



जल शक्ति
अभियान
संचय जल, बेहतर कल

JSA-CTR

Scientific Action Plan for Charkhi Dadri



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1 Introduction

1.1 History

Dadri, said to have derived its name from a Jheel called Dadier (Dadier means frog) is a town of great antiquity. During Raj times, Charkhi Dadri was a princely state with an area of 575 sq miles and revenue of Rs 103000 annually. Formerly it was ruled by Nawab Bahadur Jang, a relative of Nawab of Jhajjar but in 1857 it was conferred upon Raja Sarup Singh of Jind as a reward by Britishers. After independence it became a part of Mahendragarh District and in 1972 it became a tehsil headquarter of newly carved out district of Bhiwani. The town is known for its cement factory which was established by Dalmia in 1938. Three principal villages which took part in the rebellion, Charkhi, Mankinas and Jhanjhu, were burned down. Previously in Bhiwani district, Charkhi Dadri became part of the new Charkhi Dadri district in 2016.

1.2 Location

Charkhi Dadri district lies in south-western part of Haryana state covering an area of 1370.11sq.km. Physiographically, the district consists of flat level plain interrupted from place to place by clusters of sand dunes, isolated hillocks and rocky ridges. The district comprises two Sub Divisions of Charkhi Dadri and Badhra & two Tehsils Charkhi Dadri and Badhra and one Sub Tehsil Bond Kalan. A few isolated rocky ridges elevated sharply from the plain occur in the south central portion of the district. The district is located between 28°35" North latitude and 76°15" East longitude. It is surrounded by Bhiwani, Mahendergarh, Jhajjar & Rohtak. It is 113 Kilometer from Delhi & 295 Kilometer from Chandigarh. The Location Map of Charkhi Dadri district is shown in **Figure 1**.

1.3 Administrative Setup

The administrative setup of the District of Charkhi Dadri has been described in the following table, with specific sectoral development such as water, animal husbandry, agriculture, roadways is operated under specific departments. The detailed administrative setup is shown in **Table 1**.

Table 1 Major Administrative Jurisdictional Setup of Charkhi Dadri District.

Country	India
State	Haryana
Division	
Headquarters	Charkhi Dadri
Population (2011)	
Total	502276
Density	370/km ² (970/sq mi)
Demographics	
Literacy	70%
Vidhan Sabha constituencies	1. BADHRA, 2. DADRI
Website	https://charkhidadri.gov.in/
Location of Charkhi Dadri	South-western part of Haryana
Coordinates	28°35" N latitude and 76°15" E longitude
Total Area	1370.11sq.km.
Elevation	213.721 Metres. above Mean Sea Level

Source: https://en.wikipedia.org/wiki/Charkhi_Dadri_district

Sub Divisions (2)	Charkhi Dadri & Badhra
Tehsils (2)	Charkhi Dadri & Badhra
Sub-Tehsils (1)	Baund Kalan
Blocks (3)	Badhra, Dadri-I, Dadri-II
Municipal Corporation (1)	Municipal Corporation, Charkhi Dadri
Municipal Council (1)	Charkhi Dadri
Municipal Committees (1)	Charkhi Dadri

Source: <https://charkhidadri.gov.in/administrative-structure/>

Local Institutions: -

Total Villages	172
Village Level	Panchayat
Block Level	Panchyat Samiti
District Level	Zila Parishad

Source: <https://charkhidadri.gov.in/administrative-structure/>

1.4 Climate

1.4.1 Temperature

The climate of the study area is characterized by extreme climatic conditions with hot summer and cold winters with scanty rainfall. The year may be broadly divided into four namely, summer from April to June, monsoon extending from July to mid September, from middle September to October may be considered as transition period. Winter season extends from November to March. The temperature ranges from 5° to 45°C. Maximum temperature often touches 45°C by the end of June.

Temperature starts falling with the onset of pre-monsoon showers. After the monsoon season, the day temperature remains same but nights cooler up to October. Day and Night temperatures start decreasing rapidly in November. January is the coldest month with average monthly minimum temperature of 1.5°C and average monthly maximum temperature of 5.54°C.

1.4.2 Rainfall

The avg. annual rainfall at different rain gauge station in the district is taken from published records meteorological department. The principal precipitation is by South-Western Monsoon during the period from June to September. Most of the rainfall (about 85%) of annual precipitation occurs during this period. The rest 15% rainfall is received during non-monsoon period in the wake of western disturbances & thunderstorms. The normal annual rainfall in Charkhi Dadri district is about 483 mm mainly in months of July-August. The rainfall map of Charkhi Dadri district is shown in **Figure 2**.

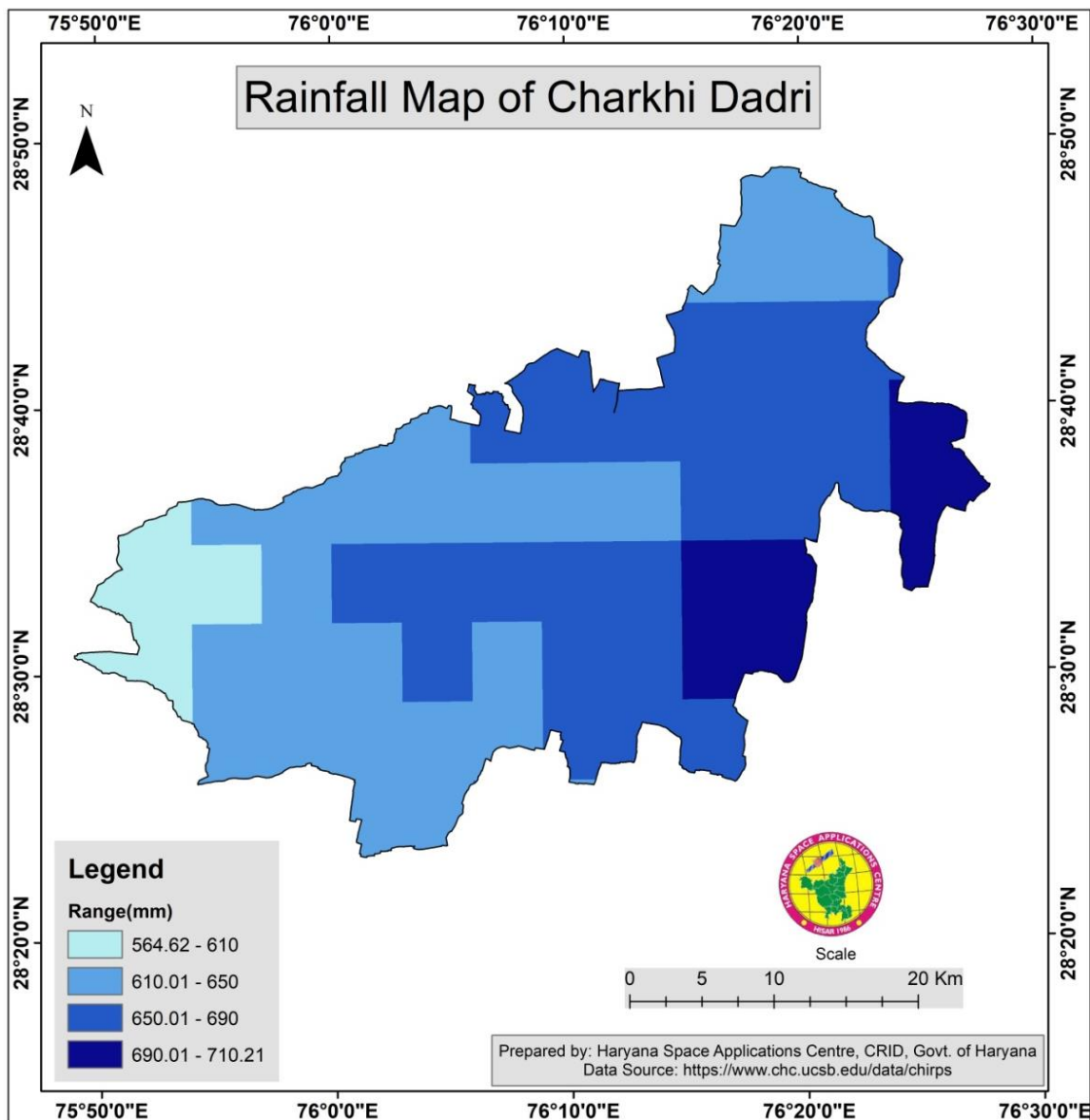


Figure 2 Rainfall Map of Charkhi Dadri District

1.5 Elevation and Topography

The height above mean sea level of the district ranges from 139 to 383 m (**Figure 3**). In general, the district is a sandy, undulating plain dotted with sand dunes of various shapes and sizes particularly in the south western parts which form a thirsty land covered with steppe vegetation. The monotony of this sandy plain is disturbed in parts by the relics of Aravalli hills. The area in general is plain with an average altitude of 213.721 Metres. Above Mean Sea Level.

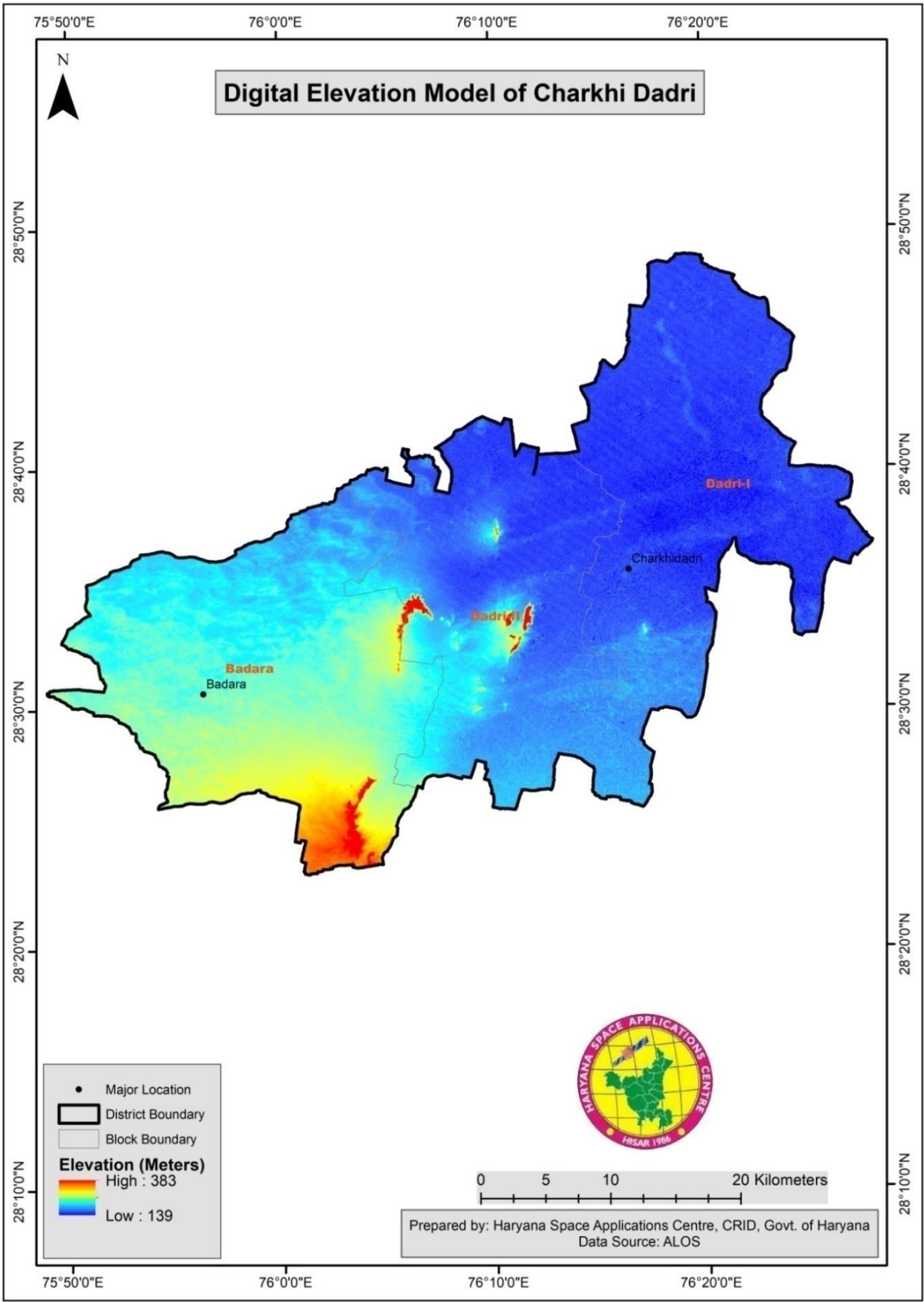


Figure 3 Digital Elevation Model of Charkhi Dadri District

Slope ranges from flat to >35 degree (**Figure 4**). In the District there are few isolated hills belonging to the Aravalli range. The general strike of the quartzite beds of Delhi System Range from NNE-SSW to North South. The rock dipping towards WNW or ESE at an angle from 59-80. Occasionally, Westerly or easterly dips are recorded.

Further Slope map of district is prepared to understand flow of water, though in-depth study is separately being conducted with the help of Contour maps (**Figure5**).

