केंद्रीय भूमि जल बोर्ड

जल संसाधन, नदी विकास और गंगा संरक्षण मंत्रालय

भारत सरकार

Central Ground Water Board

Ministry of Water Resources, River Development and Ganga Rejuvenation

Government of India

AQUIFER MAPPING REPORT

Chandvad, Deola, Niphad and Sinnar Talukas, Nashik District, Maharashtra (Part-II)

मध्य क्षेत्र, नागपुर

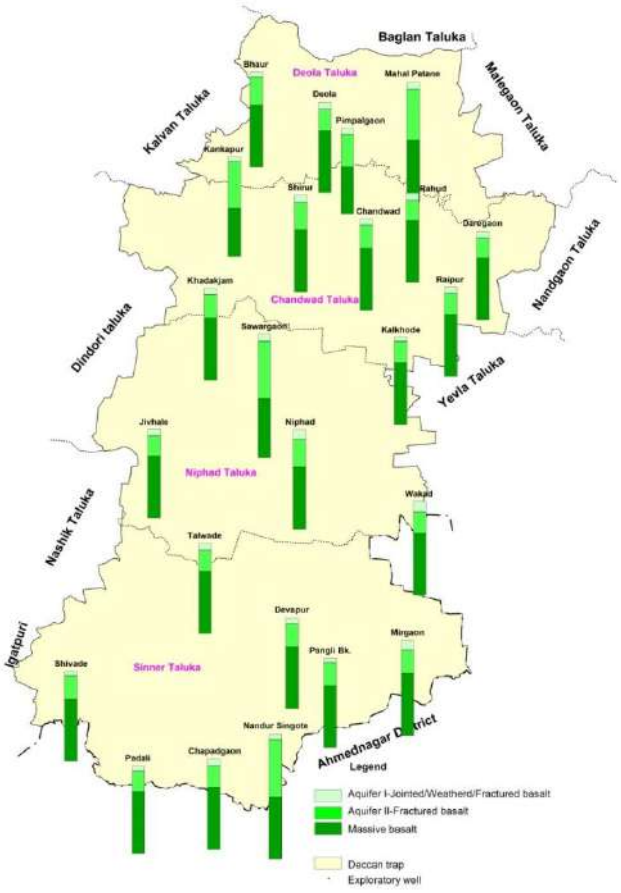
Central Region, Nagpur

भारत सरकार
Government of India
जल संसाधन, नदी विकास एवं गंगा संरक्षण मंत्रालय
Ministry of Water Resources, River Development & Ganga Rejuvenation
केन्द्रीय भूमि जल बोर्ड
CENTRAL GROUND WATER BOARD

जल बचत जल संचय

जलभृत नक्शे तथा भूजल प्रबंधन योजना

Aquifer Maps and Ground Water Management Plan



चंदवाड़, देवला, निफाड़ व सिन्नर तालुका, नासिक जिला, महाराष्ट्र

CHANDVAD, DEOLA, NIPHAD &, SINNAR TALUKAS, NASHIK DISTRICT, MAHARASHTRA

मध्य क्षेत्र, नागपुर / Central Region, Nagpur
नवम्बर 2016 / November 2016

PART-II

AQUIFER MAPS AND GROUND WATER MANAGEMENT PLANS CHANDVAD, DEOLA, NIPHAD AND SINNAR TALUKAS, NASHIK DISTRICT, MAHARASHTRA STATE

CONTRIBUTORS

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PART-II

AQUIFER MAPS AND GROUND WATER MANAGEMENT PLANS CHANDVAD, DEOLA, NIPHAD AND SINNAR TALUKAS, NASHIK DISTRICT, MAHARASHTRA STATE

CONTENTS

AQUIFER MAPS AND GROUND WATER MANAGEMENT PLANS CHANDVAD, DEOLA, NIPHAD AND SINNAR TALUKAS, NASHIK DISTRICT, MAHARASHTRA STATE

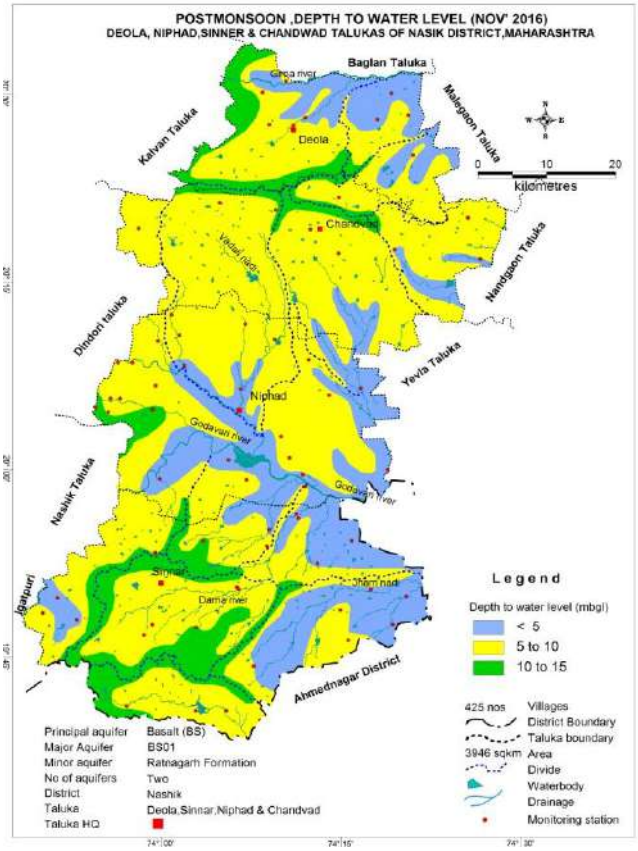
1 BRIEF INTRODUCTION

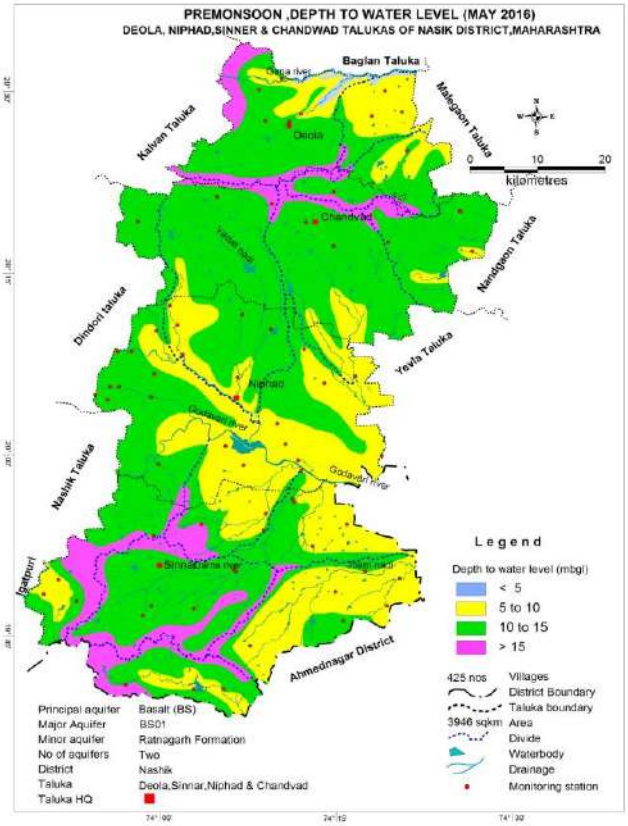
In XII five-year plan (2012-17), National Aquifer Mapping (NAQUIM) has been introduced to carry out detailed hydrogeological investigation on toposheet scale (1:50,000). Keeping in view the current demand vis-à-vis supply and futuristic requirement of water, Central Ground Water Board has taken up NAQUIM in Over-exploited, Critical and Semi-Critical talukas and prioritised stress areas. Hence, water stress areas i.e., Chandvad, Deola, Niphad & Sinnar Talukas of Nashik district have been taken up to carry out detailed hydrogeological investigation covering an area of 3945.76 sq.km. in the year 2015-16. The index map of the study area is presented below- **Fig 1.1**.

