केन्द्रीय भूमिजल बोर्ड

जल शक्ति मंत्रालय, जल संसाधन, नदी विकास और गंगा संरक्षण विभाग

भारत सरकार

Central Ground Water Board

Ministry of Jal Shakti,
Department of Water Resources, River Development
and Ganga Rejuvenation
Government of India

Report on

AQUIFER MAPPING AND MANAGEMENT PLAN

Hunsur Taluk, Mysore District, Karnataka

दक्षिण पश्चिमी क्षेत्र, बेंगलुरु

South Western Region, Bengaluru

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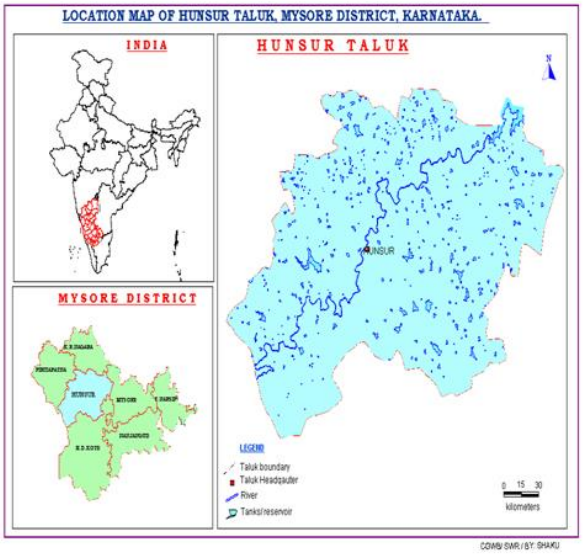
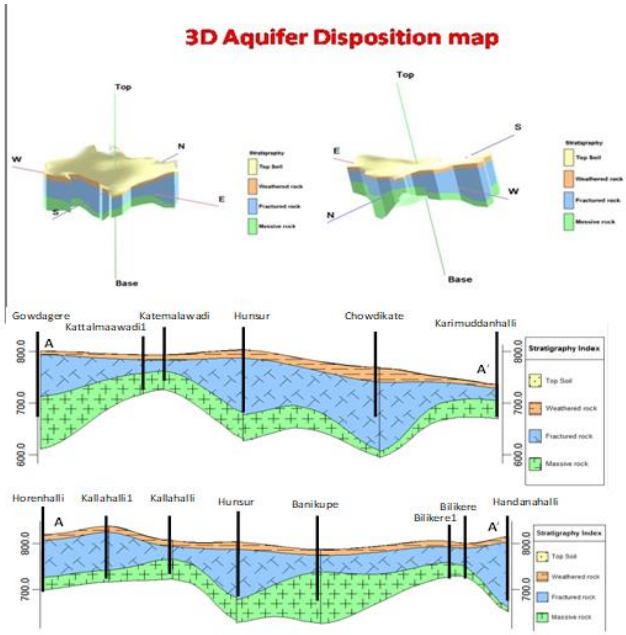
AQUIFER MAPS AND MANAGEMENT PLAN, HUNSUR TALUK, MYSORE DISTRICT, KARNATAKA STATE

(AAP – 2021-2022)





By

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AUGUST-2022

AQUIFER MAPS AND MANAGEMENT PLAN, HUNSUR TALUK, MYSORE DISTRICT, KARNATAKA STATE

Contents

AQUIFER MAPS AND MANAGEMENT PLAN, **HUNSUR** TALUK, **MYSORE** DISTRICT, KARNATAKA STATE

1 SALIENT INFORMATION

Name of the taluk	: Hunsur
District	: Myore
State	: Karnataka
Area	: 981 sq.km.
Population (Census 2011)	: 2,82,963
Normal annual Rainfall	: 816 mm

1.1 Study Area

Aquifer Mapping Studies have been carried out in Hunsur taluk, Mysore district, Karnataka state under National Aquifer Mapping Project. The Taluk is covering an area of 981 sq.kms. The Geographical extent of Hunsur taluk is located between North Latitudes 12°23'56.36'' to 12°10'52.27" and East Longitudes between 76° 29' 42.92" to 76°9'25.83". The taluk is covered in parts of Survey of India Toposheet Nos. 57D/3, D/4. D/7,D/8 and D/11. Hunsur taluk is bounded on the East by Mysore taluk, on the North by Krishnaraj Nagar taluk, on the South by Heggadadevanakote taluk, on the West by Piriyapatna taluk of Mysore district. Taluk administration of Hunsur is divided into 4 Hoblies and 43 Gram panchayats. Hunsur town is taluk Headquarter. There are 213 villages resent in this taluk. Location map of Hunsur taluk of Mysore district is presented in **Fig-1.**

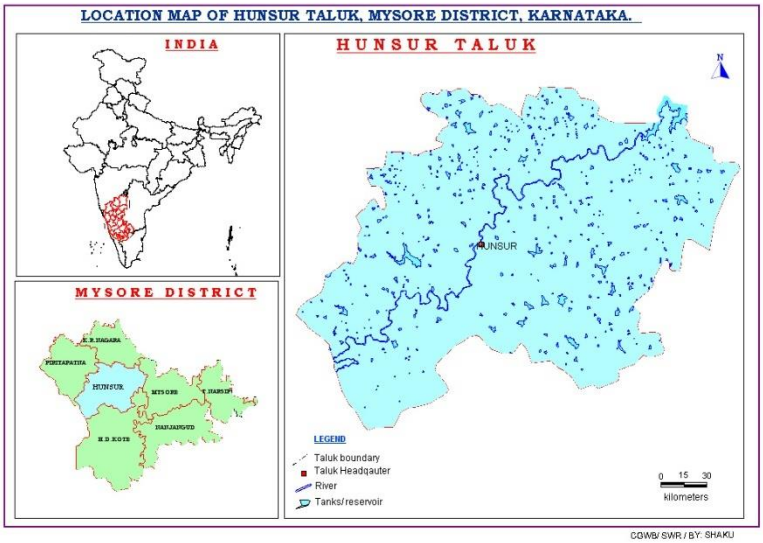

Fig-1: Location map of Hunsur taluk of Mysore district

1.2 Population

According to 2011 census, the human population in Hunsur taluk is 2,82,963, in which 2,32,098 constitute the rural population and 50,865 is the urban population. The taluk has an overall population density of 317 persons per sq.km. The decadal variation in population from 2001-2011 is 11.40% in Hunsur taluk. The population details are given in **Table-1.**

Table-1: Population details

Total	Male	Female	%Share of the district Population	Rural Population	Urban Population	Decadal change in Population	Decadal change in rural Population	Decadal change in urban Population
282963	142946	140017	9.43	232098	50865	11.4	10.5	15.86

Source: District at a glance 2016-17, Govt. of Karnataka

1.3 Rainfall and Climate

Hunsur taluk enjoys semi-arid climate. The area falls under Southern Dry Agro-climatic zone of Karnataka state. The normal annual rainfall in Hunsur taluk for the period 1990 to 2019 is 816 mm. Seasonal rainfall pattern indicates that, major amount of (386mm) rainfall was recorded during South-West Monsoon seasons, which contributes about 47.30% of the annual normal rainfall, followed by North-East Monsoon season (228 mm) constituting 27.94% and remaining (201 mm) 24.63% in Pre-Monsoon season . The coefficient of variation percent for pre-monsoon, monsoon and post-monsoon season is 47, 29&64 percent respectively. Annual Co-efficient Variation at this station works out to be 28 percent **(Table-2A).**

