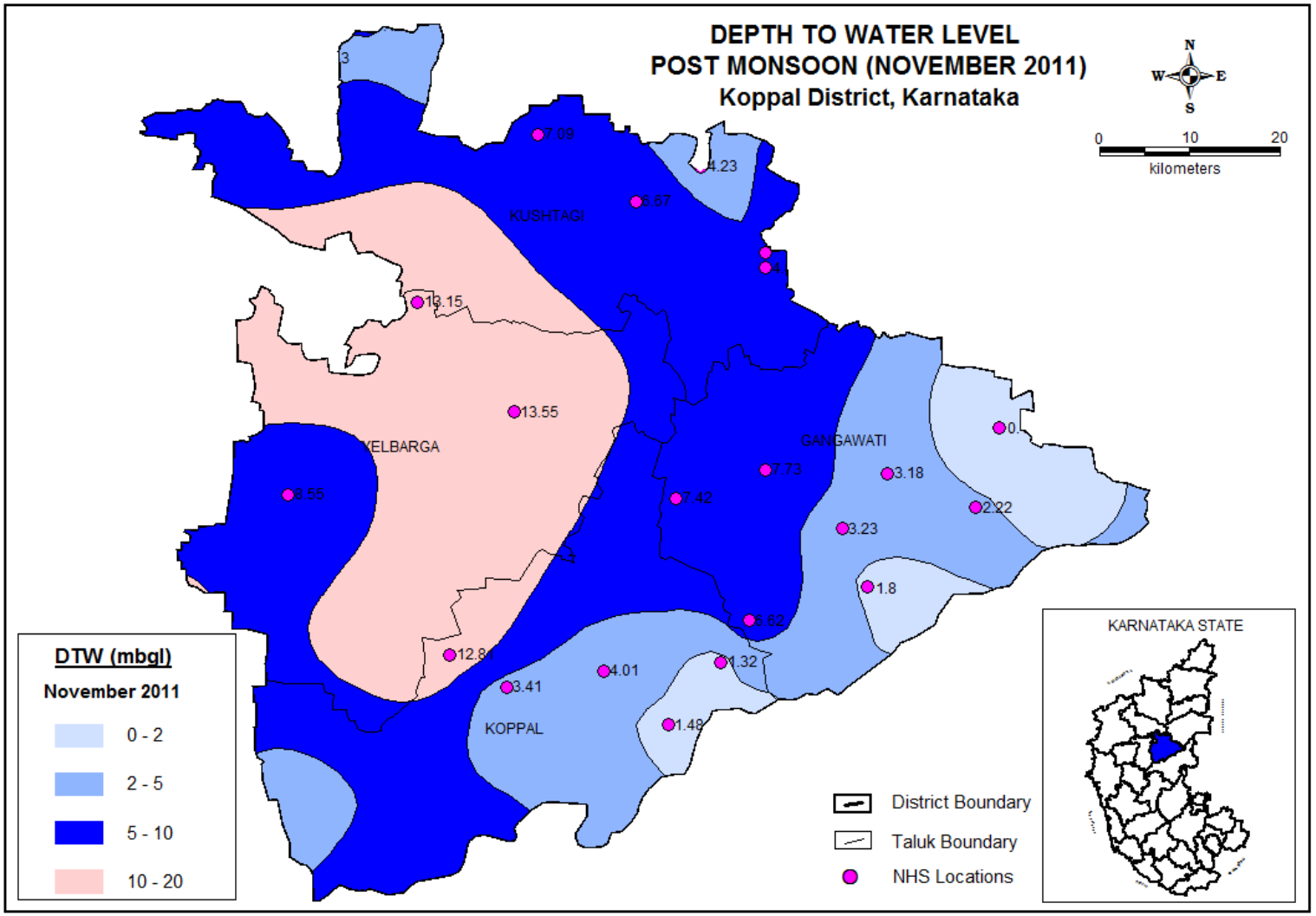
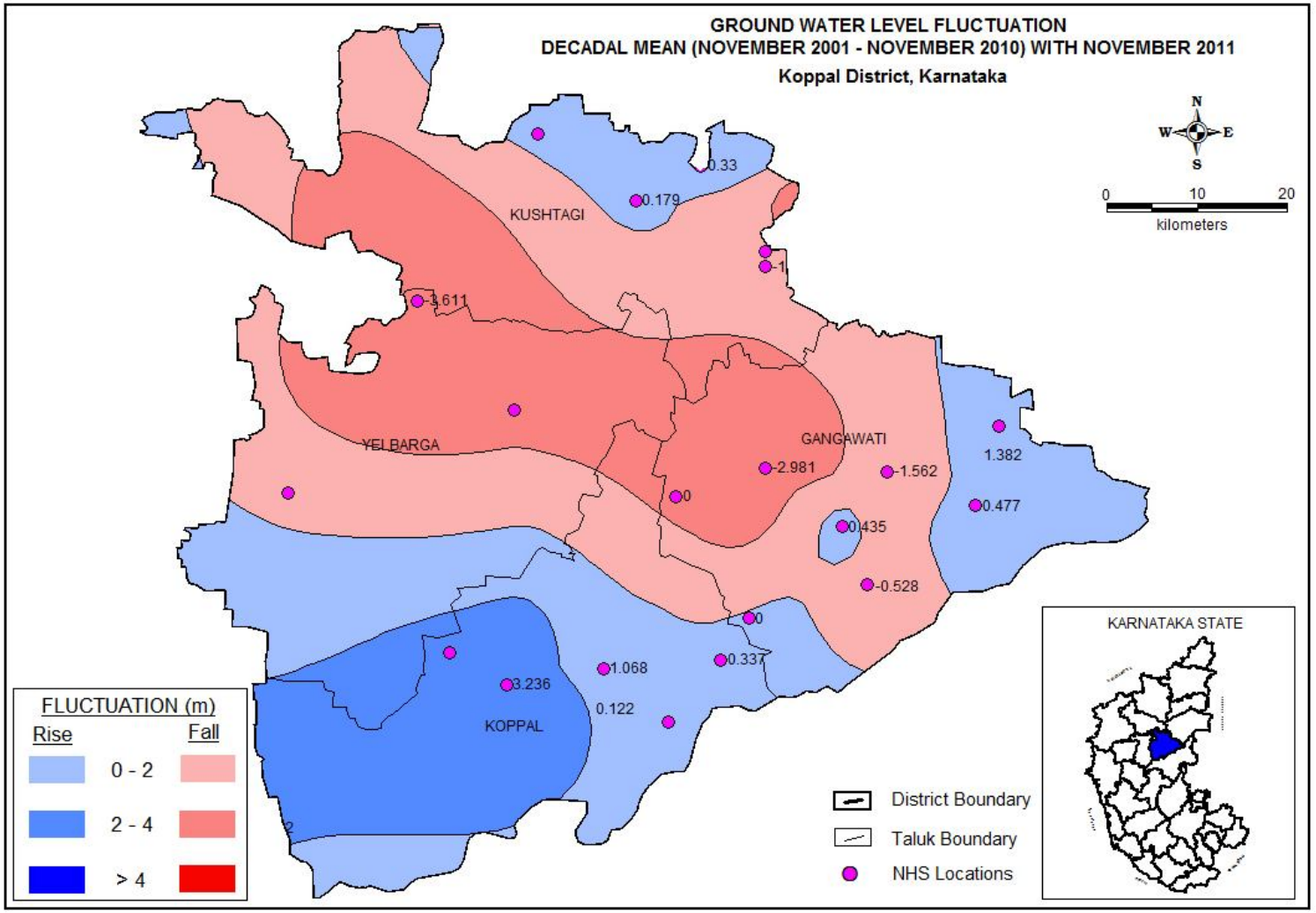