Fig 1.1 Index map of the Study area

2 SALIENT FEATURES

PARTICULARS	Chandvad	Deola	Niphad	Sinnar
District	Nashik	Nashik	Nashik	Nashik
State	Maharashtra	Maharashtra	Maharashtra	Maharashtra
Area (sq.km.) 3945.76	890.07	577.46	1151.75	1326.48
Population (2011) Rural/Urban	210805/25341	144522/0	418853/74398	281091/65299
Total	235849	144522	493251	346390
Rainfall (mm)				
I. Normal Annual Rainfall	650.3 mm	487.9 mm	540 mm	583.6 mm
II. Current Rainfall (2015)	345.6(-47% deficit)	284.8(-42% deficit)	484.2(-10% deficit)	414.2(-29% deficit)
III. Rainfall Trend (mm/yr)	-8.29 (1998 to 2015)	-9.69 (1998 to 2015)	0.59 (1901to 2015)	1.06 (1901 to 2015)
Agriculture (sq.km.)(2014-15)				
i. Principal Crops				
Onion	115.19	173.20	90.03	101.76
Cereals	388.53	247.34	439.7	218.63
Food Grains	431.14	268.31	489.27	240.33
Fruits & Vegetable	209.31	120.71	175.99	403.58
Wheat	24.38	8.82	87.35	41,08
Sugarcane	18	2.61	4.33	72.92
ii. Cultivable Area	635.95	392.23	794.21	1041.66
iii. Net Sown Area	615.02	327.63	666.71	941.34
iv. Forest	89.15	0.0	10.62	137.08
Irrigation Sources (sq.km.)				
i. Ground water	124.71	64.12	241.29	104.73
ii. Surface Water	27.50	6.63	89.85	14.63
Data Utilised				
i. Key Observation Wells	23	19	43	49
ii. GW exploration	7EW+ 1 OW + 1 Pz	5EW+ 1 OW + 2 Pz	6 EW+ 3 OW+1 Pz	7 EW+ 0 OW + 1 Pz
iii. GWQ sampling locations-				
AQI	7	2	20	24
AQII	2	2	4	4
Existing / Future Water Demands (MCM)				
Domestic & Industrial	1.83/ 4.22 (2025)	1.18/ 1.95 (2025)	2.95/ 4.53 (2025)	3.75/ 4.84 (2025)
Irrigation	88.55 / 13.19	55.03 / 8.26	154.57 / 13.76	153.23 / 5.95
Water Level Behaviour				
Aquifer I				
Premonsoon WL (m bgl)	5 to 28.2	7.1 to 22.4	4 to 17.6	2.9 to 20.3
Postmonsoon WL (m bgl)	2.3 to 23.6	4.8 to 19.5	2.9 to 17.1	1 to 10.9
WL Trend :				
Premonsoon–Rise (m/y)	0.08 to 0.24	0.01 to 0.13	0.02 to 0.5	0.009 to 0.74
Premonsoon -Fall(m/y)	-0.11 to 0.8	-0.05 to-0.44	-0.02 to -0.49	-0.03 to 0.76
Postmonsoon -Rise(m/y)	0.00 to 0.29	.00 to 2.8	-	0.10 to 0.2
Postmonsoon -Fall(m/y)	-0.00 to -2.5	-0.00 to -1.25	-0.00 to -0.77	-0.025to -0.87
Aquifer II				
Premonsoon WL (Aq-II) m bgl	17 to 61	38.5 to 57.6	*4.5 to 52*	19.5 to 61
Postmonsoon WL (Aq-II) m bgl	12 to 37	24 to 35	*2 to 27*	13 to 41


POSTMONSOON ,DEPTH TO WATER LEVEL (NOV' 2016)
DEOLA, NIPHAD,SINNER & CHANDWAD TALUKAS OF NASIK DISTRICT,MAHARASHTRA
Baglan Taluka
Kalvan Taluka
Malegaon Taluka
Deola
Chandvad
Nandgaon Taluka
Dindori taluka
Yevla Taluka
Niphad
Godavari river
Nashik Taluka
Sinnar
Dama river
Igatpuri
Shirnad
Ahmednagar District
kilometres
Legend
Depth to water level (mbgl)
< 5
5 to 10
10 to 15
425 nos Villages
District Boundary
Taluka boundary
3946 sqkm Area
Divide
Waterbody
Drainage
Monitoring station
Principal aquifer Basalt (BS)
Major Aquifer BS01
Minor aquifer Ratnagarh Formation
No of aquifers Two
District Nashik
Taluka Deola,Sinnar,Niphad & Chandvad
Taluka HQ


