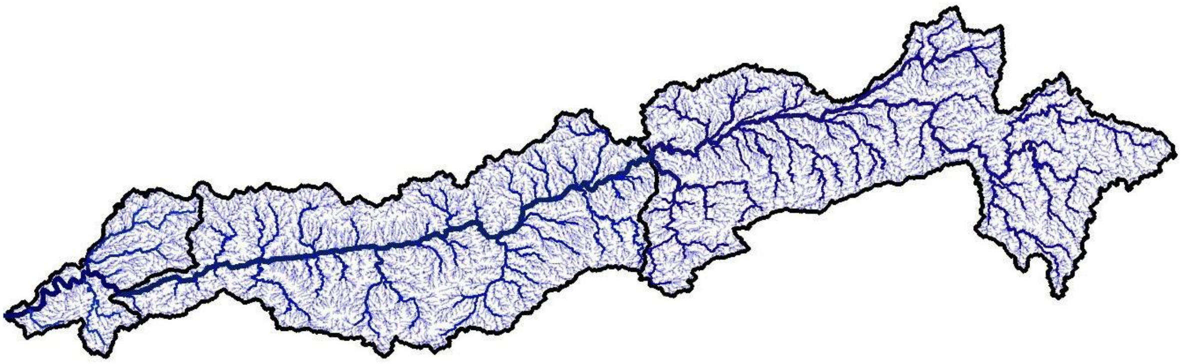
National River Conservation Directorate
Ministry of Jal Shakti, Department of Water Resources,
River Development & Ganga Rejuvenation
Government of India

Water Demand and Supply in Narmada River Basin



June 2025

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National River Conservation Directorate (NRCD)

The National River Conservation Directorate, functioning under the Department of Water Resources, River Development & Ganga Rejuvenation, and Ministry of Jal Shakti providing financial assistance to the State Government for conservation of rivers under the Centrally Sponsored Schemes of 'National River Conservation Plan (NRCP)'. National River Conservation Plan to the State Governments/ local bodies to set up infrastructure for pollution abatement of rivers in identified polluted river stretches based on proposals received from the State Governments/ local bodies.

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Centres for Narmada River Basin Management and Studies (cNarmada)

The Center for Narmada River Basin Management and Studies (cNarmada) is a Brain Trust dedicated to River Science and River Basin Management. Established in 2024 by IIT Gandhinagar and IIT Indore, under the supervision of cGanga at IIT Kanpur, the center serves as a knowledge wing of the National River Conservation Directorate (NRCD). cNarmada is committed to restoring and conserving the Narmada River and its resources through the collation of information and knowledge, research and development, planning, monitoring, education, advocacy, and stakeholder engagement.

www.cnarmada.org

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cGanga is a think tank formed under the aegis of NMCG, and one of its stated objectives is to make India a world leader in river and water science. The Centre is headquartered at IIT Kanpur and has representation from most leading science and technological institutes of the country. cGanga's mandate is to serve as think-tank in implementation and dynamic evolution of Ganga River Basin Management Plan (GRBMP) prepared by the Consortium of 7 IITs. In addition to this, it is also responsible for introducing new technologies, innovations, and solutions into India.

www.cganga.org

Acknowledgment

This report is a comprehensive outcome of the project jointly executed by IIT Gandhinagar (Lead Institute) and IIT Indore (Fellow Institute) under the supervision of cGanga at IIT Kanpur. It was submitted to the National River Conservation Directorate (NRCD) in 2024. We gratefully acknowledge the individuals who provided information and photographs for this report.

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PREFACE

The Narmada River, one of India's most iconic and ecologically vital watercourses, has long been a lifeline for millions across the states of Madhya Pradesh, Maharashtra, Gujarat, and Chhattisgarh. Spanning approximately 1,312 kilometers.

This report, prepared under the aegis of the Narmada River Basin project, seeks to provide a comprehensive understanding of the basin's water demand and supply characteristics in context of the demography. The report provides insights from national and state guidelines on water supply standards. Referencing the Central Public Health and Environmental Engineering Organization's recommendations for urban water supply (ranging from 70 LPCD in towns without sewerage to 135–150 LPCD in cities with advanced infrastructure) and the Jal Jeevan Mission's target of 55 LPCD for rural households, the report situates its water demand estimations within a realistic policy framework.

The report's district-level water demand analysis provides a stark picture of the water demand in the Basin. This report also attempts to estimate and projects the water demand for districts within the Narmada Basin. For example, Khargone's total water demand is expected to rise significantly, driven by substantial population growth. Similarly, Jabalpur's water demand is projected to increase as the basin-area population expands over the same period. These projections highlight the magnitude of future water requirements, emphasizing the need for strategic planning to prevent resource shortfalls.

A crucial aspect of the report is its reflection on the relationship between water infrastructure and broader socio-economic dynamics. By linking population growth, administrative structures, and water infrastructure, the document illuminates the complex interplay of human and environmental systems in the Narmada River basin.

In conclusion, this report provides a detailed, data-driven overview of the Narmada River basin's water resources, infrastructure, and projected demands, highlighting the need for integrated and sustainable management practices.

Centres for Narmada River Basin Management and Studies (cNarmada)
IIT Gandhinagar, IIT Indore

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1.1 Geographic Profile of the Narmada River

The Narmada River is one of the major west-flowing rivers of the Indian peninsula. It originates from the Amarkantak Plateau in Madhya Pradesh and flows westward over a length of approximately 1,312 kilometers before discharging into the Arabian Sea through the Gulf of Khambhat. The Narmada basin covers an area of about 95,960 square kilometers, constituting nearly 3% of India's total geographical area. Geographically, it stretches between 21°40'12" to 23°41'24" North latitudes and 72°48'36" to 81°45'36" East longitudes, forming an elongated basin extending 915.65 km east to west and 236 km north to south.

The basin is topographically and hydrologically divided into three main segments: the upper, middle, and lower reaches. The upper basin is marked by rugged terrain, steep gradients, dense forests, and narrow valleys, hosting features like Kapildhara Falls and the Marble Rocks at Bhedaghat. The middle basin transitions into broader valleys and fertile plains with significant basaltic rock formations, making it suitable for extensive agriculture and major irrigation infrastructure. The lower basin, located primarily in Gujarat, consists of flat alluvial plains with a gentle gradient, making it ideal for water distribution and storage structures.

A notable structural feature of the basin is the Narmada Rift Valley, which guides the river's path between the Vindhya Range in the north and the Satpura Range in the south. This geological setting plays a crucial role in influencing river flow patterns and sediment dynamics.

The river's discharge is further enhanced by 41 tributaries, with major ones including the Tawa, Hiran, and Shakkar rivers. These tributaries contribute significantly to the overall water availability, hydrological behavior, and ecological diversity of the basin—factors crucial for understanding and planning water demand and supply across various regions within the basin.

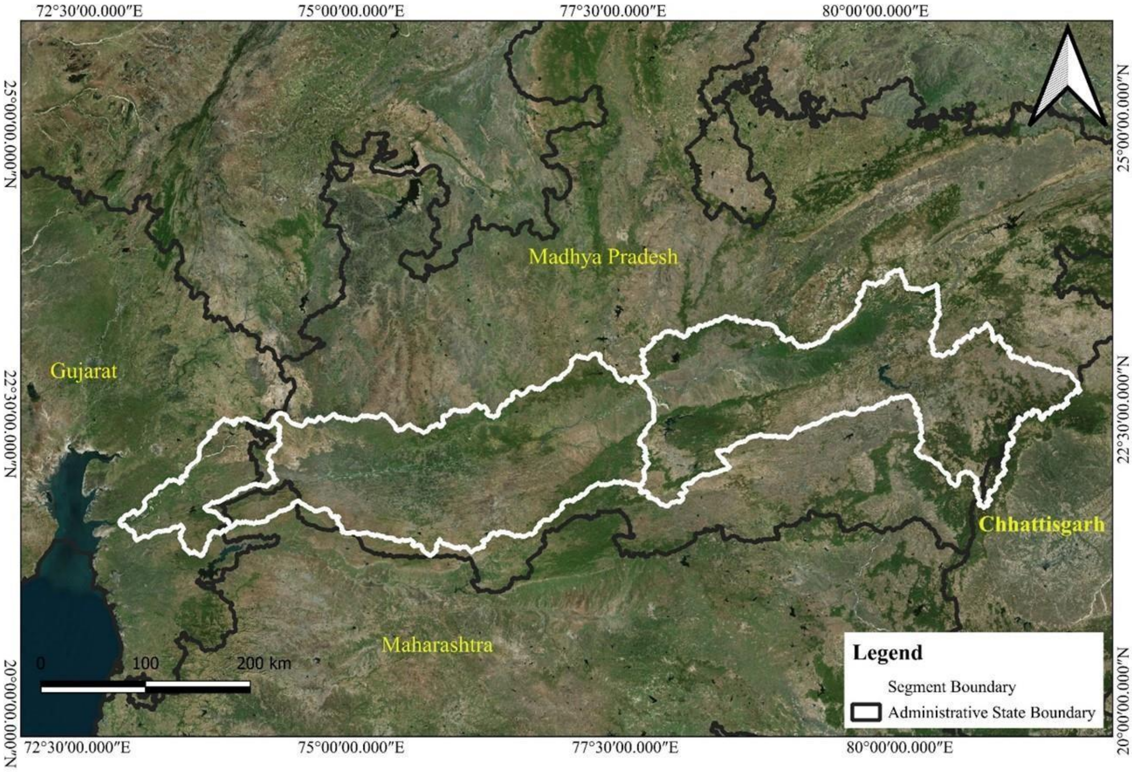

Figure 1. Drainage area of the Narmada River with its three segments

1.1.1 Sub-Divisions of the Basin

The Narmada River basin is divided into three sub-basins based on geomorphology, hydrology, and hydraulics, each with unique characteristics and challenges:

Upper Narmada Sub-Basin: Extending from Amarkantak to Hoshangabad (~720 km), this region encompasses the river's origin at the Amarkantak Plateau and its flow through rugged, forested terrain. The area is characterized by steep gradients and narrow valleys, making it ideal for hydropower projects such as the Bargi Dam. However, these steep slopes and high rainfall levels also make the sub-basin prone to soil erosion and sedimentation issues, affecting downstream water quality and reservoir capacity.

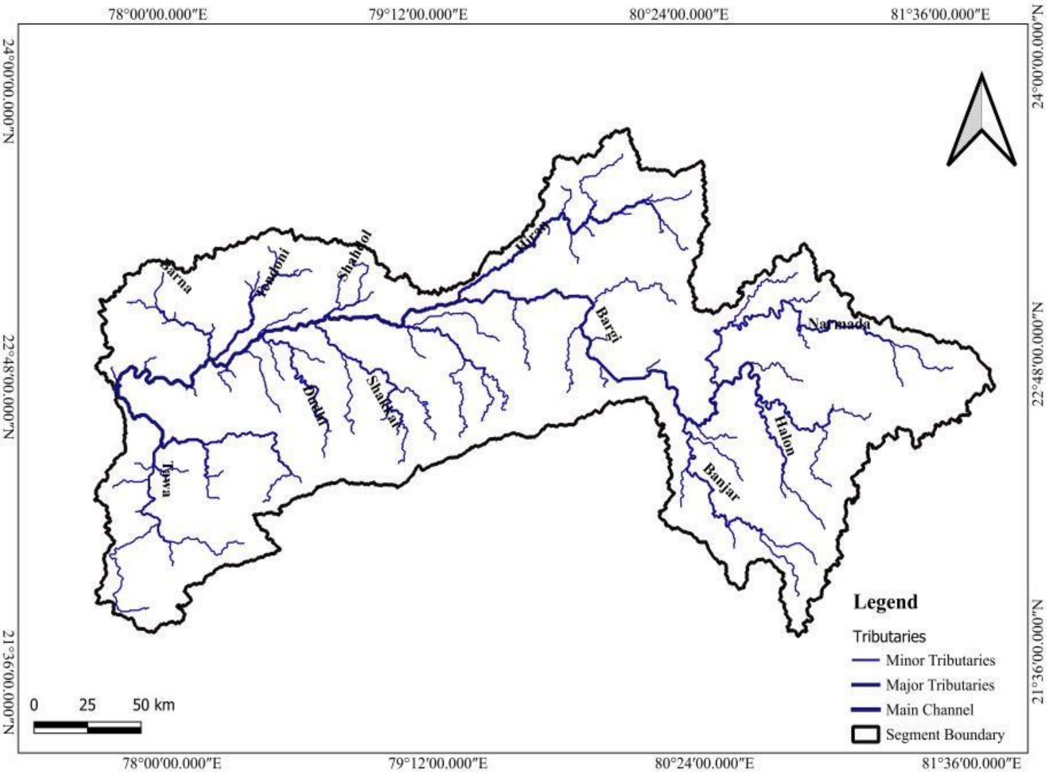

Figure 2. Streams of Upper Narmada Basin

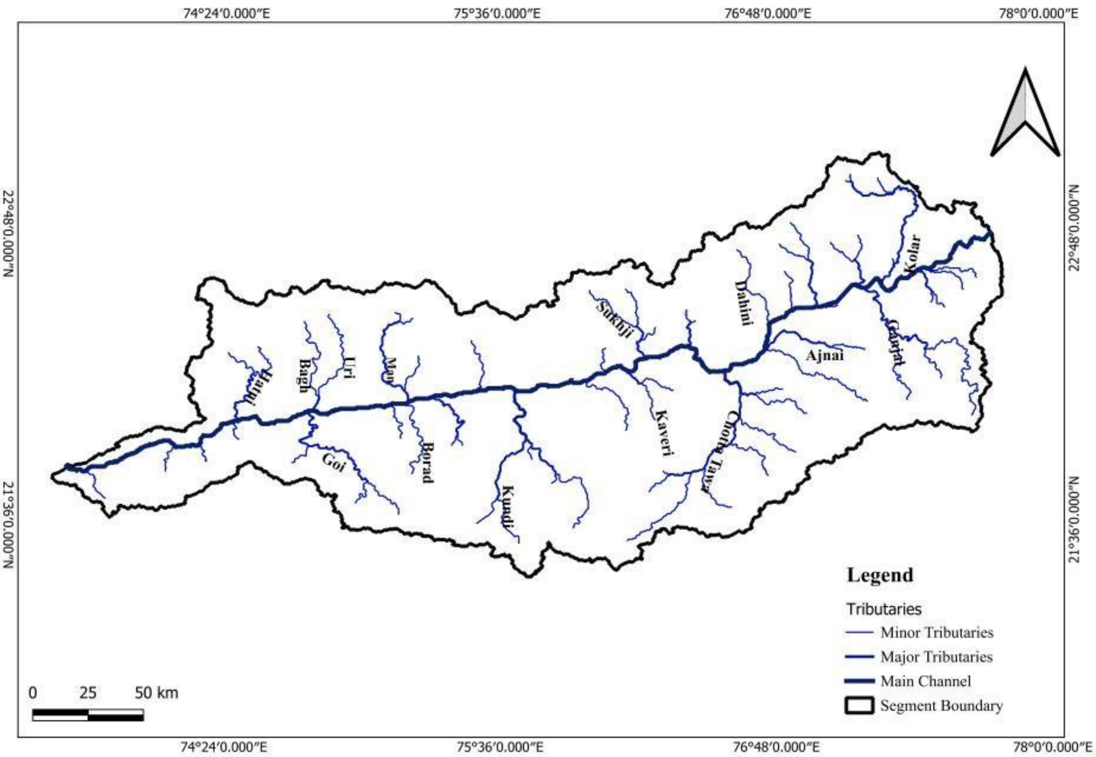

Figure 3. Streams of Middle Narmada Basin

Middle Narmada Sub-Basin: Spanning Hoshangabad to Navagam (~485 km), the middle sub-basin is marked by wider valleys, fertile plains, and basaltic rock formations. This region supports extensive agricultural activity, thanks to irrigation systems fed by major projects like the Indira Sagar and Omkareshwar Dams. Despite its agricultural productivity, the middle Narmada faces challenges such as deforestation in the surrounding uplands, leading to increased siltation, and pollution from untreated urban and industrial effluents.

Lower Narmada Sub-Basin: Covering the area from Navagam to the Gulf of Khambhat (~145 km), the lower sub-basin transitions into the flat alluvial plains of Gujarat. Here, the river slows down, creating rich floodplains that support diverse ecosystems and fertile agricultural lands. This region includes the Sardar Sarovar Dam, a critical infrastructure for irrigation, water supply, and power generation. However, the lower Narmada is heavily impacted by industrial discharges, sand mining, and changes in sediment flow due to upstream damming, leading to coastal erosion near the river's mouth.