Table-2A : Statistical Analysis of Rainfall Data HUNSUR taluk, (1990 to 2019)

Stataion Hunsur	JAN	FEB	MAR	APR	MAY	PRE	JUN	JUL	AUG	SEP	SW	OCT	NOV	DEC	NE	ANNUAL
NRM	3	5	15	72	107	201	94	91	93	108	386	161	57	10	228	816
STDEV	7	11	24	46	60	94	45	45	47	62	110	143	53	16	145	227
CV%	275	231	161	64	56	47	47	50	51	58	29	89	93	161	64	28

The annual rainfall data from 2009 to 2019 of the Hunsur taluk is given in **Table.2B.** The Monthly rainfall analysis for the period from 2009 to 2019 is shown in **Table.2C.**

Table-2B Actual Annual Rainfall of Hunsur taluk from 2009 to 2019

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Rainfall(mm)	933.6	1180.8	766	381	317	754.3	750	347	1003	909	1023.8

Table 2C : Monthly rainfall data of Hunsur taluk

Year	JAN	FEB	MAR	APR	MAY	PRE	JUN	JUL	AUG	SEPT	SWM	OCT	NOV	DEC	NEM	ANNUAL
2009	0	0	2.6	44	153	199.6	47	57	215	237	556	102	76	0	178	933.6
2010	0	0	0	124	148	272	164.8	97.2	126.8	148	536.8	181	191	0	372	1180.8
2011	0	23	0	109	194	326	23	82	82	34	221	132	87	0	219	766
2012	0	0	0	68	50	118	20	35	96	11	162	29	72	0	101	381
2013	0	16	0	38	0	54	20	35	96	11	162	29	72	0	101	317
2014	0	0	38.3	26	153	217.3	64	43	103	83	293	235	9	0	244	754.3
2015	0	0	12	92	51	155	47	10	146	199	402	101	89	3	193	750
2016	3	0	0	0	95	98	59	102	37	22	220	6	0	23	29	347
2017	3	0	32	52	216	303	50	16	145	362	573	125	0	2	127	1003
2018	0	0	24	29	248	301	213	45	70	99	427	141	33	7	181	909
2019	0	37	0	33.4	110.6	181	107.8	39	175	252	573.8	233	6	30	269	1023.8

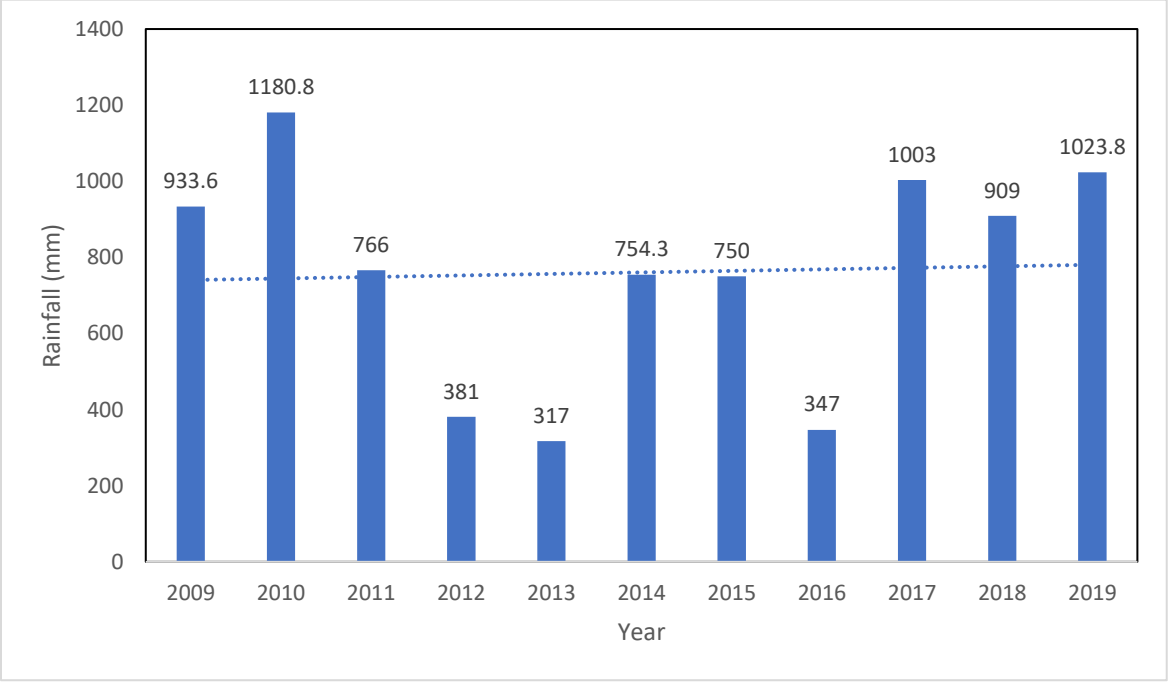

Fig. 2: Rainfall Trend Analysis

1.4 Agriculture & Irrigation

Agriculture is the main occupation in Hunsur taluk. Major Kharif crops are Paddy, Maize, ragi and Vegetables. Important crops of Rabi season are maize, vegetable and oilseeds. Water intensive crops like Paddy and Tobacco are grown in Hunsur Taluk **(Table-3A)**

Table-3A: Cropping pattern in HUNSUR taluk 2016-2017 (Ha)

Crop	Paddy	Jowar	Ragi	Maize	Pulses	Fruits	Tobacco	Oil seeds	Cotton	Total crop
Area(ha)	7505	12	3637	15982	14602	2293	30899	1140	651	39261

Source: District at a glance 2016-17, Govt. of Karnataka

About 7.92% of the Geographical area is covered by forest. It is observed that net sown area accounts 52.54 % and area sown more than once is 30.86% of total geographical area in Hunsur taluk. Area not available for cultivation, the other uncultivable land and Fallow land cover 20.12%, 3.41% and 15.98% respectively of total geographical area. About 29% of net area irrigated is only from Groundwater (wells and Bore wells) and 0% from lift irrigation. About 71 % of net area is irrigated from Surface water (Canals and Tanks). The major source of irrigation is surface water. The details of land use and details of irrigation are given in **Table-3B and Table-3C** respectively. The land use pattern is given in (Fig-3B.)