PREMONSOON ,DEPTH TO WATER LEVEL (MAY 2016)
DEOLA, NIPHAD,SINNER & CHANDWAD TALUKAS OF NASIK DISTRICT,MAHARASHTRA
Baglan Taluka
Kalvan Taluka
Malegaon Taluka
Deola
Chandvad
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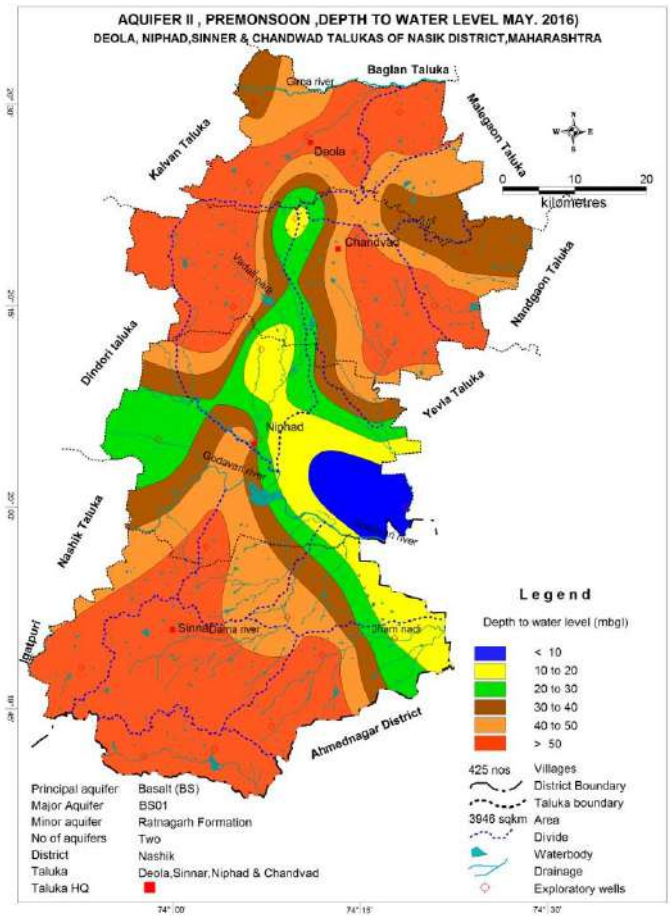
AQUIFER II , PREMONSOON ,DEPTH TO WATER LEVEL MAY. 2016)
DEOLA, NIPHAD,SINNER & CHANDWAD TALUKAS OF NASIK DISTRICT,MAHARASHTRA
Baglan Taluka
Kalvan Taluka
Malegaon Taluka
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Chandvad
Nandgaon Taluka
Dindori taluka
Yevla Taluka
Niphad
Godavari river
Nashik Taluka
Sinnar
Dama river
Igatpuri
Ahmednagar District
kilometres
Legend
Depth to water level (mbgl)
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10 to 20
20 to 30
30 to 40
40 to 50
> 50
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District Boundary
Taluka boundary
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Divide
Waterbody
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Major Aquifer BS01
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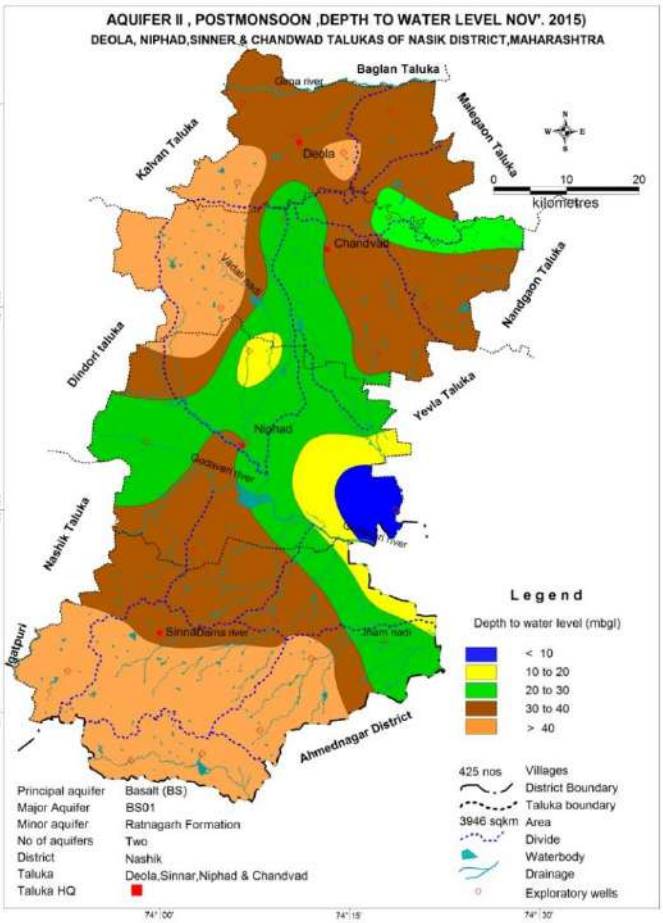
AQUIFER II , POSTMONSOON ,DEPTH TO WATER LEVEL NOV'. 2015)
DEOLA, NIPHAD,SINNER & CHANDWAD TALUKAS OF NASIK DISTRICT,MAHARASHTRA
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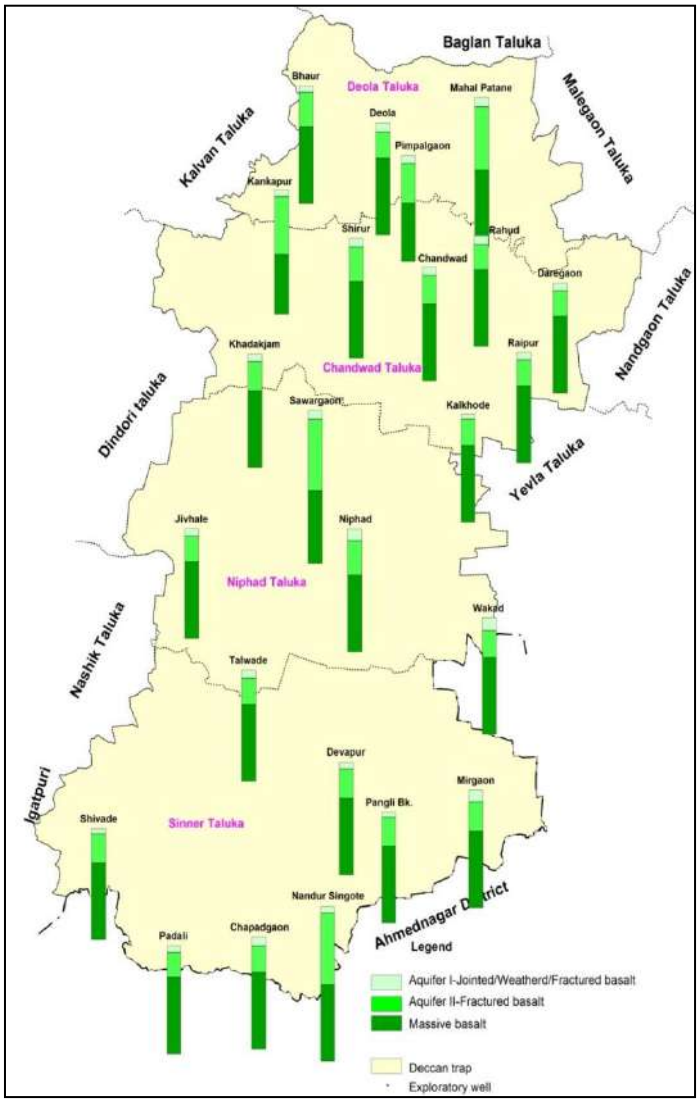
Taluka HQ

3 AQUIFER DISPOSITION

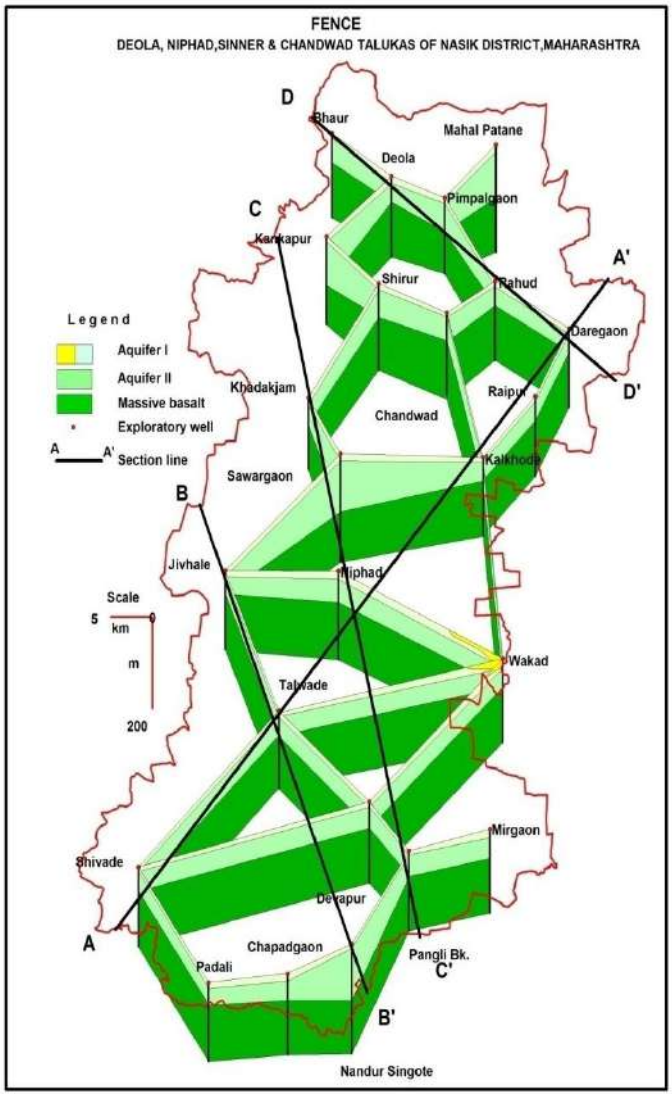
2-D and 3-D Aquifer Disposition

Aquifer: **Basalt**; **Aquifer I** - Weathered/Fractured Basalt: Depth range- 8 to 32 m and thickness of 6 to 20m.