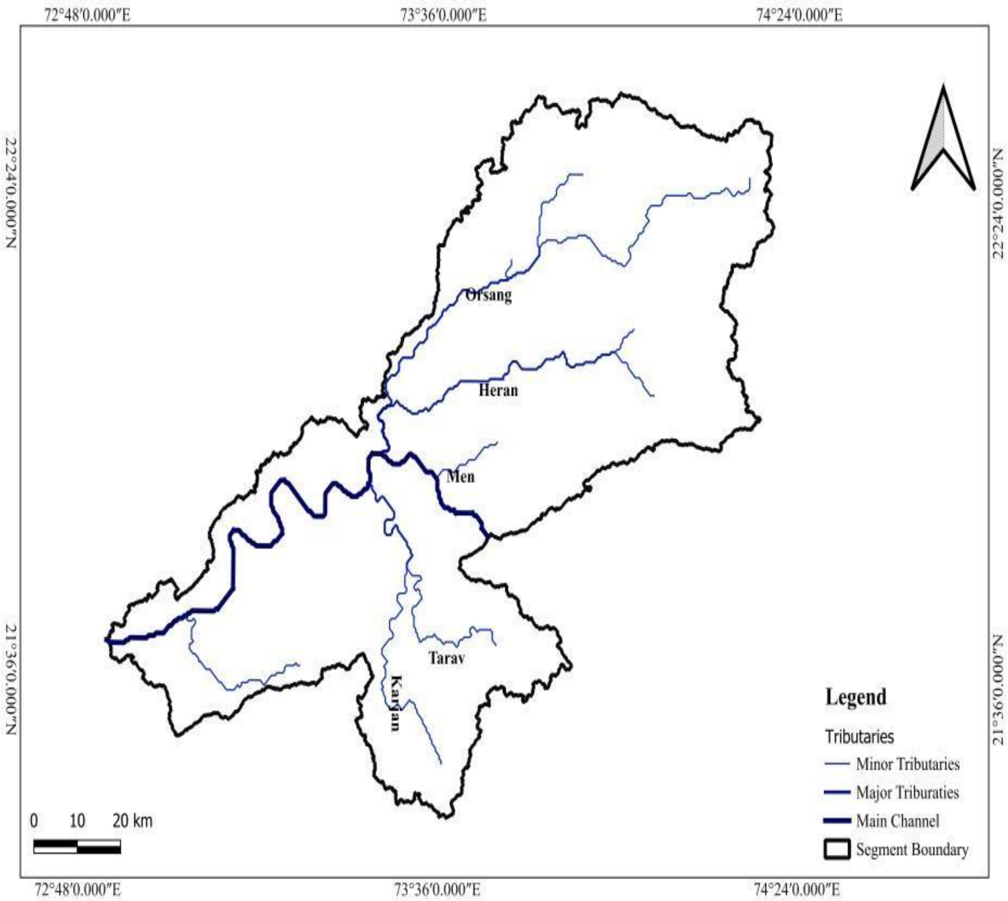

Figure 4. Streams of Lower Narmada Basin

1.2 Demography of the Basin

The Narmada River basin spans four Indian states: Chhattisgarh, Maharashtra, Gujarat, and Madhya Pradesh, each exhibiting diverse demographic patterns. The data reveals significant variations in area, population, growth rates, and population densities across these districts. In Chhattisgarh, Raj Nandgaon district, despite covering only 86.61 sq. km, supports a substantial population of over 1.5 million with a moderate growth rate of 17.79%, indicating a dense demographic spread. Kabirdham, with 627.25 sq. km, shows a significant population growth of 40.71%, reflecting rapid development and increasing population density. Madhya Pradesh shows diverse demographic characteristics. Harda district, with a population growth rate of 32.88% and a density of 833.15 people per sq. km, emphasizes rapid urbanization and potential stress on resources. Conversely, the Mandla district, with a larger area of 4,628.55 sq. km and a lower population density of 156.86, indicates less demographic pressure. Districts like Hoshangabad and East Nimar are almost entirely within the basin, underscoring their geographical significance and dependence on basin resources. The demographic dynamics within the Narmada River basin suggest that areas with higher population densities and growth rates, particularly in Maharashtra's Nandurbar and Gujarat's Narmada district, may experience significant strain on water resources, agricultural land, and urban infrastructure. This variation in population densities implies differing levels of environmental impact and resource management challenges across the basin. Consequently, tailored strategies for sustainable development and conservation efforts are crucial to managing these impacts and ensuring the basin's long-term sustainability. Thus, this demographic analysis of the Narmada River basin highlights the varied degrees of dependence on the river across different districts, substantial population growth in urban areas, and significant demographic changes. These insights are vital for developing effective planning and targeted conservation efforts to ensure the sustainable development of the Narmada basin.

1.3 Administrative Divisions

1.3.1 Administrative Divisions: Upper Narmada Basin

The Upper Narmada Basin, spanning across 18 districts in Madhya Pradesh (16) and Chhattisgarh (2) presents a diverse geographical distribution in terms of area coverage within the basin. It is important to note that none of the districts are entirely encompassed within the Upper Narmada Basin; rather, they share portions of their territories with the basin. Among these districts, Mandla stands out as the largest, with an area of 6,722.82 square kilometers under the basin, followed by Narsinghpur (5,004.57 km²), Dindori (4,706.48 km²), Jabalpur (4,675.56 km²), and Hoshangabad (4,631.51 km²). Given their extensive areas within the basin, these districts are likely to play pivotal roles in the ecological and hydrological dynamics of the Narmada River, serving as key regions for water management and environmental conservation initiatives.

Table 1. District-wise Area Under Upper Narmada Basin

Sr. No.	Districts	Basin Area (sq. km)	Total Area (sq. km)	% of the Total Area
Chhattisgarh				
1	Kabeerdham	640.54	4166.22	15.37
2	Rajnandgaon	88.47	8171.18	1.08
Madhya Pradesh				
3	Sagar	407.82	10466.36	3.9
4	Damoh	469.95	7398.78	6.35
5	Umaria	11.59	4699.56	0.25
6	Sehore*	360.77	6544.36	5.51
7	Raisen*	4494.1	8413.52	53.42
8	Betul*	2935.51	10149.33	28.92
9	Hoshangabad*	4631.52	6676.25	69.37
10	Katni	1155.75	5126.57	22.54
11	Jabalpur	4675.56	4923.07	94.97
12	Narsimhapur	5004.57	5134.59	97.47
13	Dindori	4706.49	5666.31	83.06
14	Mandla	6722.82	7606.11	88.39
15	Chhindwara	3492.1	11744.69	29.73
16	Seoni	2270.84	8774.41	25.88
17	Balaghat	2294.95	9253.5	24.8
18	Anuppur	534.67	3847.69	13.9

Source: Authors' calculation based on SOI administrative boundaries,

** Districts are part of both Upper and Middle Narmada Basin and their area is shown as per the respective basins.*

In contrast, Umaria, with only 11.59 square kilometers under the basin, is the smallest district, followed by Rajnandgaon (88.47 km²), Sehore (360.77 km²), Sagar (407.82 km²), and Damoh

(469.95 km²). These variations in district size within the basin underscore the diverse range of contributions that different regions make to the basin's environmental and hydrological frameworks.

When considering the proportion of district areas that fall within the Upper Narmada Basin, Narsinghpur contributes the highest share, with 97.46% of its total area located within the

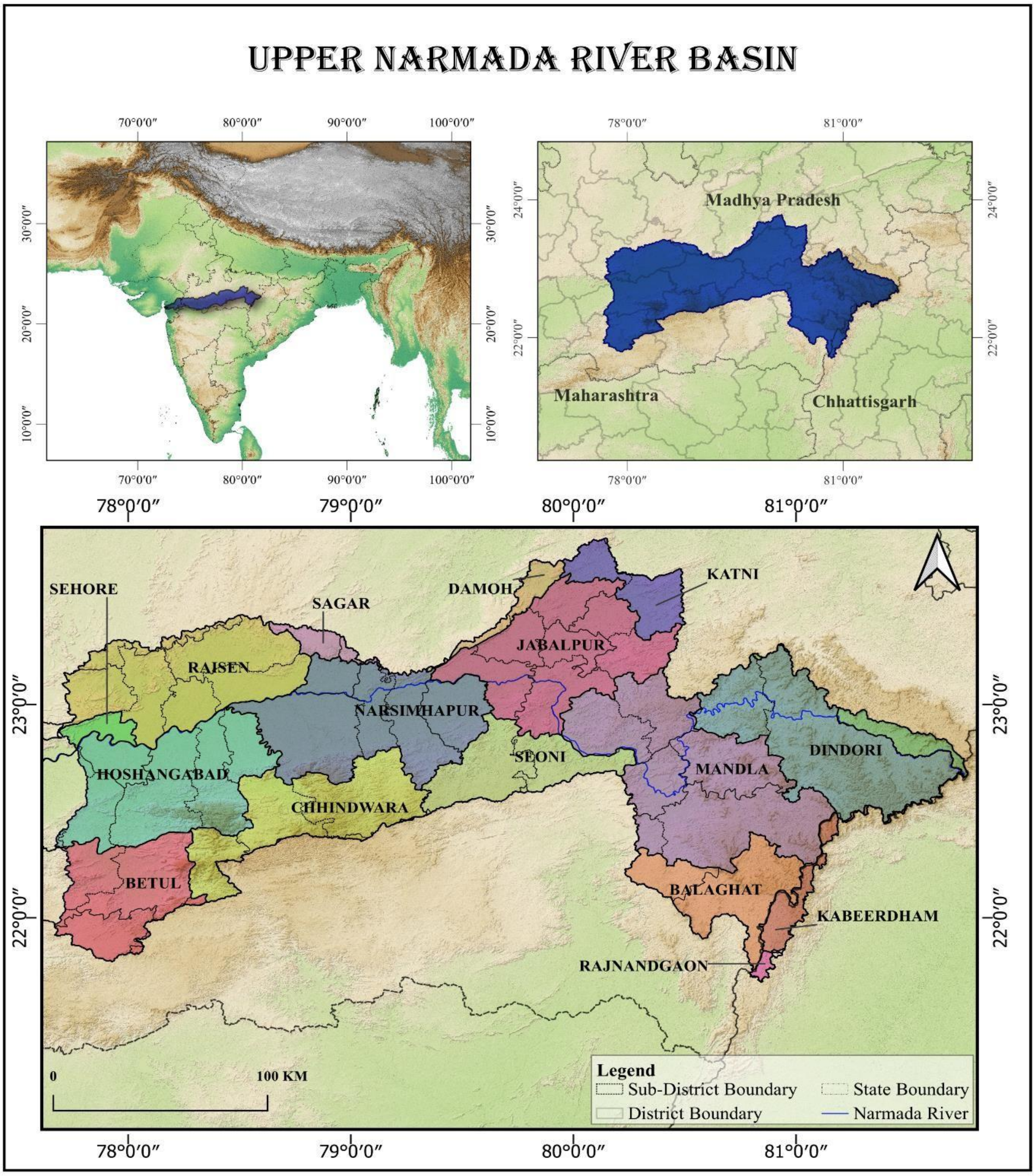

Figure 5.Upper Narmada Basin: Administrative Divisions

basin. This is followed by Jabalpur (94.97%), Mandla (88.38%), and Dindori (83.06%). On the opposite side, districts such as Umaria, Rajnandgaon, and Sagar contribute the smallest areas to the Upper Narmada Basin.

For smooth and efficient administrative functioning, districts are subdivided into smaller units known as sub-districts or tehsils. Among these, Raisen has the highest number of sub-districts with 8, followed by Jabalpur and Hoshangabad, each with 7. Mandla and Betul also have a relatively high number of sub-districts, with 6 and 5, respectively. Districts like Narsimhapur and Chhindwara have 5 and 4 sub-districts each, indicating moderately sized administrative divisions. In contrast, several districts, including Kabeerdham and Rajnandgaon in Chhattisgarh, as well as Anuppur, Sehore, and Umaria in Madhya Pradesh, have only one sub-district.

1.3.2 Administrative Divisions: Middle Narmada Basin

The Middle Narmada Basin spans 19 districts across three states: Madhya Pradesh, Gujarat, and Maharashtra. Of these, Madhya Pradesh accounts for the largest share with 15 districts falling within the basin, while Gujarat and Maharashtra contribute two districts each. Notably, four districts of Madhya Pradesh—Sehore, Raisen, Betul, and Hoshangabad—are unique in that they overlap both the Upper and Middle Narmada Basins. However, these districts have been analyzed separately in the context of their respective basins to maintain clarity and basin-wise assessments.

Among the districts of the Middle Narmada Basin, Madhya Pradesh dominates the basin with significant contributions from districts such as Khargone (7722.99 km²), Khandwa (6604.53 km²), and Dewas (4011.53 km. Smaller but contributions come from Barwani (3909.05 km²), Sehore (2875.90 km²), and Harda (3258.21 km²), Betul (1024.05 km²), Indore (1009.18 km²), and Hoshangabad (2044.73 km²) Bhopal, with a very small area of 3.14 km², and Jhabua, contributing just 26.55 km²

In Gujarat, Chhota Udaipur (170.69 km²) and Narmada (303.20 km²) have relatively small basin areas. Similarly, Maharashtra has minor contributions, with Nandurbar 1601.26 km² and Dhule only 9.91 km².

Table 2. District-wise Area Under Middle Narmada Basin

Sr. No.	Districts	Basin Area (sq. km)	Total Area (sq. km)	% of the Total Area
Madhya Pradesh				
1	Alirajpur	2126.78	3316.88	64.12
2	Barwani	3909.05	5175.42	75.53
3	Betul	1024.05	10149.33	10.09
4	Bhopal	3.14	2715.03	0.12
5	Burhanpur	441	3238.48	13.62
6	Dewas	4011.53	7183.55	55.84
7	Dhar	4955.33	8146.74	60.83
8	Harda	3258.21	3316.74	98.24
9	Hoshangabad	2044.73	6676.25	30.63
10	Indore	1009.18	3792.48	26.61
11	Jhabua	26.55	3508.96	0.76
12	Khandwa	6604.53	7297.68	90.5
13	Khargone	7722.99	8243.85	93.68
14	Raisen	116.85	8413.52	1.39
15	Sehore	2875.9	6544.36	43.94
Gujarat				
16	Chhota Udaipur	170.69	7559.93	2.26
17	Narmada	303.2	2859.11	10.6
Maharashtra				
18	Dhule	9.91	7142.96	0.14
19	Nandurbar	1601.26	5906.35	27.11

*Source: Authors' calculation based on SOI administrative boundaries * Districts are part of both Upper and Middle Narmada Basin and their area is shown as per the respective basins*

Table 2 also shows percentage of total area covered by various districts within Middle Narmada, with Harda (98.24%), Khargone (93.68%), and Khandwa (90.50%) Barwani (75.53%) and Dhar (60.83%). In contrast, districts like Bhopal (0.12%) and Jhabua (0.76%) show minimal coverage. Gujarat contributes limitedly, with Chhota Udaipur (2.26%) and Narmada (10.60%). Maharashtra has a minor presence as well, with Nandurbar at 27.11% and Dhule at a negligible 0.14%.

The above-mentioned districts of Middle Narmada Basin have also been divided in several sub-districts (Tehsil) for the smooth operational and planning purposes. In Madhya Pradesh, there are 15 districts with notable variations in sub-districts. Barwani and Khargone lead with 9 sub-districts each, while Dhar and Sehore have 7. On the other hand, Bhopal and Burhanpur have only 1, indicating a simpler administrative structure. In Gujarat, both Chhota Udaipur and Narmada have 2 sub-districts. In Maharashtra, Dhule has 1 sub-district and Nandurbar has 3 in the Middel Narmada Basin.