DEPTH TO WATER LEVEL
POST MONSOON (NOVEMBER 2011)
Koppal District, Karnataka
N
W
E
S
0
10
20
kilometers
7.09
4.23
6.67
KUSHTAGI
13.15
13.55
GANGAWATI
7.73
3.18
7.42
2.22
3.23
1.8
12.8
4.01
1.32
3.41
KOPPAL
1.48
DTW (mbgl)
November 2011
0 - 2
2 - 5
5 - 10
10 - 20
District Boundary
Taluk Boundary
NHS Locations
KARNATAKA STATE

Fig 6


GROUND WATER LEVEL FLUCTUATION
DECADAL MEAN (NOVEMBER 2001 - NOVEMBER 2010) WITH NOVEMBER 2011
Koppal District, Karnataka
N
W
E
S
0
10
20
kilometers
KUSHTAGI
YELBARGA
GANGAWATI
KOPPAL
0.33
0.179
-1
-3.611
-2.981
-1.562
1.382
0
0.477
0.435
-0.528
0
0.337
1.068
3.236
0.122
FLUCTUATION (m)
Rise
Fall
0 - 2
2 - 4
> 4
District Boundary
Taluk Boundary
NHS Locations
KARNATAKA STATE

Groundwater level fluctuation between decadal mean (Nov. 2001-Nov 10) and Nov 2011 shows both rise and fall in water levels. The central part recorded 2-4 m fall while a major part of the area recorded fall in the range of 0-2m as observed from fig.6. The southern part of the district recorded the maximum rise of water level in the range of 2-4m. Rise in water level in the range of 0 to 2 m is observed in the southern part and as two patches, one in the north and another one in the east of the district.

Groundwater level fluctuation between decadal mean (May. 2001-May 10) and May 2011 shows both rise and fall in water levels. Small patches in the central and south western part of the district recorded fall in water level while a major part of the area recorded rise in water level as observed from fig.7.. A major part of the district recorded rise of water level either in the range of 0 to 2 m or 2-4m almost in equal proportion.