Table-3B: Details of land use in HUNSUR taluk 2016-2017 (Ha)

Taluk	Total Geographical Area	Area under Forest	Area not available for cultivation	Other Uncultivable land	Fallow land	Net sown area	Area sown more than once	Gross sown area
HUNSUR	98194	7786	19761	3350	15697	51600	30309	81909
% of the area	-	7.92	20.12	3.41	15.98	52.54	30.86	83.41

Source: District at a glance 2016-2017

Table-3C: Irrigation details in Hunsur taluk (in ha)

Source of Irrigation	Length in Km/No of structures	Gross area Irrigated (Ha)	Net area Irrigated (Ha.)	% of area
Canals	140.40 (Km)	7407	6845	62
Tanks	112	1050	1050	9
Wells	113	4236	3069	28
Bore wells/ Tube wells	4004	150	150	1
Lift Irrigation				
Other Sources				
Total			**11114**	**100**

Source: District at a glance 2016-17, Govt. of Karnataka

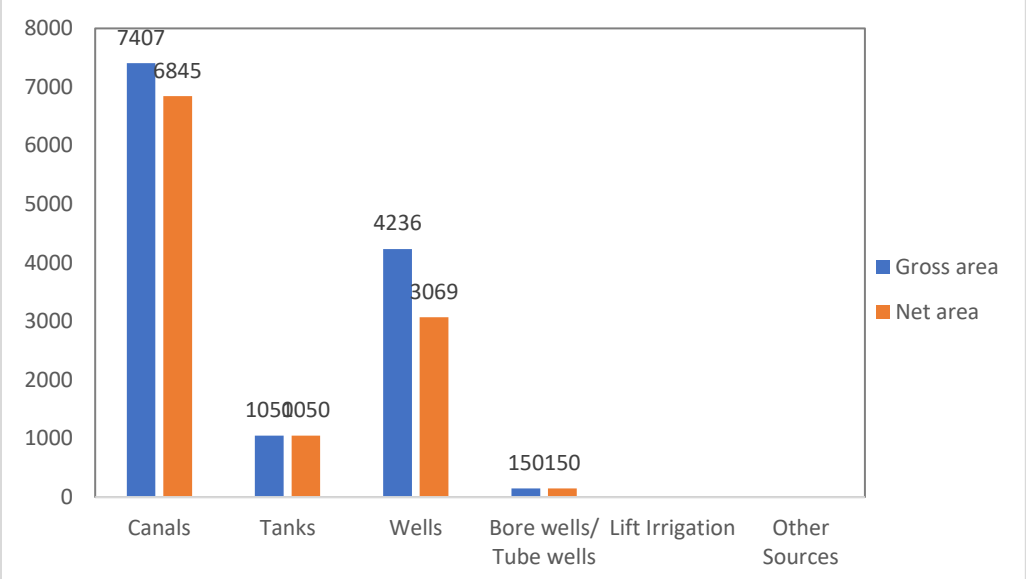

Fig. 3: Sources of Irrigation

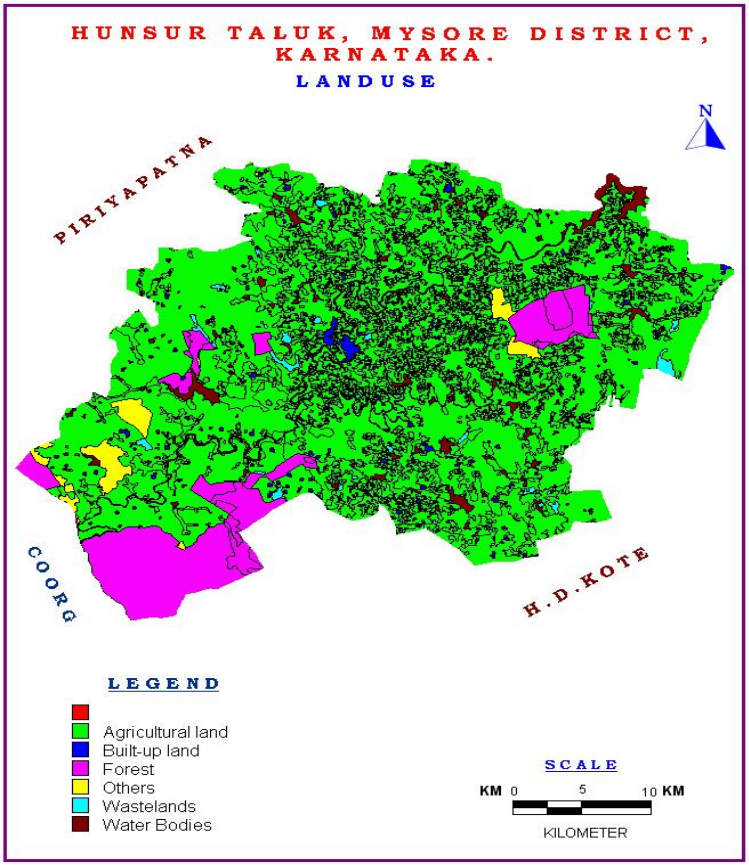

Fig 4: Land use Map

1.5 Geomorphology, Physiography & Drainage

The geomorphology of the Hunsur is formed by hilly area in central part and plain region in covered all over the taluk. Hunsur taluk also shows piedmont zone, reservoir, river/ stream and tanks etc. The general topograhic elevation in the taluk varies from 869 m in the Northern 716m amsl in the Southern part of the taluk. The differential altitude is significant because, it is likely to cause irregular ground water flow patterns on the micro scale **(Fig.-5).** Topography is dominantly controlled by geological structures. The entire Hunsur taluk falls in Cauvery river basin. The taluk is drained by 1st to 4th order streams which flow towards central to South-east and north to centre. The drainage system is well developed in the taluk.The Drainage pattern is dendritic to subdendritic **(Fig.-6).**

Fig-5: Geomorphology Map

Fig-6: Drainage Map

1.6 Soil

The soil type of Hunsur taluk can broadly be classified into Clayey soils and Clayey Skeletal soils. These soils vary in depth and texture, depending on the parent rock type, physiographic settings and climatic conditions. It is less permeable compare to the sandy soil. It is having good moisture holding capacity and is fertile. These soils are fertile and generally produce good yields **(Fig-7).**

Geologically, the taluk is mainly composed of metamorphic rocks of Pre-Cambrian age either exposed at the surface or covered with a thin mantle of residual and transported soils. The rock formation

in the taluk falls into two groups, gneissic complex and schistose formation **(Fig-8).** The identification of stream pattern in the taluk is helpful in identification and interpretation of many geological features .