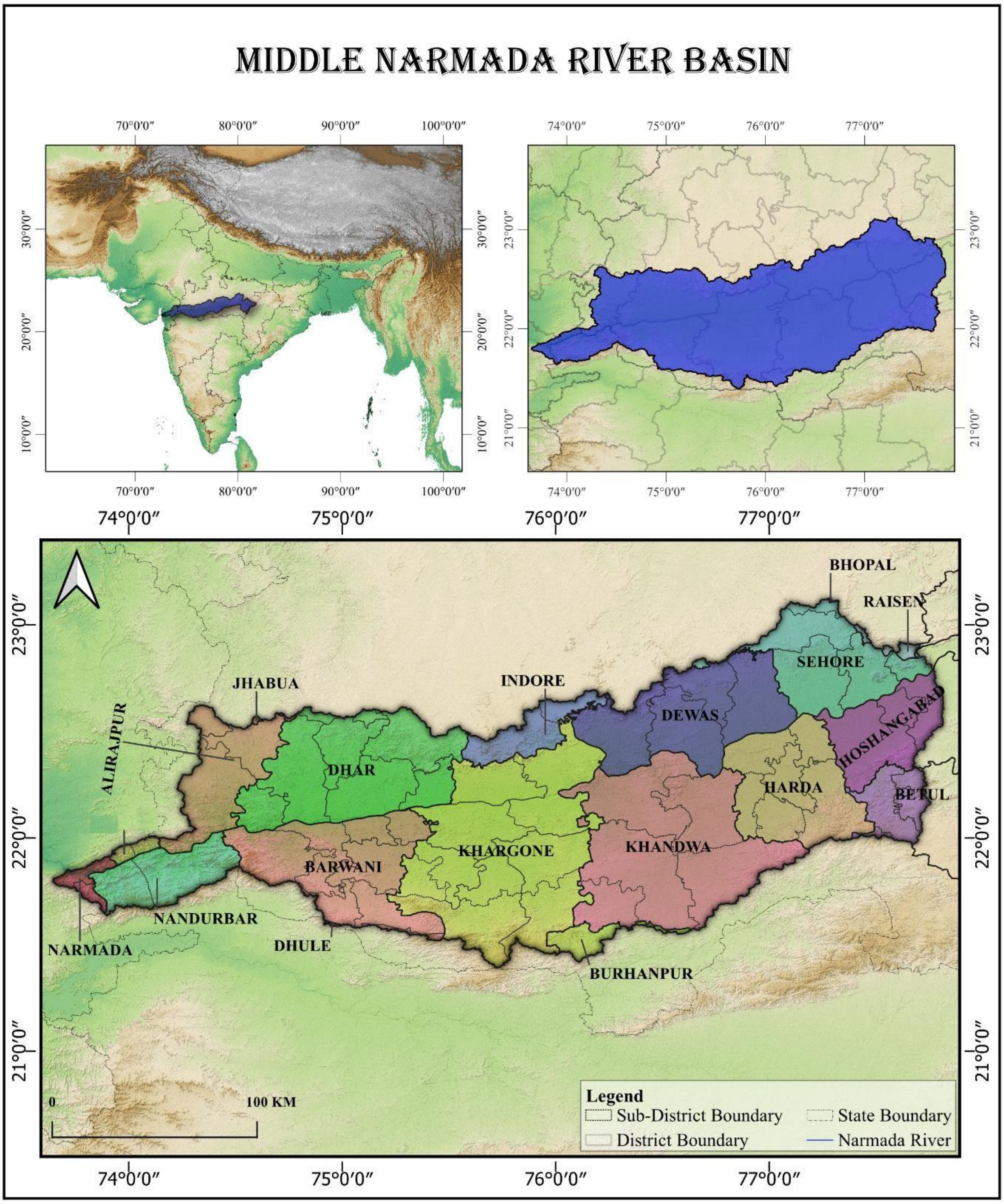

Figure 6. Middle Narmada Basin: Administrative Divisions

Figure 7. Lower Narmada Basin: Administrative Divisions

Table 3 outlines the Lower Narmada Basin delineation based on 2011 Census data, detailing the total area, area within the basin, and percentage share of each district. In Gujarat, the districts of Bharuch, Dohad, Narmada, Panch Mahals, Surat, and Vadodara are included, with Bharuch covering 31.7% of the basin area (1,651 sq km) and Vadodara accounting for 51.9% (3,914.3 sq km). Narmada has the largest percentage share within its district boundaries at 84.9% (2,146.3 sq km). Additionally, Madhya Pradesh's Alirajpur district covers 36.3% of its area within the basin (1,159.6 sq km), while Maharashtra's Nandurbar district accounts for a relatively small 0.9% share (43.4 sq km). These estimates provide a spatial definition of the Lower Narmada Basin.

Table 3. Lower Narmada Basin Delineation (Census 2011)

State/District Names	Total Area in District (sq km)	Area in Basin (sq km)	Share in Basin (%)
Gujarat			
Bharuch	3,563.40	1,651	31.7
Dohad	3,488.00	140	3.9
Narmada	382.5	2,146.30	84.9
Panch Mahals	4,955.50	164.1	3.2
Surat	3,857.00	214.5	5.3
Vadodara	3,622.30	3,914.30	51.9
Madhya Pradesh			
Alirajpur	2,034.10	1,159.60	36.3
Maharashtra			
Nandurbar	4,775.30	43.4	0.9

2 Sources of Water Supply within Administrative and Natural Boundaries

2.1 Surface water supply sources

2.1.1 River

The Narmada River itself is the primary surface water source within its basin. Originating from Amarkantak in Madhya Pradesh, it flows westward for approximately 1,312 km before emptying into the Gulf of Khambhat in the Arabian Sea.

- **Narmada River (Main Stream):** The river's substantial flow is the principal source of water, especially for large-scale irrigation, hydropower generation, and bulk water supply to major urban and rural areas.
- **Major Tributaries:** The Narmada is fed by 41 tributaries, with 22 from the Satpura range (left bank) and 19 from the Vindhya range (right bank). Key tributaries contributing significant surface water include:
    - **Left Bank:** Tawa, Sher, Shakkar, Dudhi, Ganjal, Chhota Tawa, Karjan, Burhner, Banjar, Goi.
    - **Right Bank:** Hiran, Tendoni, Barna, Kolar, Man, Uri, Hatni, Orsang. These tributaries are themselves impounded by numerous dams, contributing to localized water availability.

2.1.2 Lakes

a. Narmada Kund (Amarkantak, Anuppur District, Madhya Pradesh)

- **Nature/Origin:** This is a sacred, spring-fed pool that marks the geological origin of the Narmada River in the Maikala Range. It is a natural perennial spring, around which temple structures have been built.
- **Relevance to Water Demand & Supply:** As the very source of the Narmada, its perennial flow directly feeds the river, which is the ultimate source for all downstream water demand and supply. Locally, it serves pilgrimage needs and minor domestic water requirements for the surrounding Amarkantak town. Its primary significance is hydro-spiritual rather than direct large-scale supply, but its consistent flow is fundamental to the entire basin's water availability.

b. Matariya Talav (Matariya Lake) (Bharuch City, Gujarat)

- **Nature/Origin:** This is a natural depression situated within the lower Narmada floodplain that has been "enhanced with bunds." This indicates a natural low-lying area whose water retention capacity has been augmented by human intervention. It combines a natural origin with functional modification.
- **Relevance to Water Demand & Supply:** Matariya Talav is significant for local water management in the Bharuch area. It acts as a buffer for monsoon floodwaters, helps in local groundwater recharge, and provides water for localized irrigation and other domestic uses for the urban and peri-urban populations.

c. Panchmuli Lake (Dyke-3) (Near Statue of Unity, Narmada District, Gujarat)

- **Nature/Origin:** While closely associated with the Sardar Sarovar Dam and often referred to as 'Dyke-3,' it is recognized as having a natural topographical origin—a depression or valley segment that now holds water as part of the reservoir's extended reach. It is managed but its physical basin is natural.
- **Relevance to Water Demand & Supply:** As a direct component of the Sardar Sarovar Project's managed water body, it contributes to the overall gross storage and thus the region's water supply, although its primary function within this context is tied to the dam's operation. Its natural characteristics contribute to its ecological value, providing habitats for wildlife.

2.1.3 Canal

Canal networks are indispensable components of the Narmada River Basin's water infrastructure, critical for efficient water distribution, extensive irrigation, and vital inter-basin water transfers. These systems ensure that the substantial water resources harnessed by major dams are effectively conveyed to areas of demand, both within and beyond the natural basin boundaries.

Approximately 30% of the total Narmada basin area falls under command areas, signifying the widespread reach of these irrigation projects. This command area distribution is further categorized into 27.6% as major command and 3.3% as medium command.

The major command areas within the basin are served by extensive canal systems originating from key projects such as the Indira Sagar, Bargi (Rani Avanti Bai Sagar), Bargi Diversion, Sardar Sarovar, and Tawa projects. These systems are crucial for agricultural productivity and water supply in numerous districts across Madhya Pradesh, including Jabalpur, Narsimhapur, Raisen, Hoshangabad, Harda, Sehore, and West Nimar. In Gujarat, they serve districts like Bharuch, Narmada, and Vadodara.

Medium command areas benefit from projects like Upper Beda, Matiyari Chandrakeshar, Uri, Machak, Bohari Bund, Madai, and Heran, each featuring its own associated canal networks to meet regional demands.

A notable challenge in the lower part of the basin is waterlogging, particularly within the command areas under the Sardar Sarovar, Ukai, and Karjan projects. This issue necessitates careful management of canal operations and drainage.

The Narmada basin boasts an extensive canal network that not only irrigates within the basin but also facilitates significant interbasin water transfer. The total length of canal systems across various irrigation projects in the basin spans an impressive 6637.8 km.

a. Narmada Main Canal

The Narmada Main Canal (NMC) stands as a monumental achievement in water infrastructure. It is a contour canal, distinguished as the longest lined irrigation canal in the world.

- **Length:** Approximately 459 km from its headworks at the Sardar Sarovar Dam in Gujarat to the Gujarat-Rajasthan border. It further extends into Rajasthan, irrigating areas in Barmer and Jalore districts, demonstrating a critical inter-state water transfer.

- **Capacity:** The NMC has a design capacity to flow 1133 cumecs (40,000 cusecs**)** at its head near Kevadia, gradually reducing to 71 cumecs (2500 cusecs) at the Gujarat-Rajasthan border.
- **Lining:** The canal is meticulously lined with plain cement concrete. This crucial design feature serves to minimize seepage losses, thereby conserving water, to attain higher water velocity for efficient delivery, and to mitigate future waterlogging issues in its command areas. The scale of this concrete lining work was unprecedented in India at the time of its construction, utilizing mechanized pavers.
- **Inter-Basin Transfers:** Beyond its primary irrigation role, the NMC system is pivotal for inter-basin transfers within Gujarat, supplying Narmada water to the Mahi, Sabarmati, and west-flowing rivers in the water-scarce Kutch and Saurashtra basins.

b. Branch Canals

The Narmada Main Canal further branches into an intricate network of subsidiary canals to maximize its command area and water distribution:

- **Number of Canals:** Forty-four (44) canals off-take directly from the Narmada Main Canal. Additionally, seven Sub Branch Canals originate from the Saurashtra Branch Canal.
- **Major Branch Canals:**
    - **Saurashtra Branch Canal (SBC):** This canal off-takes from the NMC at Chainage 263.20 km near Kadi. It features a unique alignment, dropping by 40.71 meters and then rising by 70.85 meters before terminating at the Bhogavo reservoir. Hydro-power generation is proposed at three fall locations, with water then pumped in five stages to higher elevations. The SBC has seven operational Sub Branch Canals (Narsinhpur, Vallabhipur, Maliya, Dhrangadhra, Limbdi, Botad, and Morbi) that provide water for irrigation, drinking, and industrial usage in the Saurashtra region.
    - **Kachchh Branch Canal (KBC):** This 358 km long canal off-takes from the NMC with a designed enhanced discharge of 220 cumecs. It serves a net Culturable Command Area (CCA) of 175,811 hectares across Banaskantha, Patan, and Kachchh districts. The KBC traverses the challenging terrain of the Little Rann and Great Rann of Kachchh, utilizing three completed pumping

stations. Canal works beyond 190 km are divided into 23 'slices' (IR-0 to IR-22), with the canal already operational up to Tapar Dam and partially completed beyond. Its sub-branch canals include Gagodhar, Wandhiya (almost completed), and Dudhai (under progress).

Table 4. Narmada Main Canal Section Characteristics (Off-taking Canals

Sr. No	Name of Canal	Chainage of NMC (km)	Sr. No	Name of Canal	Chainage of NMC (km)	Sr. No	Name of Canal	Chainage of NMC (km)
1.	Wadia	9.931	2.	Tilakwada	17.871	3.	Mandwa	25.263
4.	Bhilodia	32.694	5.	Timbi	38.523	6.	Sankheda	45.109
7.	Miyagam	62.916	8.	Gojali	70.236	9.	Vadodara	81.834
10.	Dena	88.77	11.	Dumad	100.026	12.	Sakarda	102.953
13.	Zumkha	106.905	14.	Nahra	111.645	15.	Desar	126.645
16.	Sanali	171.961	17.	Mehmdabad	187.074	18.	Ghodasar	202.368
19.	Vehlal	212.546	20.	Daskroi	223.667	21.	Dholka	246.286
22.	Sanand	258.632	23.	Saurashtra	263.2	24.	Viramgam-I	267.063
25.	Viramgam-II	277.166	26.	Goriya	290.605	27.	Kharaghoda	292.398
28.	Zinzuwada	301.041	29.	Bolera	326.389	30.	Rajpura	344.772
31.	Amarapura	354	32.	Radhanpur	374.486	33.	Kachchh	385.814
34.	Vejpur	405.722	35.	Madka	417.792	36.	Malsan	423.732
37.	Dhima	438.552	38.	Godasisar	453.837			

Source:

The Narmada Main Canal's extensive journey necessitates the construction of various structures to negotiate water streams, rivers, roads, and railways. In total, there are 598 structures on the Narmada Main Canal. This includes 236 cross drainage structures (such as 5 Aqueducts, 15 canal syphons, 182 drainage syphons, 33 canal crossings, and one super passage), 89 regulating structures (comprising 1 Main Head Regulator, 44 Branch Head Regulators, 32 Cross Regulators, and 12 Escapes), and 274 road bridges (including National Highway, State Highway, Major District Road Bridges, Other District Road Bridges, Village Road Bridges, and Under Vehicle Road Bridges). The Narmada Main Canal is currently almost completed up to 458 km, with water successfully reaching the state of Rajasthan, signifying its operational status in fulfilling its designed objectives.

3 Water Requirement and Population Distribution

3.1 Population Distribution

The district-wise population distribution in the Upper Narmada Basin reveals notable concentrations across Madhya Pradesh and Chhattisgarh. Jabalpur emerges as the most populous district, with 2,425,715 residents, serving as a key center in the basin. Narsimhapur follows with 1,077,182 people, underscoring its regional importance. Mandla (914,427) and Hoshangabad (703,092) also make significant contributions to the basin's demographics. Additional districts with considerable populations include Raisen (682,636), Betul (627,667), and Dindori (601,517). Seoni and Chhindwara, with 319,103 and 316,153 inhabitants respectively, add to the basin's population density. Balaghat (316,049) and Katni (253,587) further illustrate the distribution of residents supporting the demographic makeup of the basin.

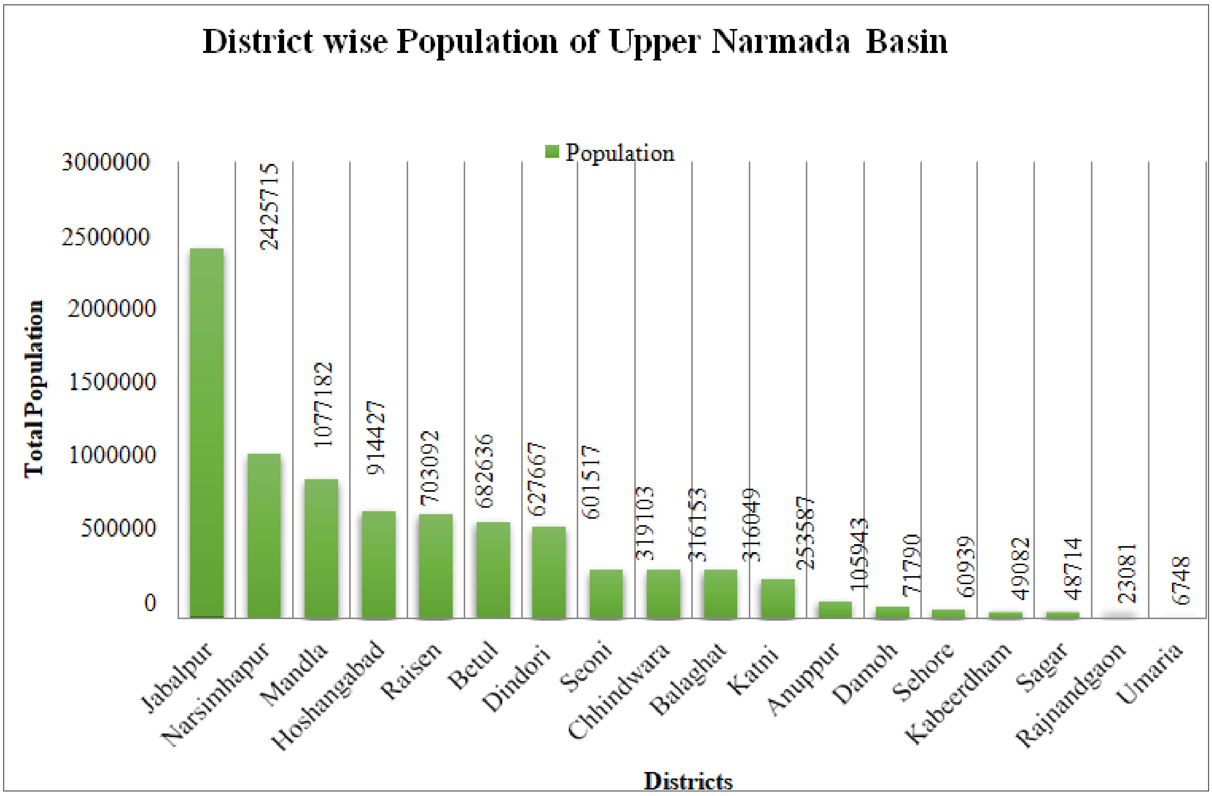

Figure 8. District-wise Population Distribution of Upper Narmada Basin

Conversely, certain districts exhibit much smaller populations, including Sehore with 60,939 residents and Sagar with 48,714, highlighting stark contrasts in demographic density across the basin. In Chhattisgarh, Kabeerdham contributes 49,082 people and Rajnandgaon 23,081, though these numbers remain modest compared to most districts in Madhya Pradesh. Umaria has the basin's lowest population at only 6,748, underscoring the necessity for targeted development initiatives in such underpopulated areas (Figure 8).