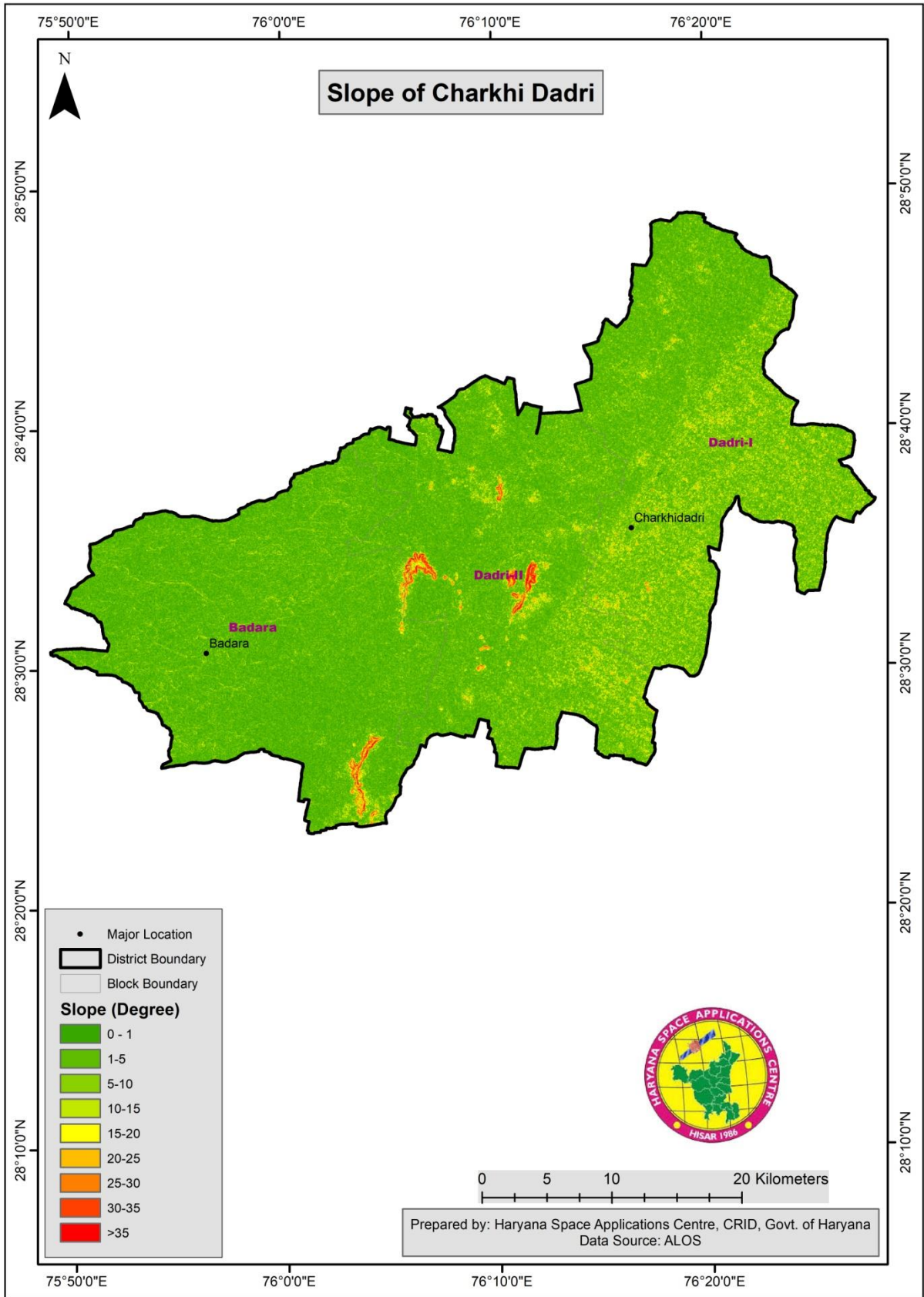


Figure 4 Slope Map of Charkhi Dadri District

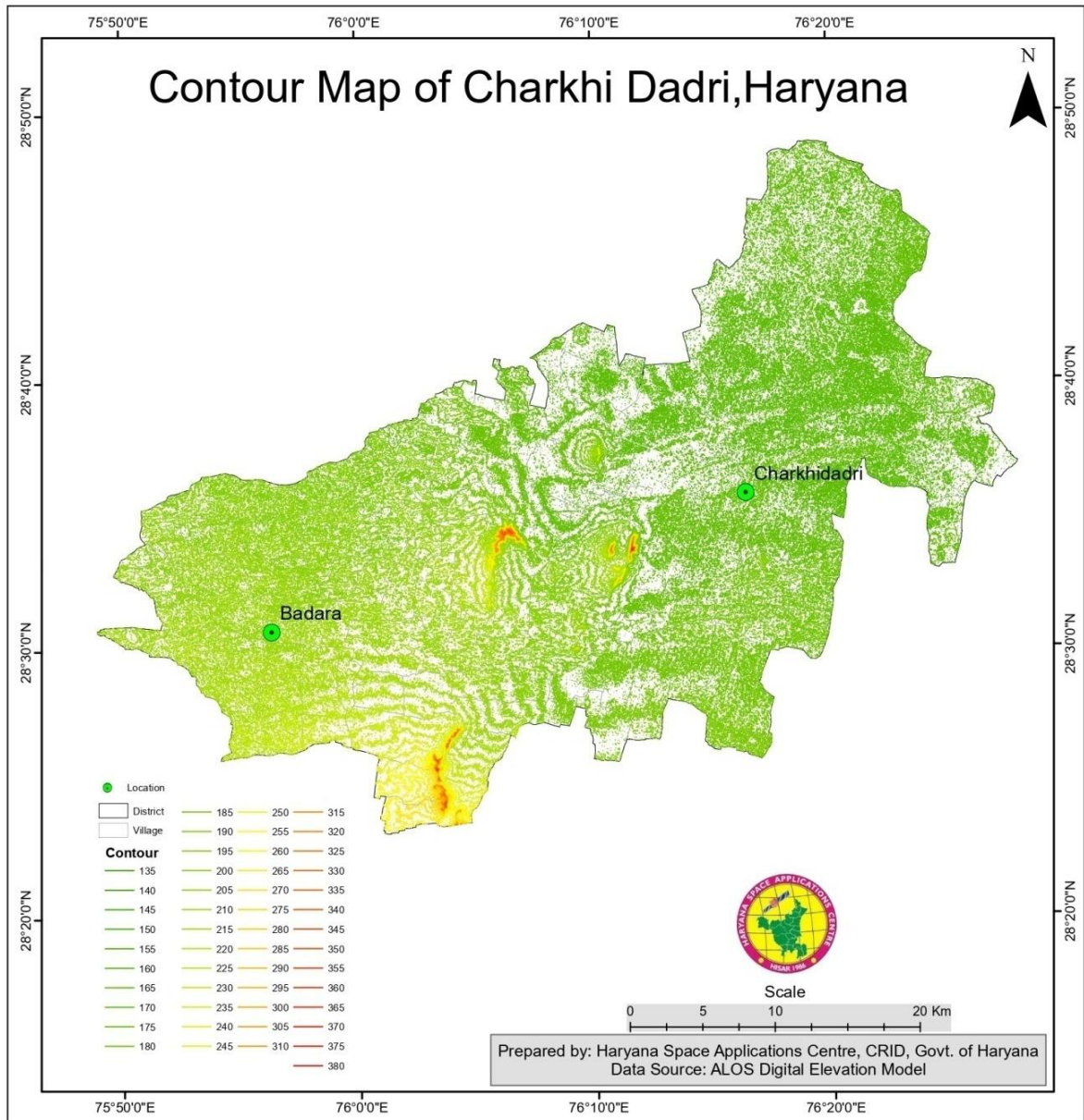


Figure 5 Contour Map of Charkhi Dadri District

1.5.1 Geology and Lithology

The flexible sandstone occurs in quarries in a small hillock, having an elevation of about 384 meter in Kaliana area. The hillock comprises mainly thick sequence of sandstone belonging to the Alwar Group of the middle Proterozoic Delhi Super group (**Figure6**). The sandstones are unmetamorphosed. A number of quarries are available from where sandstone is being quarried for the flour millstones. Itacolumite occurs as nearly 3 m thick bed traceable over several tens of meters length in thick layers of non-flexible sandstone. The sandstone beds show almost vertical dip. The abundance of non-flexible sandstone is more relative to the flexible sandstone. In fact only at few places flexible sandstones are exposed in the quarries. Loose sandstones excavated from quarries have been dumped

haphazardly in the nearby areas because they are not found suitable for making flour millstones. The excavation and dumping of sandstones in the surrounding area has exposed them to more exogenous processes.

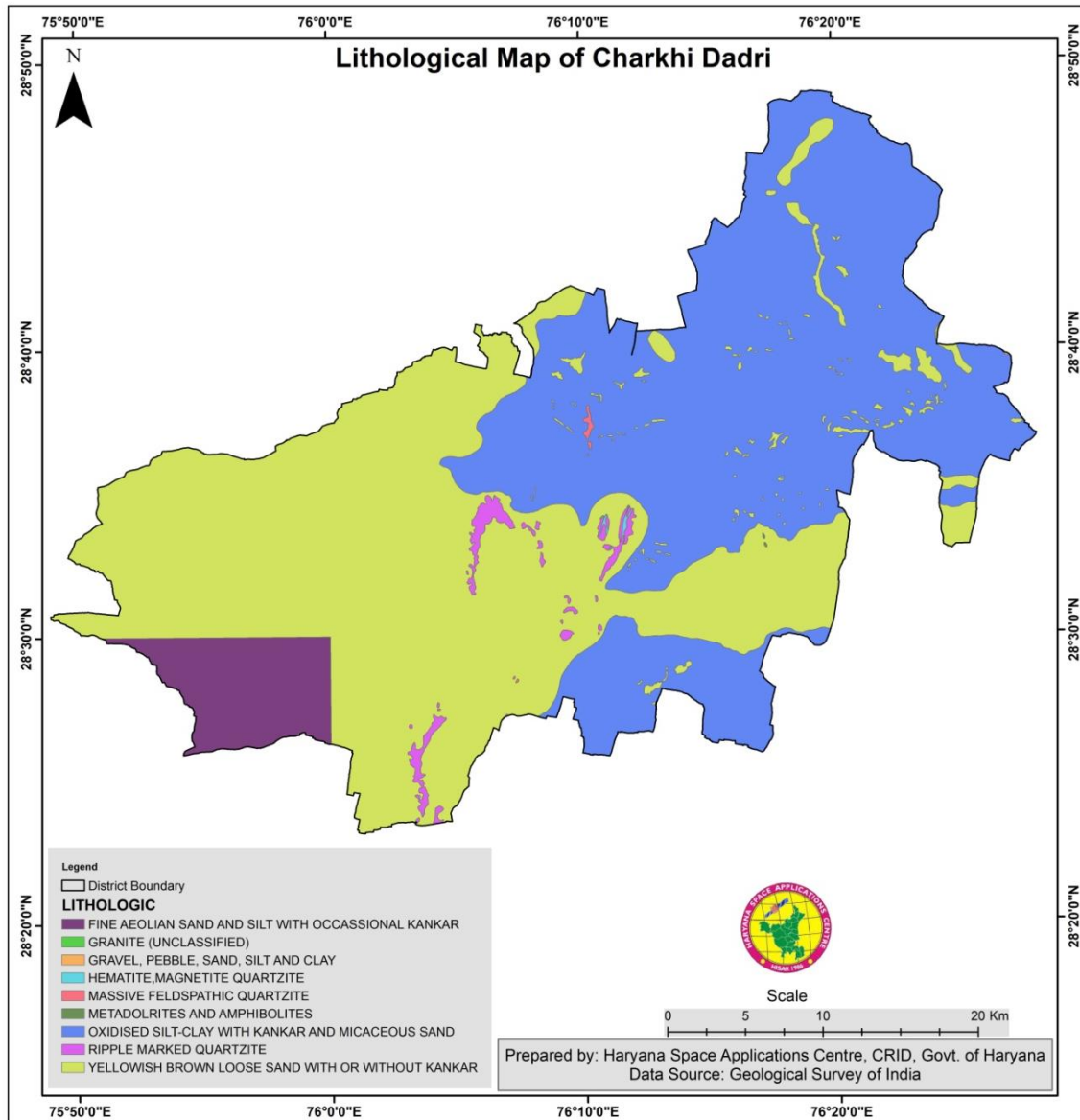


Figure 6 Lithological Map of Charkhi Dadri District

1.5.2 Soil Profile

The district is a part of semi-arid tract and most of the part is underlain by alluvium comprising inter bedded lenticular and inter fringing deposits of silt sand, sandy clay and blown sands. Isolated hillocks of Delhi system are exposed in southern part of the district.

The soils in Haryana are almost forming of alluvium. The alluvium is the oldest type containing sand, clay, silt & hard calcareous concentration about the size of the nuts known as kankar (Figure7).

Soils are light to medium in texture and pH varies from 7.8 to 8.5. The soil varies from sand to sandy loam in Dadri. The block Badhra is covered with sandy soil. Clayey loam to clay and loamy soil is found at many places of Jhojhu block. For the study of soil structure, the district may be divided into two tracts, viz. Bagar tract and Dadri tract. The general profile of soil health of Haryana state is shown in **Figure 8**.

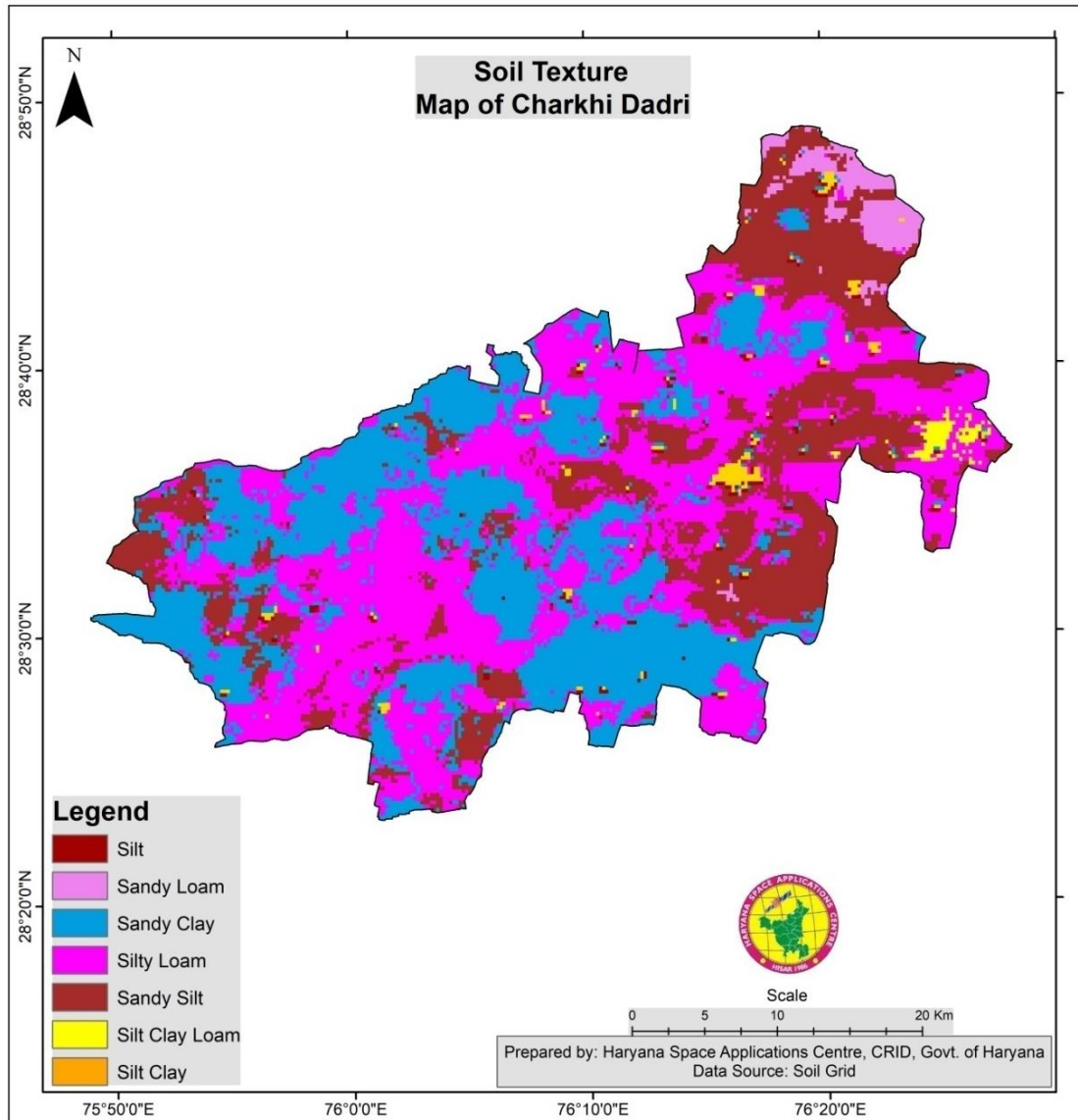


Figure 7 Soil texture map of Charkhi Dadri District

Sand Dunes: South-West of the area is marked by sand dunes. Bagri region or tract is long strip of shifting sand dunes called ‘tibba’ and relatively semi-fertile lands between them called ‘lal’ along the western border of Haryana and eastern border of Rajasthan.

The Bagar region has potentially very fertile alluvial soil interspersed with highly permeable very sandy tracts in several places with water table more than 100 feet below ground containing brackish water usually unfit for human consumption, where dust storms frequent during the warm summer months from April till the end of July when monsoon arrives. In Haryana, it covers southern parts of Sirsa district and western villages of Fatehabad, Hisar, Bhiwani and Charkhi Dadri districts.

SOIL HEALTH-HARYANA			
Major & Secondary Nutrients:-			
	L	M	H
Nitrogen	: 89.27%	7.98%	2.75%
Phosphorus	: 88.28%	9.45%	2.26%
Potash	: 10.61%	48.55%	40.84%
Sulphur	: 8.32%	Deficient	
Micronutrients:-			
Zinc	: 19.70%	deficient	
Iron	: 28.20%	deficient	
Manganese	: 8.90%	deficient	

Figure 8 General soil health profile of Haryana

1.6 Landuse

1 Residential Zone

Land required for residential and allied activities within municipal limits and within controlled area is estimated to be 1301 acres and an effort has been made to establish workplace-home relationship to reduce travelling distances by conceiving self contained sectors around the town. The sectors earmarked for this purpose are sectors 1, 2,3,7,9 and part of sectors 8, 10, and 11. A density of 70 persons per acre for the existing town and the sector adjoining existing town and 60 per sons per acre for the remaining sectors, have been considered. Thus these sectors will be adequate for a population of 75000 by 2021 A.D. The residential area of sector-11 highly potential for development as such it is proposed to e considered in first phase.

2 Commercial Zones

The commercial function will not only serve the population of the town but it will also cater to the needs of the rural population within its influence.

The existing wholesale and grain market is inadequate to cater to the needs, so a new wholesale market of 57 acres is provided along with provision of warehousing and other storage facilities in

sector 10 on Delhi-Narnaul Road. The old mandi will serve as vegetable and stone, timber market. A part of sector 8 covering an area of 35 acres is earmarked as city centre keeping in view the central location and easy approach from all part of the town.