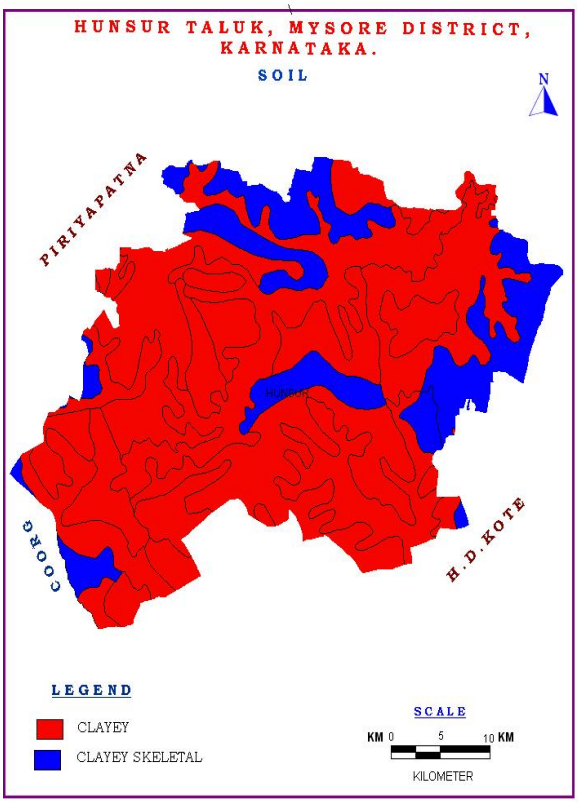

Fig-7: Soil Map

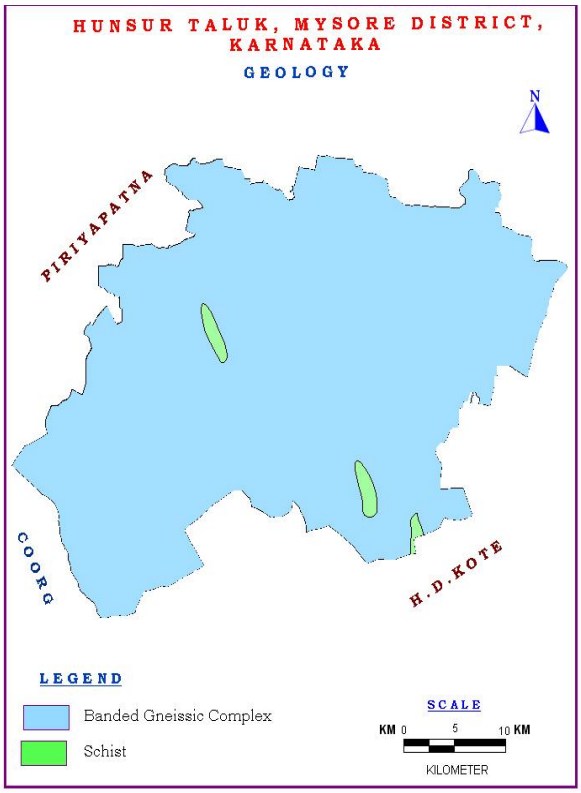

Fig-8: Geology Map

1.7 Ground water resource availability and extraction

As per Groundwater resource estimation 2020 **Table 4A,** the data on Groundwater resources shows that the net groundwater availability is 11831.61 Ham. The existing gross groundwater for irrigation is 5354.16 Ham. The stage of Groundwater development is 45.25 % and falling under 'Safe' category.

Table-4A: Dynamic Ground Water Resources (2020) (Ham)

Net Annual Ground Water Availability	Existing Gross Ground Water Draft for Irrigation	Existing Gross GW Draft for Domestic and Industrial Water Supply	Existing Gross Ground Water Draft for All Uses	Allocation For Domestic and Industrial Use for Next 25 Years	Net Ground Water Availability for Future Irrigation Development	Existing Stage of Ground Water Development (%)	Category
11831.61	4751.14	603.2	5354.16	904.56	6175.91	45.25	Safe

Aquifer wise total groundwater resources down to 150 m depth is given in **Table-4B** below as per 2020 estimation.

Table-4 B: Total Ground Water Resources (2020) (Ham)

Taluk	Annual replenishable GW resources	Fresh In-storage GW resources		Total availability of fresh GW resources
		Phreatic	Fractured (Down to 150m)	Dynamic + phreatic in-storage + fractured
HUNSUR	11831.61	2646	1735	16212.61

1.8 Existing and Future Water Demands (as per GWRA-2017 and 2020)

The details of dynamic (Phreatic) ground water resources for Hunsur taluk as on 2017 and 2020 is shown in **Table.5A and Table.5B.** It is observed that the stage of ground water extraction is 63 % to 42.25% from 2017 to 2020.

Table.5A: Dynamic Ground Water Resource, (2017 Figures in Ham)

Net Annual Ground Water Availability	Existing Gross Ground Water Draft for Irrigation	Existing Gross GW Draft for Domestic and Industrial Water Supply	Existing Gross Ground Water Draft for All Uses	Allocation For Domestic and Industrial Use for Next 25 Years	Net Ground Water Availability for Future Irrigation Development	Existing Stage of Ground Water Development	Category
11587	4294	3044	7338	3299	4400	63	SAFE

Table-5B: Present Dynamic Ground Water Resource (2020)

Net Annual Ground Water Availability	Existing Gross Ground Water Draft for Irrigation	Existing Gross GW Draft for Domestic and Industrial Water Supply	Existing Gross Ground Water Draft for All Uses	Allocation For Domestic and Industrial Use for Next 25 Years	Net Ground Water Availability for Future Irrigation Development	Existing Stage of Ground Water Development (%)	Category
11831.61	4751.14	603.2	5354.16	904.56	6175.91	45.25	Safe

1.9 Water level behavior

The water level data have been monitored from the representative dug wells and borewells under NHS monitoring programme for both pre and post monsoon seasons during 2019 in Aquifer I and Aquifer II (Table 6A). During premonsoon season water level ranges from 1.4 to 20.04 mbgl, whereas in postmonsoon it varies from 0.51 to 13.93 mbgl. Whereas in Aquifer II, the water level ranges from 9.03 to 31.42 mbgl in premonsoon and 3.2 to 15.99 mbgl during post monsoon as per Ground water Department, Govt of Karnataka data **(Table 6B)** and the maps shown in **Fig 9, 10**

Table 6A: Depth to water level of Pre- and Post-monsoon (2019), CGWB

Sl No.	Site type	Location name	May-19	Nov-19
1	Dug well	Gowdagere	1.57	0.84
2	Dug well	Rathnapuri	2.7	2.51
3	Dug well	Koimuthur colony	3.5	2.3
4	Dug well	Hunsur A	1.4	2.25
5	Dug well	Hosaramanahalli	3.1	10.4
6	Dug well	Hejjodlu	15.2	11.52
7	Dug well	Shiriyuu	22.46	7.35
8	Bore well	Hunsur	8.66	13.03
9	Bore well	Karimudanahalli	20.04	13.93

Table 6B: Depth to water level of Pre- and Post-monsoon (2019) (Ground Water Dept., Govt. Of Karnataka)

Sl No	Site_type	Location name	May-19	Nov-19
1	Bore well	Coimbatore colony	31.42	8.37
2	Bore well	Gavadager	7.25	3.2
3	Bore well	Hunsur B	9.03	4.3
4	Bore well	Kamagowdanahalli	14.2	9.67