In terms of Middle Narmada Basin, the district-wise population distribution shows marked differences. Khargone, with 1,834,133 people, is the most populous district, followed by Dhar (1,440,006), Khandwa (1,282,756), and Barwani (1,103,143), which together make up the basin's main population centers. Conversely, districts like Bhopal (1,457) and Raisen (8,803) have significantly smaller populations. Outside Madhya Pradesh, Nandurbar in Maharashtra contributes 300,444 residents, while Gujarat's Narmada district adds 29,979 people. These figures highlight Madhya Pradesh's dominant share of the basin's population, while also showing smaller yet significant contributions from Maharashtra and Gujarat, emphasizing the need for targeted, district-specific development and management strategies (Figure 9).

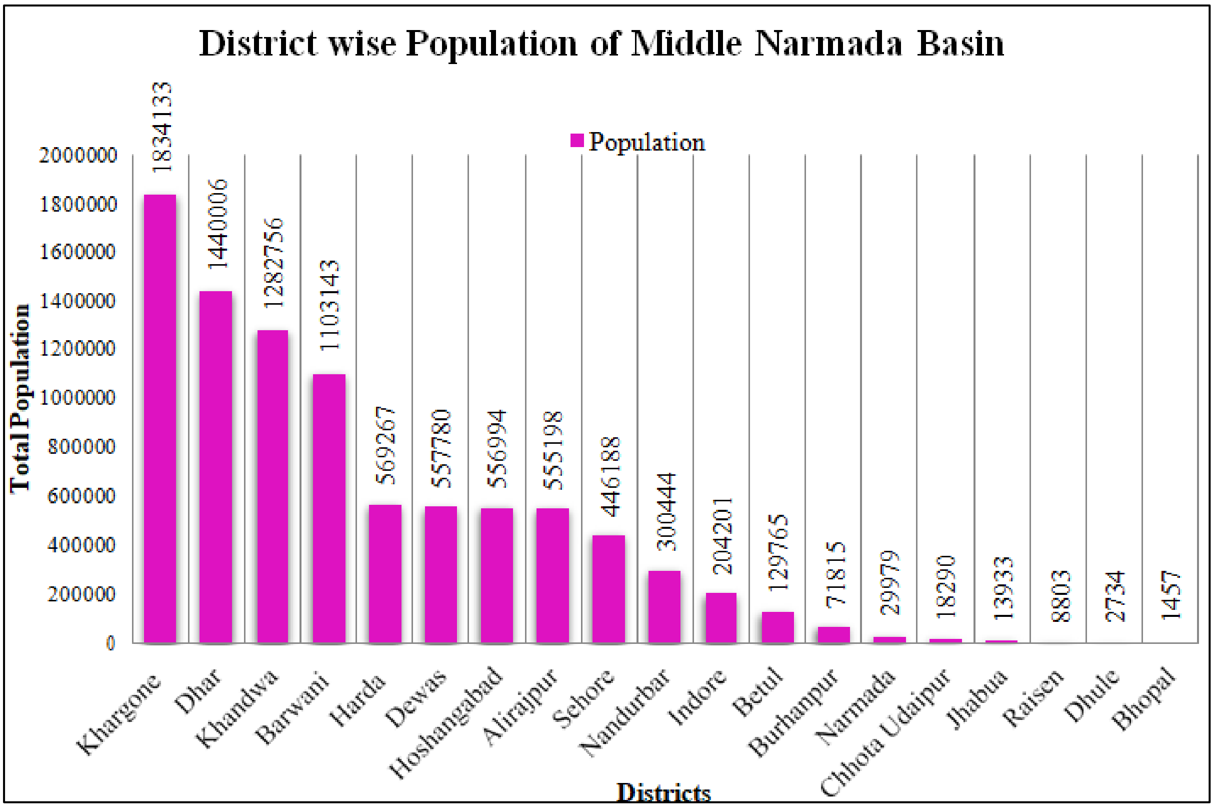

Figure 9. District-wise Population Distribution of Middle Narmada Basin

In the Lower Narmada Basin, the district-wise 2011 populations indicate significant variation across Gujarat, Madhya Pradesh, and Maharashtra. Among the Gujarat districts, Vadodara stands out with the highest population at 9.5 lakhs, followed by Bharuch with 3.7 lakhs, and Narmada with 3.3 lakhs, highlighting these as the primary population centers in the basin. Surat (0.6 lakhs), Panch Mahals (0.5 lakhs), and Dohad (0.2 lakhs) have smaller populations, reflecting less demographic concentration in these areas. In Madhya Pradesh, Alirajpur shows a modest population of 0.3 lakhs, while in Maharashtra, Nandurbar has a slightly lower population at 0.1 lakhs (Figure 10)

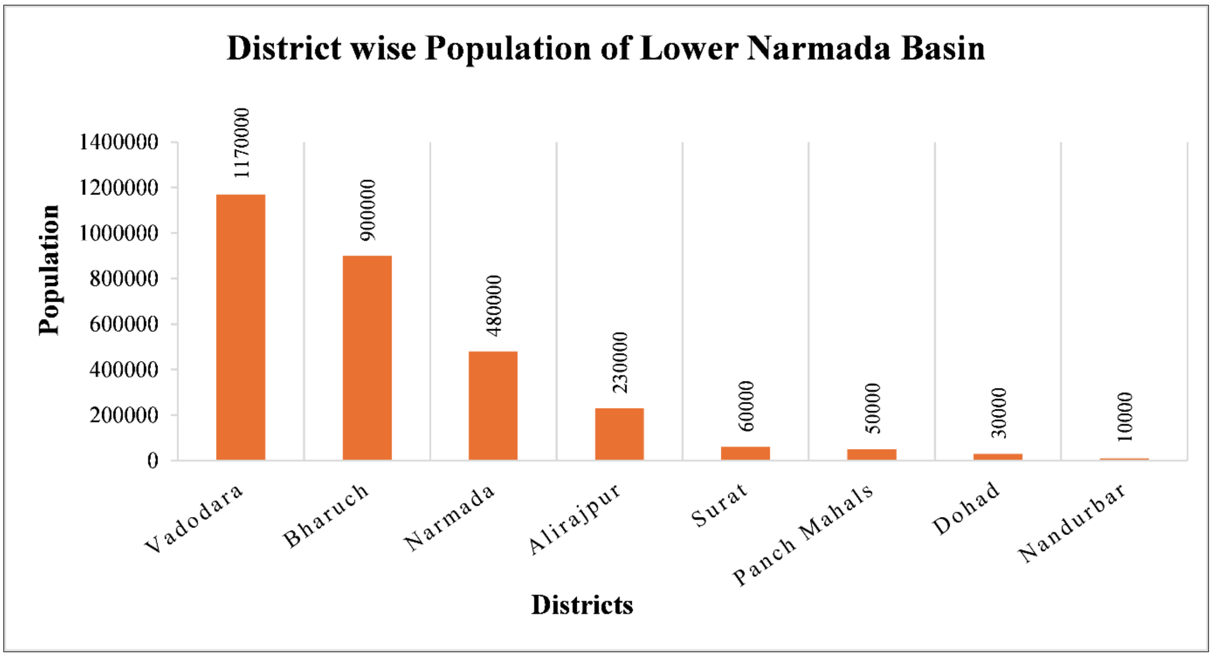

Figure 10. District-wise Population Distribution of Lower Narmada Basin

3.2 Sources of Drinking Water

Table 5 shows significant variation in household access to different drinking water sources across Madhya Pradesh districts. In Sagar, a total of 370,377 households were recorded, with a large rural component (273,645 households). Wells were the predominant source of drinking water (151,919 households), followed by handpumps (131,192), indicating continued reliance on traditional and semi-mechanized water sources. Tap water reached 71,297 households, highlighting moderate progress in piped water supply.

In Damoh, among 222,743 total households, wells (84,029) and handpumps (89,073) again dominated, with urban households (37,260) having a much higher share of tap water connections (14,770) compared to rural areas (16,867). This pattern of urban-rural disparity in tap water access persists in Dewas, where among 222,318 households, urban areas show a stronger presence of tap connections (36,621 out of 61,885 urban households) than rural regions (11,699 tap connections for 160,433 rural households).

Districts like Indore stand out for much higher access to tap water. Indore's total 419,358 households include a striking 228,256 with tap water, mostly in urban areas (209,876 urban households with tap connections), reflecting better urban infrastructure. However, rural Indore households still lag behind, with only 18,380 having tap access.

In Barwani, out of 170,266 households, a substantial number rely on wells (22,706) and handpumps (73,430), while just 51,679 households use tap water—again reflecting gaps in piped supply. Similarly, Jhabua demonstrates high dependence on handpumps (157,189) compared to just 26,768 households with tap water, underscoring the reliance on groundwater sources.

Districts like Jabalpur show both high overall household counts (421,203) and a significant number of tap connections (188,499), particularly in urban areas (160,958), while rural Jabalpur remains more dependent on handpumps and wells.

In tribal-dominated districts such as Dindori and Mandla, reliance on wells and handpumps is pronounced. Dindori has 52,157 households using handpumps but only 7,230 with tap water, whereas Mandla reports 75,878 households with handpumps compared to just 27,582 with tap connections. This disparity indicates ongoing infrastructure challenges in these remote and forested districts.

Bhopal, the state capital, shows stark urban-rural differences. Of 335,376 total households, 229,158 have tap connections, nearly all in urban areas (224,692), while rural areas have just 4,466 households with taps, despite a significant rural population.

Finally, Sehore, Katni, and Hoshangabad reveal similar patterns: widespread reliance on handpumps and wells in rural regions, with urban households having far better access to piped water supply.

Table 5. Upper and Middle Narmada Basin Source of drinking water

District	Total/Urban/ Rural	Total Number of Households	Tap	Handpump	Tubewell	Well	Tank, Pond, Lake	River, Canal	Spring	Any other
Sagar	Total	370377	71297	131192	10804	151919	314	2796	830	1225
	Rural	273645	22436	111636	3393	132655	107	2442	804	172
	Urban	96732	48861	19556	7411	19264	207	354	26	1053
Damoh	Total	222743	31637	89073	3302	84029	273	11684	1674	1071
	Rural	185483	16867	78435	2028	74378	226	11443	1643	463
	Urban	37260	14770	10638	1274	9651	47	241	31	608
Umaria	Total	105671	14586	28130	732	56697	1060	3406	730	330
	Rural	89667	5188	26886	451	52203	1026	2919	704	290
	Urban	16004	9398	1244	281	4494	34	487	26	40
Shahdol	Total	327008	49566	74302	2201	183047	5000	6451	4939	1502
	Rural	249682	3912	66376	756	162624	4226	6079	4762	947
	Urban	77326	45654	7926	1445	20423	774	372	177	555
Dewas	Total	222318	48320	100990	26450	42088	971	1757	205	1537
	Rural	160433	11699	93783	14642	37819	420	1750	177	143
	Urban	61885	36621	7207	11808	4269	551	7	28	1394
Jhabua	Total	236053	26768	157189	2948	32655	2201	11399	1824	1069
	Rural	213879	9387	153616	2463	32111	2163	11285	1818	1036
	Urban	22174	17381	3573	485	544	38	114	6	33
Dhar	Total	304910	86450	138421	24593	41653	3346	6957	559	2931
	Rural	251447	51501	131041	19131	38686	2544	6889	511	1144
	Urban	53463	34949	7380	5462	2967	802	68	48	1787
Indore	Total	419358	228256	90034	76708	15659	2984	353	177	5187
	Rural	122385	18380	70685	23693	8114	705	221	56	531
	Urban	296973	209876	19349	53015	7545	2279	132	121	4656
West Nimar	Total	266970	129072	88574	6233	33360	681	6374	849	1827
	Rural	225874	94932	86129	4344	31443	522	6172	829	1503

	Urban	41096	34140	2445	1889	1917	159	202	20	324
Barwani	**Total**	170266	51679	73430	7964	22706	901	8511	2507	2568
	Rural	143701	28019	72787	6943	21786	809	8511	2507	2339
	Urban	26565	23660	643	1021	920	92	0	0	229
East Nimar	**Total**	306115	143132	110880	7180	39834	774	3014	296	1005
	Rural	229797	73710	109345	4952	37358	718	2858	278	578
	Urban	76318	69422	1535	2228	2476	56	156	18	427
Bhopal	**Total**	335376	229158	66008	23741	12287	1309	202	253	2418
	Rural	62648	4466	44186	4549	8768	98	159	123	299
	Urban	272728	224692	21822	19192	3519	1211	43	130	2119
Sehore	**Total**	183400	33384	90961	10667	44526	347	2629	169	717
	Rural	150511	12374	84952	8131	41757	320	2548	158	271
	Urban	32889	21010	6009	2536	2769	27	81	11	446
Raisen	**Total**	197496	40639	110631	7880	34063	686	2354	548	695
	Rural	161803	20522	100319	5028	32230	473	2275	532	424
	Urban	35693	20117	10312	2852	1833	213	79	16	271
Betul	**Total**	248131	61720	109453	9681	63425	354	2216	870	412
	Rural	199707	24595	104568	6403	60605	349	2214	852	121
	Urban	48424	37125	4885	3278	2820	5	2	18	291
Harda	**Total**	81758	16729	37600	2965	23118	58	956	57	275
	Rural	64256	4982	35093	1693	21388	57	954	53	36
	Urban	17502	11747	2507	1272	1730	1	2	4	239
Hoshangabad	**Total**	198176	62216	84751	8803	39950	39	1533	368	516
	Rural	137024	16870	78214	2908	36865	35	1514	361	257
	Urban	61152	45346	6537	5895	3085	4	19	7	259
Katni	**Total**	222551	41411	103852	5711	69337	225	1624	250	141
	Rural	179781	15112	94495	1980	66146	215	1571	206	56
	Urban	42770	26299	9357	3731	3191	10	53	44	85
Jabalpur	**Total**	421203	188499	169313	16591	39029	828	4091	695	2157
	Rural	200374	27541	135993	4347	27049	554	3776	523	591
	Urban	220829	160958	33320	12244	11980	274	315	172	1566
Narsimhapur	**Total**	179627	44871	112643	9705	9311	51	1683	524	839
	Rural	151741	24337	107839	7687	9096	47	1682	511	542
	Urban	27886	20534	4804	2018	215	4	1	13	297

Dindori	**Total**	126318	7230	52157	586	50079	856	7573	7335	502
	Rural	120484	3602	51221	539	49065	852	7389	7330	486
	Urban	5834	3628	936	47	1014	4	184	5	16
Mandla	**Total**	191633	27582	75878	2411	68930	1169	8141	6861	661
	Rural	173559	15042	73492	1199	68008	1162	7325	6859	472
	Urban	18074	12540	2386	1212	922	7	816	2	189
Chhindwara	**Total**	356244	136047	118209	6767	84465	831	5028	3845	1052
	Rural	268347	69018	112192	5457	72273	394	4684	3628	701
	Urban	87897	67029	6017	1310	12192	437	344	217	351
Seoni	**Total**	234760	46520	105759	3649	74229	495	2056	1632	420
	Rural	211177	29151	102266	3158	72265	417	2054	1521	345
	Urban	23583	17369	3493	491	1964	78	2	111	75
Balaghat	**Total**	316470	29178	141403	1423	140432	599	1440	1751	244
	Rural	277316	11562	133729	965	127184	589	1399	1732	156
	Urban	39154	17616	7674	458	13248	10	41	19	88

Source: Census of India

Table 6. Lower Narmada Basin Source of drinking water

District	Total/Rural/urban	No. of households	Tap	Handpump	Tubewell	Well	Tank, Pond, Lek	River, Canal	Spring	Any other
Panch Mahals	Total	362908	81234	142807	6450	123125	375	6057	1350	1510
	Rural	314881	44049	138721	2955	120443	372	6019	1348	974
	Urban	48027	37185	4086	3495	2682	3	38	2	536
Dohad	Total	242495	26635	114838	2478	88248	1983	4786	2973	554
	Rural	214512	7732	110027	1334	85487	1982	4673	2804	473
	Urban	27983	18903	4811	1144	2761	1	113	169	81
Vadodara	Total	733109	502522	157955	18206	38399	389	5719	2520	7399
	Rural	388736	189724	135724	14223	36526	359	5598	2513	4069
	Urban	344373	312798	22231	3983	1873	30	121	7	3330
Narmada	Total	104422	29049	62497	1835	5389	43	3607	1785	217
	Rural	93513	18539	62298	1776	5340	43	3548	1780	189
	Urban	10909	10510	199	59	49	0	59	5	28
Bharuch	Total	280409	196964	38568	9320	25912	92	3507	84	5962
	Rural	206501	130577	35707	5766	25592	89	3495	83	5192
	Urban	73908	66387	2861	3554	320	3	12	1	770
Surat	Total	1002078	652624	191232	60979	83084	176	2200	417	11366
	Rural	393748	153252	146076	10941	78455	72	2137	411	2404
	Urban	608330	499372	45156	50038	4629	104	63	6	8962
Nandurbar	Total	250526	131370	71240	7591	21477	465	7321	9824	1238
	Rural	215455	101158	69094	5788	21278	436	7302	9814	585
	Urban	35071	30212	2146	1803	199	29	19	10	653
Dhule	Total	329868	247681	37143	3991	34154	264	1218	1711	3706
	Rural	252920	181637	35350	3494	27649	169	1128	1686	1807
	Urban	76948	66044	1793	497	6505	95	90	25	1899