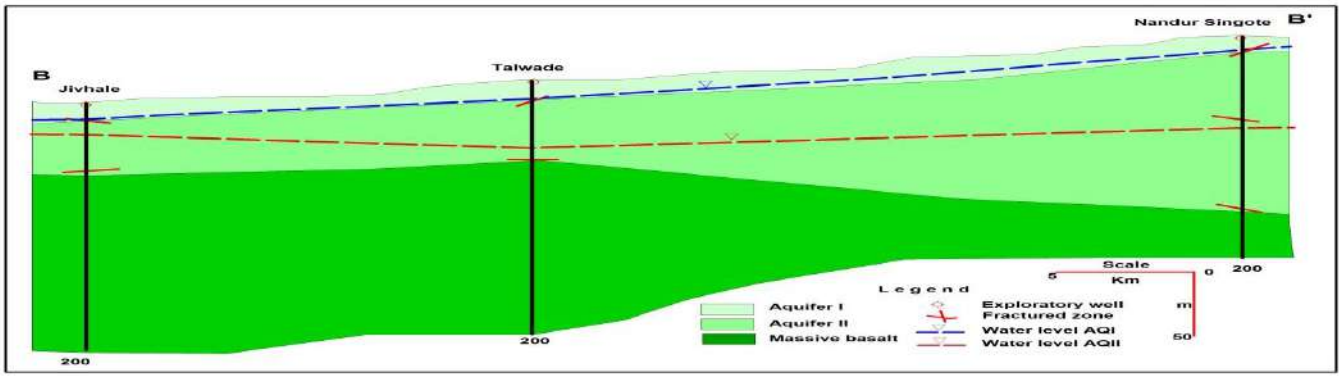
Aquifer II - Jointed/Fractured Basalt: Depth range – 25 to 160 m, Thickness – 0.5 to 10 m