3 Industrial Zone

Prior to its up-gradation as tehsil headquarter, Dadri was known for its cement factory which was established by Dalmia in 1938. This factory employs near by 75 per cent of the workers engaged in secondary sector. There were a few ancillary units of this cement factory mainly of cement pipes, tiles, etc.

The increased irrigation facilities have increased the demand for agricultural implements thus resulting in development of agro-based industries. Similarly, 440 K.V. electric sub-station built near Bhiwani, will augment the existing supply of power to industries. Besides these towns' proper linkages with its surrounding settlements and far off areas is another advantageous factor for its growth.

In order to remove regional imbalances in the industrially backward area, the Government of India, in 1984 had declared Dadri and Bhiwani sub divisions as industrially backward, incentives were provided to prospective entrepreneurs for setting up their industries in these areas. These incentives were concessional finance extended to the fixed capital investments, preferential treatment in the grant of industrial license and other rebates in taxes and octroi etc. All these facts promoted industrial activities in this town.

Assuming participation ratio of 35% (26260) for 2021 A.D., 45% (11860) of the total workers are estimated to be engaged in secondary sector. After excluding workers in construction (2.5%) and household industry (4%) about 11,000 workers are assumed to be engaged in manufacturing. Taking an average of 27.4 workers per acre an area of approximately 401 acres is required for industrial purposes. Keeping in view the wind direction, trend of industrial growth, existing infrastructure and future potentiality, the sectors 4,5,12 and 13 have been earmarked for industrial purposes.

4 Transports and Communication

The existing infrastructure of railways, bus stand, workshop and major roads has been accommodated in the proposed land use plan. In addition to the existing area of bus stand (3 acres) an area of 10 acres have been provided for the new bus stand and workshop on outer bye-pass road in sector -8. To cater to the needs of industrial township in particular and town as whole in general, an area of 10 acres has been earmarked for truck stand and its ancillary activities in sector 10 on Narnaul- Delhi road. 2 acres of land has been reserved for Telegraph Offices and Telephone Exchange etc. in sector 8.

The existing roads in rural zone connecting the town with its region have been earmarked as V-1, a, b, c, d, e, f, and their existing widths are maintained. The proposed outer ring road has been designated as V-1 with a width of 60-metres the major town roads as V-2 (45 meters) and the sector dividing roads as V-3 with the width of 30 meters.

5 Public Utility Zones

The existing water works and its extension on Rohtak road shall continue to be under such uses and have been earmarked as such. An additional area of 18 acres abutting existing water works have been earmarked for future extension. The site for sewerage disposal and solid waste disposal having an area of 12.5 acres each is proposed, approximately 2000 feet south of existing disposal point near Bhatinda-Rewari broad-gauge railway line.

6 Public and Semi Public Uses

The Government offices are scattered all over the town. In order to shift all Government offices at one place an area of approximately 41 acres in sector 8 near Eye Hospital, is reserved for this purpose. The existing educational institutions which are located on Delhi-Narnaul road have been kept as such and adjoining area is proposed for future expansion, of the institutions (sector 11).

7 Major Open Spaces

The open spaces which form the lungs of the town is also used as buffer separating the non compatible land uses, A city park of 30 acres is proposed in sector 8. Similarly green belts of 30 meters width have been provided between residential and industrial areas. In order to present a picture of green city park of about 20 acres has been provided in sector 11. Similarly the old burial and cremation ground have been preserved as such.

8 Agricultural Zones

The remaining area surrounding the future urbanised area is proposed to be preserved as an agricultural zone. This zone, however, would not eliminate the essential building development within this area such as extension of existing villages contiguous to abadi-deh undertaken as a project approved or sponsored by the Government in addition to the ancillary facilities necessary for the maintenance and improvement of the agricultural zone as such.

The land use land cover map of Charkhi Dadri District is shown in **Figure 9**. The **Table2** shown Land use pattern of Charkhi Dadri district and **table 3** show proposed land use of Charkhi Dadri district.

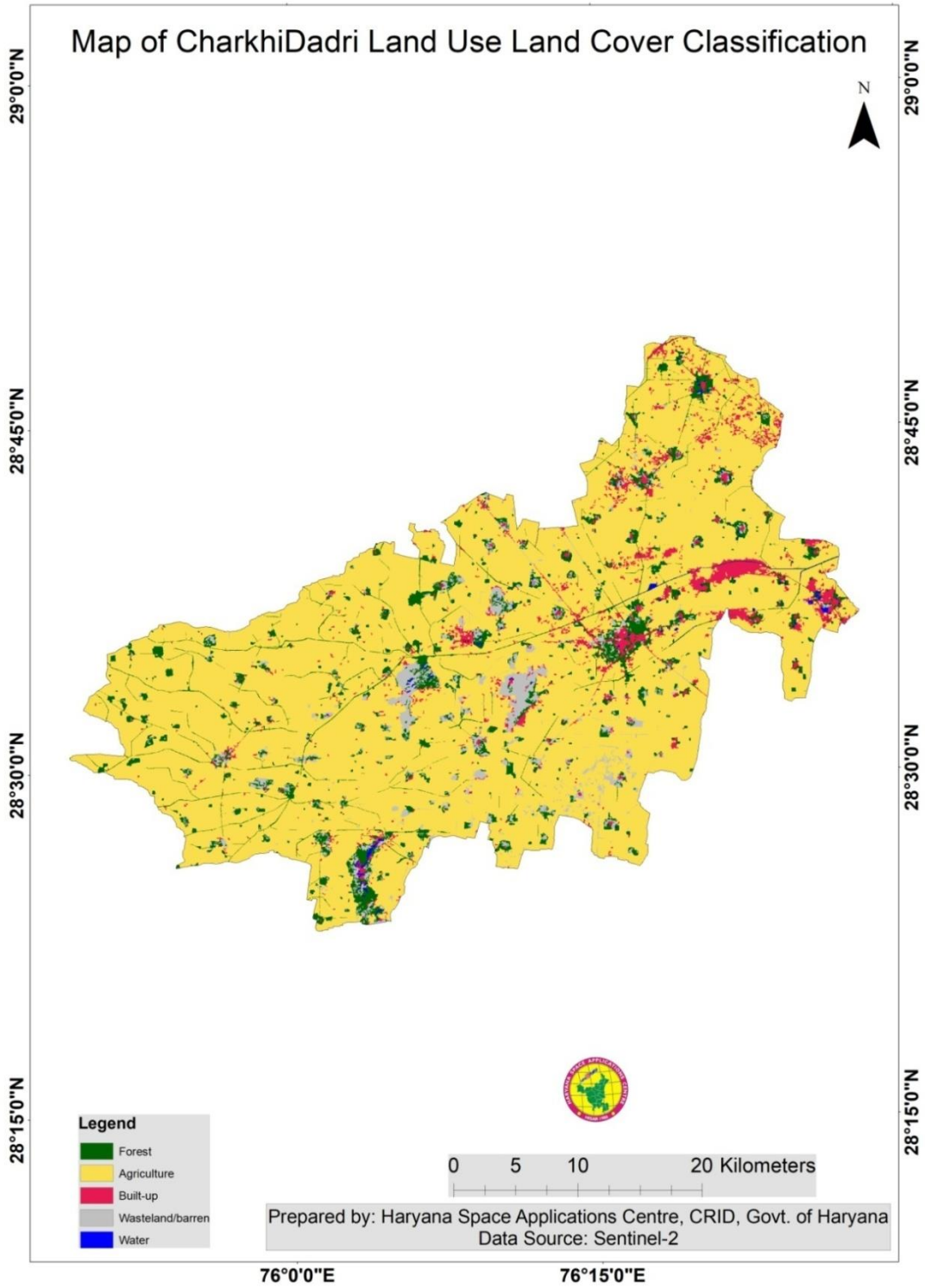


Figure 9 Landuse Landcover of Charkhi Dadri

Table 2 Land use pattern of Charkhi Dadri district

Blocks	No. Of villages	Total Geographical Area	Area under Agriculture			Area under Waste Land	Area under otherUse
			Gross cropped area	Net sown area	cropping intensity		
Badhra	54	48800	65220	32602	178.46	533	3616
Dadri-I	67	45308	77074	40110	174.96	780	5057
Dadri-II	49	42951	64905	33156	174.95	1096	4352

Table 3 PROPOSED LAND USE

Sr. no.	Land Use	Existing land use within Municipal Committee limit	Proposed land use within Municipal Committee limit	Proposed land use within controlled area	Total area in acers	Percentage
1.	Residential	450	821	30	1301	55.93%
2.	Commercial	66	92	--	158	6.79%
3.	Industrial	200	178	23	401	17.24%
4.	Transportation and Communication	90	20	--	110	4.73%
5.	Public Utilities	30	38	25	93	4.00%
6.	Public and Semi Public	50	155	--	205	8.82%
7.	Major Open Spaces	5	53	--	58	2.49%
	Total area =	891	1357	114	2960	100%

2 District Water Profile

2.1 Source of Water

The sub-soil water level in the district is 100ft to 250 ft; therefore, the main source of water is through existing canal system i.e., from Bakra Head at RD235070 of JLN Feeder 1100Cs to Charkhi Dadri district through Loharu Feeder & forwarding to Indira Gandhi Canal/Loharu Canal. In addition to above, tube wells have also been installed by the Public Health Engineering Department and by Agriculture Department.

2.1.1 Canals

The district has a wide network of irrigation system fed by the Jawahar Lal Nehru Canal. The off taking system includes Badhwana system, Loharu feeder, Loharu canal, Kitlana system, Gokal system etc. The canal water is used mainly for the purpose of irrigation, drinking water and filling ponds. The crop water requirement includes the water needed for field preparation, raising nurseries.

Gross command area is 305000 acres out of which 292000 are cultural command area. However the cultivated area is only 278000 acres. The land under irrigation is 23000 acres and unirrigated land is 48000 acres. The total numbers of canals in the district are 62; with total length 375 km. Irrigation in the districts done mainly by gravitational flow canal and irrigation system through the following canal networks. **Table 4** shows Loharu Water Services Division with length of Charkhi Dadri district.

Table 4 Channels of Loharu Water Services Division Charkhi Dadri

Sr. No.	Name of Channel	Length (RD)	Discharge (in CS.)
1	Link channel	4973	1100
2	Loharu feeder	97000	1379
3	Loharu Canal	88365	1189
4	Badhwana Distributary	102500	176
5	Kheri Bura mr.	20500	28.50
6	Dadri sub mr.	8694	14.42
7	Kheri Sanwal mr.	20830	13.42

8	1-R Dadri Sub mr.	10000	5.75
9	1-R minor	9500	7.0
10	Gothra minor	39700	61.50
11	Gothra sub minor	5750	14
12	Makrana minor	7750	34.20
13	Kitkana Disty.	58500	106
14	Paintawas minor	9250	8.75
15	Dohki Minor	8000	5.75
16	Roopgarh minor	12500	12.50
17	Goripur minor	11750	21.70
18	Pehladgarh minor	10500	7.20
19	Pandwan minor	13500	9.75
20	Atela Disty.	35451	36
21	Birhi minor	12500	14
22	Birhi sub minor	7000	5
23	Mehra disty.	30500	16
24	Dudiwala disty.	34750	44.30
25	Rampura minor	22500	14.75
26	Kaluwala minor	10700	10
27	Kural disty.	74500	78.50
28	Nangla minor	27000	16.75
29	Nangla sub minor	5000	4.25
30	Umarwas minor	18500	13.50
31	Khair pur sub minor	9625	6.25
32	Bhariwas minor	10000	7

33	Bhariwas sub minor	5700	3.25
34	Pokharwas minor	11800	9.75
35	Pokharwas sub minor	7500	4.50
36	Pichopa disty	13500	18.50
37	Todi minor	18000	13
38	Rehrodi disty	22000	32.25
39	Rehrodi minor	17500	13
40	Gokal disty	38500	127
41	Pichopa minor	17000	14.50
42	Gudana minor	21000	49
43	Siswala sub minor	13000	37.25
44	Asawari sub minor	37000	32.25
45	Badal sub minor	7700	5.75
46	Kalali sub Minor	7000	7.75
47	Bijan minor	14000	17
48	Jhojju minor	14250	17.25
49	Sahuwas minor	13500	9.75
50	Ram Nagar sub minor	10150	7
51	Loharwara minor	15000	43
52	Samaspur minor	30500	28.50
53	Bharvi minor	17950	5.50
54	Dadhi chhillar minor	13750	11.85
55	Mandhi ditch minor	4100	5.45
56	Dudhwa minor	25500	39

57	Dudhwa link channel	5174	15.75
58	Mankawas minor	10500	7.11
59	Kubja Nagar minor	9800	5.77
60	Balali minor	km 7.540	21.50
61	Balali sub minor	km2.320	5
62	Barsana minor	8000	4.90

2.1.2 Ponds

A **pond** is a body of standing water, either natural or man-made, that is usually smaller than a lake. They may arise naturally in floodplains as part of a river system, or they may be somewhat isolated depressions (examples include vernal pools and prairie potholes). Usually they contain shallow water with marsh and aquatic plants and animals. A wide variety of man-made bodies of water are classified as ponds. Some ponds are created specifically for habitat restoration, including water treatment. In Charkhi Dadri district total 878 ponds found with the help of satellite data on village level. **Table 5** shows Charkhi Dadri block wise no. of ponds. The map of total ponds/waterbodies that include ponds, canals are shown in **Figure 10** and **Figure 11** show Monsoonal water-logged area of Charkhi Dadri.