Source: Census of India

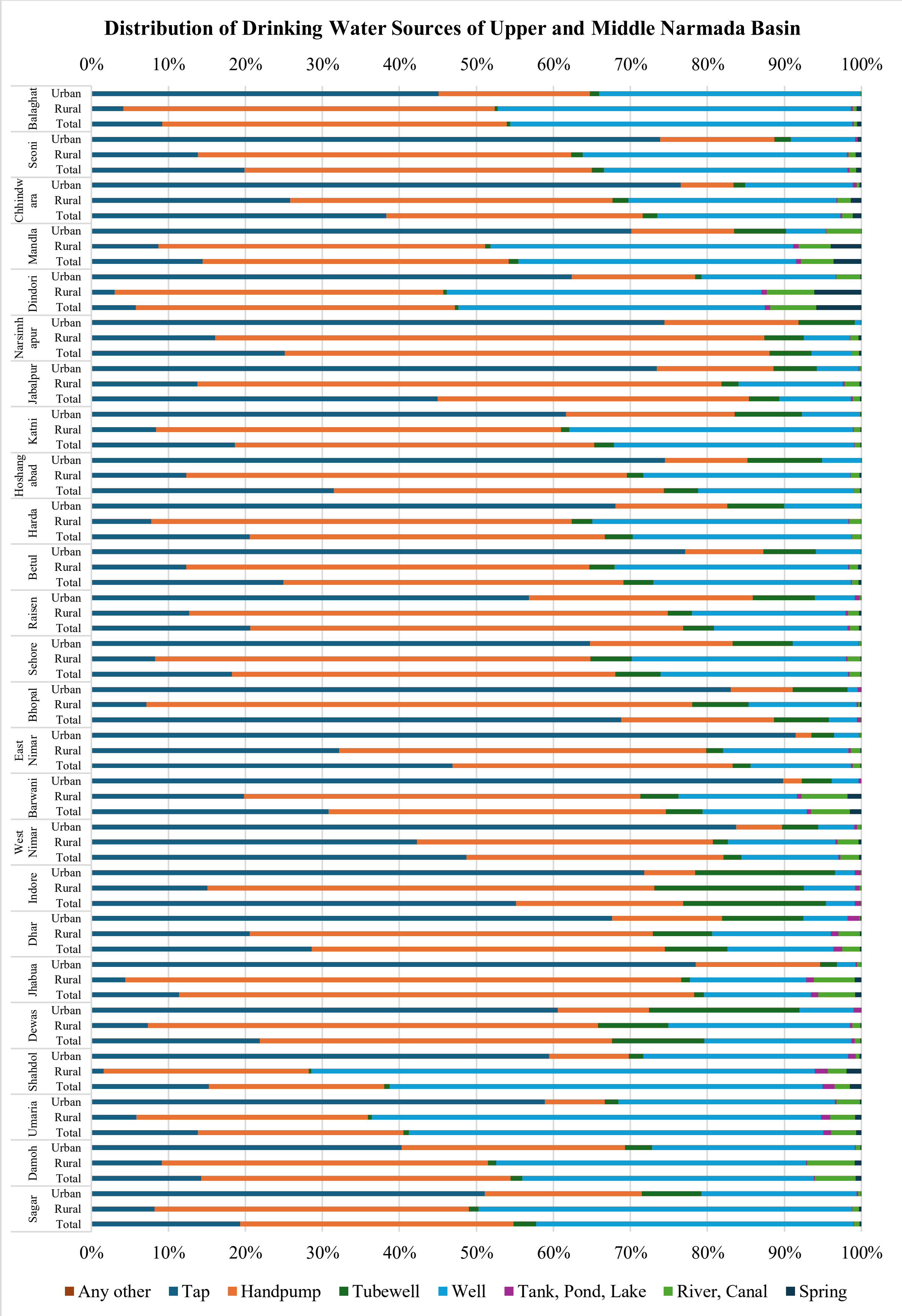

Figure 11. Upper and Middle Basin Share of Drinking Water Sources

Across districts, a consistent urban-rural gap is visible, with urban areas having far better access to tap water, while rural households still rely heavily on handpumps and wells. Districts with large rural and tribal populations (e.g., Dindori, Mandla, Jhabua) show slowest progress in tap water coverage, indicating a need for focused infrastructure development in these regions to achieve equitable water supply.

In terms of Lower Naramda Basin, the analysis of household water sources across the Lower Narmada River Basin reveals stark contrasts between rural and urban areas in terms of access to improved water infrastructure. In Panch Mahals, with around 363,000 households, the majority rural population still relies heavily on handpumps (143,000) and wells (123,000), while urban areas show better access to tap water connections (37,000). In Dohad, which has approximately 242,500 households (88% rural), rural residents depend predominantly on handpumps (115,000) and wells (88,000), whereas urban centers exhibit some advancement with about 19,000 tap connections.

In Vadodara, the district with over 733,000 households nearly split between rural and urban populations, urban areas have extensive piped water coverage with over 313,000 tap connections out of a total 503,000 taps, reflecting substantial urban infrastructure investment. However, rural households still rely on handpumps (135,000) and wells (36,000). Narmada district, the smallest in terms of households (104,000), shows limited tap water coverage (29,000 taps), especially in rural areas, where 62,000 households use handpumps and many depend on alternative sources like river or canal water (1,785 households).

In Bharuch, with 280,000 households (74% rural), both urban and rural areas show substantial tap coverage with nearly 197,000 taps, but handpumps (38,000) and wells (26,000) remain important rural sources. Surat, the largest district with over 1 million households, demonstrates a sharp urban-rural divide; urban areas boast extensive tap coverage with 500,000 taps, yet rural households still significantly rely on handpumps (146,000) and wells (78,000).

Nandurbar has around 250,000 households (86% rural), where handpumps (71,000) and wells (21,000) are common rural sources. Interestingly, 9,800 households rely on springs, highlighting the continued importance of traditional water sources in certain pockets. Dhule, with approximately 330,000 households (77% rural), shows strong piped water infrastructure with 248,000 taps, though handpumps (37,000) and wells (34,000) remain in use.

Overall, the data underscores that while urban centers across these districts have made notable progress in extending piped water networks, rural populations continue to depend on handpumps, wells, and alternative sources like rivers, tanks, and springs. These disparities highlight the critical need for targeted investments in rural water supply infrastructure to ensure equitable and reliable access to safe drinking water throughout the Lower Narmada River Basin.

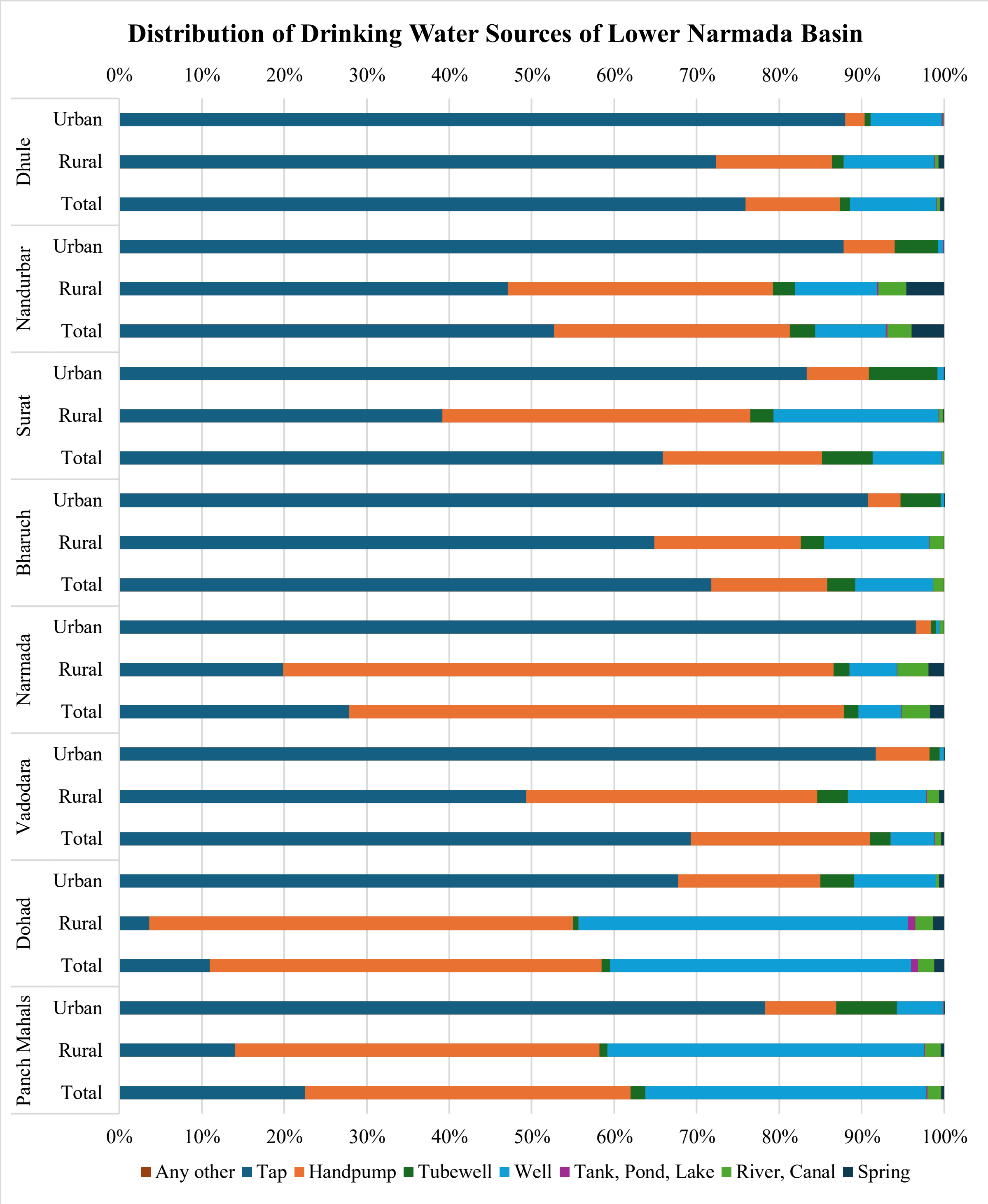

Figure 12. Lower Narmada Basin: Share of Drinking Water Sources

4 Water Demand of the Narmada River Basin

LPCD (liters per capita per day) is the standard metric used to assess and plan for domestic water supply needs. It represents the average amount of water required per person per day for drinking, cooking, bathing, cleaning, and sanitation. Basin Planning Directorate, CWC, XI Plan estimates water demand In terms of guidelines for the water requirement The Central Public Health and Environmental Engineering Organization (CPHEEO), under the Ministry of Housing and Urban Affairs, provides the principal guidelines for water supply standards across India. For urban areas, CPHEEO recommends 70 liters per capita per day (LPCD) for towns without sewerage systems, 135 LPCD for cities with sewerage systems and equipped with piped water supply, and up to 150 LPCD in metropolitan cities with higher living standards. For rural areas, the Jal Jeevan Mission (JJM) sets a target of 55 LPCD as the basic minimum to ensure functional household tap connections. These guidelines serve as the benchmark for state governments, urban local bodies, and rural water supply programs, helping to plan and implement water supply schemes effectively across different regions. Table 7 shows sector wise water demand of India.

Table 7. Water Demand in BCM (Billion Cubic Meter)

Sector	Standing Sub-Committee of MOWR								
	2010			NCIWRD					
	2010	2025	2050	2010		2025		2050	
				Low	High	Low	High	Low	High
Irrigation	56	910	1072	543	557	561	611	628	807
Drinking Water	12	73	102	42	43	55	62	90	111
Industry	5	23	63	37	37	67	67	81	81
Energy	52	15	130	18	19	31	33	63	70
Other	813	72	80	54	54	70	70	111	111
Total	813	1093	1447						

***Source: Basin Planning Directorate, CWC, XI Plan Document*.**

However, The Comptroller and Auditor General's (CAG) Performance Audit (Report No 3, 2019) on water supply management in Indore and Bhopal revealed a significant gap between the targeted and actual per capita water supply. While the Ministry of Urban Development recommends 135 liters per capita per day (LPCD), Madhya Pradesh's average surface water availability was only 78 LPCD, leaving a substantial shortfall of 57 LPCD. Specifically, Bhopal

Municipal Corporation (BMC) showed a difference of 9–20 LPCD between claimed and actual supply, whereas Indore Municipal Corporation (IMC) had a much larger gap of 36–62 LPCD, indicating that residents were receiving far less water than required. Both cities experienced enormous water losses, with 30%–70% of water lost between filtration plants and consumer endpoints due to the absence of leakage detection systems, flow meters, and timely repair mechanisms. Leakage repairs were delayed by 22 to 182 days because separate tenders were invited for each incident instead of maintaining annual repair contracts. Report also revealed that Coverage was also inadequate: only 56.32% of households (5.3 lakh out of 9.41 lakh) had authorized water connections. Apart from the differences in actual water demand and supply states like Madhya Pradesh and Gujrat prepare plan to achieve the standard guidelines for example Rural Water Supply Programme of Gujrat aims to achieve 100 LPCD (including water demand of cattle) (Gujarat Water Supply and Sewerage Board, https://watersupply.gujarat.gov.in/). However, a report published on **Dynamic Ground Water Resources of Gujarat State (March 2023)** considers 70 LPCD for the estimation of water requirements. CGWA 2016 also considers 70-100 LPCD

Keeping in mind the above-mentioned standard LPCD related criteria of water demand, and Jal Jeevan Mission's aim to provide 55 LPCD to all rural household, this report considers 70 LPCD for the estimation of Naramda River Basin's water requirement. In this estimation both the urban and rural population has been considered as most of the population of the basin is rural with a few major cities like Jabalpur, Bharuch, Indore, and Bhopal (Indore and Bhopal are not part of the basin but utilis significant amount of water from the Narmada River Basin). However, this criterion needs further validation keeping in mind local and ground scenarios.

This report also estimates the future LPCD water demand for the year 2031. The basin's population forecast has been prepared using methods developed by the International Institute for Population Sciences (IIPS) and the Census of India. For more details on the methodology of the basin's population forecast, refer to the *Narmada Demographic Characteristics Report, 2024*.

Table 8 presents the population and corresponding water demand estimates for districts in the Narmada River Basin for the years 2011 and 2031. It reveals a significant increase in both population and water demand across the basin.

Table 8. District wise Water Demand (MLP) of Narmada River Basin.

State	Districts	2011 Population	2011 water Demand (MLP)	2031 Population	2031 Water Demand (MLD)
Gujarat	Chhota Udepur	18290	1.28	23583	1.65
	Narmada	29979	2.10	38655	2.71
	Bharuch	897495	62.82	1157225	81.01
	Dohad	26888	1.88	34669	2.43
	Narmada	453446	31.74	584671	40.93
	Panch Mahals	54807	3.84	70668	4.95
	Surat	62433	4.37	80501	5.64
	Vadodara	1155469	80.88	1489855	104.29
Maharashtra	Nandurbar	308781	21.61	366697	25.67
	Dhule	2734	0.19	3247	0.23
Chhattisgarh	Kabeerdham	49082	3.44	62866	4.40
	Rajnandgaon	23081	1.62	29563	2.07
Madhya Pradesh	Alirajpur	695156	48.66	900275	63.02
	Barwani	1103143	77.22	1428647	100.01
	Betul	757432	53.02	980927	68.66
	Bhopal	1457	0.10	1887	0.13
	Burhanpur	71815	5.03	93005	6.51
	Dewas	557780	39.04	722364	50.57
	Dhar	1440006	100.80	1864908	130.54
	Harda	569267	39.85	737240	51.61
	Hoshangabad	1260086	88.21	1631899	114.23
	Indore	204201	14.29	264454	18.51
	Jhabua	13933	0.98	18044	1.26
	Khandwa	1282756	89.79	1661258	116.29
	Khargone	1834133	128.39	2375329	166.27

Raisen	691439	48.40	895461	62.68
Sehore	446188	31.23	577844	40.45
Anuppur	105943	7.42	137204	9.60
Balaghat	316049	22.12	409305	28.65
Chhindwara	316153	22.13	409440	28.66
Damoh	71790	5.03	92973	6.51
Dindori	601517	42.11	779006	54.53
Jabalpur	2425715	169.80	3141469	219.90
Katni	253587	17.75	328413	22.99
Mandla	914427	64.01	1184246	82.90
Narsimhapur	1077182	75.40	1395025	97.65
Sagar	48714	3.41	63088	4.42
Sehore	60939	4.27	78920	5.52
Seoni	319103	22.34	413261	28.93
Umaria	6748	0.47	8739	0.61

Source: Calculation based on Census of India, JJM, Gujrat Ground Water Report

The table reveals a significant water demand differences as per their population across the districts. Among the districts, Khargone (Madhya Pradesh) stands out with the highest projected water demand, rising from approximately 128 million liters per day (MLD) in 2011 to over 166 million MLD in 2031, reflecting its large population growth from 1.83 million to 2.38 million. Jabalpur, another major district, is estimated to see its water demand surge from about 170 million MLD in 2011 to nearly 220 million MLD in 2031, aligning with a population increase from 2.42 million to 3.14 million.