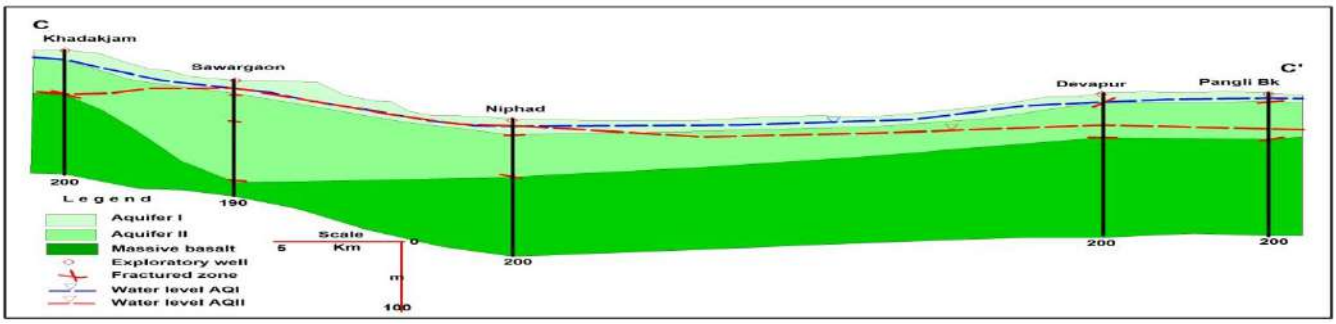


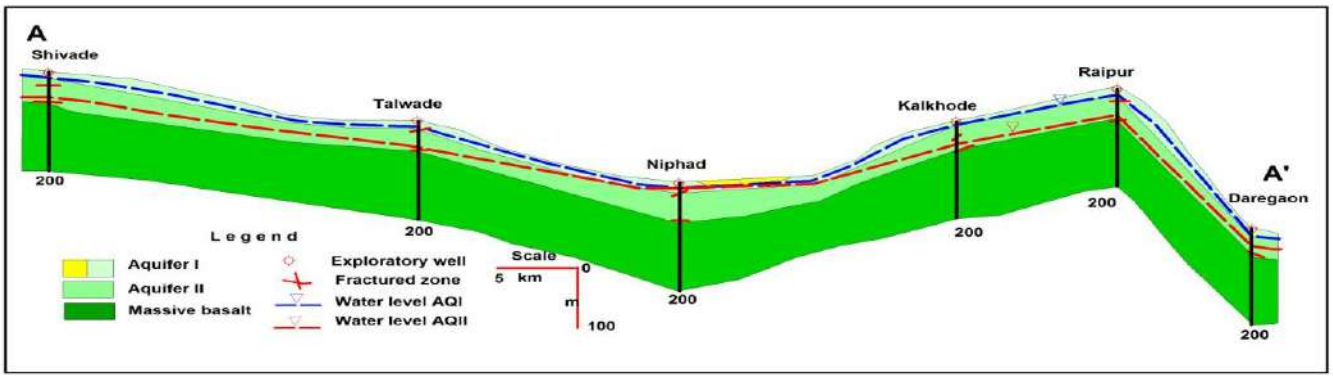
Depth-wise Aquifer Disposition

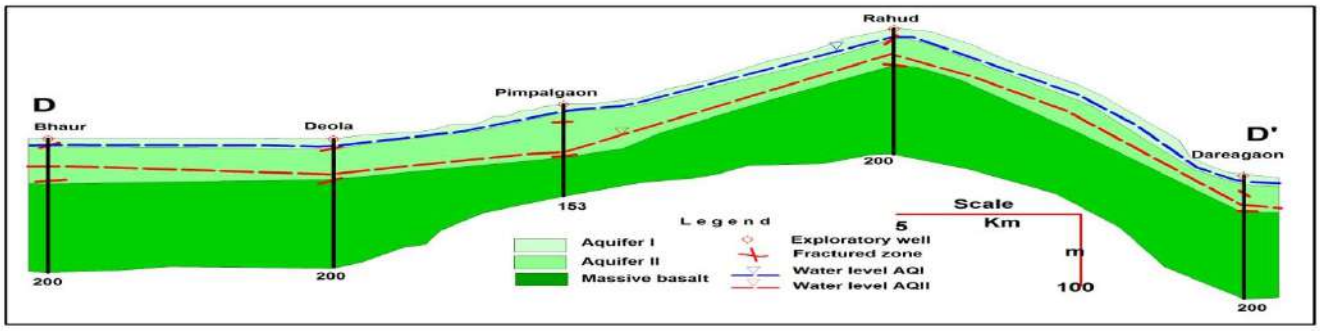


Fence Diagram of Aquifer Disposition



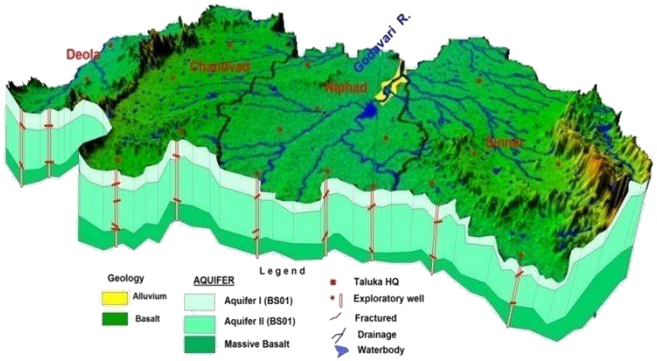






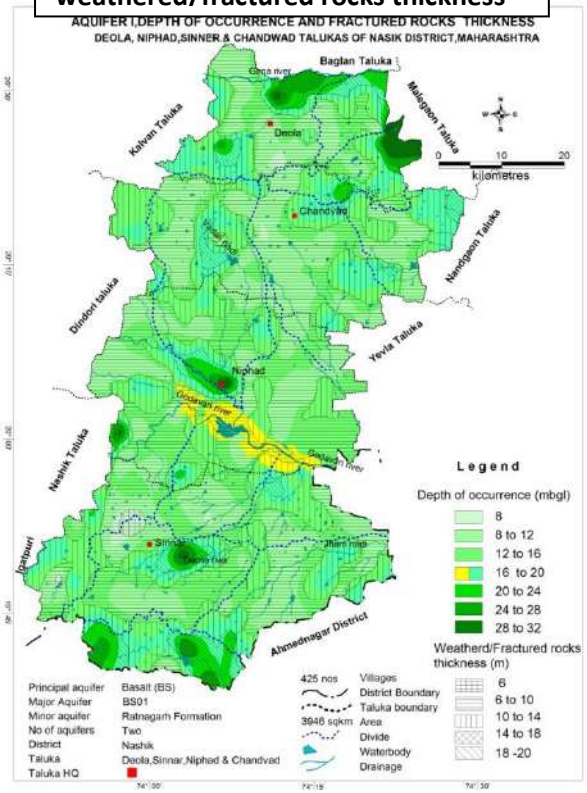
Sections showing Aquifer Disposition

3-D Aquifer Disposition

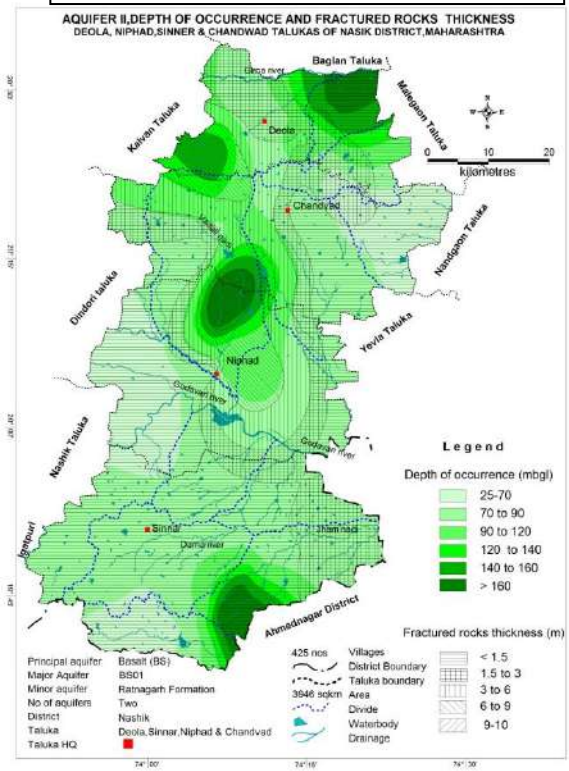


1. High yielding well at Sawargaon; Q- 7.76lps
Zones – 38.10-41.10, 71.60-74.70,99.10-102.10, 135.70-138.70, 181.40-184.50m bgl
2. High yielding well at Niphad; Q- 4.43 lps
Zones – 43-45 and 52-55 m bgl

Aquifer- I, Depth of occurrence & weathered/fractured rocks thickness



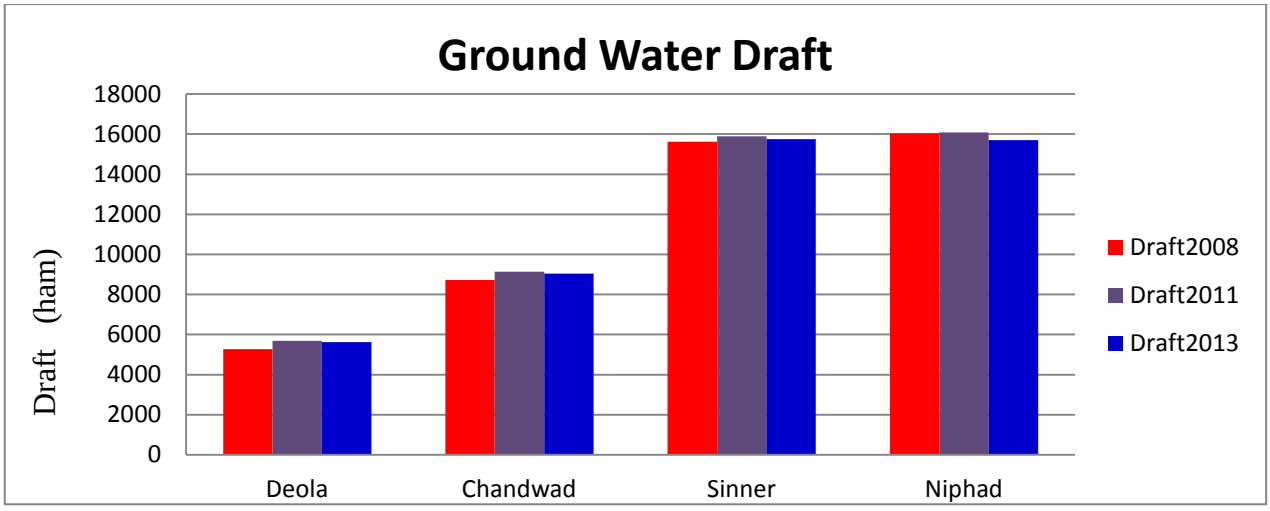
Aquifer-II, Depth of occurrence & fractured rocks thickness



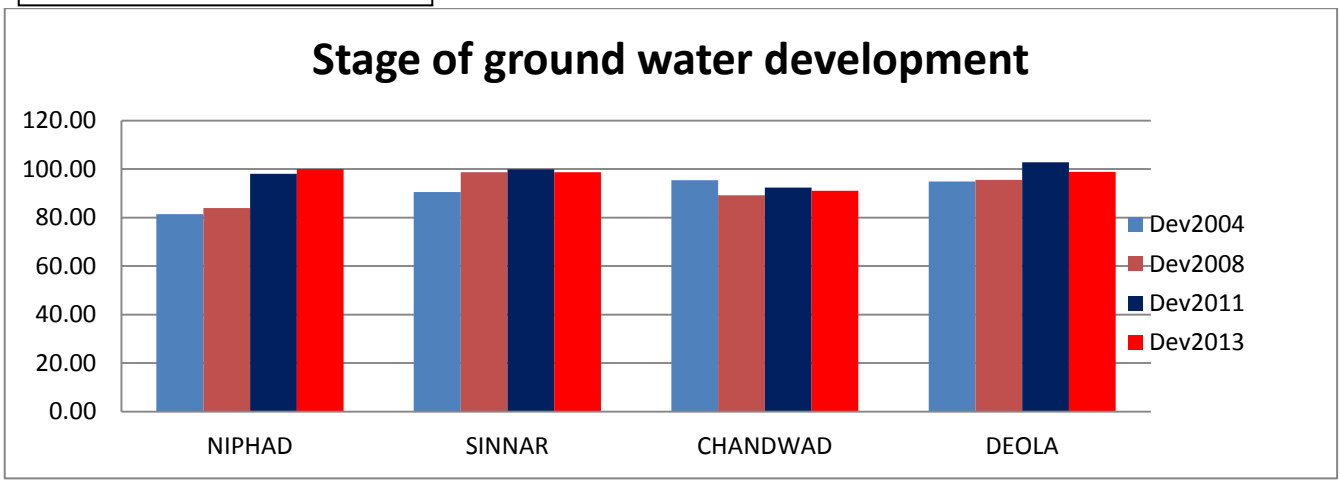
Type of Aquifer	Formation	Depth range (mbgl)	SWL (mbgl)	Fractures / weathered Zones encountered (m bgl)	Fractures / weathered rocks Thickness (m)	Yield	Sustainability	Aquifer parameter (Transmissivity – m^2/day)	Sy/S	Suitability for drinking/ irrigation
Aquifer-I	Deccan Trap- Weathered/ Fractured Basalt	8 - 32	1.20 – 15.00	Up to 32	6 to 20	10 to 100 m^3/day	1 to 5 Hours	9.25-89.04	0.019-0.028	Yes , suitable for both
Aquifer-I	Alluvium	10-20	5 - 10	Granular zone up to 20	1 to 3	200-300 m^3/day	2 to 5 Hours			
Aquifer-II	Jointed/ Fractured Basalt	25 -160	8-55	Up to 160	0.5 to 10	Upto 2.5 lps	0.5 to 3 hours	10.85-131.11	1.30×10^{-4} - 5.31×10^{-4}	Yes, suitable for both, except High EC