Drinking water system

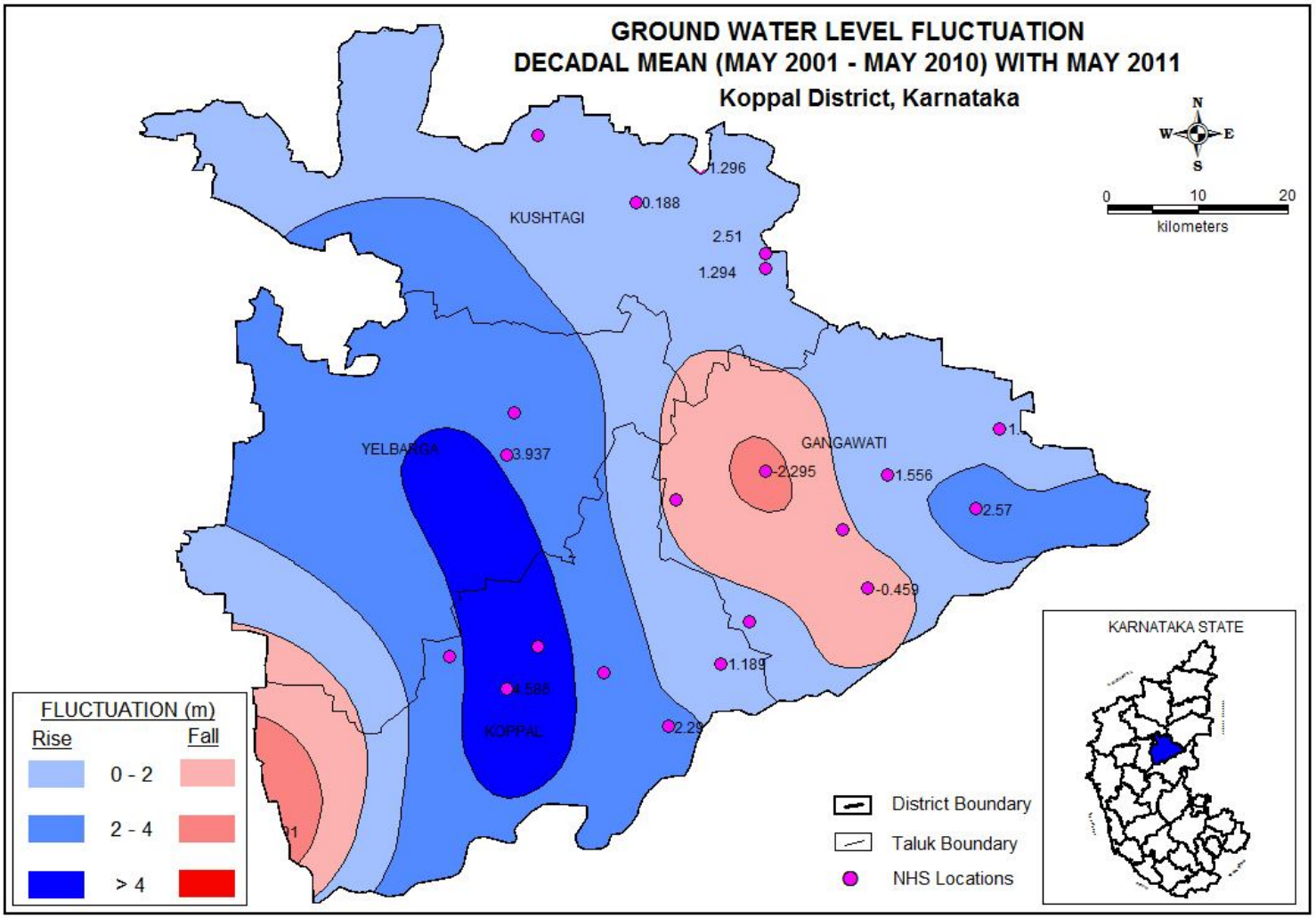
In the district except Yelburga town in all other taluk head quarters drinking water requirement is met from surface water sources. At Yeburga town and at other rural areas drinking and domestic water supply is met through borewells. A total of 4985 borewells are drilled for rural drinking water supply and out of this 299 are used for piped water supply schemes and 687 for mini water supply schemes.

Rainwater harvesting

The different rain water harvesting methods are to be adopted for this low as well as erratic rain fall region. Rain water harvesting may help in controlling flood and at the same time soil erosion. Artificial recharge structures are expected to augment the ground water resources in the district. Different type of artificial structures recommended for the district is shown in fig 9.

Rainwater collected on the rooftop is channeled through a system of PVC pipes and stored in an enclosed surface tank or allowed to infiltrate in to the ground through infiltration beds.. The pipeline consists of a first-flush device which flushes out the first rainfall along with other contaminants that may exist on the roof and then subsequent cleaner rainwater is allowed to pass on to the tank for direct use or infiltrated down to the groundwater through a sand bed filter.