5	Bore well	Kattemalavadi	11.89	8.32
6	Bore well	Somanahalli	27.28	15.99

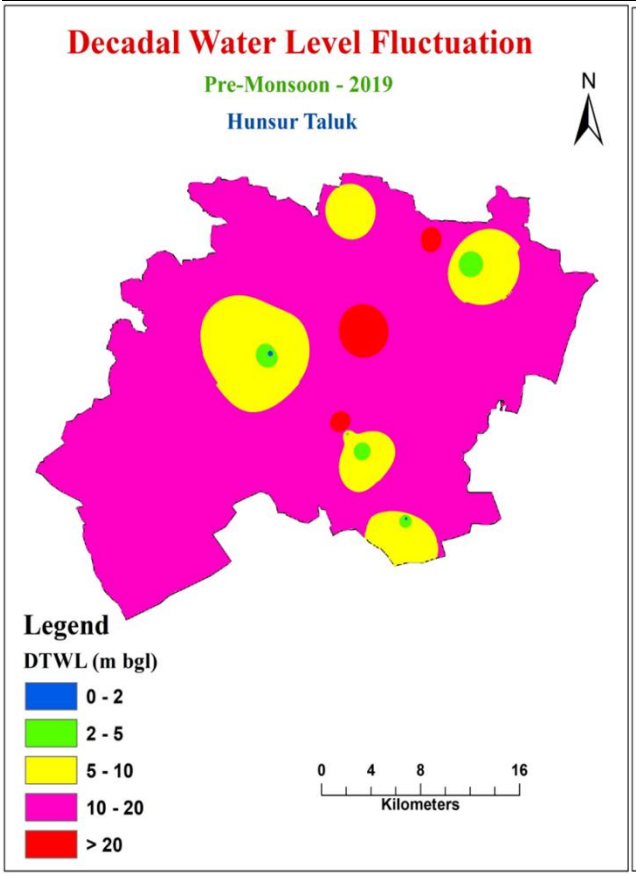

Fig-9: Pre-monsoon Depth to Water Level

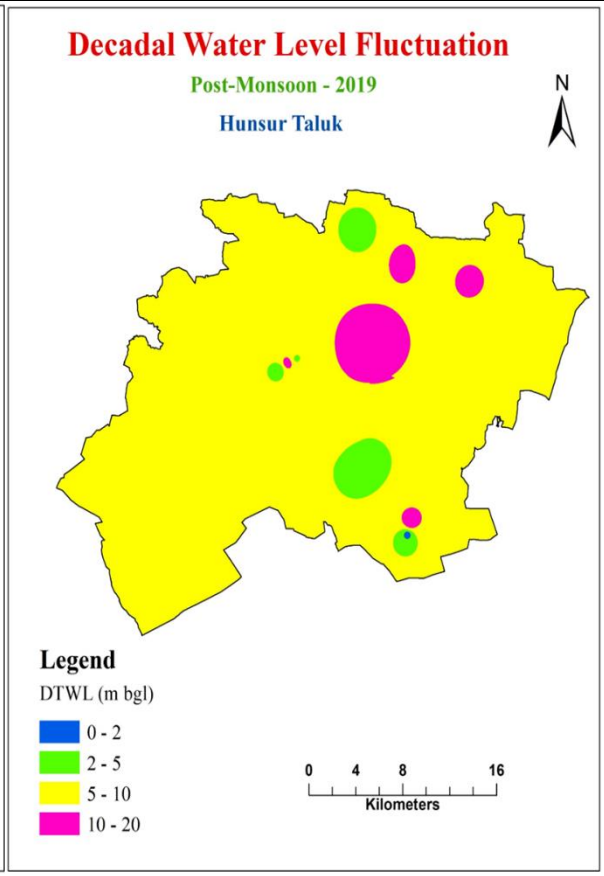

Fig-10: Post-monsoon Depth to Water Level

2 AQUIFER DISPOSITION

The occurrence and movement of water in the subsurface is broadly governed by geological Frame works i.e., nature of rock formations including their porosity (primary and secondary) and Permeability. The principal aquifers in the area are Gneisses and Schist and the occurrence and movement of ground water in these rocks is controlled by various factors and it primarily depends on the degree of interconnection of secondary pores/voids developed by fracturing and weathering in the hard rock.

2.1 Aquifer Types

In Hunsur taluk, there are mainly two types of aquifer systems

i. Aquifer-I (Phreatic aquifer): Weathered Gneissic complex
ii. Aquifer-II (Fractured aquifer) Fractured Gneissic complex

In Hunsur taluk, Schist and Banded gneissic complex are the main water bearing formations **(Fig-8).** Ground water occurs within the weathered and fractured Schist, Granite and Granitic gneiss under water table condition and semi-confined condition. In Hunsur taluk bore wells were drilled from a minimum depthof 30 mbglto a maximum of 200.00 mbgl. Depth of weathered zone ranges from 4.5 mbgl to 34 mbgl. Ground water exploration reveals that aquifer-II fractured formation was encountered between the depth of 9 to 107.7 mbgl. Yield ranges from Negligible to 6.0 lps. The basic characteristics of each aquifer are summarized **Table-7A** and **Table-7B**. The 3D aquifer disposition models, 2D aquifer sections and 3D aquifer fence diagrams have been prepared based on Exploration data and borewell inventory data and it presented in **Fig-11A, Fig-10B and Fig-10C**.

Table-7A: Details of Groundwater Exploration

Sl.No	Location	Lat &Long	Depth m bgl	Casing (m)	Lithology	SWL (mbgl)	Q (lps)	T (m^2/day)
1	Hunsur-EW	15°37'56.6'' 74° 56'26.0''	200	18.3	Granite Gneiss	49.24	5.5	12.49
	Hunsur-OW	15°37'57.3'' 74° 56'25.8''	200	18.3	Granite Gneiss	44.5		0.783
2	Hunsur-EW	15°48'49.7'' 74° 50'58.5''	200	18.2	Granite Gneiss	12.38		9.44
3	Handanahalli-EW	15°35'59.1'' 74° 46'42.5''	200	12.2	Granite Gneiss	36.03	1.19	1.71
	Handanahall-OW	15°35'00.1'' 74° 46'39.5''	200	12.5	Granite Gneiss	34.67	1.67	0.314
4	Gowdagere EW	15°48'07.7'' 74° 43'16.2''	200	6.4	Granite Gneiss	13.71	4.04	79.89
5	Chowdikatte	15°42'47.7'' 74° 55'24.2''	20	34.0	Granite Gneiss	14.86	2.33	10.24
6	Kallahalli EW	15°54'32.0'' 74° 46'35.4''	127	12.2	Granite Gneiss	43.60	4.04	88.77
7	Kallahall OW	15°53'15.0'' 74° 47'13.0''	130.5	14	Granite Gneiss	37.54	4.51	71.35

Table-7B: Details of Bore well inventory data

S.No	Location	Lat &Long	Depth (mbgl)	Casing (m)	Lithology	Fracture (m)	Q (lps)
1	Kallahalli	12.319631 76.26187	91	15	Granite Gneiss	38	2.22
2	Nilvagilu	12.30124 76.268167	36	6	Granite Gneiss	12	4.57
3	B. B village	12.240572 76.264579	152	25	Granite Gneiss	91	2.22
4	Kodi1	12.23244176.354795	54	6	Granite Gneiss	24	2.22
5	Kodi2	12.232957 76.351207	60	6	Granite Gneiss	18	1.41
6	Sankahalli	12.277224 76.44069	76	12	Granite Gneiss	45	2.22
7	Bilikere	12.335382 76.456989	36	6	Granite Gneiss	30	0.8
8	Banikuppe	12.326172 76.358683	167	12	Granite Gneiss	45	0.39
9	Katemalawadi	12.352222 76.284894	57	12	Granite Gneiss	24	0.8
10	Marur	12.374545 76.25733	36	6	Granite Gneiss	27	4.57