Table 5 Charkhi Dadri block wise no. of ponds

Sr.No.	Blocks	No. of Ponds
1	Badara	214
2	Dadri-I	373
3	Dadri-II	293

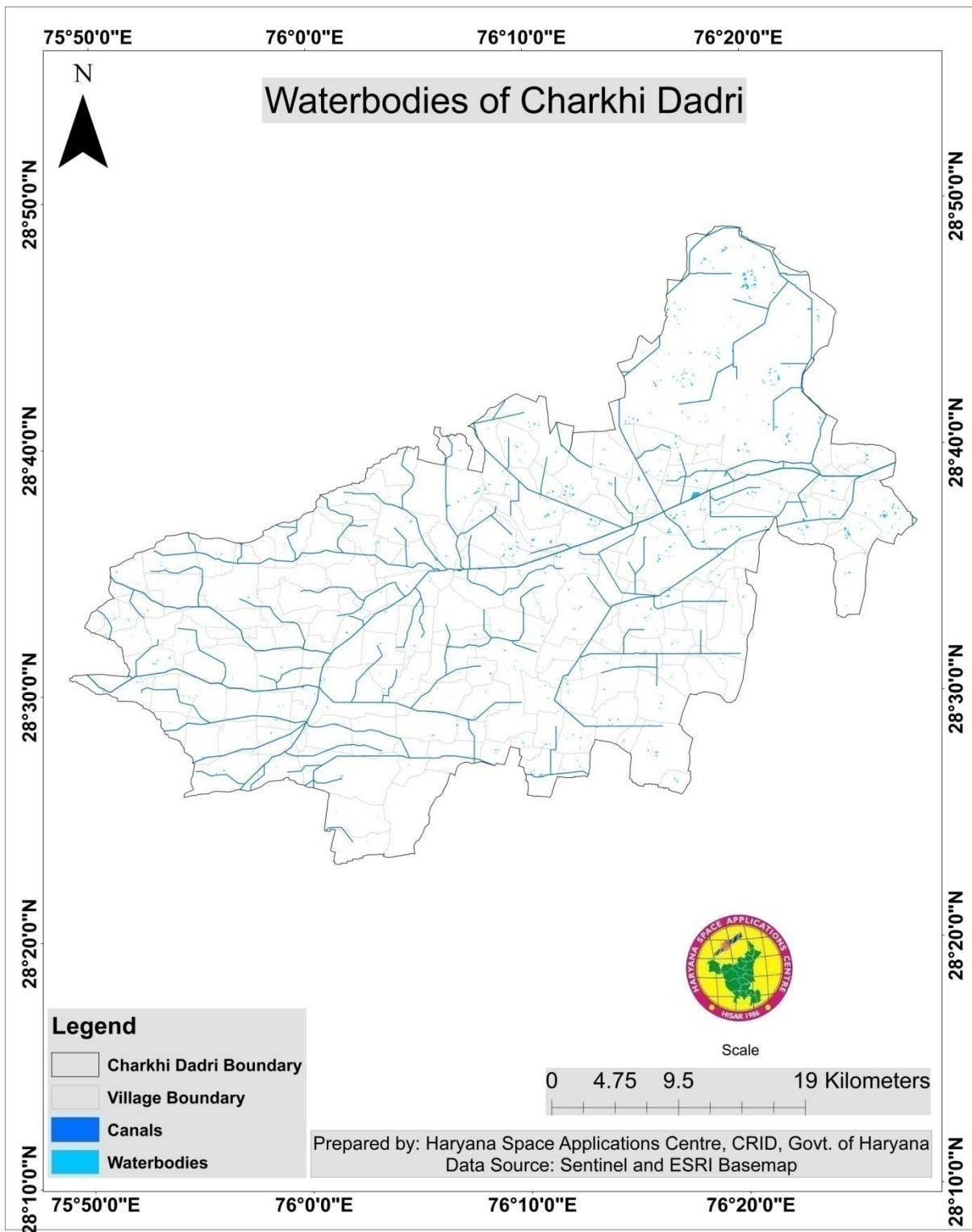


Figure 10 Water bodies of Charkhi Dadri District

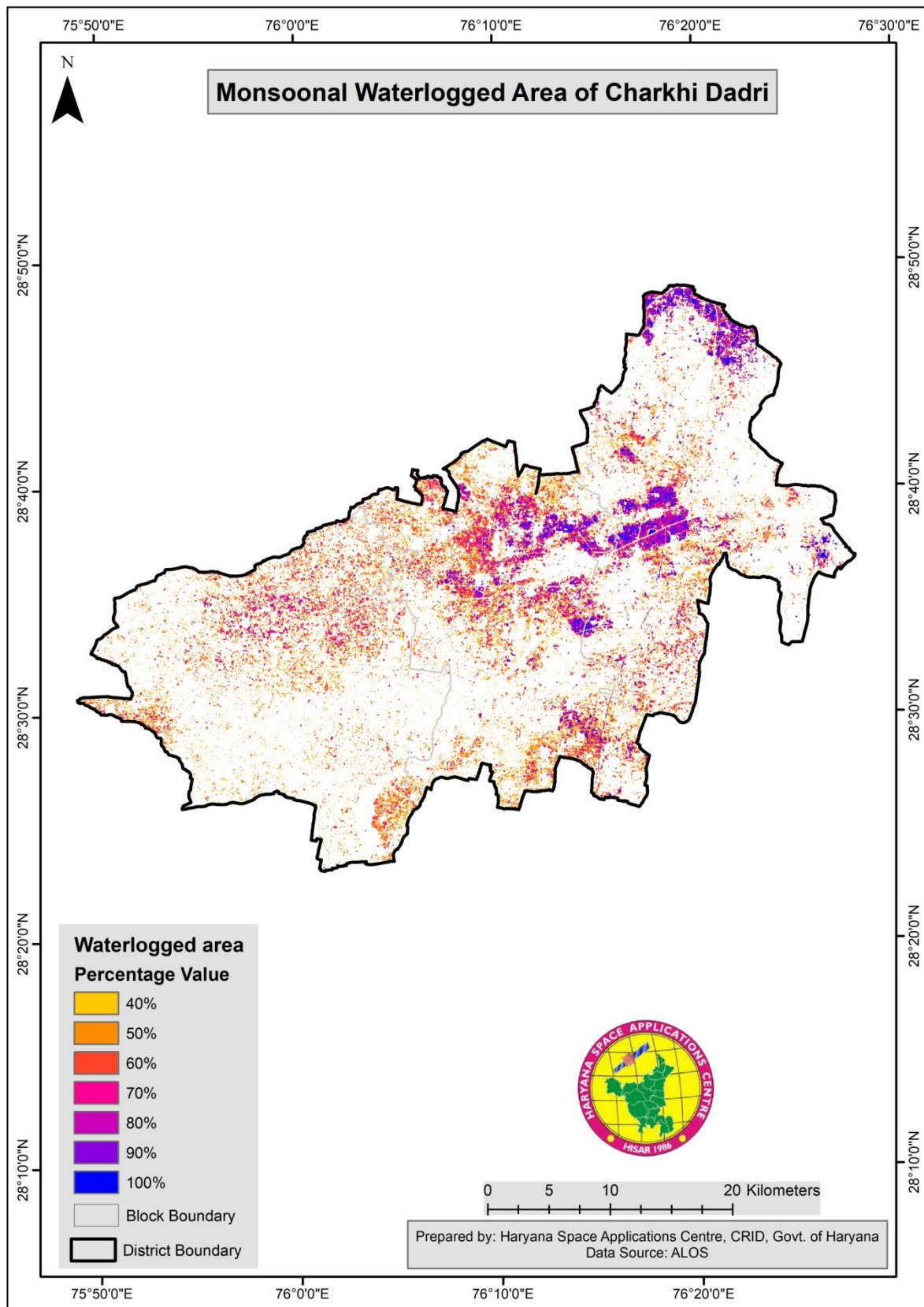


Figure 11 Monsoonal water-logged area of Charkhi Dadri

2.2 Drain

Natural drainage means a drainage consisting of native soils such as a natural swale or topographic depression, which gathers or conveys run-off to a permanent or intermittent watercourse or water body. During rain or irrigation, the fields become wet. The water infiltrates into the soil and is stored in its pores. When all the pores are filled with water, the soil is said to be saturated and no more water can be absorbed; when rain or irrigation continues, pools may form on the soil surface. Surface drainage is the removal of excess water from the surface of the land. Shallow ditches, also called open drains, normally accomplish this. The shallow ditches discharge into larger and deeper collector drains. In order to facilitate the flow of excess water toward the drains DEM is very important. The drainage map of Charkhi Dadri District is shown in **Figure 12**. The statistics of length of drainages under each order are shown in **Table 6**.

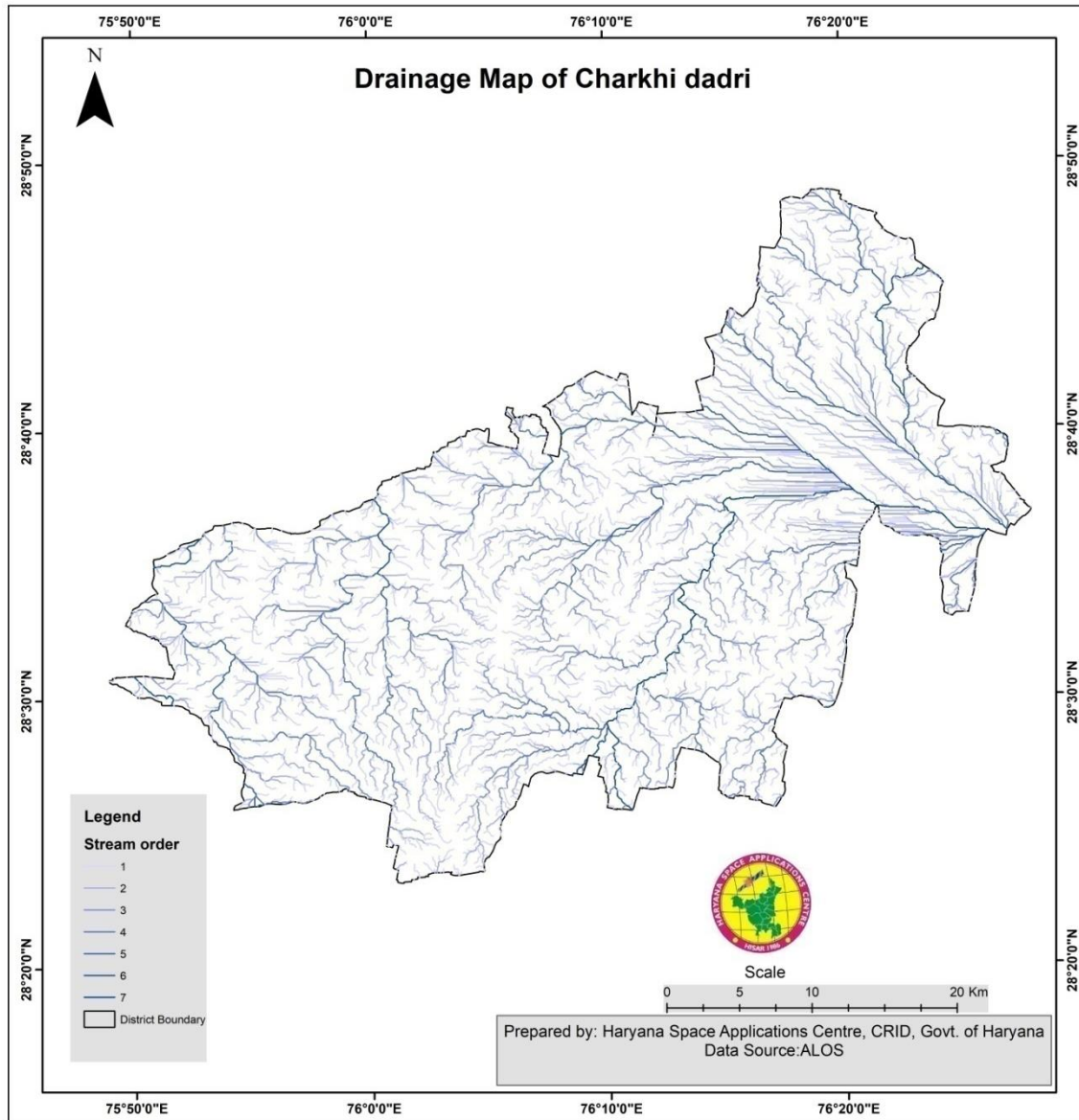


Figure 12 Drainage Map of Charkhi Dadri

Table 6 Drainage order and total length of the drains in Charkhi Dadri District

Sr.No.	Stream Order	Length in meters
1	1 st order	1472554.87
2	2 nd order	739730.31
3	3 rd order	398105.28
4	4 th order	217754.35
5	5 th order	113991.69
6	6 th order	59275.09

2.3 Water Harvesting System

A rainwater harvesting system comprises components of various stages - transporting rainwater through pipes or drains, filtration, and storage in tanks for reuse or recharge.

2.3.1 Roof Top Harvesting

There are a number of different ways to harvest rain water. But the one most essential thing that is common in all of the available water conservation techniques is to utilize natural rainwater to supplement the daily life's water consumption. People in the city are becoming all the more conscious day by day in implementing the best possible water conservation techniques. The major benefits of harvesting natural rainfall that the water can be harvested on a small-scale basis, such as on a bungalow or in housing societies, and it can also be done on a large-scale basis, such as at industrial level.

Many commercial premises have incorporated rainwater harvesting system in their building. And slowly, a lot of housing societies are also incorporating this technique. Harvesting rainwater involves the installation of a very simple technology that can be used by both commercial as well as residential places to make a tiny difference for a good cause.

In general, there are three main types of rainwater harvesting systems, which include direct pump, indirect pump and indirect gravity. Mentioned below (**Table 7**) is some of the most popular rain water harvesting techniques:

Rooftop Rain Water Harvesting is the technique through which rain water is captured from the roof catchments and stored in reservoirs. Harvested rain water can be stored in sub-surface ground water reservoir by adopting artificial recharge techniques to meet the household needs through storage in tanks. The Main Objective of rooftop rain water harvesting is to make water available for future use. Capturing and storing rain water for use is particularly important in dry land, hilly, urban and coastal areas.

For this task/activity the District target is fixed for 1300 nos. The Department wise target is as follow:-

- a. Panchayati Raj Department :-
 - Roof top water harvesting = 760
 - Soak Pit = 90
 - Soak Pit (through Anganwadi) = 200
- b. Rural development Department:-
 - Soak Pit = 50
- c. PWD B&R:-

- Roof top water harvesting = 16
- d. Forest Department:-
- Roof top water harvesting = 3
- e. MC, Ch. Dadri:-
- Roof top water harvesting = 9
- f. Irrigation & Water resources Department:-
- Roof top water harvesting = 3
 - Sewage Soak Pit = 200
- g. DEO, Education Department:-
- Sewage Soak Pits = 160

Table 7 Water Harvesting System in Charkhi Dadri District

Sr.NO.	Activity Name	Works Completed	Works Ongoing	Expenditure (in Lakhs)
Water Conservation and Rain Water Harvesting				
1	Check Dam		0	
2	Pond / Tank		5	
3	Trench	2623	1	
4	Rooftop Water Harvesting Structure (Public)	167	0	
5	Rooftop Water Harvesting Structure (Private)	7		
6	Other Rainwater Recharge Structures (Open Well Recharge, Sand Filter for open well recharge)		0	
7	Other Water Conservation Structures (Bench Terracing, Canal)		19	
Total			25	213
Renovation of Traditional and other Water Bodies / Tanks				
1	Traditional Water Bodies Restored	1529	48	
Total		1529	48	649
Reuse and Recharge Structures				

1	Soak Pit	1388	55	
2	Stabilization Pond	3	0	
3	Other Reuse / Recharge Structure	930	1	
Total		2321	56	11
Watershed Development				
1	Gully Plug	0	0	
2	Percolation Tank		2	
3	Staggered Trenches	1882	0	
4	Other Watershed Construction Activities	136	39	
Total			41	605
Intensive Afforestation				
1	Intensive Afforestation-Nurseries	691997	0	
2	Intensive Afforestation- Plantation		39	
Total			39	27
Awareness Programs by KVK				
1	Farmers training programs by KVKs on Water Use Efficiency and Appropriate Crops	368		
2	Distribution of one packet of vegetable seeds and saplings of five nutritious plants to farmers			
3	Awareness Programs/ Kisan Mela on the theme Valuing Water	1118		
Total		1486		
Waste Water Treatment				
1	Use of Treated Waste Water	60680		
Total		60680		

2.3.2 Water Harvesting System Roof Top

The surface that receives rainfall directly is the catchment of rainwater harvesting system. It may be a terrace, courtyard, or paved or unpaved open ground. The terrace may be a flat RCC/stone roof or sloping roof. Therefore the catchment is the area, which actually contributes rainwater to the harvesting system. Rainwater from the rooftop should be carried through down to take water pipes or drains to the storage/harvesting system. Water pipes should be UV resistant (ISI HDPE/PVC pipes) of the required capacity. The total no of activities achieved in Charkhi Dadri District for rain water

harvesting is shown in **Table 8** at rural and urban area. The map of water conservation activity in Charkhi Dadri at rural and urban level is shown in **Figure 13**.