Fig7


GROUND WATER LEVEL FLUCTUATION
DECADAL MEAN (MAY 2001 - MAY 2010) WITH MAY 2011
Koppal District, Karnataka
N
W
E
S
0
10
20
kilometers
KUSHTAGI
YELBARGA
GANGAWATI
KOPPAL
1.296
0.188
2.51
1.294
3.937
-2.295
1.556
2.57
-0.459
1.189
4.585
2.29
FLUCTUATION (m)
Rise
Fall
0 - 2
2 - 4
> 4
District Boundary
Taluk Boundary
NHS Locations
KARNATAKA STATE

4.3 Ground Water Resources

AS per the 1997 GEC methodology ground water resources estimated as administrative unit wise and the same for the year 2008-2009 is presented in Table-3.

Table. 3

No	Taluk	Net annual ground water availability	Existing gross ground water draft for irrigation	Existing gross ground water draft for domestic and ndustrial water supply	Existing gross ground water Draft for all uses	Allocation for domestic and industrial use for next 25 yrs	Net ground water availability for future irrigation development	Existing stage of ground water development	Catagorisation 2008-2009			
									Safe area (%)	Semicritical area (%)	Critical area (%)	Over-exploited area (%)
		ha m	ha m	ha m	ha m	ha m	ha m	ha m	%	%	%	%
1	Gangvati	32442	6085	666	6751	1056	25782	21	60	-	-	40
2	Koppal	8395	5248	485	5733	555	3804	68	20	20	-	60
3	Kushtagi	5233	3471	635	4106	770	1096	78	45	35	-	20
4	Yelburga	7641	10185	920	11106	950	98	145	15	-	-	85
5	Total	53711	34989	2706	27696	3331	30780			80		20

From the above table it can be concluded that major parts of Koppal, Gangavathi and Yelaburga are coming under over exploited category. A map showing categorization of areas as per ground water utilization is presented as Fig-8