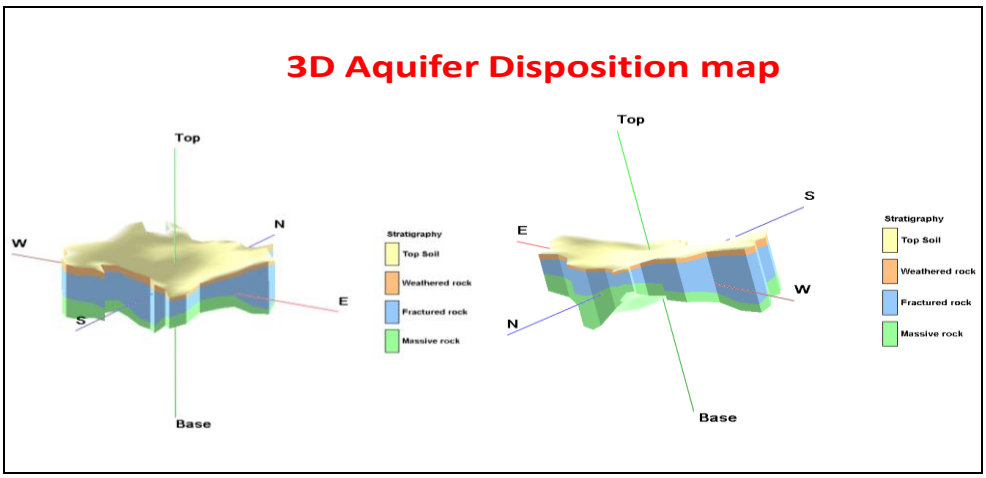

Fig. 11A: 3D Aquifer model

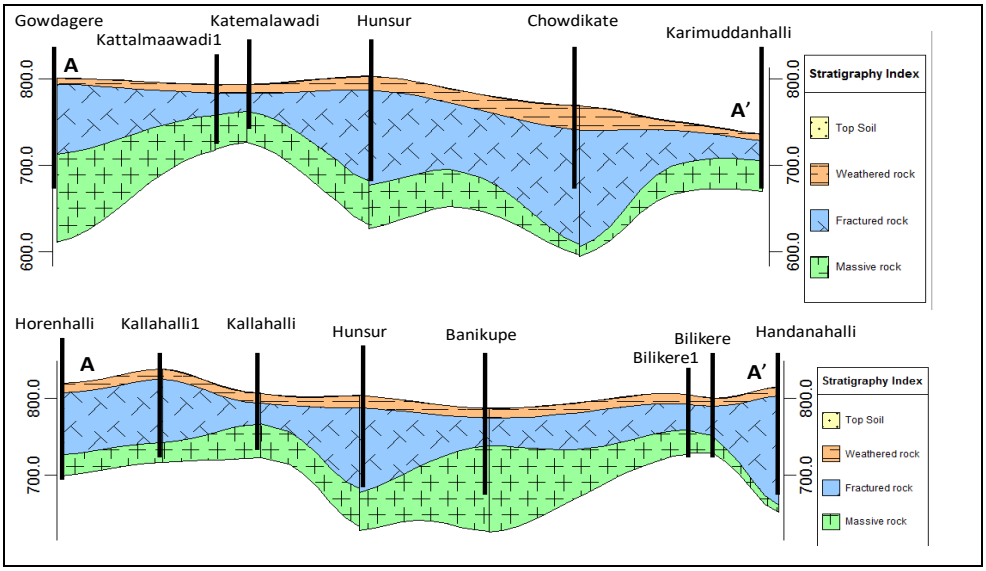

Fig. 11B: 2D Aquifer section

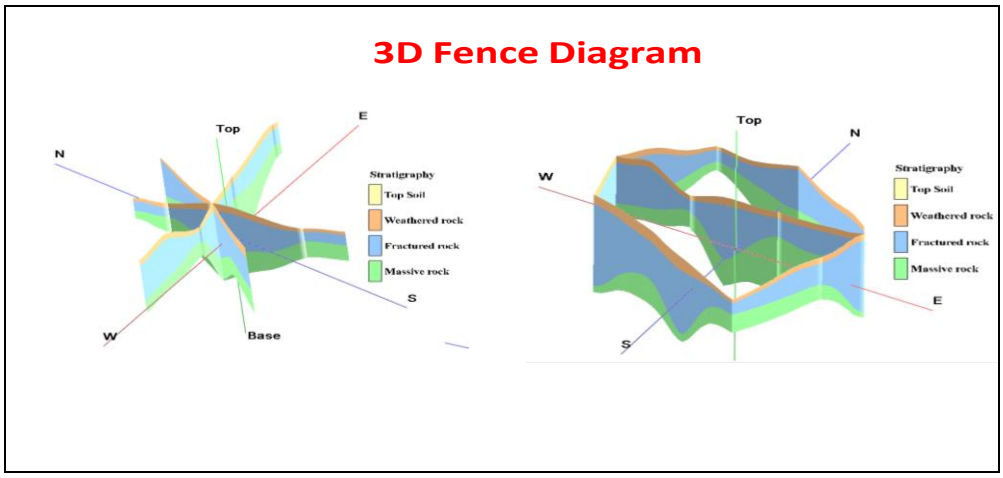

Fig. 11C: 3D Aquifer fence diagram

3 GROUND WATER RESOURCE, EXTRACTION, CONTAMINATION AND OTHER ISSUES

The main ground water issues are Limited Ground Water Potential / Limited Aquifer Thickness / Sustainability, declining water level trend which are all inter-related or inter dependent and Inferior ground water quality due to nitrate contamination in major part of the area.

3.1 Comparison of Ground Water Resource and Extraction

The Dynamic Ground Water Resource 2017 and as on 2020 have summarized and presented in **Table-8.** It is observed that the ground water availability in 2020 is slightly increased compare to 2017. Groundwater draft in 2020 is less compare to 2017, so stage of Groundwater development is improved (45.25%). As Hunsur taluk is 'safe' category, there is scope to develop the Groundwater resources in this

taluk through additional wells. In view of the prevailing practice of abstraction structures, bore wells are the preferred structures in the area.

Table 8: Comparison of groundwater availability and draft scenario (in ham)

Taluk	March 2017			March 2020		
HUNSUR	GW Availability (in ham)	GW Extraction (in ham)	Stage of GW Development %	GW Availability (in ham)	GW Extraction (in ham)	Stage of GW Development%
	11587	7338	63	11831.61	5354.16	45.25

3.2 Chemical Quality of Ground Water and Contamination

The water samples were collected in different parts of Hunsur taluk and analyses in CGWB, Bangalore laboratory. Interpretation from Chemical Analysis results in Hunsur taluk is mentioned as under: (**Table-9)**

- **ELECTRICAL CONDUCTIVITY:** In general, EC values range from 440 to 3220 µ/mhos/cm in the aquifer-Iat 25°C **(Fig-12 A)** and range from 630 to 1918 µ/mhos/cm in the aquifer-II.
- **FLUORIDE:** Fluoride concentration in ground water ranges between 0.77 and 1.23 mg/l in the aquifer-I **(Fig-12 B)** and ranges between 0.35 and 1.5 mg/l in the aquifer-II.
- **NITRATE:** Nitrate concentration inground water ranges from 5.54 and 123.39 mg/l in the Aquifer –I **(Fig-12 C)** and ranges from 0.5 and 49.0 mg/l in the Aquifer –II.