4 GROUND WATER RESOURCE, EXTRACTION, CONTAMINATION AND OTHER ISSUES

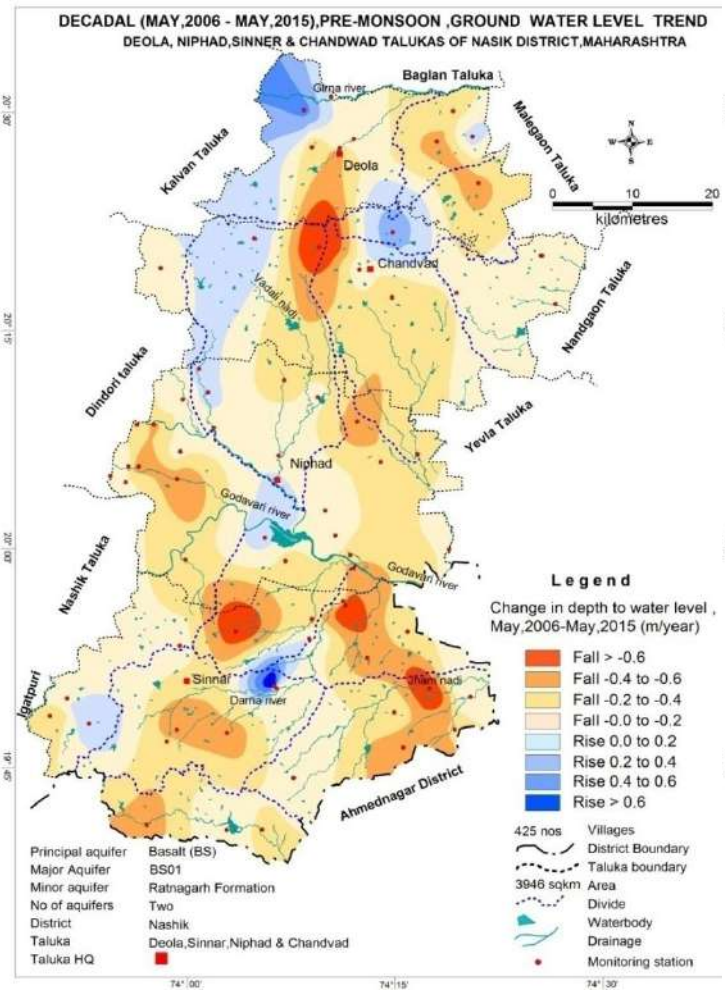
	Chandvad	Deola	Niphad	Sinnar
Aquifer wise Ground Water Resource availability and Extraction				
Ground Water Resource (MCM)				
Aquifer –I: upto 32 m				
Availability	99.22	56.89	159.51	157.02
Withdrawal	88.55	55.03	154.57	153.23
Ground Water Resource (MCM) **Aquifer –II:** 25 to 160 m				
Availability	2.46	1.24	1.89	1.45
Withdrawal	0	0	0	0
Stage of GW Development	91.09%	98.80%	98.75%	99.98%
Present Category	Semi Critical	Semi Critical	Semi Critical	Semi Critical
Ground Water Related Issues				
Over Exploitation	Stage of GW Development has increased over the period of time. Overdraft for irrigation purpose.			
Deeper Water Levels	In AQII Deeper Water Levels (DTW> 40 m) – Area 2450 sq km			
Declining Water Levels	Declining Water Levels area –Pre-monsoon 1993 sq.km & Post-monsoon 3646 sq.km (Falling Trend > 0.20 m/yr)			
GW based irrigation of cash crops like sugarcane	Sugarcane crop (103 sq.km)– water intensive crop.			
Micro Irrigation	About 25 % area of Sugarcane are under drip irrigation through GW, thus further scope of implementing WUE in Sugarcane crop, Onion and Grape crops			

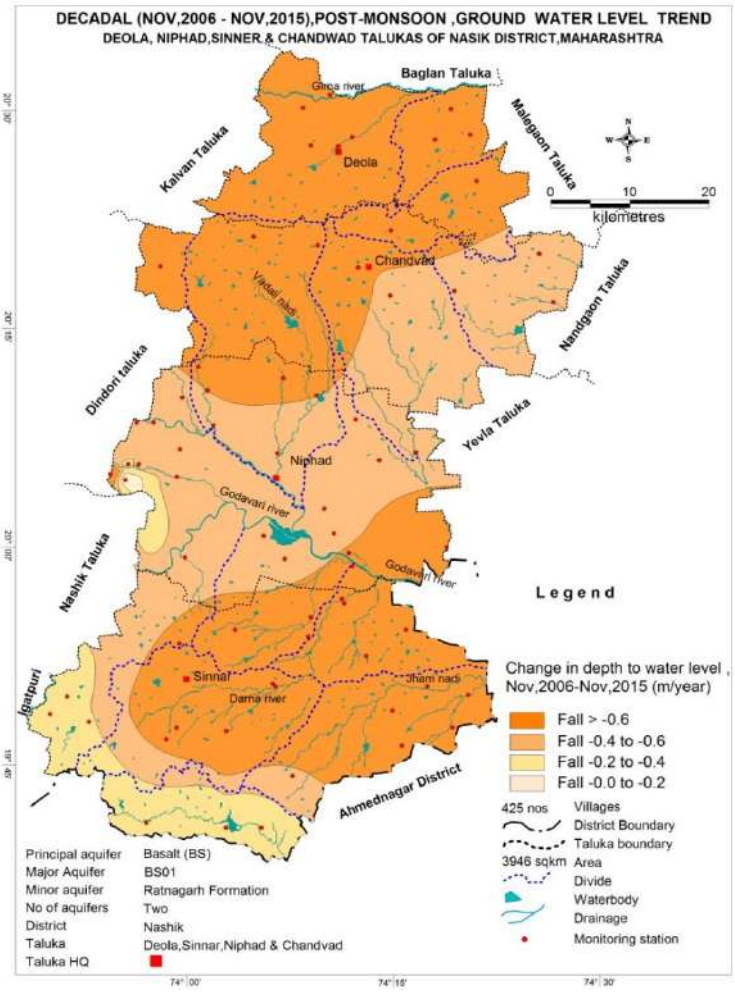


ISSUE: OVER-EXPLOITATION



ISSUE: DECLINE OF WATER LEVEL





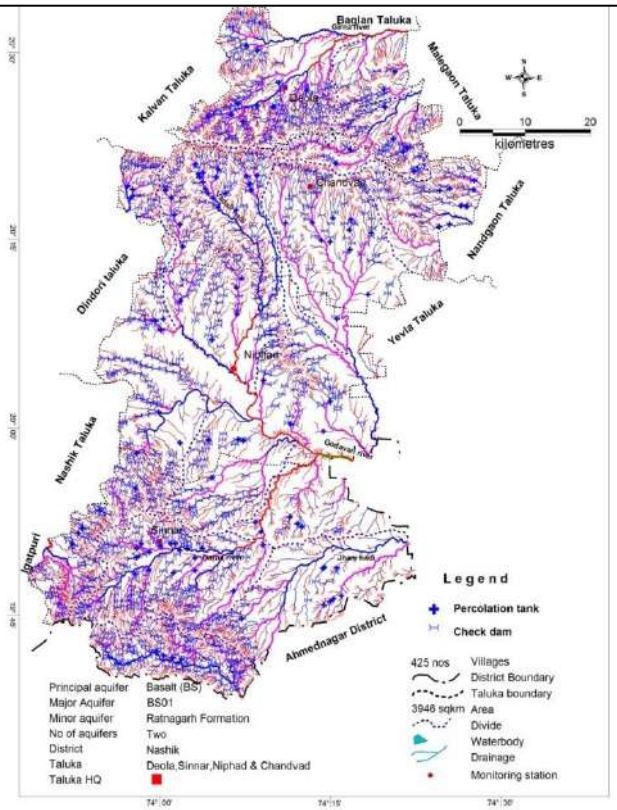
Pre monsoon Trend 2006 – 2015, Fall @ > 20 cm/year) area – 1993 sq.km.

Post monsoon Trend 2006 – 2015 Fall @ > 20 cm/year) area 3646 sq.km.