Fig. 8

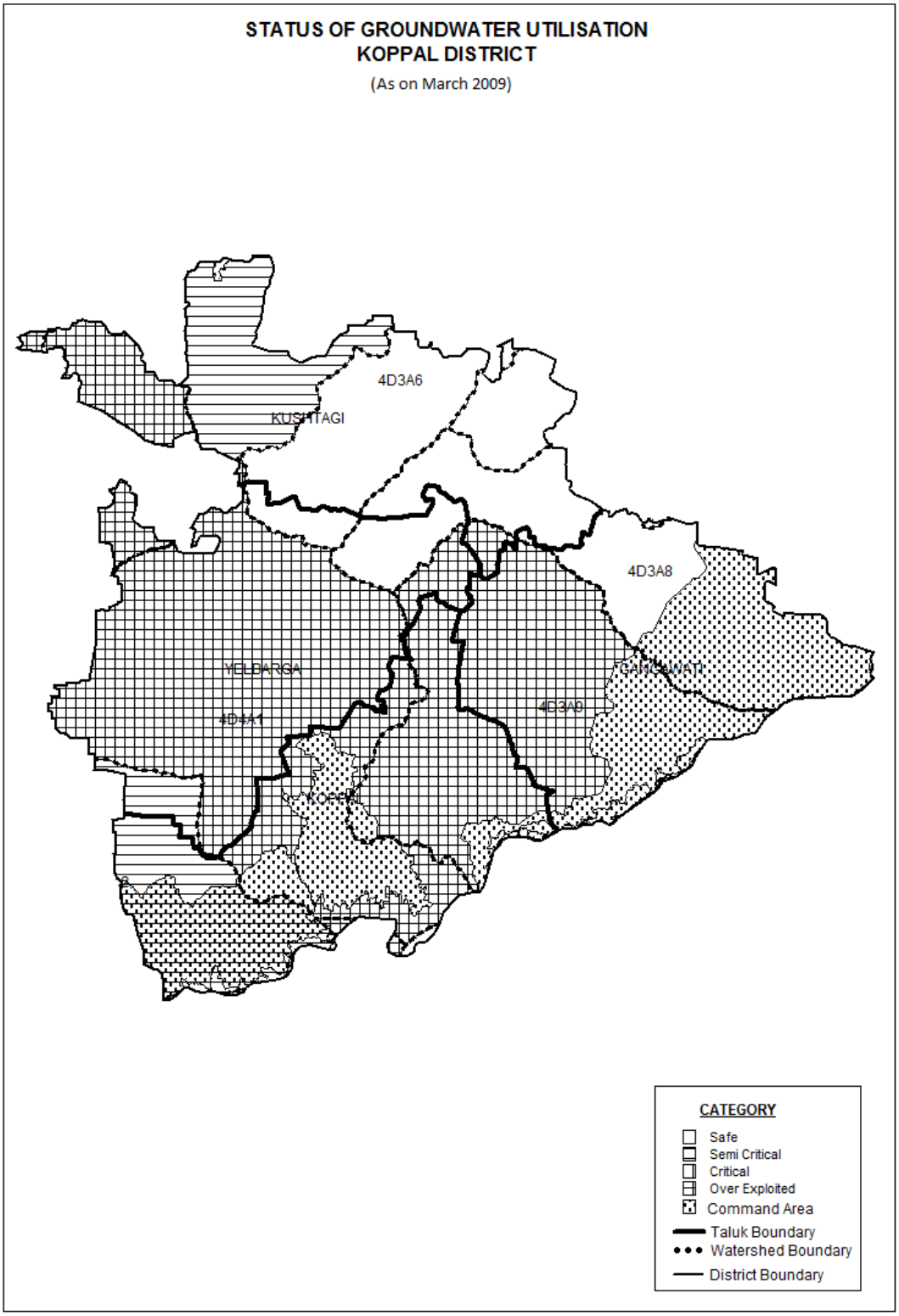
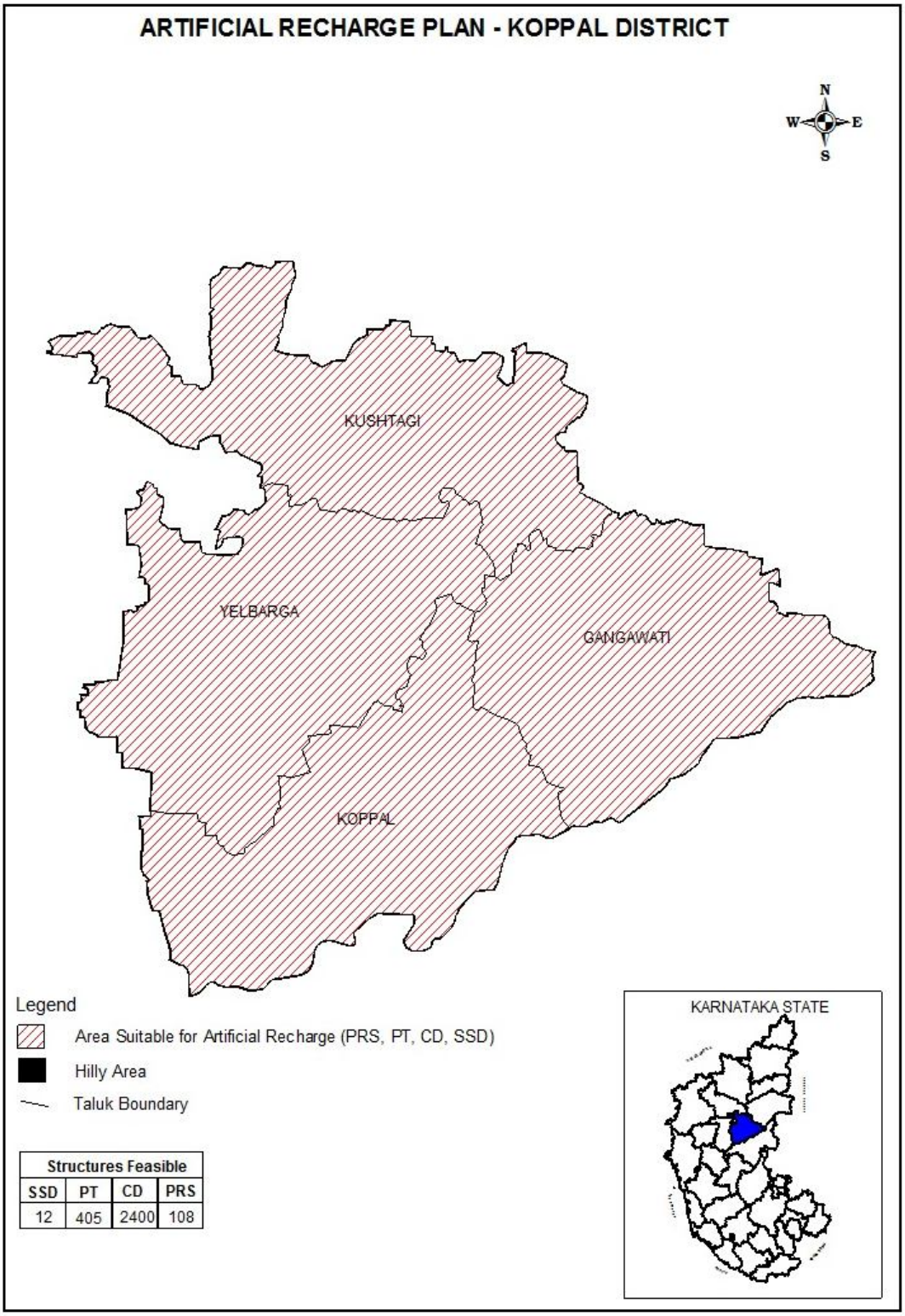

STATUS OF GROUNDWATER UTILISATION
KOPPAL DISTRICT
(As on March 2009)
4D3A6
KUSHTAGI
4D3A8
YELBARGA
4D4A1
4D3A9
KOPPAL
CATEGORY
Safe
Semi Critical
Critical
Over Exploited
Command Area
Taluk Boundary
Watershed Boundary
District Boundary