Table 8 Water Harvesting activities in Rural area and Urban Area

In Rural Area		
Sr. No	Block Name	Total No of Activity (no.)
1	Badara	1339
2	Dadri-I	407
3	Dadri-II	0
In Urban Area		
1	Charkhi Dadri	0

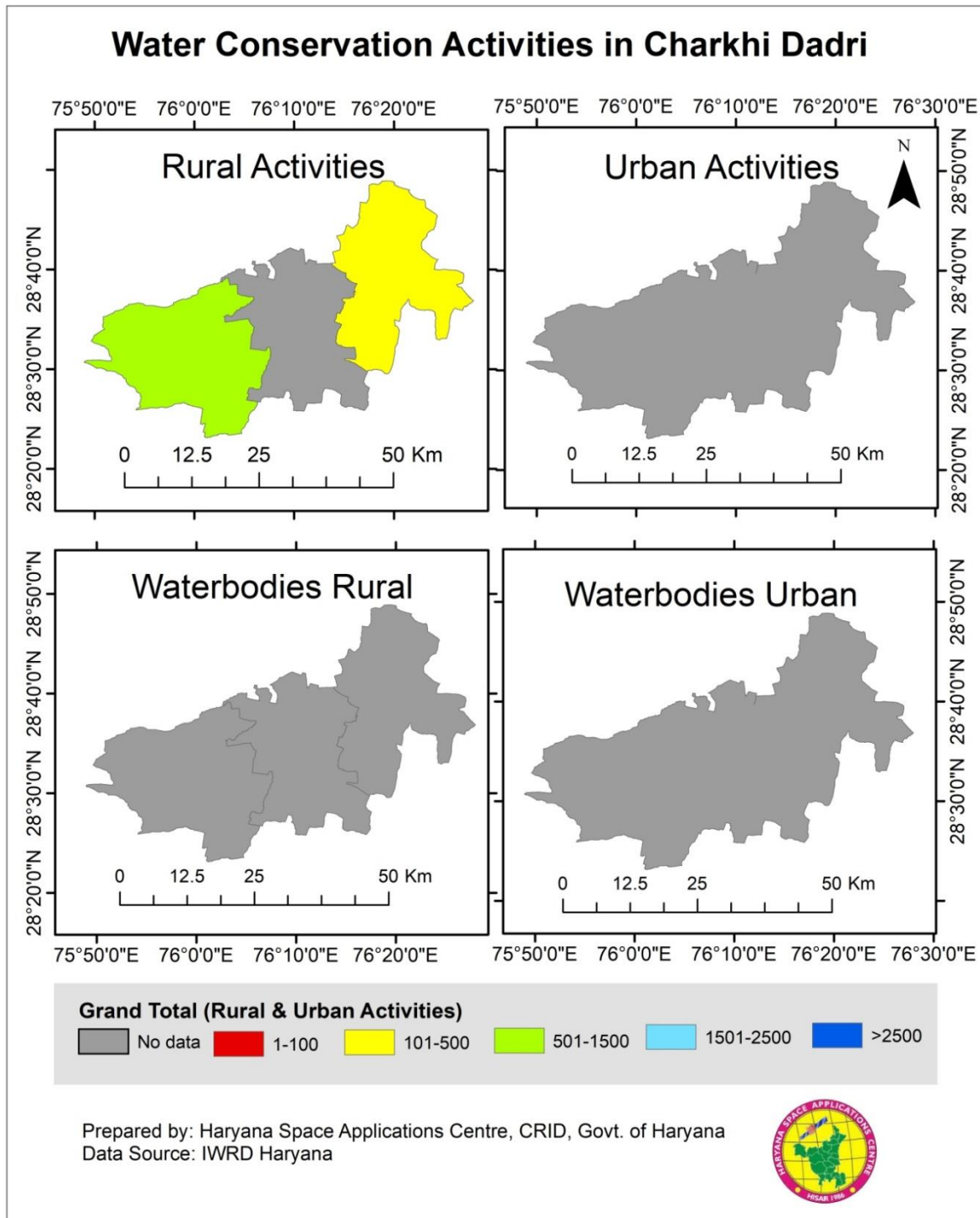


Figure 13 Water Conservation Activities in Charkhi Dadri

2.3.3 Sewerage Treatment Plant

Sewage from every residential colony, hotel, or corporate office collected in the sewage collection system. The purpose of a sewage treatment plants (STPs) is to thoroughly treat wastewater. The sewerage treatment plant map is shown in **Figure 14**. In Charkhi Dadri District a total of 2 treatment plant are installed having total capacity of approx. 10 MLD.

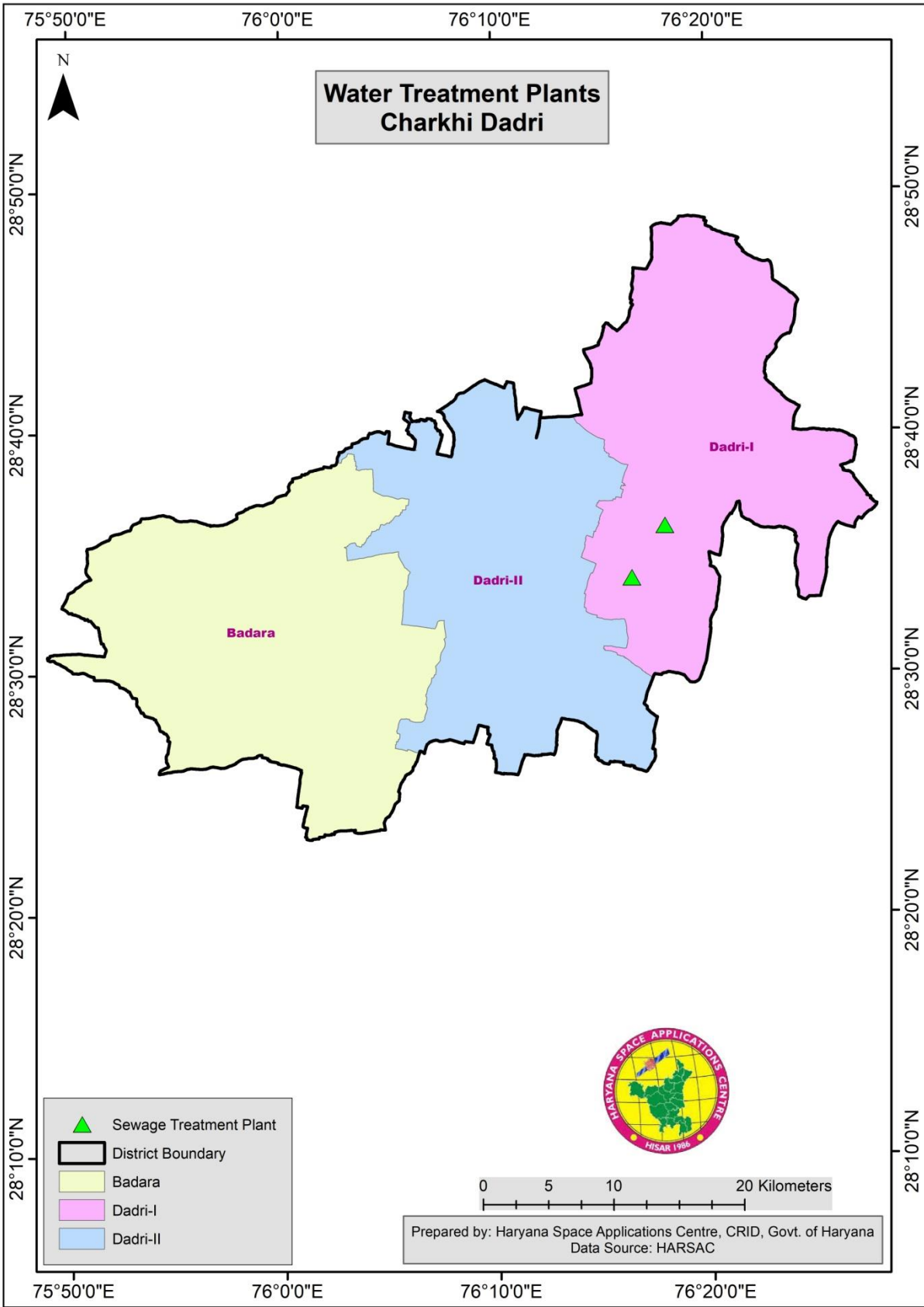


Figure 14 Water Treatment Plant of Charkhi Dadri

3 Irrigation Profile

Irrigation is the agricultural process of applying controlled amounts of water to land to assist in the production of crops as well as to grow landscape plants and lawns, where it may be known as watering. Agriculture that does not use irrigation but instead relies only on direct rainfall is referred to as rain-fed. Irrigation helps to grow agricultural crops, maintain landscapes, and revegetate disturbed soils in dry areas and during periods of less than average rainfall. Irrigation also has other uses in crop production, including frost protection, suppressing weed growth in grain fields and preventing soil consolidation.

4 Water Availability

4.1 Surface Water Availability

The total surface water availability in the district mainly comprises of canal irrigation. The water availability in kharif season is 298.04 MCM and 229.42 MCM under rabi season. **Table 9** shows block wise water availability in kharif season in Charkhi Dadri district.

Table 9 Water availability in kharif season

Blocks	Volume of water (MCM)in kharif	Volume of water (MCM)in rabi	Total volume of water(MCM)
Badhra	63.21	48.31	111.52
Dadri-I	125.77	105.11	230.88
Dadri-II	109.06	76	185.06
Total=	298.04	229.42	527.46

4.2 Ground Water Availability

The depth to water level is shallow and range between 0.84 m to 10 m in the Northern, and 10 to 20 m.bgl in the Southern and North western parts of the district (Badhra, Dadri-II and Siwani). Ground water levels are deeper in the Western and some patches in the Central part ranging from 40 to more than 60 m. Water level fluctuation for 10 years shows rising water level trend in the Northern blocks and declining water level trend in southern blocks. During pre-monsoon water level rise fluctuates between 0.35 to 4.44 m, while in post monsoon it varies from 1.12 to 3.35 m. The decline varies from

0.71 m to 7.68 m. The following map (**Figure 15**) depicts the ground water depth in Charkhi Dadri district.

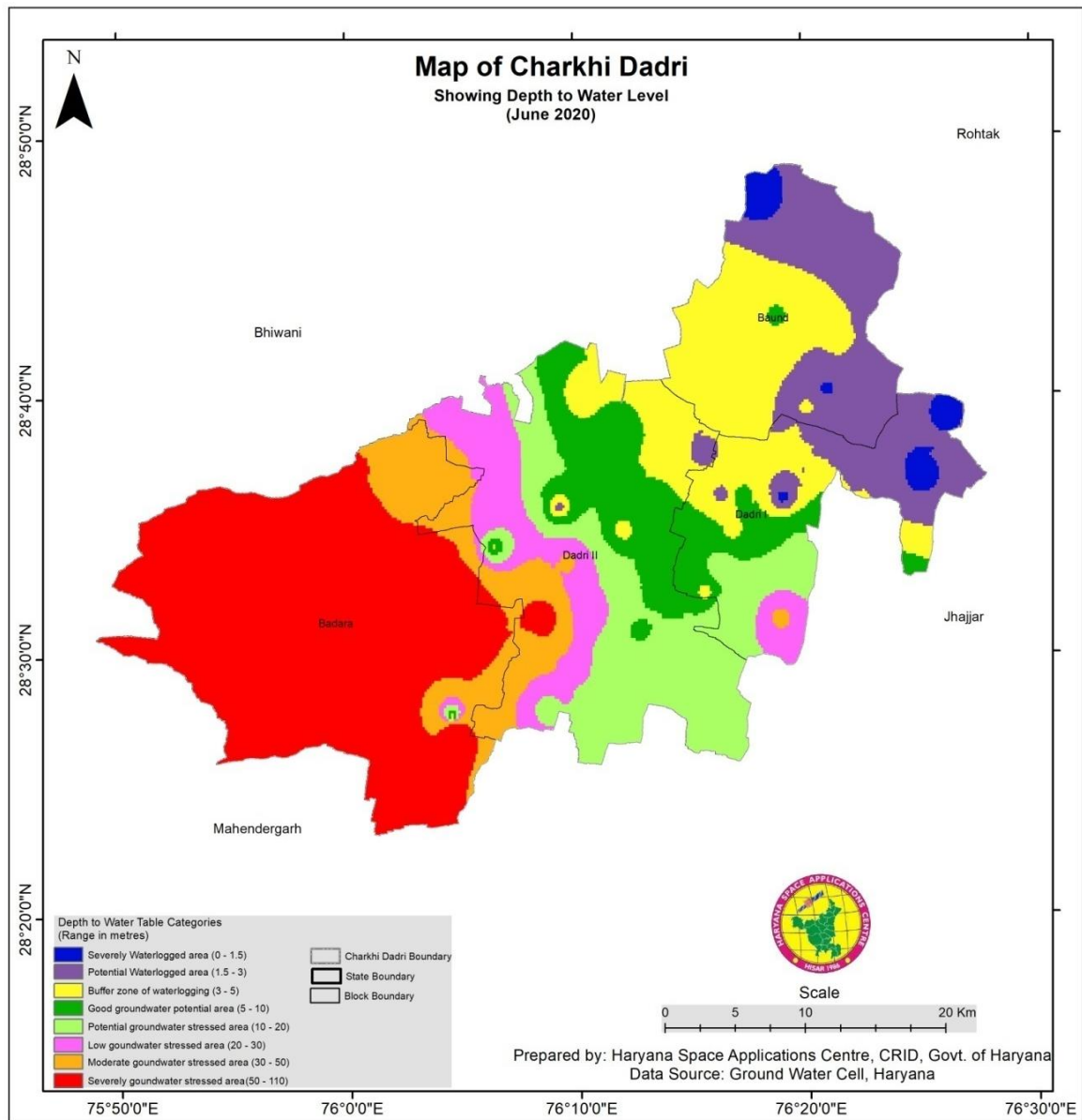


Figure 15 Ground water Availability Map of Charkhi Dadri District

4.3 Ground Water Quality

Groundwater is the water found underground in the cracks and spaces in soil, sand and rock. It is stored in and moves slowly through geologic formations of soil, sand and rocks called aquifers. Ground water quality index determines the purity of water. Higher the values on index represent the more turbid water which cannot be used for drinking purpose. In contrast to that lower values on

quality index represent the purity of water and are suitable for drinking purpose. According to (http://www.sarasota.wateratlas.usf.edu/library/learn-more/learnmore.aspx?toolsection=lm_wqi) water quality range from 0-45 is good, 45-60 is fair and >60 is very poor quality of water. So, based on that Charkhi Dadri district's water quality varies from good to poor (**Figure 16**) for the whole district. Whereas block wise water quality index value is shown in **Table 10**.

Table 10 Block wise average water quality index value in Charkhi Dadri District

Sr.No.	Block Name	Average Water Quality Index Value
1	Badhra	132.877391
2	Dadri-I	247.395485
3	Dadri-II	216.970316

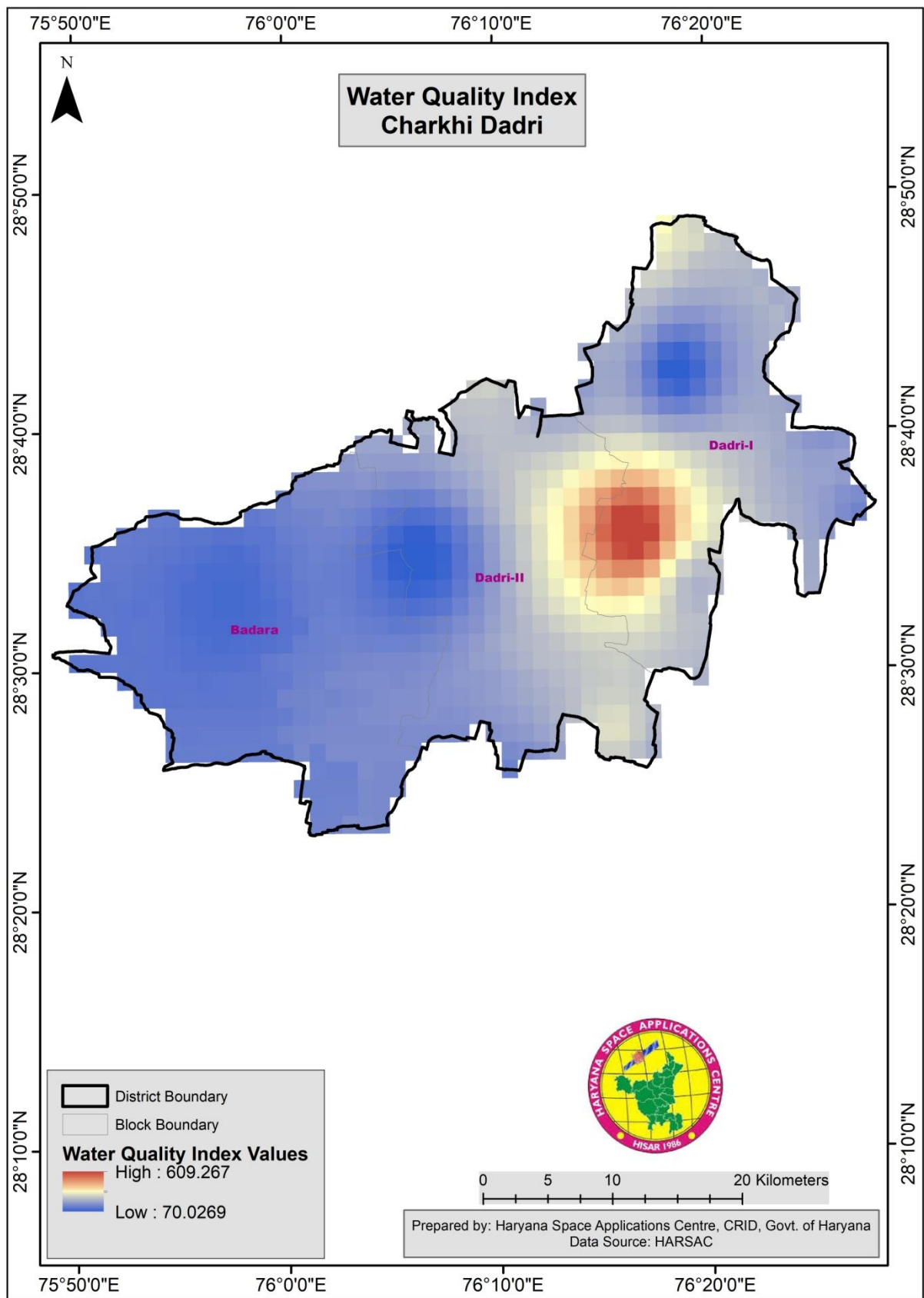


Figure 16 Water quality index of Charkhi Dadri District

5 Aquifer System

An aquifer is a body of saturated rock through which water can easily move. Aquifers must be both permeable and porous and include such rock types as sandstone, conglomerate, fractured limestone and unconsolidated sand and gravel. Fractured volcanic rocks such as columnar basalts also make good aquifers. The rubble zones between volcanic flows are generally both porous and permeable and make excellent aquifers. In order for a well to be productive, it must be drilled into an aquifer. Rocks such as granite and schist are generally poor aquifers because they have a very low porosity. However, if these rocks are highly fractured, they make good aquifers. A well is a hole drilled into the ground to penetrate an aquifer. Normally such water must be pumped to the surface. If water is pumped from a well faster than it is replenished, the water table is lowered and the well may go dry. When water is pumped from a well, the water table is generally lowered into a cone of depression at the well. Groundwater normally flows down the slope of the water table towards the well. **Table 11** shows the Charkhi Dadri district there are various observation points for the ground water table level in all the four blocks that are Dadri, Bond, Badhra & Jhojhu.