5 GROUND WATER RESOURCE ENHANCEMENT AND PROPOSED MANAGEMENT INTERVENTIONS

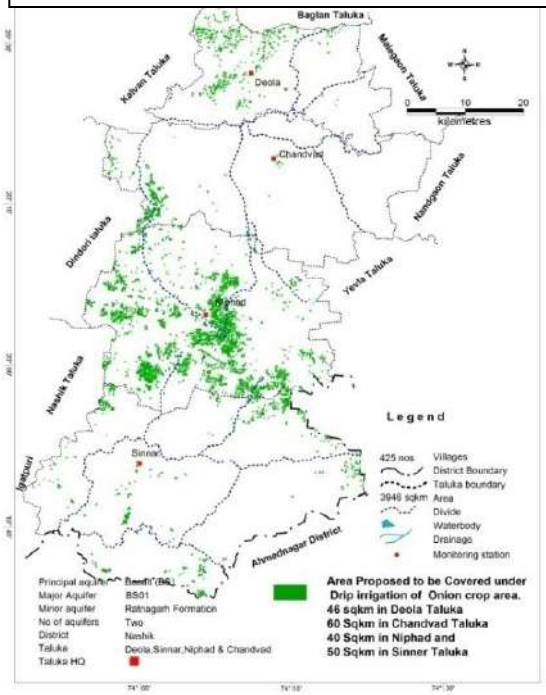
Particulars	Chandvad	Deola	Niphad	Sinnar	Total
SUPPLY SIDE INTERVENTIONS					
Recharge Potential	20.93	19.76	21.46	39.58	**101.73**
Surface water requirement @ 75% efficiency	27.91	26.35	28.61	52.77	**135.64**
Availability of Surplus surface runoff	21.95	20.72	22.49	41.49	**106.65**
Utilisation for small WC structure under state govt programme	0,75	0.70	0.85	1.20	**3.50**
Proposed AR Structures					
PT @ Rs. 1.50 crore Av. Gross Capacity-100 TCM*2 fillings = 200 TCM	77	73	79	145	**374**
CD @ Rs. 0.30 crore Av. Gross Capacity-10 TCM * 3 fillings = 30 TCM	220	207	225	415	**1067**
Volume of Water expected to be recharged @ 75% efficiency (MCM)	16.50	15.61	16.91	31.09	**80.11**
Estimated Expenditure (Rs. in Cr.)	177	167.1	180.0	333.0	**881.1**
RTRWH - Economically not viable & Not Recommended. Total estimated Cost of RTRWH would be-89.57 Cr. For Harvesting the Water of 1.25 MCM					

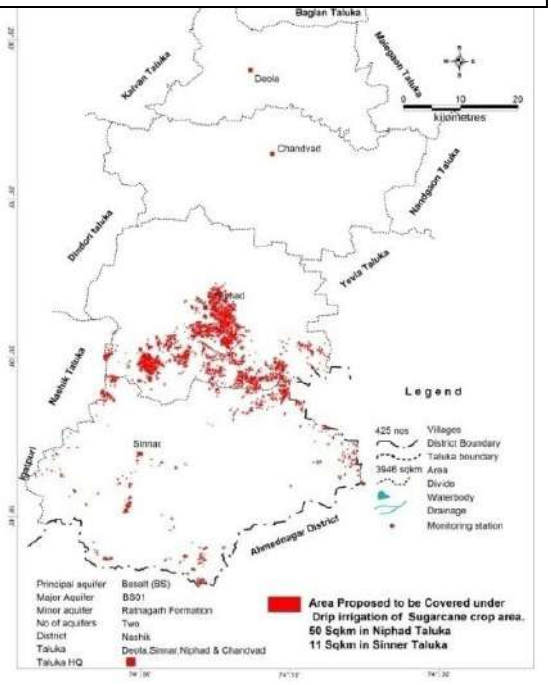
SUPPLY SIDE INTERVENTIONS: LOCATIONS OF PROPOSED AR STRUCTURES

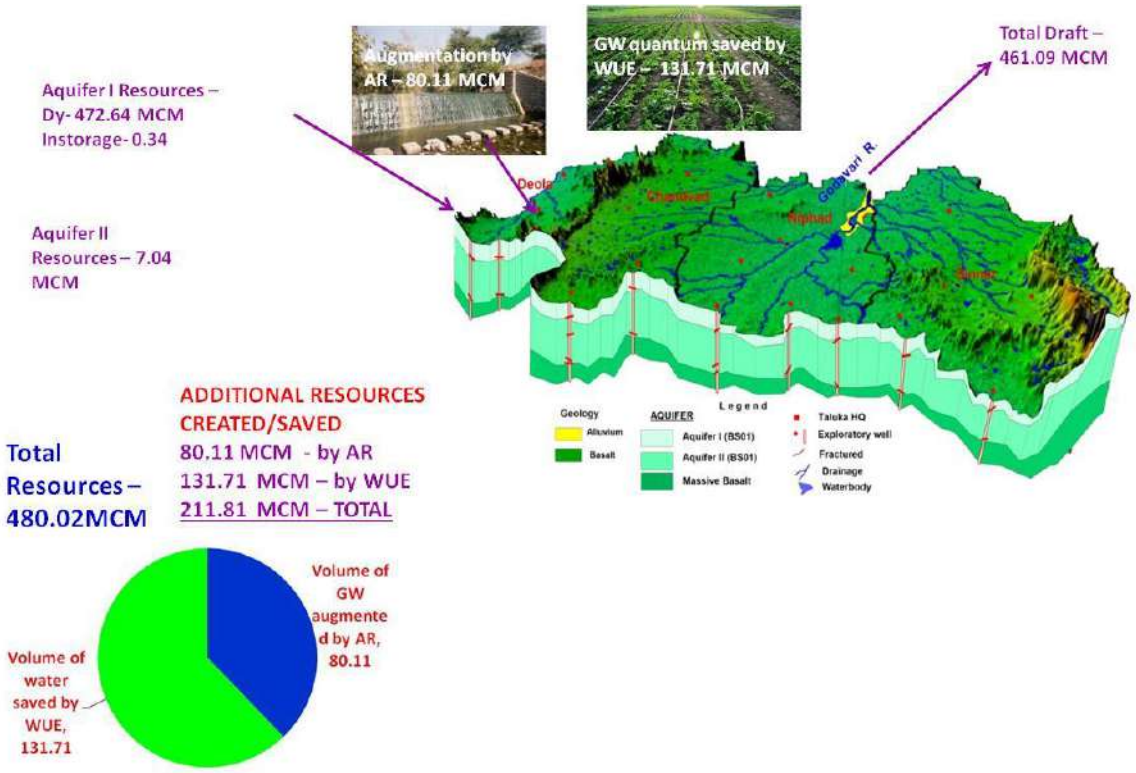


DEMAND SIDE INTERVENTIONS					
Proposed Cropping Pattern change	----------None----------				
Micro irrigation techniques	**Chandvad**	Deola	**Niphad**	**Sinnar**	**Total**
Existing area under Drip(sq.km)	19.98	10.92	50.27	24.74	**105.93**
Area proposed to be covered under Drip(Sq.km)					
Onion	60 sq.km (80%)	46 sq.km (80%)	64sq.km (80%)	40 sq.km (80%)	**210 sq.km**
Entire Sugarcane area	5.48sq.km	12.18 sq.km	44 sq.km	73sq.km	**135 sq.km.**
Volume of Water expected to be saved from these sources (MCM)	18.58	18.97	42.06	52.10	**131.71**
Estimated Expenditure (Rs. in Cr.) @ Rs. 30,000/- per acre for onion&Horticulture ,@Rs60,000 for Sugar cane	52.19	52.36	113.57	138.17	356.29