Fig 9


ARTIFICIAL RECHARGE PLAN - KOPPAL DISTRICT
N
W
E
S
KUSHTAGI
YELBARGA
GANGAWATI
KOPPAL
Legend
Area Suitable for Artificial Recharge (PRS, PT, CD, SSD)
Hilly Area
Taluk Boundary
Structures Feasible
SSD
PT
CD
PRS
12
405
2400
108
KARNATAKA STATE

4.4 Unit area annual groundwater recharge

Sustainability of groundwater resource depends mainly on two factors viz. Annual groundwater recharge and annual groundwater draft. The annual groundwater recharge depends on the quantity and intensity of rain fall, the infiltration characteristics of the soil, the depth to groundwater level, the slope of the area and the geomorphology. The groundwater recharge is assessed separately for the monsoon and non monsoon period due to rainfall as well as due to other sources. The annual groundwater recharge includes all the above.

The recharge from other sources includes return seepage from irrigated area, seepage from canals, seepage from water bodies, seepage from influent rivers etc. The recharge can be expressed in metres. In the state of Karnataka, the unit area recharge is grouped into four categories viz. 0.025-0.10m, 0.10-0.15m, 0.15-0.25m and 0.25-0.50m. In Koppal district the unit area annual recharge is in the range of 0.025 to 0.10m. and shown in figure 10.

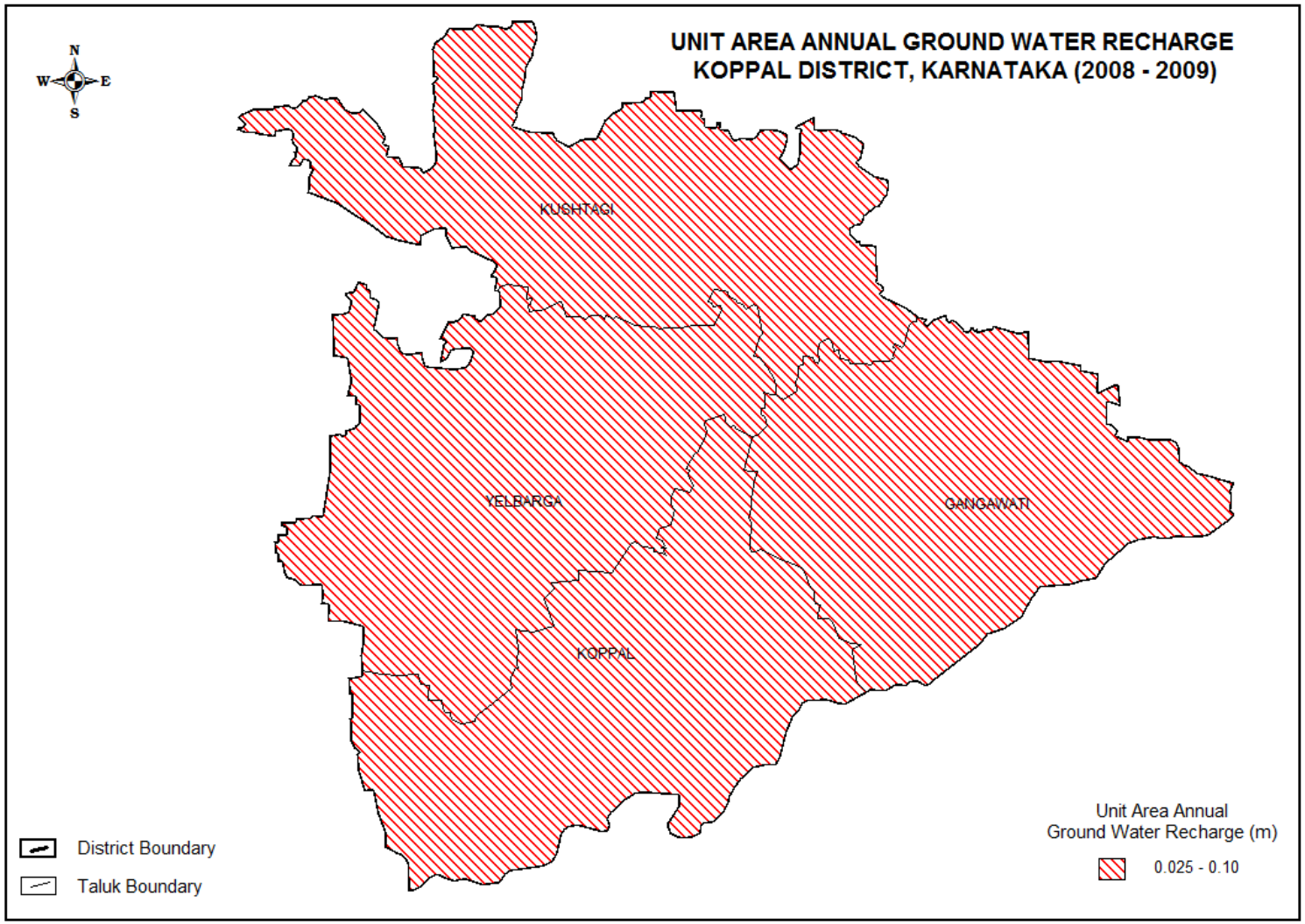
5.0 GROUND WATER DEVELOPMENT

As on 31.3.2006 in the district a total of 33526 I.P Sets were present consuming 62.60 lakh units/year. Taluk-wise net area irrigated in the district during 2005-06 is presented in the table-4. During the period in general about 49% of irrigated area is irrigated by ground water through wells and bore wells.