In Indore, the basin area population is projected to grow from 204,201 in 2011 to 264,454 in 2031, pushing its water demand from around 14 million MLD to over 18 million MLD. Although smaller in population compared to Khargone or Jabalpur, Indore's economic importance makes these figures significant for urban water planning. Districts like Hoshangabad and Khandwa also show sharp increases, with Hoshangabad's water demand expected to rise from 88 million MLD in 2011 to 114 million MLD in 2031, driven by a population increase from 1.26 million to 1.63 million; Khandwa follows a similar trajectory with demand rising from 90 million MLD to 116 million MLD.

Other notable districts include Alirajpur, where population is expected to grow from 695,156 to over 900,000, leading to an increase in water demand from 48 million MLD to 63 million MLD. Barwani shows one of the steepest jumps, with demand climbing from 77 million MLD to 100 million MLD. Additionally, districts like Mandla, Narsimhapur, Dindori, and Dewas exhibit consistent growth in both population and water requirements, signaling widespread pressure on water resources across the basin.

Meanwhile, smaller districts such as Bhopal's basin area show limited absolute growth, with population increasing from 1,457 to 1,887 and water demand from roughly 0.1 million MLD to 0.13 million MLD, indicating their limited share within the basin. The districts in Gujarat—particularly Bharuch, where water demand is expected to jump from 62 million MLD to 81 million MLD due to population growth from 897,495 to over 1.15 million—highlight the need for inter-state water coordination.

Overall, this analysis illustrates a clear trend: substantial increases in both population and water demand are expected across nearly every district in the Narmada Basin by 2031, with the most dramatic changes projected in Khargone, Jabalpur, Hoshangabad, and Khandwa. This underscores the critical need for integrated basin-level water management strategies to ensure sustainable supply amid rising demands.

5 Infrastructure for Water Supply

5.1 Dams And Reservoirs

Dams and reservoirs are pivotal components of riverine infrastructure, serving a multitude of purposes such as water storage, irrigation, hydropower generation, and flood control. The Narmada River, with its significant water resources and potential, has been harnessed through the construction of numerous dams and reservoirs along its course. These structures play a crucial role in managing the river's flow, ensuring water availability for various needs, and mitigating the impacts of floods. This section provides a comprehensive overview of the dams and reservoirs on the Narmada River, based on a meticulously compiled dataset. The dataset encompasses a variety of attributes, including the type of dam, year of construction, length, maximum height, design flood, spillway type, and total dam volume. This information enables a thorough analysis of these structures' physical characteristics and functionalities, facilitating a deeper understanding of their role in the Narmada River basin.

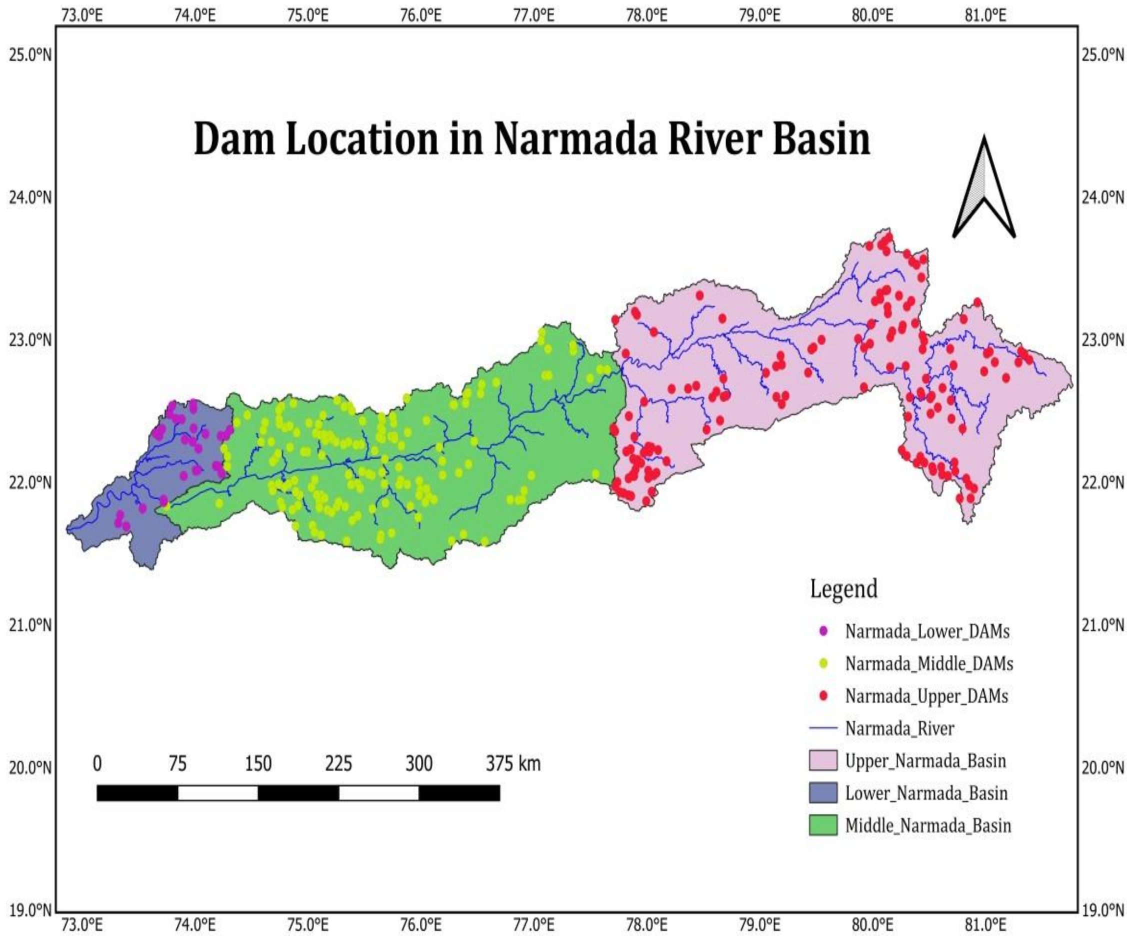

Figure 13. Spatial Distribution of Dams in the Narmada River Basin

The India-WRIS dataset reveals a significant presence of dams within the Narmada River basin, with 324 recorded structures. These dams are distributed across the basin, with 142 located in the upper reaches, 153 in the middle basin, and 29 in the lower basin. This distribution highlights the extensive utilization of Narmada's water resources for various purposes, including irrigation, hydropower generation, and water supply.

5.2 Fifty Major Dams on the Narmada River

The following table presents details of 50 major dams on the Narmada River, including their name, river, type, year of completion, catchment area, length.

Table 9. Major Dams on the Narmada River

Sr. No	Dam Name	River	Type	Year of completion	Catchment Area (sq km)	FRL (m)	Height (m)	Storage Capacity	Purpose
1	Indira Sagar (NHDC) Dam	Narmada	Earthen / Gravity / Masonry	2006	62000	654	91.4	12200	HE, IR
2	Sardar Sarover Dam	Narmada	Gravity / Masonry		88000	1210	163	9500	HE, IR
3	Rani Avanti Bai Sagar (Bargi (Nvda) Dam	Narmada	Gravity / Masonry	1988	15000	5357	69.8	3924.8	HE, WS, IR
4	Tawa Dam	Tawa	Earthen / Gravity / Masonry	1978	6000	1944.92	57.91	2312	HE, IR
5	Omkareshwar (NHPC) Dam	Narmada	Gravity / Masonry	2007	65000	949	64	987	HE, WS, IR
6	Karjan Dam	Karjan	Earthen / Gravity / Masonry	1987	1404	903	100	630	IR
7	Barna Dam	Barna	Gravity / Masonry	1977	1200	432	47.7	539	IR, PS
8	Maheshwar Dam	Narmada	Earthen / Gravity / Masonry		69184	3123	36	483.0	HE
9	Kolar Dam	Kolar	Gravity / Masonry	1990	508	1242	45	270	IR, WS
10	Upper Narmada Dam	Narmada	Earthen / Gravity / Masonry		12	2120	33.8	206.26	IR

11	Sukhi Dam	Sukhi	Earthen / Gravity / Masonry	1986	412	4271	38	178.47	IR
12	Halon (Nvda) Dam	Halon	Gravity / Masonry		715	993	35	146.08	IR
13	Man (NVDA) Dam	Man	Gravity / Masonry		690	633	53	145.0	IR
14	Lower Goi Dam	Goi	Earthen / Gravity / Masonry		1100	2400	44.2	143.18	IR
15	Satpura (Mpseb) Dam	Tawa	Earthen / Gravity / Masonry	1967	553.13	513.58	33.52	110.44	WS
16	Upper Beda Dam	Kundi	Gravity / Masonry	2010	520	2431	23.93	91.82	IR
17	Sukta Dam	Sukta	Earthen	1984	468.79	2219	32	89.5	IR
18	Jobat (NVDA) Dam	Hatni	Gravity / Masonry	2007	790	462.55	34.6	77.84	IR
19	Dejla Dewada Dam	Dejla	Earthen	1988	340	1560	35.2	56.35	IR, PS
20	Matiyari Dam	Matiyari	Earthen	1986	158.75	1131.42	28.1	46.87	IR
21	Bohribund Dam	Bhuta Nalla	Earthen	1927	108.8	518.8	22.25	36.98	IR
22	Chandrakeshar Dam	Chandrakeshar	Earthen	1976	110	2450	21.1	30.07	IR
23	Satak Dam	Satak	Earthen	1960	28.37	1650	25	25.61	IR
24	Choral Dam	Choral	Earthen	1988	64.75	620	28.04	23.92	IR
25	Ambak Dam	Local Nala	Earthen	2001	151	1250	25.05	22.05	IR

26	Pariat (Corporation) Dam	Pariat Nalla	Earthen	1927		1182	22.74	20.06	WS
27	Sampana Dam	Sampna	Earthen	1956	44.75	1790	21.95	16.9	IR
28	Beherakhar (Banjar) Dam	Kuru Behrakhara Nalla	Earthen / Gravity / Masonry		36	670.73	21.81	15.7	IR, WS
29	Sakalda Dam	Chiri and Khuj Nalla	Earthen	1981	84.17	539.5	22	15.66	IR
30	Gadigaltar Dam	Undri Nadi	Earthen	1990	9.9	873	23.19	15.55	IR
31	Dholi Dam	Madhumati	Earthen	1995	34	1280	36	14.17	IR
32	Lower Palakmati Dam		Earthen	1936	85.45	990	15.24	13.87	IR
33	Dukrikheda Dam	Ghoghara Nalla	Earthen	1956	22.5	1981	18.67	12.23	IR
34	Upper Palakmati Dam	Palakmati	Earthen	2002	50.29	210	22.71	11.04	IR
35	Bhikarkhedi Dam	Borad	Earthen	1985	43.86	613	20.85	10.39	IR
36	Ranipur Dam	Local Nala	Earthen	1992	25.8	774	23.86	9.65	IR
37	Madai Dam		Earthen	1966	27.2	307	18.9	8.7	IR
38	Moga Dam		Earthen	1997	25.9	210	20.7	8.62	IR
39	Bichhia Dam	Kathar Nalla	Earthen	1975	19.42	1579	26.53	8.51	IR, WS
40	Kunda Nala Dam	Buti Nalla	Earthen	1963	31.75	2500	15.6	8.5	IR
41	Gagan Dam	Local Nala	Earthen	1959	41	880	18.28	8.34	IR

42	Utawad Dam	Local Nala	Earthen	1987	36.6	450	22.39	8.05	IR
43	Banganga Dam	Rohini Nadi	Earthen	1988	46.6	539	23.8	7.58	IR
44	Paras Dam	Paras	Earthen	1982	24.05	660	26.94	7.54	IR
45	Padliya Dam	Local Nala	Earthen	1984	38.23	825	16.02	7.39	IR
46	Rami Dam	Rami	Earthen	1980	24.68	485	26.52	7.08	IR
47	Jhirbhar Dam	Local Nala	Earthen	1980	51.56	327	21.33	5.66	IR
48	Dhuandhar Dam	Dhuandhar Nalla	Earthen	1962	13.2	1240.5	27.19	5.46	IR
49	Harwant Dam	T- Narmada	Earthen	1982		279	23.11	4.92	IR
50	Samaldo Dam	Local Nala	Earthen	1960	18.45	823	12.9	4.88	IR

Source: *India Water Resources Information System (https://indiawris.gov.in/wris/)*

6 City Specific Studies

Apart from the basin level analysis this report presents city specific study for the three cities Bharuch, Ankleshwar and Rajpipla.

6.1 Bharuch City

Bharuch, one of the oldest cities in Gujarat, is located on the banks of the Narmada River in the southern part of the state. Positioned about 182 km from Ahmedabad, it is bounded by Vadodara and Kheda districts to the north, Narmada district to the east, Surat to the south, and the Gulf of Khambhat to the west. Historically important and economically dynamic, Bharuch has grown into a prominent Class-I municipality, governed by a municipality established over 42 years ago. The city is divided into 14 wards, with its population increasing from 1.48 lakh in 2001 to approximately 1.69 lakh by the 2011 Census. Bharuch, along with its twin city Ankleshwar, is known as the “Chemical Capital of India” due to the concentration of chemical, pharmaceutical, and petrochemical industries.

The city’s rapid urban and industrial development has been driven by the presence of Gujarat Narmada Valley Fertilizers & Chemicals Ltd. (GNFC), GIDC estates, Bharuch District Co-operative Dairy, and numerous other industrial units. This industrial boom has attracted significant migration from nearby rural areas. In 1987, several peripheral villages—Dungari, Aali, Kanbivaga, Kasakpatti, and Mojampur—were merged into the city limits, increasing its area from 9.40 sq.km to 19.18 sq.km under the 1988 revised development plan. Currently, Bharuch's urban agglomeration covers around 43.80 sq.km and shows mixed land use, with residential, commercial, and industrial zones. It is well connected by National Highway 48 and the Western Railway line.

Bharuch experiences a semi-arid to sub-humid climate, with annual rainfall between 800 and 1000 mm, minimum winter temperatures around 6.1°C, and summer highs reaching 44.4°C. Its terrain is generally flat to gently undulating, sloping toward the Narmada River, placing it within a flood-sensitive zone during the monsoon. Small water bodies like Matariya Talav support urban drainage and groundwater recharge.

The city's water supply comes from both surface water (Narmada River) and groundwater (tube wells), delivering about 140 liters per capita per day (lpcd) while accounting for 15% losses due to leakage. Increasing domestic and industrial demands, along with seasonal water stress, make efficient water management vital. Traditionally, Bharuch relied on talavs, kunds, and step-tanks for community water needs and aquifer recharge. Although many of these systems declined with the introduction of piped water and pumps, restoration efforts by local organizations are reviving some of these features. Bharuch's geography, industrial base, and water heritage all play key roles in shaping its future as a sustainable urban center.

6.1.1 Water Supply system

There is existing one Water Treatment Plants located at Ayodhya Nagar with capacity of 45MLD which is established in year 2010. At present water from Intake Well at Matariya pond is pumped to Ayodhya Nagar WTP through 800 mm dia. M.S. Rising Main.

Table 10. Details of Water Infrastructure of Bharuch City

Sr No.	Location of Unit	Structure	Capacity	Dimension
1	Dungari	UGSR	20.00 LL	6mtr depth
2	Maktampur	ESR-1	10.00 LL	20 mtr Staging height
		ESR-2	10.00 LL	21 mtr Staging height
		UGSR-1	40.00 LL	5 mtr depth
3	Ayodhya Nagar	WTP	45 MLD	-
		CWS	25 MLD	4 mtr depth
		ESR	3.00 LL	18 mtr Height
4	ShaktiNath	ESR	10.00 LL	20 mtr Staging height
		UGSR	20.00 LL	6 mtr depth
5	Soneri Mahal	ESR	6.5 LL	18 mtr staging height
		UGSR-1	4.50LL	6 mtr depth

		UGSR-2	20.00 LL	3 mtr depth
6	Station	ESR	7.5 LL	18 mtr staging height
		UGSR	13.5 LL	5 m Depth
7	Tower	ESR	1.00 LL	20 mtr Staging height
		UGSR	27.00 LL	6 mtr depth
8	Bambakhana	ESR	6.00 LL	16 mtr Staging height
		UGSR	6.00 LL	6 mtr depth
9	Shoyeb Park	ESR	5.50 LL	16 mtr Staging height
		UGSR	10.50 LL	6 mtr depth
10	J B Modi Park	UGSR	47.00 LL	5.5 mtr depth

Source: Bharuch Municipality

Table 11. Details of Existing Gravity Main lines

Distribution Main Lines	Diameter	Total Length of Existing lines (in Rmts)
Distribution Main Lines	250 mm Dia DI Pipe	2663.00
	300 mm Dia DI Pipe	164.00
	350 mm Dia DI Pipe	505.00
	400 mm Dia DI Pipe	768.00
	450 mm Dia DI Pipe	844.00
	500 mm Dia DI Pipe	1027.00
	600 mm Dia DI Pipe	998.00
	Total	6969.00

Source: Bharuch Municipality

Sump

There are two existing sumps: one at Maktampura (Jyoti Nagar) with a capacity of 43 lakh liters, and another at Bambakhana with 2.5 lakh liters capacity.