Table 9: Water quality parameters

SL. No	Location	EC	F (mg/l)	NO3 (mg/l)
1	Hunsur EW	1355	0.64	18.5
2	Hunsur OW	1659	0.78	46.1
3	Hanagoodu	1030	0.43	92.1
4	Handanahalli EW	1156	0.35	81
5	Handanahalli OW	1166	1.04	83.5
6	Gowdagere EW 55m	973	1.5	23.1
7	Gowdagere EW 200m	1027	1.18	26.1
8	Chowdikate EW 35m	667	1.12	16.65
9	Chowdikate EW 127m	594	0.69	9.48
10	Kallahali1 EW 93m	1941	0	110.07
11	Kallahalli1 EW 127	1918	0	123.39
12	Kallahalli OW	1895	0	116.1

13	Kallahali(BW)	1240	0.93	41.81
14	Nilvagilu(BW)	840	1.04	25.03
15	B.B villgage(BW)	1080	0.85	43.11
16	Kodi1(BW)	990	1.01	30.33
17	Kodi2(BW)	1190	1.07	19.03
18	Sankahali(BW)	1800	1.12	41.35
19	Bilikere(BW)	1670	0.85	7.75
20	Banikupe(BW)	1680	1.01	42.76
21	Katemalawadi(BW)	1250	1.14	35.26
22	Marur (BW)	630	0.56	5.54
23	Gowdagere (DW)	1270	1.22	38.49
24	Hejjodlu (DW)	1980	0.98	42.88
25	Shiriyur (DW)	1340	1.23	35.071
26	Ratnapuri (DW)	3220	1.04	41.56
27	Hunsur (DW)	1500	1.04	2.9
28	Hanagodu (DW)	1570	0.84	4.78
29	Chowdikate (DW)	1450	0.88	39.46
30	Katemalawadi(DW)	1260	0.85	30.01
31	K.M. Vadi Lake (SW)	440	0.77	1.29

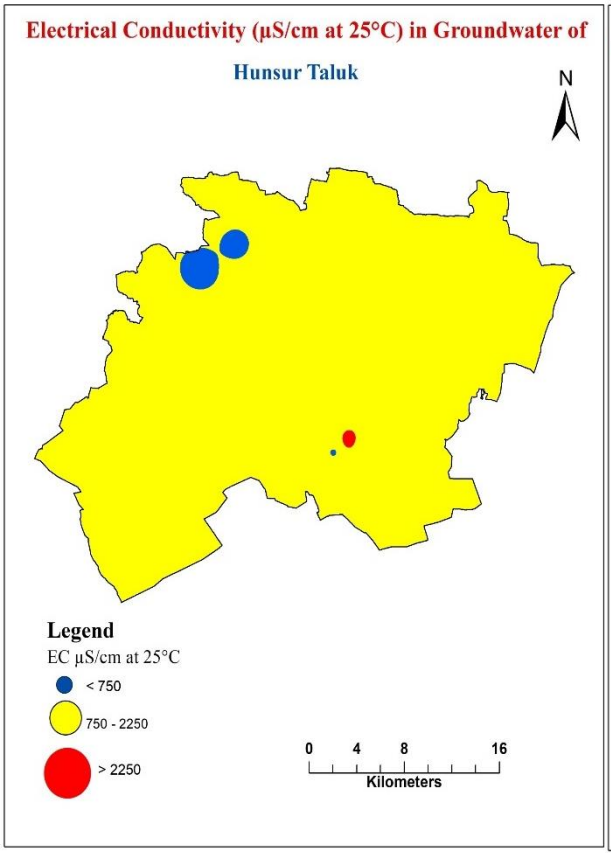

Fig. 12 A: EC distribution map

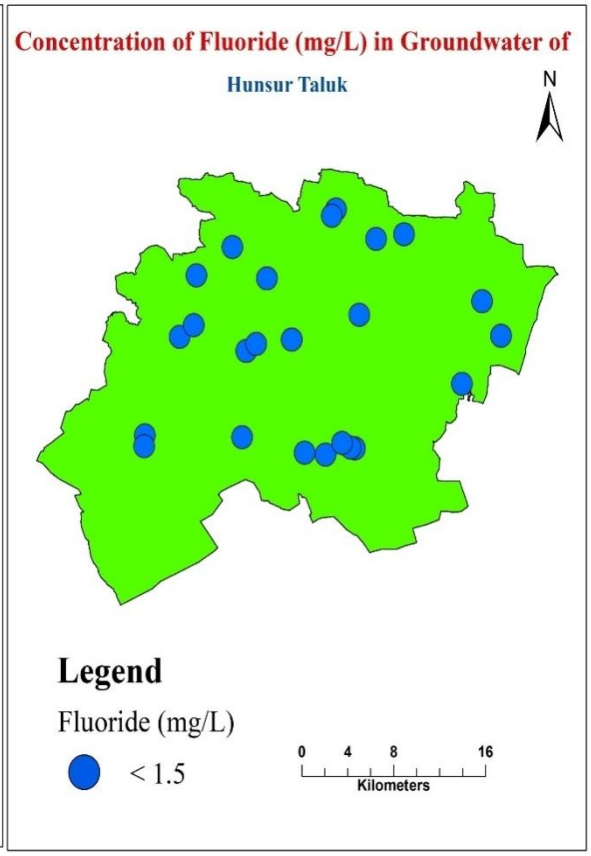

Fig. 12 B: Fluoride distribution map

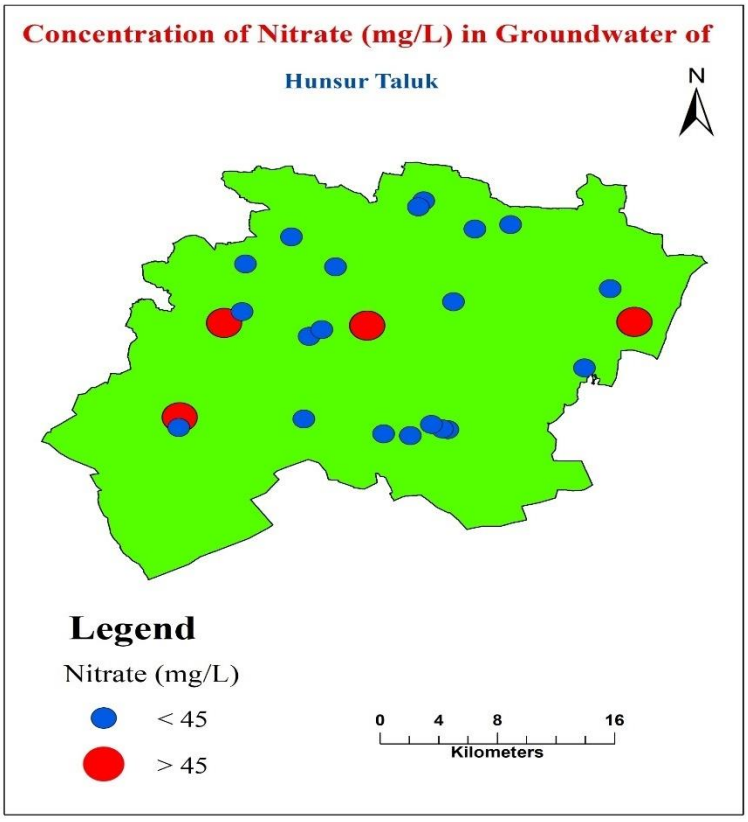

Fig. 12C: Nitrate distribution map

4 GROUND WATER RESOURCE ENHANCEMENT AND PROPOSED MANAGEMENT STRATEGY

4.1 Resource Enhancement by Supply Side Interventions

Recharge dry **phreatic aquifer (Aq-I)** in the taluk, through construction of artificial recharge structures, viz; check dams, percolation tanks & Sub surface dyke **(Table-10A).** The choice of recharge structures should be site specific and such structures need to be constructed in areas as feasible for artificial recharge.