Table -4 showing net area irrigated in Koppal district 2009-10 in hectares

Taluk	canals	Tanks	Wells	Borewells	Lift irrigation	Other source	Total
Gangavathi	41278	0	0	6370	0	0	47648
Koppal	5860	105	566	18478	1309	0	26318
Kushtagi	0	150	0	8326	0	0	8476
Yelburga	0	100	800	12677	0	0	13577
District total	47138	355	1366	45851	1309	0	96019

Fig 10


UNIT AREA ANNUAL GROUND WATER RECHARGE
KOPPAL DISTRICT, KARNATAKA (2008 - 2009)
N
W
E
S
KUSHTAGI
YELBARGA
GANGAWATI
KOPPAL
District Boundary
Taluk Boundary
Unit Area Annual
Ground Water Recharge (m)
0.025 - 0.10

6.0 GROUND WATER QUALITY

As per hydrochemical data of National Hydrograph Stations for the month of May 2003 the Electrical Conductivity (EC) values of water samples ranges from 730-2870 micro mhos /cm at 25°c. Chloride in water is in the range of 43 to639 mg/l and floride in the range of 0.6 to 2.7 mg/l. As per the Bureau of Indian standards for drinking water the water having E.C less than 750 micro mhos/cm at 25°C is desirable and water having EC above 3000 micro mhos/cm at 25°C is unsuitable .The concentration of fluoride is generally found in the range of 1.0 to1.5 mg/l in the district with exceptions up to 2.7 mg/l noticed as pockets in Gangavathi and Kushtagi taluks.. The desirable limits for drinking purposes are less than 1 ppm. The concentration beyond 1.5 ppm is unsuitable. A ground water vulnerable map based on water quality is presented as Fig-11.

7.0 GROUND WATER CONSERVARION

The soil and moisture conservation works on water shed basis are being executed under different centrally sponsored, state sector and district sector schemes .The important schemes are;

(1) National watershed Development project for rain fed areas.

(2) River valley project.

(3) Desert development programme

(4) Special component plan

(5) Sumpurna gramina rojgar yojana/EAS.

Out of the total geographical area of 552495 hectars, 296151 ha is under rain-fed agriculture. As on 31-03-2002 about 112217 Ha had been developed on various watershed schemes and the details of the schemes are given in table-5.