ESR at Bambakhana

Capacity = 7Lakh litre

Height = 20m

Table 12. Details of Pumping Machinery

Sr no	Location	KW	H.P.	Type	No
1	Bumbakhana Sump To Bumbakhana ESR	75	90	HSCF	1W + 1S
2	Soneri Mahel Sump To Soneri Mahel ESR	55	75	HSCF	2W + 1S
3	Intake To WTP	110	147	VT	2W + 1S
4	Maktampura Sump To Maktampura ESR	90	121	HSCF	1W + 1S
5	Shaktinath Sump To Shaktinath ESR	75	101	HSCF	2W + 1S

Rising Main Summary

Bambakhana Sump to Bambakhana ESR, DI K-9 pipe of dia. 400 mm with 60m length

Shaktinath ESR Junction to Gujarat Gas Office, DI-K pipe of dia. 400 mm with 900m length

Maktampura (Jyotinagar) Sump to ESR, DI-K pipe of dia. 400 mm with 100m length

Distribution Pipe Summary:

- 250 mm DI K-7 pipe with a total length of 2,097 Rmt

HDPE Pipe Summary:

- 90 mm Dia.: 10,548 Rmt
- 110 mm Dia.: 5,360 Rmt
- 125 mm Dia.: 305 Rmt
- 140 mm Dia.: 1,630 Rmt
- 160 mm Dia.: 1,190 Rmt
- 200 mm Dia.: 1,638 Rmt

6.1.2 Existing Water Supply System in Bharuch City

The existing water supply infrastructure in Bharuch is based on a network of rising mains, gravity mains, and elevated storage reservoirs (ESRs) that serve different regions of the town and industrial estate.

Water is initially drawn from the Intake Well at Matariya Pond, from where it is pumped to the Ayodhya Nagar Water Treatment Plant (WTP) via an 800 mm diameter mild steel (M.S.) rising main. After treatment, the water is conveyed from Ayodhya Nagar to Shaktinagar and Maktampur Clear Water Sumps (CWS) through dedicated rising mains. From the Maktampur ESR, water is distributed further: To the Station ESR and Soneri Mahel CWS via a 525 mm diameter M.S. gravity main. Notably, the CWS at Station is currently non-operational (idle).

Additional distribution includes: Vejalpur CWS, which receives water from Maktampur through a 525 mm diameter M.S. rising main. CWS at Dungari, which is supplied via Maktampur through Shaktinagar using a 564 mm diameter M.S. gravity main.

The Soneri Mahel CWS is also supplied by water from the Ayodhya Nagar WTP, routed through Shaktinagar via a 600 mm diameter M.S. rising main.

Furthermore, the CWS at Tower is directly served by the Ayodhya Nagar WTP. Unlike other areas, the Tower area does not have an ESR. Instead, water is supplied directly by gravity from the CWS. Across the town, elevated service reservoirs (ESRs) are fed by their respective clear water sumps (CWS), with the exception of the Tower area, where gravity supply is utilized due to the absence of an ESR. Currently, the distribution network has been laid across approximately 80% of the total town area, ensuring a widespread and decentralized supply system. Water at the town level is managed and delivered through these established headworks, forming the backbone of Bharuch's water infrastructure.

6.1.3 Frequency of Water Supply:

As per the information made available by the municipality, the frequency of water supply is normally 1.5 to 15.5 hours a day, out of which 1.5 to 6.5 hours are in the morning and 2 to 8.5 hours in the evening time. However, most of the consumers get water for less numbers of hours due to their location at tail end or at higher levels. Inequitable distribution is a common problem particularly faced by the residents in old town due to steep slopes and ineffective valves operations.

Table 13. Frequency of Water Supply

Water tank / Tube well	Morning time	Evening Time	Service areas
Station tank	7.00-11.30	6.30-11.30	Dholikui area, Narmada Society, Pushpakunj, Baranpura, Railway sump and 24 hrs supply to S.T. depot and Fire Brigade tanks.
Soneri Mahal	3.00-9.30	4.00-9.00	Swami Narayan slope to Vhorwad area, Panchbatti and Fatatalao areas.
Tower tank	3.00-7.00	5.00-7.00	Entire tower areas of Prikanthi
Vejalpur Tank	4.00-6.30	5.00-7.00	Machinate, Kumbharia Dholav, Suthar Falia and Vejalpur area
GHB Tube well no.1	5.00-11.00	3.00-8.00	Krishna Nagar, Ranga Varsha, Valshruti, Sindhu Nagar, Gandhugram, Gayatri nagar, Mukti Nagar.
GHB TW2	5.00-11.30	2.00-10.30	Siddhanath Nagar, Maruthi Nagar, Nilkanth Nagar, Greenpark, Narain Nagar
GHB TW3	6.00-10.00	4.00-8.00	Ayodhya Nagar area part-1
GHB TW4	6.00-11.00	4.00-8.00	Mukti Nagar, Bahumali upto Anand Managal Society
GHB TW5	5.00-11.30	3.00-8.30	Mataria Talav surrounding area.
Sabugadh Tube well	8.00-11.30	3.00-6.00	Munda Falia, Khatkiwad, Dabhoiawad, Ali Patel Falia, Garijanawad
Dungri Tube well	5.00-7.30	3.00-5.30	Nani Dungri, Moti Dungri areas
Limbu Chhapri Tube well	5.00-7.30		Due less yield from this well water is supplier during morning hours only

Limdi Chowk	7.00-9.00	3.00-5.00	Limdi chowk, Vejalpur Tank area

Source: Bharuch Municipality

6.1.4 Water supply system in Bharuch GIDC

Bharuch GIDC (Gujarat Industrial Development Corporation) is a dedicated industrial zone situated within the administrative boundary of Bharuch city. However, unlike the rest of the city, the water supply and infrastructure management in GIDC Bharuch is not handled by the Bharuch Municipality. Instead, it is independently managed by a separate government authority under the GIDC framework, tailored specifically to serve the needs of industrial units — the majority of which are engineering-based industries.

1. Water Distribution System

The water distribution system within Bharuch GIDC is efficiently structured to meet the operational demands of the industrial estate. Key features include:

- **Pipeline Network**:
    - The network is constructed using PVC and HDPE pipes, chosen for their durability and resistance to corrosion.
    - Pipe diameters range from 160 mm, 140 mm, 110 mm, to 90 mm.
    - The total pipeline installed length is approximately 7.34 kilometers.
- **Storage Infrastructure**:
    - Elevated Service Reservoir (ESR) with a storage capacity of 0.350 MLD (Million Litres per Day).
    - Underground Sump with a storage capacity of 0.567 MLD, serving as a buffer reservoir to ensure continuous supply during peak demand.
- **Water Supply Schedule**:
    - Water is supplied daily for 14 hours, from 6:00 AM to 8:00 PM, ensuring reliable access for all industrial units.
- **Pump House**:

    - The main pump house responsible for distribution is located at Plot No. 50/C, serving as the operational hub for water supply control.

2. Groundwater Supply

To supplement the surface water distribution system, Bharuch GIDC also utilizes **groundwater sources**:

- **Borewell System**:
    - The estate has 2 borewells, each with a 200 mm diameter casing.
    - At any given time, only one borewell is operated, maintaining redundancy while ensuring sustainability of the groundwater table.
- **Pumping System**:
    - A single submersible pump of 25 horsepower (HP) is used to lift water from the operating borewell to the supply network.

6.1.5 Water Distribution network of Bharuch city

The city of Bharuch is served by a structured and phased water distribution network designed to meet the domestic and urban demands of its residents across 10 municipal wards. The system uses high-density polyethylene (HDPE) and ductile iron (DI) pipes of various diameters, distributed zone-wise to ensure reliable water supply coverage.

Ward-Wise Sample Pipe Network Details

Ward 1 – Areas: Santoshi, Rehmat Park, Sobana Park, Gulsan Park

- Pipe Types: HDPE 90 mm, 110 mm, 160 mm
- Notable Line: *Santoshi to Nurani* – 629 m of 110 mm HDPE

Ward 2 – Areas: Alif Park, Khatkiwad Masjid

- Pipe Types: HDPE 90 mm to 200 mm
- Khatkiwad has multi-size connections from 90 mm to 200 mm

Ward 3 – Areas: Dev Bhumi, Aashutosh Societies

- Pipe Types: HDPE 90 mm to 200 mm, DI 250 mm
- One of the densest networks: *Aashutosh 1,2,3* has over 1,300 m of 90 mm line

Ward 4 – Areas: Shriji Soc., Shaktinath ESR to Ganshyam Roadways

- Pipe Types: HDPE 90 mm to 140 mm
- Line lengths: e.g., 614 m of 110 mm pipe

Ward 5 – Areas: Ode Fadiyu, Gulabi Tekaro, Pritam So

- Pipe Types: HDPE 90 mm to 140 mm, DI 250 mm
- Notable: *Pritam So* has 700 m of 250 mm DI pipe

Ward 6 – Areas: Saiwadi, Tekra Faliya, Chitrakut

- Pipe Types: HDPE 90 mm to 160 mm, DI 250 mm
- *Tekra Faliya* alone has 2,000 m of 90 mm HDPE

Ward 7 – Areas: Chingaspara, Sardarji Vistar

- Pipe Types: HDPE and DI (up to 250 mm)
- *Ghee Kudiuya* line: 520 m of 250 mm DI pipe

Ward 8 – Areas: Santoshnagar, Satakar to Hadka ni Vakhar

- Pipe Types: HDPE 110 mm
- Line lengths of 280–395 m

Ward 9 – Areas: Bava Chakala, Juno Road

- Pipe Types: HDPE (up to 200 mm), DI 250 mm
- *Hydraulic 1 line*: 1,180 m of 90 mm + 499 m of 200 mm

Ward 10 – Areas: Sipai Vad, Malek Vad

- Pipe Types: HDPE 90 mm & 110 mm
- *Malek Vad – Chunavala Chok*: 403 m (110 mm), 39 m (90 mm)

Pipe Diameter Distribution Summary:

- 90 mm: Used for distribution in small housing societies and faliyas
- 110 mm: Functions as primary ward-level conveyance lines
- 140 mm: Serves inter-society feeder networks
- 160 mm: Applied in mid-volume distribution routes
- 200 mm: Supplies higher load zones such as dense housing clusters
- 250 mm: Used for bulk transmission, typically DI class

6.1.6 Quality of supplied Water

The water from the Amleshwar branch of Narmada Canal is treated in a straightforward fashion in the Water Treatment Plant (WTP). Water with the required head from the Narmada Canal is piped directly to the inlet chamber of the WTP.

Table 14. Bacteriological reports of treated water in Bharuch at 10 different locations

BW No.	**280**	**281**	**282**	**283**	**284**	**285**	**286**	**287**	**288**	**289**
Date of Collection	08.05.2025	08.05.2025	08.05.2025	08.05.2025	08.05.2025	08.05.2025	08.05.2025	08.05.2025	08.05.2025	08.05.2025
Date of Arrival at Lab.	08.05.2025	08.05.2025	08.05.2025	08.05.2025	08.05.2025	08.05.2025	08.05.2025	08.05.2025	08.05.2025	08.05.2025
Source of Water Sample	At Maxtampur borohama bet	At Manarbazar vistar	At Soneri mahel vistar	At tower tanki vistar	At Dungri 3 kuwa vistar	At Shoaib vatar	At Shaktinath vistar	At JB Modi park vistar	At Yogeshwar nagar society	At Ayodhya nagar vistar
Village	Bharuch	Bharuch	Bharuch	Bharuch	Bharuch	Bharuch	Bharuch	Bharuch	Bharuch	Bharuch
Habitation	Bharuch	Bharuch	Bharuch	Bharuch	Bharuch	Bharuch	Bharuch	Bharuch	Bharuch	Bharuch
Taluka	Bharuch	Bharuch	Bharuch	Bharuch	Bharuch	Bharuch	Bharuch	Bharuch	Bharuch	Bharuch
District	Bharuch	Bharuch	Bharuch	Bharuch	Bharuch	Bharuch	Bharuch	Bharuch	Bharuch	Bharuch
APHA, AWWA, 9221-D Presence - Absence Coliform Test @ 37°C	A	A	A	A	A	A	A	A	A	A
APHA, AWWA, 9221-F Presence - Absence E-Coli Test @ 37°C	A	A	A	A	A	A	A	A	A	A
MPN of coliform per 100 ml of sample at 37°C	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2

MPN of Faecal coliform per 100 ml of sample at 44°C	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Free Chlorine (PPM)	3	0.5	2	4	0.5	0.5	0.2	5	3	2
OPINION FOR POTABILITY:	FIT	FIT	FIT	FIT	FIT	FIT	FIT	FIT	FIT	FIT

Source: Bharuch Municipality

Table 15. Chemical Reports of treated water in Bharuch at 4 different locations

Sr. No.	Parameter	Unit	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source (Max)	Reference Method	Analytical Value (Matariya Lake)	Analytical Value (Tower Tanki)	Analytical Value (Muktampur Plant)	Analytical Value (Station Tanki)
1	Colour	Hazen	5	15	APHA (Various Eds.) Method 2120B	Agreeable	1	Agreeable	1
2	Odour	-	Agreeable	Agreeable	APHA (Various Eds.) Method 2120B	Agreeable	Agreeable	Agreeable	Agreeable

3	Taste	-	Agreeable	Agreeable	APHA (Various Eds.) Method 2120B	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity	NTU	1	5	APHA (Various Eds.) Method 2130B	0.74	1.72	0.76	0.37
5	pH at 25°C	-	6.5 to 8.5	No relaxation	APHA (Various Eds.) Method 4500-H+B	8.74	8.02	7.96	8.02
6	Conductivity at 25°C	µS/cm	-	-	APHA (Various Eds.) Method 2510 B	450	512	407	602
7	Total Dissolved Solids	mg/L	500	2000	APHA (Various Eds.) Method 2540 C	272	492	2442	552
8	Total Hardness (as $CaCO_3$)	mg/L	200	600	APHA (Various Eds.)	152	215	2442	397

					Method 2340 C				
9	Calcium (as Ca)	mg/L	75	200	APHA (Various Eds.) Method 3500 Ca-B	19	39	40	67
10	Magnesium (as Mg)	mg/L	30	100	APHA (Various Eds.) Method 3500 Mg-B	64	40	1124	43
11	Chloride (as Cl)	mg/L	250	1000	APHA (Various Eds.) Method 4500-Cl-B	14.18	140	765	364
12	Sulphate (as SO_4)	mg/L	200	400	APHA (Various Eds.) Method 4500-SO4-E	75	213	240	18
13	Fluoride (as F)	mg/L	1	1.5	APHA (Various Eds.) Method	0.21	0.19	0.42	0.18

					4500-F-C				
14	Total Alkalinity (as $CaCO_3$)	mg/L	200	600	APHA (Various Eds.) Method 2320 B	272	160	241	364

Source: Bharuch Municipality

6.1.7 Water Treatment Plant

The Ayodhya Nagar Water Treatment Plant, established in 2010, has a capacity of 45 MLD. Raw water is sourced from the Matariya pond and conveyed through an 800 mm diameter M.S. rising main to the WTP.
Water treatment follows a systematic sequence: raw water is collected, chemicals are added for coagulation, suspended solids are removed through sedimentation and filtration, pathogens are disinfected, and clean water is stored for distribution.

1. **Raw Water Tank (4.9 lakh litres):** Stores untreated water.
2. **Chemical House:** Adds coagulants (e.g., alum, lime) to aid impurity aggregation.
3. **Pump House:** Transports water to clarifiers and filters.
4. **Clarifiers (2 Units):** Settles heavier suspended solids.
5. **Filter Beds (2 Units):** Removes finer suspended particles.
6. **Chlorination Room:** Disinfection using chlorine to ensure potability.
7. **Clear Water Reservoir:** Stores treated water ready for distribution.