Table 11 the Charkhi Dadri district there are various observation points for the ground water table level in all the four blocks that are Dadri, Bond, Badhra & Jhojhu.

Block Badhra			
Sr.No	Name of Village	Type of O/W	Depth (in meters)June 2021
1	Berla	P/T	53.40
2	Chandwas	T/well	70.85
3	Dudiwala	P/T	36.68
4	Dhanasari	P/Tube	83.65
5	Gopi	T/Well	71.64
6	Hui	P/T	61.87
7	Kariadu	P/Tube	66.87
8	Karimod	P/Tube	70.29
9	Karirupa	T/W	67.46
10	Ladawas	T/W	75.68

11	Kakroli	T/W	68.98
12	Lad	T/W	73.67
13	Nandha	P/T	80.37
14	Kakroli Hatti	T/W	70.54
15	Bilawal	P/T	70.68
16	Badhra	P/T	70.68
17	Kakroli Sardhara	P/T	63.54
18	Badeshra	T/W	75.35
19	Jevli	P/Tube	67.15

Block Dadri

Sr. No.	Name of Village	Type of O/W	Depth (in meters)June2021
1	Atela Kalan	P/T	26.43
2	Bharvi	O/W	7.15
3	Bigowa	O/W	1.65
4	Birhi Kalan	O/W	3.10
5	Gothra	O/W	32.61
6	Ghoasla	O/W	4.16
7	Kheri Bura	O/W	4.38
8	Kapori	O/W	4.98
9	Kitlana	O/W	3.42
10	Kanehti	O/W	2.37
11	Makrana	O/W	20.33

12	Mankawas	O/W	4.97
13	Mori	O/W	17.25
14	Patuwas	O/W	12.20
15	Paintawas Khurd	O/W	5.90
16	Samaspur	O/W	1.95
17	Sarangpur	P/T	23.94
18	Sarupgarh	O/W	1.10
19	Dadri	KOW	5.75

Block Jhojhu			
Sr. No.	Name of Village	Type of O/W	Depth (in meters)june2021
1	Adampur Dadhi	P/T	15.26
2	Bijna	T/well	17.36
3	Bindraban	T/well	66.70
4	Badhwana	P/T	13.10
5	Chang Road	P/Tube	13.84
6	Chiriya	O/W	19.25
7	Channani	T/Well	31.65
8	Dudwa	O/W	13.42
9	Gopalwas	T/Well	88.98
10	Kadma	T/Well	80.28
11	Kalali	O/W	23.95
12	Mandola	O/W	10.28
13	Manodli	O/W	9.35
14	Mehra	P/T	33.18
15	Noswa	O/W	15.67
16	Pichopa Kalan	T/Well	92.88
17	Jhojhu	T/Well	61.88
18	Todi	T/Well	75.88
19	Unn	T/Well	

Block Bond			
Sr. No.	Name of Village	Type of O/W	Depth (in meters)june2021
1	Achina	O/W	3.10
2	Jhinjar	O/W	3.42
3	Misri	O/W	3.52
4	Mirch	O/W	3.35
5	Ranila	O/W	3.58
6	Sankroad	O/W	4.16
7	Sanjarwas	O/W	5.48
8	Sanwar	O/W	4.36
9	Unn	O/W	3.15
10	Malposh	O/W	1.65
11	Bond Kalan	KOW	2.14
12	Bond	P/T	2.36

6 Water Requirement/ Demand

6.1 Water Supply and Gap

6.2 Water Budget

1. Domestic water demand

Data of census 2011 and 2001 has been considered to arrive at the growth rate of population of the district (**Table 12**). As per census 2011, the district has shown an annual growth rate of 14.77%. It has been assumed that per capita daily water requirement of people residing in urban areas of the district is 150 Lts. And for population in rural area, the per capita daily water requirement is 70 Lts. using the same norms domestic water.

Table 12 Domestic Water Demand

Blocks	Population as per Census 2011	Present population as in 2021	Rate of w/s 70 LPCD	Additional 25%	Total	Total Req. per annum
Ch. Dadri(city)	56337	67604	4732308	1183077	5915385	2.16 MCM
Dadri	121109	145331	10173156	2543289	169050	4.64 MCM
Bond	90523	108628	7603932	1900983	9504915	3.47 MCM
Badhra	25685	30822	2157540	539385	2696925	0.984 MCM
Jhojhu	58585	70302	4921140	1230285	6151425	2.25MCM

2. Crop water requirement

Crop Water Requirement (CWR) is the amount of water needed by the various crops to grow optimally (**Table 13**). CWR is defined as amount of water required to meet the need of evaporation and transpiration by the crop throughout its life, called Crop Evapotranspiration (Etc.). Generally, it is expressed in terms of depth of water (millimeter/centimeter/inch). The water requirement of a particular crop is affected by sunshine, temperature, wind speed, humidity, soil type, canopy cover.

Table 13 Crop Water Requirement

Crop	Water Requirement (mm)	Crop	Water Requirement (mm)
Rice	1200	Tomato	600-800
Wheat	450-650	Potato	500-700
Sorghum	450-650	Pea	350-500
Maize	500-800	Onion	350-550
Sugarcane	1500-2500	Chillies	400-600
Sugar beet	550-750	Cabbage	380-500
Groundnut	500-700	Banana	1200-2200
Cotton	700-1300	Citrus	900-1200
Soybean	450-700	Grapes	700-1200
Tobacco	400-600	Mango	1000-1200
Beans	300-500	Turmeric	1200-1400

3. Livestock water Demand

The **Table 14** below represents the livestock water requirement as well as total water requirement of the district for the livestock.

Table 14 Livestock Water Demand

Blocks	Present population as in 2021	Rate of w/s 30 LPCD	Additional 25%	Total	Total Req. per annum
Dadri	77613	2328390	582097	2910487	1.06 MCM
Bond	29727	891810	222952	1114762	0.41 MCM
Jhojhu	59460	1783800	445950	2229750	0.81 MCM
Badhra	55891	1676730	419182	6151425	2.25MCM

Below showing (**Table 15**) Water budget in Charkhi Dadri district from present to next year.

Table 15 Water budget in Charkhi Dadri District

<u>Demand, Supply (Withdrawals) Consumptive Use:</u>										
<u>Government Offices and Campuses : (Litre) Present Water Year : 1st June to 31st May</u>										
<u>Next Year</u>										
District	Block	Previous Year/ Average Annual Demand	Demand for Present Water Year	Previous Year/Average Annual Supply				Previous Year/ Average Annual Waster Water	Previous Year/ Average Annual Consumptive Use	Remarks
				R ai n W a t e r	S u r f a c e W a t e r	G r o u n d W a t e r	T o t a l S u p p l y			
Charkhi Dadri	Charkhi Dadri	0	0	0	0	0	0	0	0	
	Badhra	155025	155025	0	0	155025	155025	7751.25	155025	
	Jhoju	584325	584325	0	0	584325	584325	29216.25	584325	
	Baund	417375	417375	0	0	417375	417375	20868.75	417375	

7 Strategies for Water Conservation

District Administration is committed to giving high priority to water security. It will complete the long pending irrigation project as well as water conservation structures on priority and launch the ‘Pradhan Mantri Krishi Sinchayee Yojana’ integrated with “Jal Shakti Abhiyan” with the motto of ‘Har Khet Ko Pani’ and “Sinchay Jal Behtar Kal”. There is a need for seriously considering all options of conserving water for ensuring optimal use of our water resources to prevent the recurrence of floods and drought. By harnessing rain water through ‘Jal Sanchay’ and ‘Jal Sinchan’, we will nurture water conservation and ground water recharge. Micro irrigation will be popularized to ensure ‘Per drop-More crop’. The goals of plan can be enumerated as:

- Improving the effectiveness of consumption of water in district
- Ensuring to make this campaign as people’s campaign through Samvadand participation
- Reducing the loss of water.
- Recycle/Reuse of water.
- Recharge of groundwater by rainwater harvesting methods and afforestation.
- Reviving the traditional infrastructure for water recharge.
- Convergence of existing and new schemes for water conservation with Local Bodies funds under 14th Finance Commission
- Effective monitoring and sustainability of various structures built under this abhiyan.

7.1 Artificial Recharge

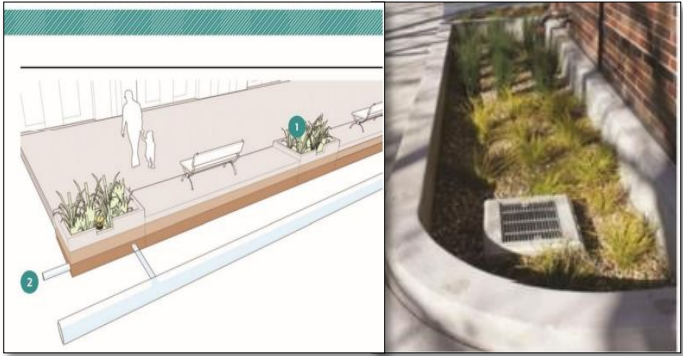
There are few isolated pockets located in the eastern part of the district where water levels are declining very fast. Fresh ground water at deeper level is being exploited by deep tube wells. Limited possibilities of artificial recharge exist in these areas during monsoon season, where excess runoff from upland areas can be utilized. Some of drains which were constructed to drain out excess water can be utilized for artificial recharge by constructing suitable recharge structures, such as injection wells, recharge shafts etc.

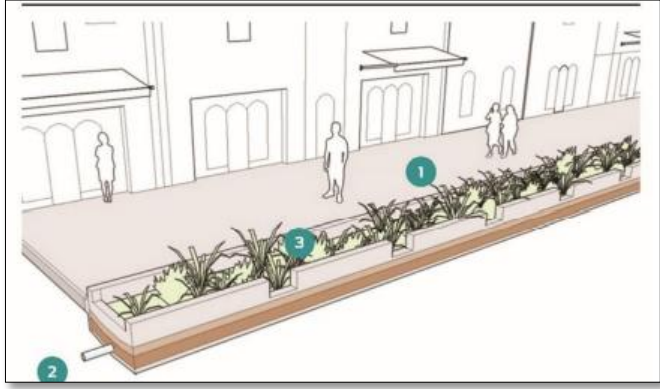
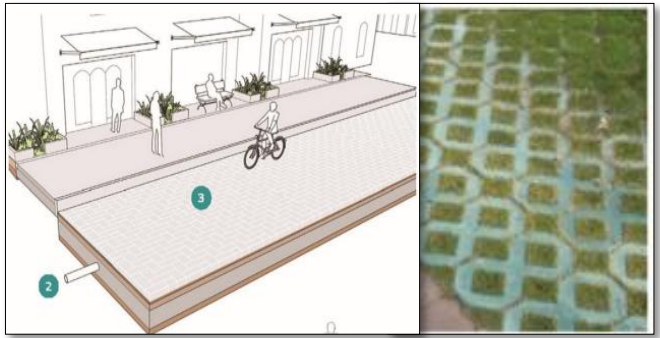

Possibility of Artificial Recharge There is few isolated pockets located in the eastern part of the district where water levels are declining very fast. Fresh ground water at deeper level is being exploited by deep tube wells. Limited possibilities of artificial recharge exist in these areas during monsoon season, where excess runoff from upland areas can be utilized. Some of drains which were constructed to drain out excess water can be utilized for artificial recharge by constructing suitable recharge structures, such as injection wells, recharge shafts etc.

7.2 Water Sensitive Urban Design

As more and more portions of the District become urbanized, it is crucial to integrate water sensitive urban design into planning of the major upcoming clusters of towns and cities that are in the satellite of the main city of Charkhi Dadri. Water Sensitive Urban Design (WSUD) is a familiar concept for engineers and architects practicing and designing in the face of overwhelming environmental changes brought in by climate change. A major part of WSUD also allows us as a society to grow more resilient towards more intensive changes in rainfall patterns, as they grow more intensive, however more scarce in terms of frequency. The methods of water table recharge strategies in urban area are shown in **Table no 16**.

Table 16 the methods of water table recharge strategies in urban area

Sr. No.	Method	Image
1	Flow Through Planters	 <p>The image contains two parts. On the left is a cross-sectional diagram of a planter box. It shows a concrete base with a drainage layer at the bottom. A person is standing next to a bench in the planter. A blue arrow labeled '2' points to the drainage layer. On the right is a photograph of a similar planter box installed in an urban setting, showing a drainage grate and plants growing in the planter.</p>

2	Pervious Strips	
3	Pervious Pavement	
4	Storm water Tree	

7.3 Plantation

A major portion of WSUD that is popular within the Government Departments is plantation of various species of plants, both in public and private spaces, to encourage community participation and increase green cover. While increasing the aesthetic value of a location, plants are heavily influential to change microclimates and in fact playing a factor to rainfall patterns. Along with benefits of carbon sequestration, they contribute to increasing the local biodiversity of the region by attracting several types of fauna as well. Currently a multi-departmental approach is being undertaken both within and outside of government with the engagement of several active citizen stakeholders and non-governmental organizations. Geo-tagging of these plantations and survival monitoring would be undertaken actively by engagement of the mentioned stakeholders. The wasteland that could be used

for plantation for conservation of water in Charkhi Dadri district is shown in **Figure 17** and **Table 17** shows the proposed no of plantation targets in Charkhi Dadri District.