Fig. 11

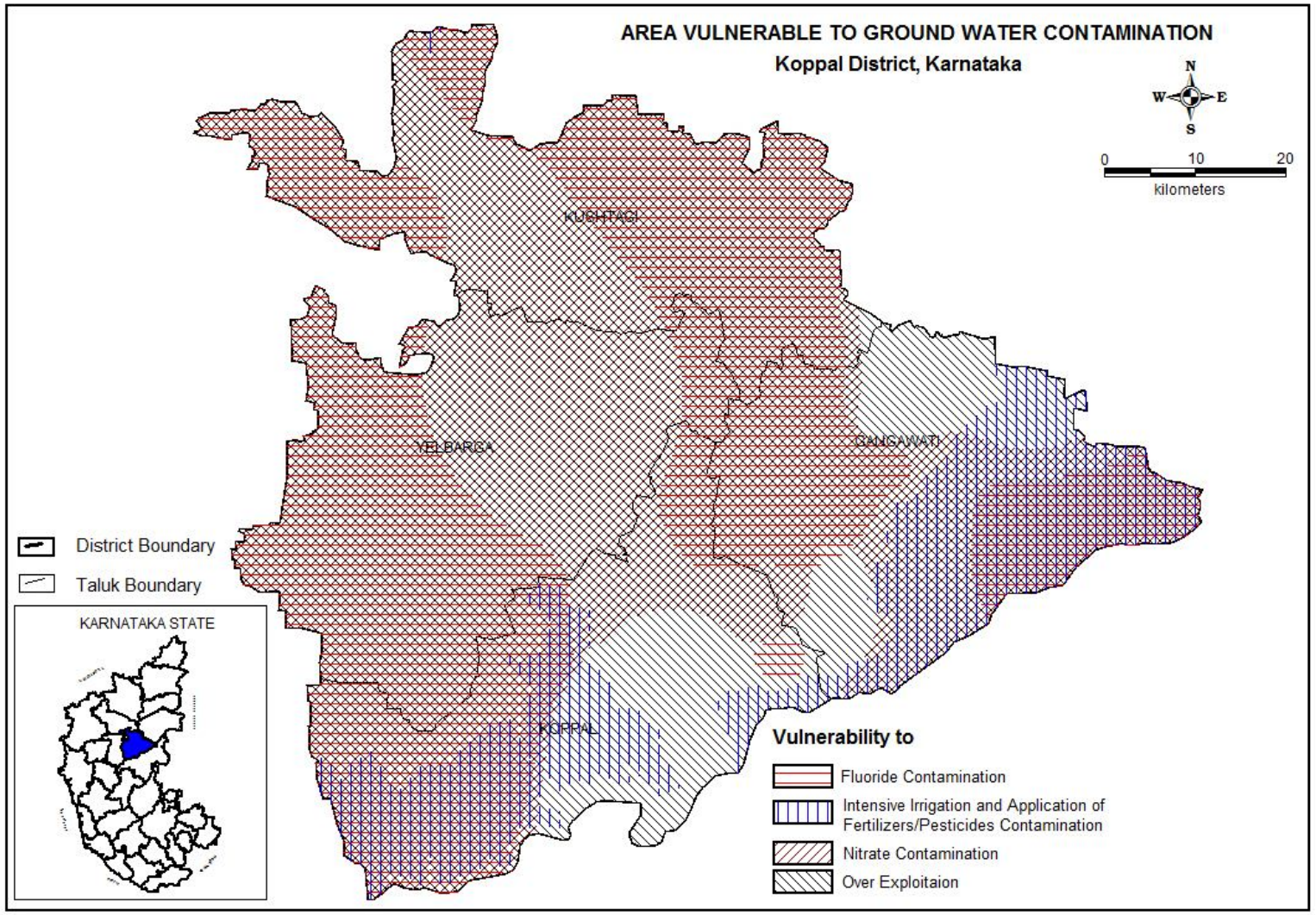

AREA VULNERABLE TO GROUND WATER CONTAMINATION
Koppal District, Karnataka
N
W
E
S
0
10
20
kilometers
KUSHTAGI
YELBARGA
GANGAWATI
KOPPAL
District Boundary
Taluk Boundary
KARNATAKA STATE
Vulnerability to
Fluoride Contamination
Intensive Irrigation and Application of Fertilizers/Pesticides Contamination
Nitrate Contamination
Over Exploitaion

Table –5 Different watershed development schemes in progress in the district.

Name of the schemes	Gangavathi **area in hectars**	Koppal **area in hectars**	Kustagi **area in hectars**	Yelburga **area in hectars**	Total area **in hectars**	No. of water-shed
SCP	164	141	138	138	581	-
EAS	427	1532	1345	1611	4915	20
DDP	-	3253	3309	3205	9767	87
NWDPRA	-	5679	2527	9618	17824	5
RVP	-	19609	6156	39552	63317	52
others	-	-	13813	-	1318	1
Total	591	30214	27288	54124	112217	165

8.0 AWARENESS AND TRAINING ACTIVITY

Training programme on ground water management was organised at J.H.Patel Auditorium, Zilla Panchayat office, Koppal During 13/11/2003 and 14/11/2003. Thirty trainees from various state government departments, NGOs, Educational Institutions from Koppal district participated in the training programme Officers of CGWB, SWR, presented seven lecture topics on the theme. Field visit to roof top harvesting site was arranged in Koppal town. Visit was also arranged to the construction site of Ashraya Housing Scheme being executed by Government of Karnataka and rooftop rainwater harvesting schemes prepared as part of field demonstration.

9.0 RECOMMENDATIONS

There is no scope for future ground water development in overexploited areas. Hence, ground water augmentation and conservation measures may be adopted in larger scale, and micro level ground water studies may be initiated for effective management of the ground water resources.

In the safe areas there is scope for ground water development. In Gangavathi taluk 43% of the total area is safe where,10261 borewells are feasible. Similarly, 4514 borewell are feasible in kushtagi taluk and 748 borewells in Yelburga taluk. These bore wells are feasible with an annual draft of 1.1ham/well. This may be taken up in a phased manner with annual growth rate of 5% .

The bore wells may be constructed up to a depth of 70m, and top weathered zone may be sealed with blank casing pipe to avoid well collapse.

For construction of bore wells scientific site selection may be made to minimize failure of wells. The yields from an irrigation bore well is expected to irrigate a minimum of 1.5 ha.

In areas of inferior water quality, attempts can be made to locate suitable sites for bore well construction, adjacent to canal/distributaries, so that wherever bad quality water is encountered it can be mixed with good quality canal water and supplied for irrigation. This may help to supply more water at the tail end of the canal command area.

The spacing in between two borewells may be kept about 300m to avoid mutual interference. This may reduce up to 150m in canal/tank command areas.

The 1st phase of ground water exploration by C.G.W.B. had been completed for the depth of less than100m, it is necessary to identify the deep aquifers beyond 100m.

In O.E.areas with deep water levels and areas with poor quality ground water artificial recharge with desilted surface water sources like tanks etc and rain water may be used.