Table-10A: Quantity of non-committed surface runoff & expected recharge through AR structures

Artificial Recharge Structures Proposed	Hunsur taluk
Non committed monsoon runoff available (MCM)	71.114
Total no. of existing Artificial Recharge Structures	437
Number of Check Dams	371
Number of Percolation Tanks	64
Number of Sub surface dyke	2
Number of Filter beds	17
Tentative total cost of the project (Rs. in lakhs)	5056.31 Lakhs
Excepted recharge (MCM)	53.335
Additional Irrigation Potential (Lakh hectares)	0.064

Table 10B: Improvement in GW availability due to Recharge as per GWRA 2020

Taluk	Net annual ground water availability	Existing gross ground water draft for all uses	Existing stage of ground water development	Expected recharge from proposed Artificial Recharge structures	Expected improvement in stage of ground water development after the implementation of the project	Expected improvement in overall stage of groundwater development
	HAM	HAM	%	HAM	%	%
Hunsur	11831.61	5354.16	45.25	5335.5	14.06	31.19

After implementation of Artificial Recharge structures for GW recharge, the annual groundwater availability will increase from 11831.61 to 17165.11 ham and the expected improvement in stage of development is 14.06% from 45.25% to 31.19% **(Table-10B).**

4.1.1 Strategic Action Plan

The provision for minimum protective irrigation can only improve the agricultural growth in the taluk which is dependent on rain. This objective can be achieved by utilizing the rain water more efficiently by harvesting structures like farm ponds, check-dams, barrages and other surface structures. The Strategic Action Plan, prepared for the taluk has included the irrigation infrastructure for major irrigation, minor irrigation, ground water recharge, harvesting of rain water, improvement of irrigation efficiency and strengthening the adoption of micro-irrigation. Considering the existing infrastructure in the taluk and considering the irrigation potential required to be created to meet the gap between demand and supply of all the sectors of water use, the Strategic Action Plans are developed under PMKSY project and the same is given below.

4.1.2 Benefits of Artificial recharge scheme

Artificial recharge structures namely check dams and Nala bunds can be taken up on large scale in the over-exploited areas as a management plan to tackle falling ground water levels.

- These structures have proved in building-up of ground water levels and sustainability of ground water abstraction structures, mainly in bore wells.
- An increase in the area irrigated by ground water source is also observed in the area of influence.
- Such activities help in providing sustainable drinking water to the rural population. The qualitative result from farmer's perception indicate that, there is rising trend in ground water levels in the area of influence, productivity of crops enhanced and improvement in yield is observed in bore wells.

The cropping pattern has shown that farm households have resumed growing crops such as grapes which were not previously grown in the area.

4.2 Resource Savings by Demand Side Interventions

4.2.1 Water Use Efficiency by Micro Irrigation Practices

Hunsur Taluk falls under Safe category with the stage of groundwater extraction of 45.25 %. However, Water Use Efficiency (WUE) practices like Drip irrigation needs to be strengthened to save irrigation water by way of precision farming mechanism. This ultimately enhances the area under irrigation potential

4.3 Ground Water Development Plan

Hunsur taluk has been categorized as **Safe**. However mandatory guideline issued by Government of Karnataka like rain water harvesting and Artificial recharge structures should be constructed. Groundwater recharge component needs to be made mandatory in the non-command area of the taluk for further development of ground water.

4.4 Other interventions proposed

- Periodical maintenance of artificial recharge structures should also be incorporated in the Recharge Plan.
- Excess nitrate concentration is found in ground water samples require remedial measures viz.
- Dilution of nitrate rich ground water through artificial recharge & water conservation.
- Roof top rain water harvesting

5 SUMMARY AND RECOMMENDATIONS

The main ground water issues are Low Ground Water Development, Limited Ground Water Potential / Limited Aquifer Thickness / Sustainability, which are all inter-related or inter dependent and Inferior Ground Water Quality due to nitrate contamination major part of the area. The summary of ground water management plan of Hunsur taluk is given in **Table-11.**

Table-11: Summary of Management plan of Hunsur taluk

Hunsur taluk is Safe & present stage of Ground water extractiont (2020)	45.25%
Net Annual Ground Water Availability (Ham)	11831.61
Existing Gross Ground Water extraction for all uses (Ham)	5354.16
Expected additional recharge from monsoon surplus runoff (MCM)	53.335
Change in Stage of GW development, %	45.25 to 31.19
Excess nitrate concentration	• Dilution of nitrate rich ground water through artificial recharge & water conservation. • Roof top rain water harvesting.
Water Use efficiency measures	• Government to take initiative to encourage at least 70% farmers to adopt water use efficiency irrigations practices like dip & sprinkler irrigation

As per the resource estimation – 2020, Hunsur taluk falls under Safe category with the stage of groundwater extraction is 45.25 %. However, there is need to formulate management strategy to tackle the water scarcity related issues in the taluk in the coming days to avoid water crisis in the future. It is suggested to adopt a scientific and multi-pronged ground water management strategy covering supply

side interventions, demand side interventions, ground water development interventions and groundwater quality protection aspects as mentioned in the management plan suggested above

- **Ground water resource enhancement by supply side interventions**: Quantity of surface water available through non-committed surface run-off is estimated to be 7111.4 ham. This can be used to recharge the aquifer mainly through percolation tanks (64), check dams (371) and sub surface dyke structures (2). The volume of water expected to be conserved/recharged is 5333.5 ham through these AR structures. The approximate cost estimate for construction of these AR structures is Rs. 50.56 Cr. The additional area which can be brought under assured ground water irrigation will be about 6400 hectares. However, the figures given are tentative and pre-field studies / DPR are recommended prior to implementation of these recharge structures.
- **Ground water resource enhancement by demand side interventions:** At present about 29 % of irrigation is by wells and bore wells (ground water). The micro irrigation practices like drip and sprinkler irrigation are comparatively less practiced in comparison with traditional surface flooding mode of irrigation. The micro irrigation water efficient methodology needs to be adopted for growing water intensive crop like Paddy and Tobacco which is grown in the cropped area largely and groundwater dependent. Implementation of efficient irrigation techniques will contribute in saving Groundwater.
- **Change in cropping pattern:** Farmers are facing inadequacy of groundwater for agriculture during summer. Water intensive crops like Paddy and Tobacco are grown in 38,404 ha of the cropped area. However, oil seeds grown during kharif and rabi period. At present (2020), the stage of ground water extraction is 45.25% and taluk has been categorized as Safe, thus change in cropping pattern has not been suggested.

By adopting the supply side and demand side management plan itself, the stage of groundwater extraction decreases to 31 % from 45% and the taluk falls under safe category.