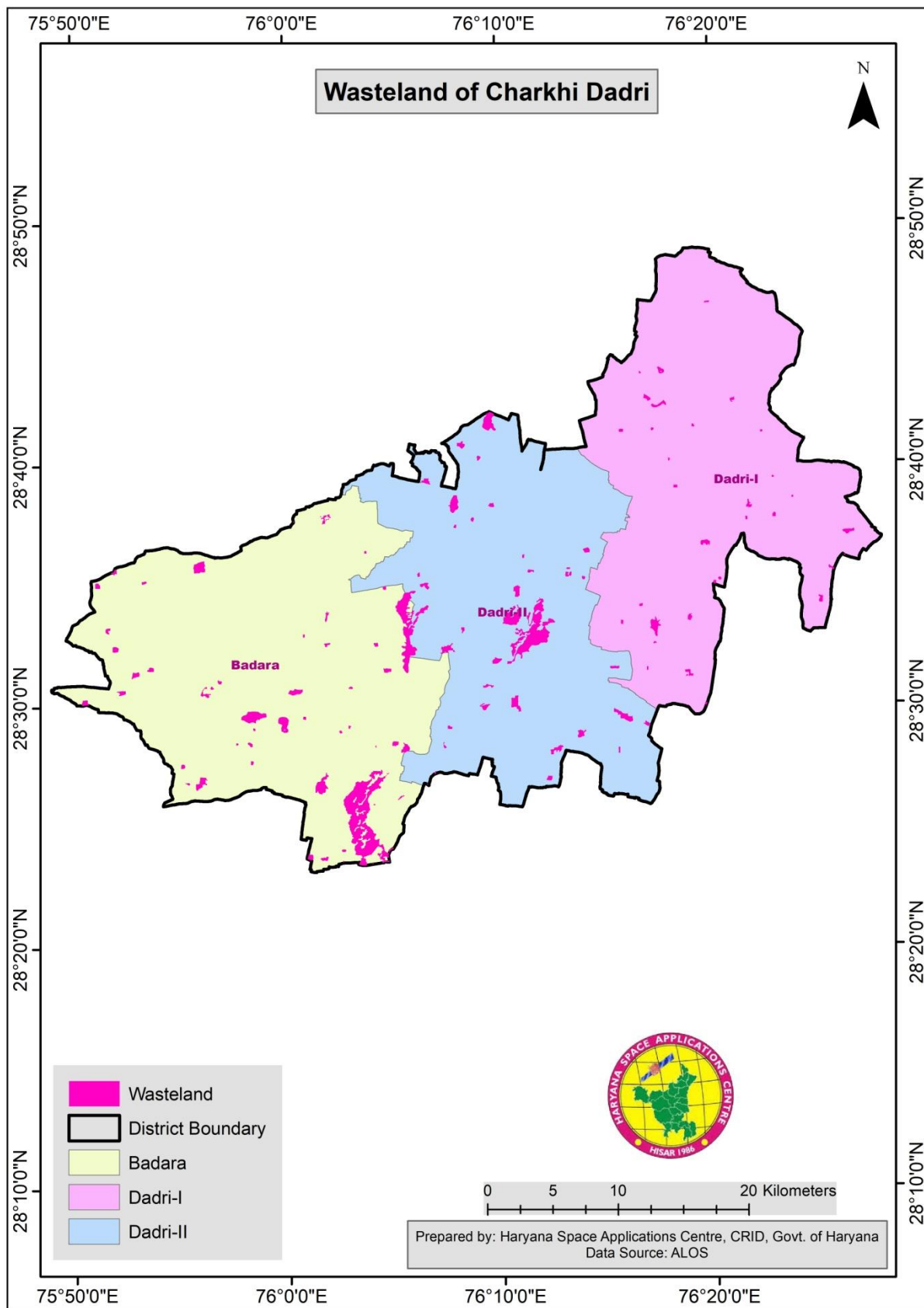


Figure 17 Wasteland Map of Charkhi Dadri district

Table 17 The Plantation targets have been provided in the table below

Block	Wasteland Area (acres)	Plantation at 5 feet spacing
Badara	200817.078	1749518387
Dadri-1	30638.34	266921248
Dadri-2	143828.66	1253035362

7.4 Surface water management

7.4.1 Pond restoration and rejuvenation

Priority ponds in Charkhi Dadri district 38. The number of surface water bodies such as ponds and lakes are continuously disappearing from the landscape. However, their preservation, restoration and rejuvenation would be essential to not only survival of biodiversity, but also to maintain microclimates, and ultimately essential to preserve human civilization.

Research also shows that that storage of water within a single pond structure contributed to a range of 26,000 to 62,000 m³ to groundwater recharge over a year, that was equivalent to 1.3 to 3.6% of the total water recharge volumes in the study carried out in Ramganga Basin, India, which would serve to irrigate lands of 8 to 18 hectares of land cropped in the rabi season. As such ponds demonstratively serve as an essential structure for water security. Although it serves to only hold a relatively small volume of water, the stored water becomes vital for food security and economic stability within a small community.

Ponds are also essential structures that provide water security in areas where groundwater has grown extremely saline and cannot be used for irrigation purposes. Irrigation channels have been built in such areas during the Green Revolution in these areas in order to meet irrigation demands in this region. However, in order to supply to the increasing demands of high yield production, a lot of pressure has been put on the agriculture industry, as a result of which freshwater demand has increased. The original channels are therefore not sufficient to meet the current water demands. Without accesses to enough water, structures such as ponds become of essential service to allow for agriculture to be sustained in areas of water scarcity.

These traditional water bodies are what saved drought hit villages from the brink of extinction and starvation in the great spell of droughts that the nation faced in the 1970's. Examples led by pioneers such as Anna Hazare and P R Mishra who revolutionized and reinstated the importance of having water storage and wise utilization for increasing crop yield have served as models for reviving these traditional lifelines within the rural eco-system, while setting important benchmarks for its urban

counterparts. Culturally, due to its life-sustaining properties, ponds have also been the centers or natural hubs for monthly or annual fairs to be held, and have been biodiversity hotspots that encourage the link between human and wildlife.

Therefore ponds form a fundamental part of the hydrological cycle in the environment and has allowed a rich cultural, agricultural and societal practices to flourish in India. Since ponds can be formed in a much broader range of environments and landscapes, they demonstrate a wide range of physiochemical activities that allows a wide range of flora and fauna to flourish. However the ground reality suggests that there are a lot of unmapped points of discharge of wastewater that pollute the local water bodies. These localized incidents of pollution of water bodies contribute to the loss of biodiversity and pose a threat to water security. In the recent years, it has been realized that wastewater may be an essential commodity and tool that may be used to close the demand supply gap and augment freshwater supply.

In order for pond restoration and rejuvenation to be done in a scientific and methodical manner, following 11 step procedures that is accommodative of each individual pond site requirements is given below

1. Pond Identification and Pond profiling
2. Project Feasibility Assessment
3. Administrative Approvals (Demarcation, GIS mapping, and Panchayat Resolution)
4. Detailed Project Report
5. Financial Approval
6. Community Mobilization
7. Cleaning and Leveling
8. Civil Work, Micro-STP Installation and Waste Management
9. Landscaping and Beautification
10. Sustainability Plan (O & M)
11. Monitoring and Evaluation

While the above methodology has been described in a step wise fashion, the cycle of pond rejuvenation and restoration functions on a feedback system and therefore inputs from each step can be integrated into steps proceeding and after as well.

7.4.2 Decentralize Treatment Plant

It is recognized that in the absence of 100% sewerage network connectivity just managing the gray water component would be an incomplete solution. In the rapidly urbanizing cities of developing countries, decentralized wastewater treatment systems are an attractive solution for addressing the problems of water pollution and scarcity.

Decentralized wastewater treatment consists of a variety of approaches for collection, treatment, and dispersal/reuse of wastewater for individual dwellings, industrial or institutional facilities, clusters of homes or businesses, and entire communities. An evaluation of site-specific conditions is performed to determine the appropriate type of treatment system for each location. These systems are a part of permanent infrastructure and can be managed as stand-alone facilities or be integrated with centralized sewage treatment systems. They provide a range of treatment options from simple, passive treatment with soil dispersal, commonly referred to as septic or onsite systems, to more complex and mechanized approaches such as advanced treatment units that collect and treat waste from multiple buildings and discharge to either surface waters or the soil.

Decentralized wastewater treatment systems could be a feasible alternative for areas which are not connected to sewer networks as well as ones which are newly developed, so that the construction of their infrastructure is inadequate, not ready or would be executed in the future. Therefore for local communities in the peripheries of urban development that exists outside the city center and rural areas where open drainage systems still exists.

However, planning for sewage infrastructure and pipelines are a long term investment, with the advent of exponential population increase also has been a challenge. Instead, decentralized wastewater management approach can be considered as a sustainable and cost-effective alternative as it treats discharges or reuses the effluent in the relative vicinity of its source of generation. Therefore, decentralization of wastewater treatment facilities are a feasible solution that may allow for localized treatment which may eventually be reused for secondary purposes. Like other systems, decentralised systems must be properly designed, maintained, and operated to provide optimum benefits. **Table 18** shows the activities being undertaken by the District for Surface water management.

Table 18 The activities being undertaken by the District for Surface water management.

Intervention	Planned Targets
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Water conservation and rain water harvesting	1300
Renovation of traditional and other water bodies / tanks	500
Reuse, bore well recharge structures	784
Water shed development	150
Intensive Afforestation	166000
Krishi Vigyan Kendra	855

7.5 Information Education and Communication

Through open exchange of information, education and communication established between the community and the implementing agency, ownership of the projects and interventions is reinstated; from inception to implementation and beyond. Selected committee members that form groups such as self-help groups, youth groups are in fact chosen to carry out regular capacity building of the community at large, with special attention paid to children, women and those belonging most vulnerable groups are carried out. Knowledge exchange and capacity building are at the core of IEC activities. The following image shows the various stakeholders involved in IEC Activities. The following image shows the various stakeholders involved in IEC Activities (**Figure 18**) and **Table 19** shows the numerous activities and interventions that can be carried out for IEC.

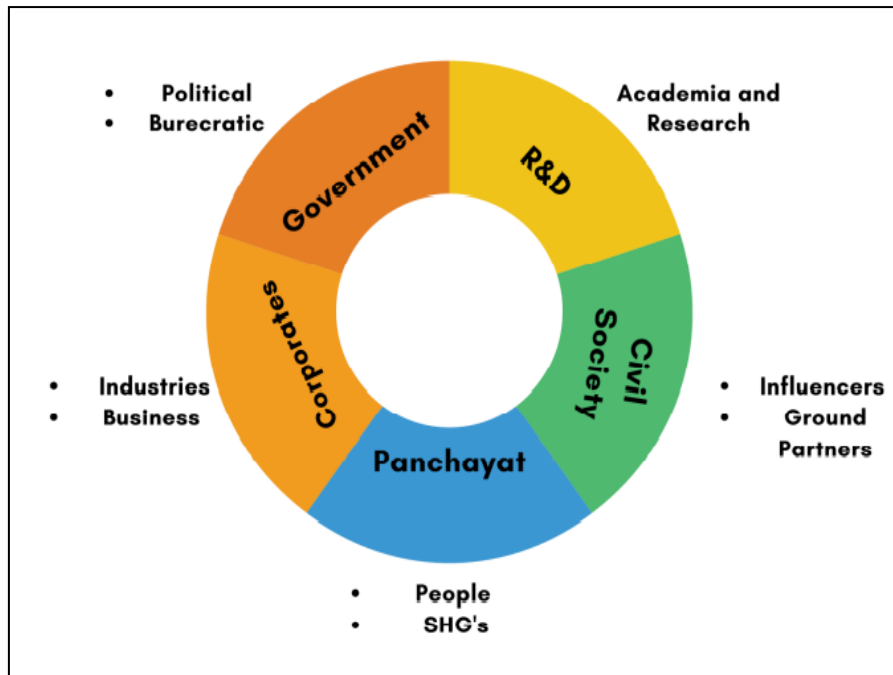


Figure 18 The above figure shows the various stakeholders of IEC Activities

Table 19 The numerous activities and interventions that can be carried out for IEC

S. No.	IEC	Intervention / Topic	Target Group	Objective	Collaterals	Outcome/ Result
1	Webinars	<ul style="list-style-type: none"> - Role of RWA, Schools and Citizen in Rain water harvesting - How to Harness and Harvest Rain 	<ul style="list-style-type: none"> - RWA (through MCG) - Schools (3rd party) - Corporates (3rd Party) 	<ul style="list-style-type: none"> - To Engage Local People in Rain water Harvesting - To make them aware of the facts and rules of RWH 	<ul style="list-style-type: none"> Letter from which dept. Letter to Mayor and Commissioner for inviting for webinar 	<ul style="list-style-type: none"> - Knowledge about Rain water harvesting - Respective roles and duties towards RWH
2	Capacity Building Sessions	<ul style="list-style-type: none"> - Technical Training sessions - Awareness Training Sessions - Workshops 	<ul style="list-style-type: none"> - MCG Workers - MCM Workers 	<ul style="list-style-type: none"> - Training of ground worker of MCG - Implementation Work 	<ul style="list-style-type: none"> Presentation Retrofitting Checking list Repair and Cleaning List 	<ul style="list-style-type: none"> 1. The workers will clean and repair the RWH post training - Training on Real time Problems - Generate Employment Opportunities
3	Competitions in RWA's (Same type of Settlements)	<ul style="list-style-type: none"> - Water Management and Conservation 	- RWA	<ul style="list-style-type: none"> - To save water - To bring the best practices through RWA 	- Competition brief with parameters	<ul style="list-style-type: none"> - To recognise and reward the best RWA - Lead by Example
4	Formation of Clubs	<ul style="list-style-type: none"> - how do we know about good vendor? - how do we identify places for RWH - How do we build RWH? 	RWA	To make water representative from every RWA	Check list of water auditing for the water representative	<ul style="list-style-type: none"> 1. do the meetings with respective water representative from every RWA. - Team building for the Society
5	Guidelines	- Guidelines for All the drops of the Society	<ul style="list-style-type: none"> - RWA - govt institutions - Schools - Corporates 	Information Flow	- guidelines and poster	- Information and Awareness on Water

		regarding Rain water harvesting and its maintenance	- Rural Public buildings			conservation and Rules
6	Information Boards	- Water awareness (Ponds, RWH, Plantation)	- Schools - Public Institutes Open Spaces Roads -	- To change the perspective of people	Location, Capacity, Design OF RWH, information board	Awareness , mobilise citizens - Information about the RWH in Their vicinity
7	Rain Centre	- Any Problems related to water	- All the Citizens	To Resolve the issue related to RWH	FAQ (Technical)	Acts as Point of Contact for all the queries in Water Management
8	Social Media	- All the updates of the Events and posts	- All the Citizens	- Digital marketing - Awareness	FAQ TYPES Best Practices Video clips of Officers and celebrities	Awareness , mobilise citizens
9	Recognitions/Awards	- Rain water Harvesting - Best Practises - Best RWA in Water management	- RWA - In Panchayats - NGO - Schools - Corporates - Active Citizens	to recognise best practices	-Parameters list for best practices	To encourage more practices and people - Increase interest and motivation for the end users
10	Video Clips and Interviews	- Individual water Conservation steps - Best Water Management Practices	- RWA - In Panchayats - NGO - Schools - Corporates - Celebs	Digital marketing - Awareness - virtual presence	- letters for the celebs, script.	To recognise people, encourage more
11	Working Models	- Rain water Harvesting Models - GuruJal Pond Sites	- Schools	To aquire more prototypes for District Administration	- Proper Guidelines	Showcasing Children work in Administration

12	Plantation Drives	- Awareness on Plantation drives	- Urban (RWA, MCG, MC) - Rural (Pond Sites) - Schools -NGO's - NYK - District Youth Affairs and Sports	-To increase the green Cover To increase the water holding Capacity	- Plant List Nursery Database - Distribution Chain Management Posters	Better environment for Future Generations
13	Collaborations	- For IEC	-Kalagram -NGO's -Durga Shakthi -Civil Defence -Lion Club	To involve stakeholders to facilitate sessions	- Letter of Collaboration -Google form	- No Overlapping of the work or activities - More effectiveness in Catch the rain Campaign

8 Proposed Activity

8.1 Rainwater harvesting

Roof top rain water harvesting system: A technique through which rain water is captured from the roof catchments and stored in reservoirs. Harvested rain water can be stored in sub-surface ground water aquifers by adopting artificial recharge techniques or meet the household needs through storage in tanks. These works have to be compulsorily taken up for public/community buildings namely Panchayat Bhawans, schools, Anaganwadis, Public Health Centers and Community halls (if available). Also, households should be convinced to take up roof-top rainwater harvesting structures for their houses.