DEMAND SIDE INTERVENTIONS: PROPOSED AREAS FOR DRIP IN ONION & SUGARCANE

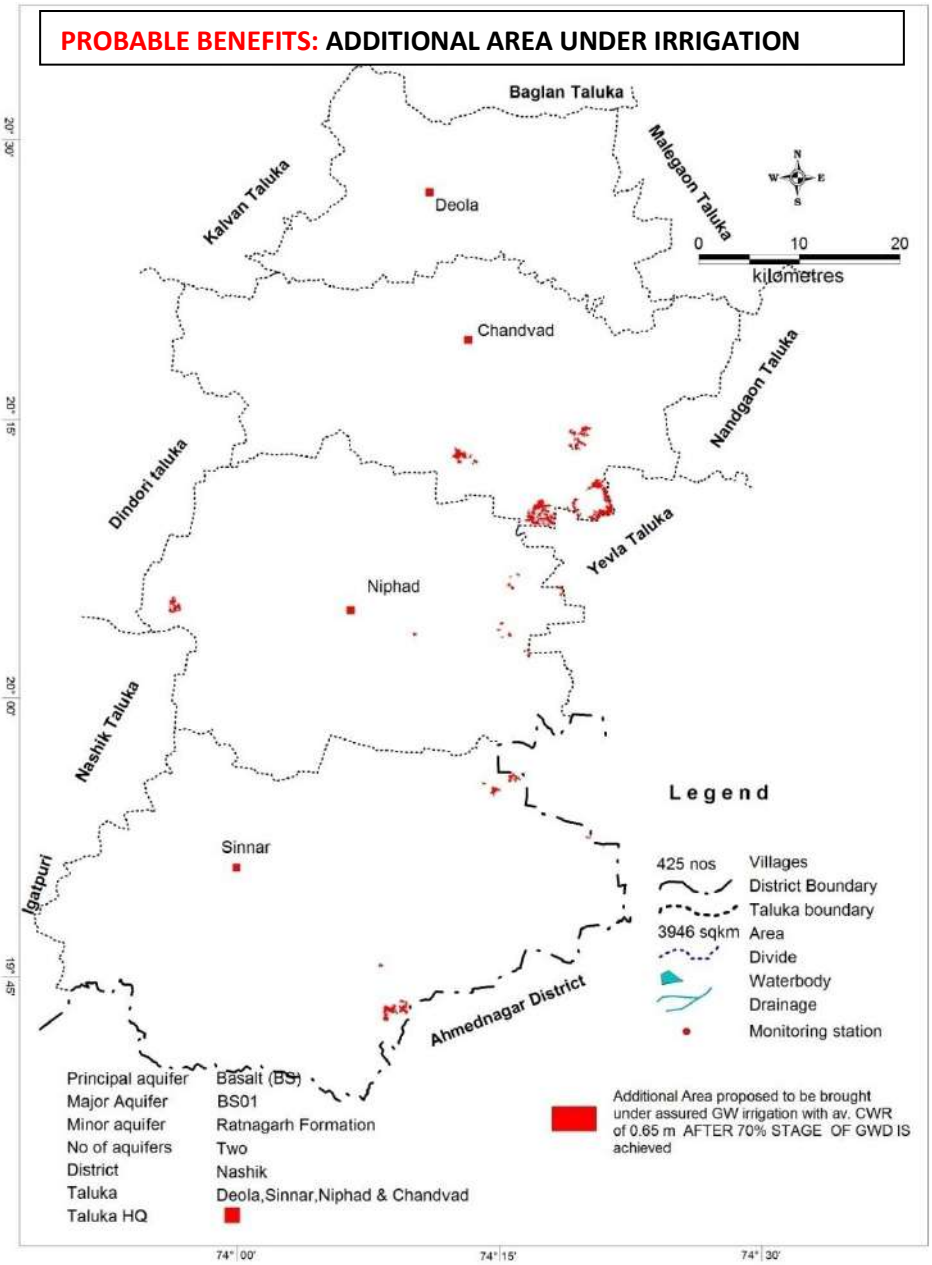






5.1 Probable Benefits

	Chandvad	Deola	Niphad	Sinnar	Total
GW resources available after implementing above measures (Artificial recharge and micro irrigation) in mcm	35.08	34.58	58.97	83.19	211.82
Volume of water Required to bring stage of development upto70%	29.89	23.41	67.24	65.52	186.06
Balance ground water available for ground water development after stage of development is brought to 70%	5.18	11.17	0.00	17.67	34.03
Additional Area (sq.km.) proposed to be brought under assured GW irrigation with av. CWR of 0.65 m.	7.97	17.19	0.00	27.19	52.35
Stage of GW Development after intervention in %	70%	70%	70%	70%	70%



5.2 Regulatory Measures

	Chandvad	Deola	Niphad	Sinnar
Regulatory Measures	Regulation of wells below 60 m	Regulation of wells below 60 m	Regulation of wells below 60 m	Regulation of wells below 60 m

6 SUM UP

A thorough study was carried out based on data gap analysis, data generated in-house; data acquired from State Govt. departments and GIS maps prepared for various themes. All the available data was brought on GIS platform and an integrated approach was adopted for

preparation of aquifer maps and aquifer management plans of Chandvad, Deola, Niphad & Sinnar Talukas of Nashik district

The study area is spanning over 3945.76 sq.km. Geologically the area is mainly occupied by Basalt and the stage of ground water development is 91.09 % in Chandvad, 98.8 % in Deola, 99.98 % in Niphad and 98.75 in Sinnar taluka. The area has witnessed ground water depletion and over exploitation over a period of time. In Aquifer-I, the deeper water levels of >15 m bgl has been observed in central parts of Chandvad and southern parts of Sinnar talukas, while in Aquifer –II, deeper water levels of > 40 mbgl has been observed in major parts (about 2450 Sqkm in pre monsoon) of the study area. The declining water level trend > 0.20 m/yr. has been observed in major part about 3645 sq km during post monsoon and 1993 sq km during pre monsoon trend (2006 to 2015). This has been due to cultivation of water intensive cash crop like Sugarcane (103 sq.km) and increase in area under Rabi crops over the year, which are dependent on ground water irrigation.

Ground water management plan has been prepared with the objective of bringing the current stage of ground water development down to 70% and to arrest decline of water level, so that the taluka comes under Safe category by adopting both, supply side and demand side interventions.

As a part of supply side interventions, a total of 374 Percolation Tanks and 1067 Check Dam are proposed in Chandvad, Deola, Niphad & Sinnar Talukas, which will augment ground water resources to the tune of 80.11 MCM (56.1 MCM by Percolation Tanks and 24.01 MCM by Check Dam). The total cost of implementing these interventions will be Rs. 881.1 crore.

As a part of demand side interventions, change in irrigation techniques from surface flooding to drip irrigation is also proposed. A total 135 sq km Sugarcane crop area and 210 sq km onion cropped area are proposed to be covered under drip irrigation techniques instead of flood irrigation that will save 131.71 MCM of water resources. The total cost of implementing these interventions will be Rs 356.29 crore.

In Chandvad, Deola, Niphad & Sinnar, a total of 34.03 MCM resources will be augmented after adopting artificial recharge, whereas and 211.82 MCM will be saved after implementing water user efficiency measures (drip irrigation). This will bring the stage of ground water development to 70 % from the present stage of 91.09 % in Chandwad , 98.8 % in Deola , 99.98 % in Niphad and 98.75% in Sinnar taluka and 52.35 Sqkm additional area proposed to be brought under assured GW irrigation with av. CWR of 0.65 m

This will probably result in arresting the decline of water levels. These interventions also need to be supported by regulation of deeper aquifer and hence it is recommended to regulate/ban deeper tubewells/borewells of more than 60 m depth in these talukas, so that the deeper ground water resources are protected for future generation and also serve as ground water sanctuary in times of distress/drought.

Similarly IEC activities and capacity building activities needs to be aggressively propagated to establish the institutional framework for participatory groundwater management.