- Check dams: Small engineering structures constructed across a stream/ water course with cement to store water.
- Trenches: Constructed depressions of about 6 feet length, 2 feet width and 1 foot deep (sizes may vary across states) to impound the expected runoff .

There are some factors that affect the rainfall water harvesting which needs to be focused for the development of suitable sites of water harvesting. These factors include rainfall, slope, soil texture, drainage, topography and land use / land cover and integration of these factors using weighted overlay analysis that results in suitable sites for rainwater harvesting. These sites are then classified into various suitability levels, namely, not suitable, less, medium, good and very good. The most suitable sites for rainfall water harvesting are shown in map (**Figure 19**). The block wise area proposed for

rainwater harvesting under most suitable sites is shown in **Table 20**. For the process of calculating suitable site a fixed weightage is needed to be applies on the above-mentioned criteria (**Table 21**).

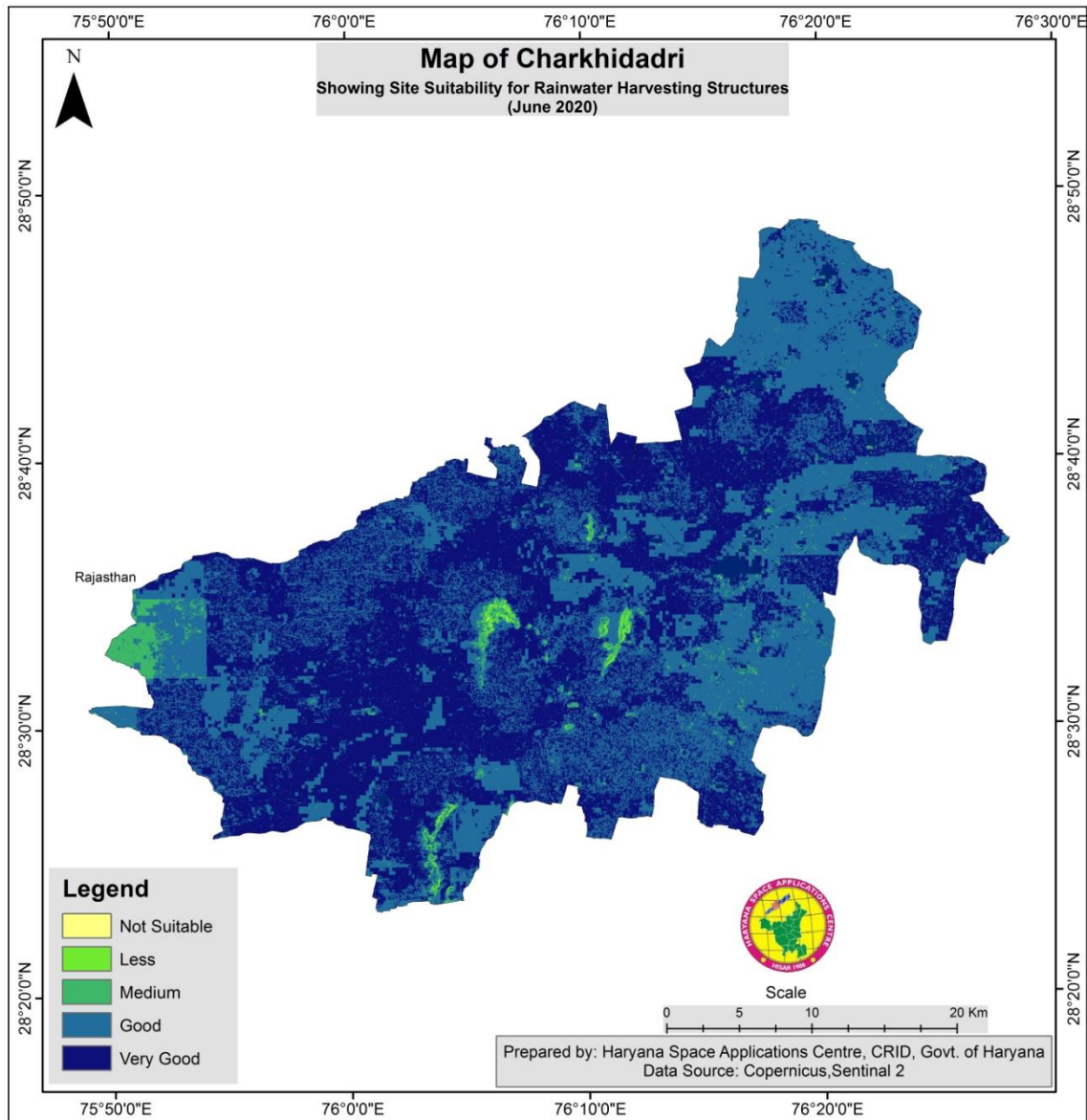


Figure 19 Rainwater Harvesting Structures of Charkhi Dadri

Table 20 Block wise area under very good suitable site proposed for rain water harvesting.

Block Name	Area (Very Good suitability area in Sq meter)
Badara	303966919
Dadri-1	162842872
Dadri-2	242094724

Table 21 Assigned Weight for Criteria Parameters

Parameters	Weightage
Rainfall	35
Slope	25
Drainage Density	5
Soil Texture	20
Lulc	15

8.2 Proposed Suitable Site based on Multicriteria

In this section some water harvesting structures are proposed with the suitable sites. These structures are calculated based on different criteria. These criteria are Natural drainage and water occurrence datasets that should exclude the settlement and water bodies on the same place. Stream order system is a simple method of classifying stream segments based on the number of tributaries upstream. Following are the outcomes that show the type of structure on the streams. **Figure 20** shows the proposed suitable site based on multi criteria. Block wise proposed suitable sites based on multi-criteria is shown in **Table 22**.

Following are the harvesting structures proposed based on criteria mentioned as above.

1. 2 Mini percolation Tanks
2. 4 Percolation Tanks
3. 1Pakka check Dams
4. 0 Annicut
5. 2 Micro Irrigation tanks

Table 22 Block wise proposed suitable sites based on multi-criteria

Sr. No.	Block Name	Mini percolation Tank	Percolation Tank	Pakka Check Dam	Annicut	Micro Irrigation Tank
1	Badara	1	1	0	0	0
2	Dadri-1	0	1	1	0	2
3	Dadri-2	1	2	0	0	0

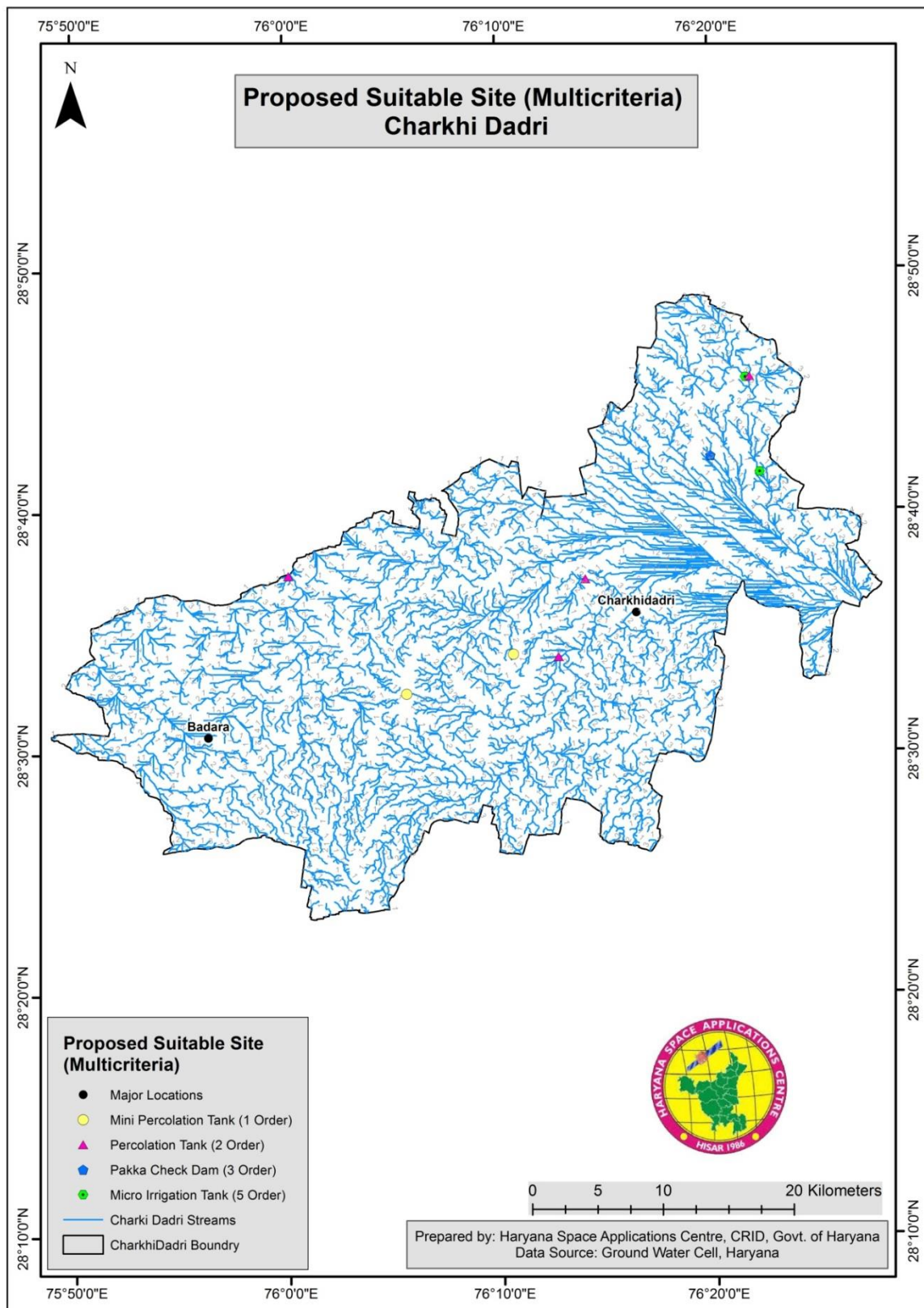


Figure 20 Proposed Suitable Site based on Multicriteria of Charkhi Dadri

8.3 Proposed Suitable Site based on Drainage

The drainages that are created from satellite imagery can be used as base for the water harvesting structure. Stream order system is a simple method of classifying stream segments based on the number of tributaries upstream. So, based on the order of streams we can propose the suitable sites for water harvesting structures. A general idea says that Mini percolation Tanks on 1st order Stream, percolation Tanks on 2nd Order Stream, pakka check Dams 3rd Order Stream, Annicut on 4th order, Micro Irrigation tanks 5th Order can be built. **Figure 21** shows the proposed suitable sites based on drainage structure in Charkhi Dadri district. Proposed harvesting structures in Charkhi Dadri based on drainage **Table 23**.

Table 23 Proposed harvesting structures in Charkhi Dadri based on drainage

Sl. No.	Block Name	Mini percolation Tank	Percolation Tank	Pakka Check Dam	Annicut	Micro Irrigation Tank
1	Badara	24	10	31	34	27
2	Dadri-1	88	64	112	56	132
3	Dadri-2	57	33	68	32	71

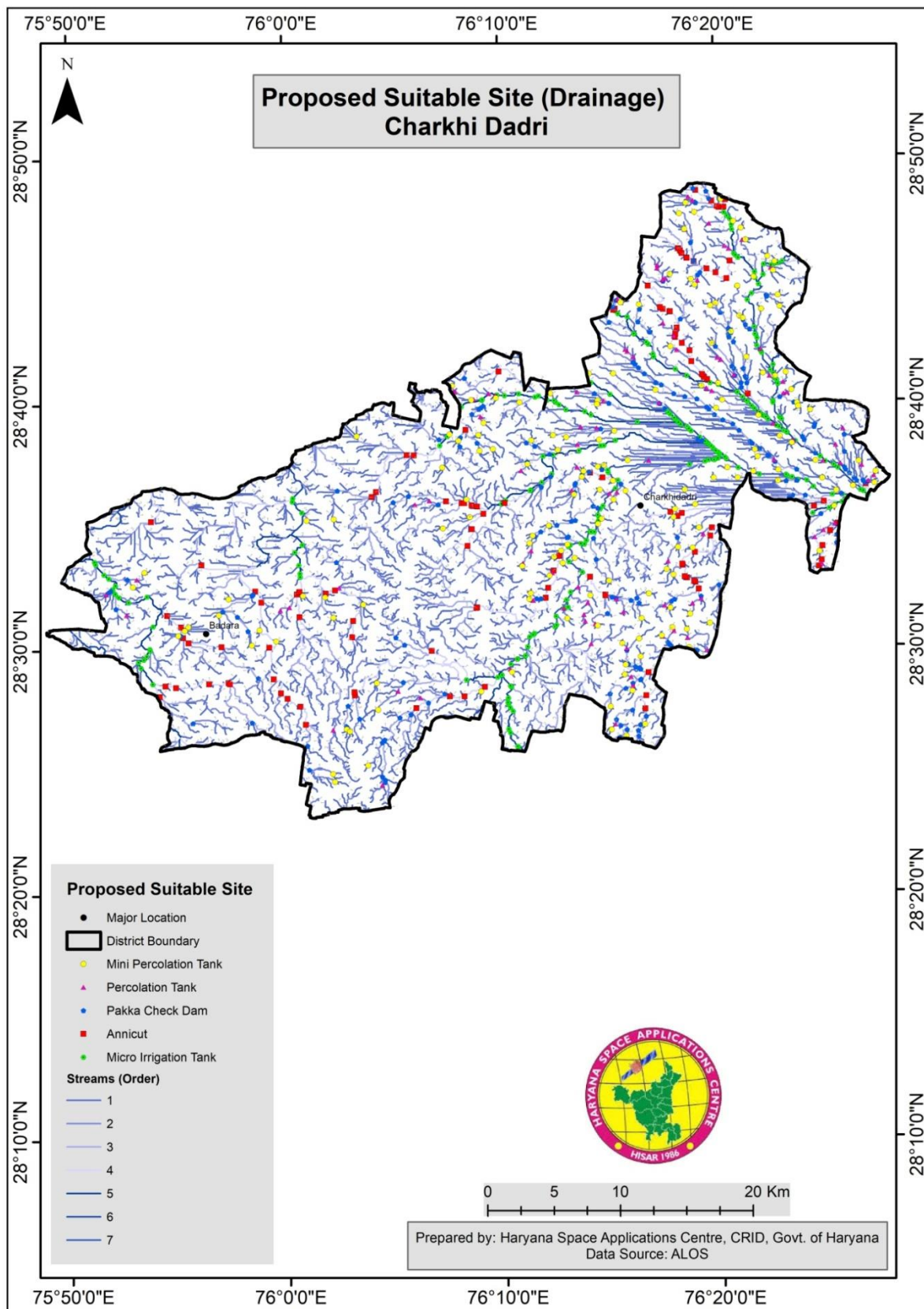


Figure 21 Proposed Suitable Site (Drainage) Charkhi Dadri

9 Conclusion

Water being an ongoing reliable source around the world, it will not be available forever. When top energy consumers include the United States and China, along with environmental factors affecting these two regions, there is no doubt that this valuable resource will be limited on Earth. Water scarcity is no joke and shouldn't be taken lightly for it has great affects on food production, our farm lands, our health, and our economies. Droughts are common factors of this scarcity of water by drying up land and all the life contained in it. The land for crops are shrinking and are in need of more and more water everyday causing limited amounts of fruits and vegetables to be produced according to the research found by Daryanto and Gilis. When there is low food production, there come high demands which affect the economy.

Environmental concerns are not situated in one side of the world. Water is a broad source extending to different countries along with different advanced technologies. Irrigation has become widespread to improve farming and food production as well. Risks are taken into account because there may be cases in which misuse of conservation technology can affect our health and other resources other than water. Menses illustrates this situation well in his research regarding wastewater in the dairy industry. Through extended research, it is found that these happenings don't just occur once and in one place. The solution to prevent these occurrences exists in such initiatives of the government such as the JAL SHAKTI ABHIYAN. This is where collaboration is important among states and regions. To better and preserve our natural resources, actions and attitudes towards sustainability must stay at a high level throughout nation who is willing to work together towards the same goal.

.....END.....

“Jal Shakti Abhiyan: Catch The Rain”