Table 16. Details of Pumping Machinery at WTP

Location	Pump Type	Hours of Pumping	Discharge (m^3/hr)	Total Head (m)	HP	KW	No. of Sets	Status
Pumping Machinery at Intake Well	HSCF	22	1642.23	13	75	55	3 (2W+1S)	Existing
Pumping Machinery at Ayodhya Nagar Pro. CWS for	Centrifugal Sub-mersible Pump	8	254.15	28	40.3	30	2 (1W+1S)	Existing

Zone 1 ESR								
Pumping Machinery at Ayodhya Nagar CWS for Maktampur CWS Zone 3 & Station CWS Zone 4	Centrifugal Sub-mersible Pump	16	619.65	17	60.5	45	2 (1W+1S)	Existing
Pumping Machinery at Ayodhya Nagar CWS for CWS at Zone 2, 5, 6, 7, 8 & 9	Centrifugal Sub-mersible Pump	16	1548.53	28	214.8	160	2 (1W+1S)	Existing
Pumping Machinery at Zone 2 CWS for Zone 2 ESR	HSCF	8	831.98	34.06	147.7	110	3 (2W+1S)	Existing
Pumping Machinery at Zone 3 CWS for Zone 3 ESR	Centrifugal Sub-mersible Pump	8	393.82	34	73.9	55	2 (1W+1S)	Existing
Pumping Machinery at Zone 4 CWS for Zone 4 ESR	Centrifugal Sub-mersible Pump	8	755.55	29	120.9	90	2 (1W+1S)	Existing

Pumping Machinery at Zone 5 CWS for Zone 5 ESR	Centrifugal Sub-mersible Pump	8	676.26	27	100.7	75	2 (1W+1S)	Existing
Pumping Machinery at Zone 6 CWS for Zone 6 ESR	Centrifugal Sub-mersible Pump	8	626.02	35	120.9	90	2 (1W+1S)	Existing
Pumping Machinery at Zone 7 CWS for Zone 7 A	Centrifugal Sub-mersible Pump	8	380.14	24	49.7	37	2 (1W+1S)	Existing
Pumping Machinery at Zone 7 CWS for Zone 7 B	Centrifugal Sub-mersible Pump	8	117.5	27	20.2	15	2 (1W+1S)	Existing
Pumping Machinery at Zone 8 CWS for Zone 8 ESR	Centrifugal Sub-mersible Pump	8	198.08	26	29.6	22	2 (1W+1S)	Existing
Pumping Machinery at Zone 9 CWS for ESR Zone 9	Centrifugal Sub-mersible Pump	8	360.31	25	49.7	37	2 (1W+1S)	Existing

Source: Bharuch Municipality

Table 17. Details of Rising Mains at Water Treatment Plant

Location	Designed Flow in MLD	Static Head (m)	Diameter (mm)	Type & Class	Length (m)	Status
Rising main from Intake Well to Ayodhya Nagar WTP Inlet Chamber	39.45	12.31	800	M.S.	1022	Existing
Rising main from Pro. Ayodhya Nagar WTP CWS to Ayodhya Nagar ESR Zone 1	2.1	26.21	300	DI K-9 Class	480	Existing
Rising main from Ayodhya Nagar WTP CWS to Jn. Pt. A	27.52	23	800	M.S.	980	Existing
Rising main from Jn. Pt. A to Shaktinagar CWS Zone 2	7.23	23	400	DI K-9 Class	80	Existing
Rising main from Pro. Ayodhya Nagar WTP CWS to Junction Pt. E	9.84	13	450	DI K-9 Class	930	Existing
Rising main from Junction Pt. E to Maktampur CWS Zone 3	3.98	13	300	DI K-9 Class	2995	Existing
Rising main from Junction Pt. E to Station CWS Zone 4	5.86	13	400	DI K-9 Class	1305	Existing
Rising main from Junction Pt. A. to Jn. Pt. B	10.46	23	600	M.S.	915	Existing
Rising main from Junction Pt. B to Soneri Mahel CWS Zone 5	4.89	23	350	DI K-9 Class	546	Existing

Rising main from Jn. Pt. A to Jn. Pt. D	9.84	23	400	DI K-9 Class	2245	Existing
Rising main from Jn. Pt. D to Dungari CWS Zone 6	6.02	23	350	DI K-9 Class	205	Existing
Rising main from Junction Pt. B to Junction Pt. C	5.57	23	400	DI K-9 Class	878	Existing
Rising main from Junction Pt. C to Tower CWS Zone 7	3.94	23	300	DI K-9 Class	770	Existing
Rising main from Junction Pt. C to Vejalpur CWS Zone 8	1.62	23	200	DI K-9 Class	1505	Existing
Rising main from Jn. Pt. D to Shoeba Park CWS Zone 6 for Zone 9	3.81	23	300	DI K-9 Class	540	Existing
Rising main from Shaktinagar CWS to Shaktinagar ESR Zone 2	7.23	34.01	500	DI K-9 Class	30	Existing
Rising main from Makatampur CWS to Maktampur ESR Zone 3	3.98	33.62	400	DI K-9 Class	30	Existing
Rising main from Station CWS to Station ESR Zone 4	5.86	28	500	DI K-9 Class	30	Existing
Rising main from Soneri Mahel CWS to Soneri Mahel ESR Zone 5	4.89	26.13	450	DI K-9 Class	30	Existing
Rising main from Dungari CWS to Dungari ESR Zone 6	6.02	34.01	450	DI K-9 Class	30	Existing
Rising main from Tower CWS to ESR Zone 7 B	0.73	26.11	200	DI K-9 Class	60	Existing

Rising main from Vejalpur CWS to Vejalpur ESR Zone 8	1.62	25	250	DI K-9 Class	30	Existing
Rising main from Shoeba CWS to Shoeba Park ESR Zone 6 for Sterling Park (Zone 9)	3.81	24.8	350	DI K-9 Class	30	Existing

Source: Bharuch Municipality

6.1.8 Missing Link In Bharuch City Water Supply

The Bharuch water supply scheme has been commissioned for 140 lpcd. As the existing Distribution network had been laid only in 96% area of the town,, it is necessary to plan and as per requirement scheme for the better development of future generation of Town. Focusing of all above matters this is the real optimum, point of time to plan and augment water supply system, so that Bharuch town gets access to reliable, (detailed engineering design),sustainable (well design sources), Cost effective (with maximum use of existing components and optimal proposal to overcome deficiencies), Environmental friendly and affordable domestic water (primary need) of assured quality.

Water Supply Project - Missing Link in Bharuch Water Supply (Amrut 2.0)

This project aims to address the critical gaps in the existing water supply system in Bharuch city by establishing essential infrastructure components. It is being implemented under the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) 2.0 framework. It focuses on improving water availability, treatment, and equitable distribution to urban and peri-urban areas.

Funding Structure:

The total project cost is jointly funded by the three tiers of government with the following contribution ratio:

- Central Government: 33%
- State Government: 57%
- Bharuch Municipality**:** 10%

Scope of project:

Laying of distribution pipelines and construction of storage facilities (ESRs/UGRs).

Ensuring 24×7 potable water supply coverage in uncovered and partially covered zones.

For the project base year is considered as 2022. Hence, an Intermediate stage will be 2037 and design year will be year 2052 i.e. Project is planned to cater for next 30 years. Peak factor 3.00 is adopted which is available in design calculation of each water zone.

Table 18. Projected water demand for Future Population

Sr. No.	Zone	Location	Projected Population in 2037	Projected Population in 2052	Net Water Demand in MLD@140l pcd in 2037	Net Water Demand in MLD@140l pcd in 2052	Gross Water Demand in MLD@161L PCD in 2037	Gross Water Demand in MLD@161L PCD in 2052
1	1	Ayodhya Nagar	19376	23252	2.71	3.26	3.12	3.74
2	2	Shakti Nagar	67448	80938	9.44	11.33	10.86	13.03
3	3	Muktampur	22938	27525	3.21	3.85	3.69	4.43
4	4	Station	66496	79795	9.31	11.17	10.71	12.85
5	5	Soneri Mahel	56357	67629	7.89	9.47	9.07	10.89
6	6	Dungari	32861	39433	4.6	5.52	5.29	6.35
7	7A	Tower	41216	49459	5.77	6.92	6.64	7.96
	7B		12433	14919	1.74	2.09	2	2.4
8	8	Vejalpur	14211	17053	1.99	2.39	2.29	2.75
9	9	Sterling Park	12122	14546	1.7	2.04	1.95	2.34
10	10	Muktampura OG Area	15826	18991	2.22	2.66	2.55	3.06
Total			361284	433540	50.58	60.7	58.17	69.8

Source: Bharuch Municipality

Proposed Structure

Table 19. Details of Proposed Pumping Machinery

Location	Pump	Hours Of Pumping	Discharge (m^3/hr)	Total head (m)	HP	KW	No of sets	Existing/ Proposed
Pumping Machinery at Intake Well	VT	22	1301	19	147	110	3(2W + 1S)	Proposed
Pumping Machinery at Bambakhana Sump To Bambakhana ESR	HSCF	7	492.86	25	90	75	2(1W+1S)	Proposed

Pumping Machinery At Sonerimahel sump to Sonerimahel ESR	HSCF	6	743.33	26	75	55	3(2W + 1S)	Proposed
Pumping machinery at Maktampuram Sump to Maktampura ESR	HSCF	8	767.5	25	120	90	2(1W+1S)	Proposed
Pumping machinery at Shaktinath Sump To Shaktinath ESR	HSCF	12	455	32	90	75	3(2W + 1S)	Proposed

Source: Bharuch Municipality

Proposed ESR at Bambakhana:
7 lakh liters RCC circular tank with 20 m staging height. Ground level, hydraulic gradient level, and full supply level are 16.71 m, 16.71 m, and 41.71 m respectively.

Proposed rising main from the Bambakhana sump to the Bambakhana ESR

It is designed to carry 3.45 MLD of water. It will operate under a static head of 30 meters, using a 400 mm diameter Ductile Iron (DI) K-9 class pipe over a length of 60 meters.

Proposed Underground Sump

1. At Makatampur, a sump with 43 lakh liters capacity is planned. It will have a ground level of 19.71 m, clear water depth of 6 m, full supply level at 47.33 m, and bottom supply level at 27.62 m.

2. At Bambakhana, a 2.5 lakh liters capacity sump is proposed with a ground level of 4.5 m.

6.2 Ankleshwar City

Ankleshwar is a prominent industrial city in Gujarat's Bharuch district, located approximately 14 km south of Bharuch on the western bank of the Narmada River. The city spans around 9.59 km^2 and is administratively divided into 16 wards. It plays a central role in the Ankleshwar–Bharuch industrial corridor, housing over 2,000 registered industries within its Gujarat Industrial Development Corporation (GIDC) estate. As per the 2011 Census, Ankleshwar Municipality had a population of about 89,457, while the wider Ankleshwar Taluka recorded over 3.15 lakh people, with 61% living in urban areas.

Alongside Bharuch, Ankleshwar is recognized as the "Chemical Capital of India," with a strong industrial base in chemicals, pharmaceuticals, dyes, and petrochemicals. This economic growth has led to intense water demand across manufacturing, commercial, and residential sectors. Climatically, Ankleshwar experiences a semi-arid to sub-humid environment with hot summers reaching 44 °C, mild winters with lows near 7 °C, and annual rainfall between 800 and 1,000 mm, primarily during the monsoon.

The city's water supply is managed jointly by Ankleshwar Municipality and the GIDC, drawing from surface water sources such as the Narmada River and groundwater via borewells. Per capita municipal supply is approximately 140 litres per day, though 15–20% is lost due to leakages, unmetered use, and aging infrastructure. Industrial water is supplied to GIDC units at competitive rates (~₹57 per KL as of 2023–25), reflecting the region's commercial focus.

Unlike older cities such as Bharuch or Ahmedabad, Ankleshwar lacks a documented heritage of traditional water systems like stepwells or talavs. Its water resource development has been heavily shaped by post-independence industrialization, particularly following the establishment of the GIDC estate in the 1970s. Over time, this industrial expansion contributed to pollution in both surface and groundwater, and the city shifted away from community-based water practices in favor of utility-driven supply systems.

Geographically, Ankleshwar lies at 21.626° N and 73.015° E, with an average elevation of 17 m above sea level. The terrain is generally flat to gently undulating, located in the lower Narmada floodplain, making it hydrologically sensitive, especially during the monsoon. The city is well-connected by major transportation networks, including National Highway 8 (part of the Golden Quadrilateral) and the Western Railway main line via Ankleshwar Junction. It is also linked to Bharuch by the historic Golden Bridge and a newer eight-lane highway bridge. Rapid development and urban sprawl have reshaped the landscape, leaving limited traditional water bodies and increasing the importance of modern, resilient infrastructure to ensure long-term water security.

6.2.1 Water Supply system

Ankleshwar Municipality provide water to city for 1-1.5hr per day at different time at different locations. Duration of water supply per day depends on availability of water and season like in summer water requirements are more as compared to winter.

Sources:

Ukai Right Bank Canal: Intake capacity of 12.36 MLD

Groundwater: 23 tube wells with 35 HP submersible pumps; intake 5 MLD

Storage Tanks:

3 Overhead Tanks – Total 9 lakh litres

5 Underground Sumps – 3 of 9 lakh litres, 2 of 10 lakh litres

Pumping:

4 Pumping Stations, each with 6 pumps of 70 HP

6.2.2 Distribution Network

Ankleshwar city has a structured and expansive water distribution network managed by the Ankleshwar Nagarpalika, supplying potable water to residential, commercial, and industrial areas. The system spans approximately 158.66 kilometers, covering both urban and suburban zones to meet present and future demands.

Infrastructure and Pipe Materials:
The network uses 23 different types of pipe diameters and materials for optimal flow and durability:

75–110 mm (PVC): Used in inner residential streets for household connections**.**

110–200 mm (HDPE): Common in flexible layouts and smaller distribution loops**.**

80–450 mm (AC): Extensively used in main distribution lines across mixed-use zones**.**

100–450 mm (CI/DI): Found in high-pressure and trunk mains connecting major areas and storage tanks.

Larger diameters (300 mm+): Used along main corridors and high-demand industrial zones (e.g., near GIDC estate).

Water Supply Points:
Water is stored and distributed via strategically placed elevated reservoirs, including:

- Hasti Talav Water Tank
- Faizpark Water Tank
- Ganga Jamuna Water Tank
- Ukai Colony Water Tank

6.2.3 Water Supply in Ankleshwar GIDC Notified Area

Ankleshwar GIDC area is part of Ankleshwar city in which water supply and wastewater drainage manage by Ankleshwar GIDC and Anleshwar Notifies Area offices.

Ankleshwar GIDC water supply to industries, Residential area and commercial units but industries require more water for their processes. Below table describes number of industries of different type and total industries present in Ankleshwar GIDC area

WATER SUPPLY:

Source of water: Canal Base.

Install Capacity

A. 45.40 MLD Ukai Right Bank Canal Base.

B. 22.70 MLD Narmada canal Base.

Rate of Water Supply: 2024-25

Industrial Sector : Rs. 57.00 / 1000 lit.

Housing Sector : Rs. 44.00 / 1000 lit.

Fixed charges : Unmetered

Raw water storage reservoir Capacity: 185 MG.

Rising Main: -23.50 K.M

Distribution System: - (1) Industrial zone: -80.00 K.M

(2) Housing Zone: - 35.00 K.M

Filtration plant: - 2.00 No’s each of 5.00 MGD Capacity.

Table 12. Details Showing Existing water supply structure of ESR & UGS At NA GIDC Ankleshwar

Sr. No	Name Of Estate	Location ESR	Capacity of ESR	Capacity of U/G Sump
1	Ankleshwar	Filteration Plant	2.7 0ML	1) 7.20 ML
		(Ind..+ houshing)		2) 4.50 ML
2	Ankleshwar	MILAN TANK Ind..	3.64 ML	1) 5.40 ML
		PLOT NO. 4800		
3	Ankleshwar	15 HP Tank(Houshing)	0.40 ML	1) 0.60 ML
		PLOT NO. 901		
4	Ankleshwar	7 Tank (Hgs + Ind..)	3.60 ML	
		Plot N. 5725 & 5726		
5	Ankleshwar	Nr. Jogger Park	0.50 ML	
		Houshing		
6.	Ankleshwar	Nr ESI Hospital Housing	1.00 ML	1) 0.50 ML(UC)
7.	Ankleshwar	Utiliti plot.3	1.00 ML	1) 2.0 ML(UC)

Source: Ankleshwar GIDC Notified Area

Table 21. Details of Pumping Machinery:

Sr. No.	Location	Pumps under operation			Standby Pumps		
		Nos.	H.P.	Discharg e in LPM.	No.	H.P.	Dischar ge in LPM.
1.	Filtration Plant. (ESR-I)	1	170	18333	1	170	18333
2	Filtration Plant. (ESR-seven tank, housing sector III and new ESR nr Joggers park)	2	125	18333	2	125	18333
3	Filtration Plant. (Fire station)	2	125	18333	2	125	18333
4	Central Pumping Station (Turbine - Reservoir)	2	100	36666	2	100	36666
5	ESR-II (Plot No.4800)	1 1	180 100	18,750 10.000	1 --	180 --	18,750 --
6	Nr ESI Hospital Houshing	1	50	4166	1	50	4166

Source: Ankleshwar GIDC Notified Area

D.G. Sets:

1. 200 HP (Filter Plant) 500.00 KVA
2. Central Pumping station380.00 KVA Turbine(VT)

Details of Water Supply Connection:

Industrial	2384 No's
Housing	4459 No's
Commercial	90 No's
Total	6633 No's

6.2.4 Water Quality and Monitoring

The water from Ukai Right Bank Canal is treated in a straightforward fashion in the Water Treatment Plant (WTP). Water with the required head from the Ukai Right Bank Canal is piped directly to the inlet chamber of the WTP.

Quality of Supplied water

Table 22. Bacteriological reports at 6 different locations in Ankleshwar

BW No.	TABW 264	TABW 265	TABW 266	TABW 452	TABW 453	TABW 454
Date of Collection	25/02/25	25/02/25	25/02/25	18/05/23	18/05/23	18/05/23
Date of Arrival at Lab.	25/02/25	25/02/25	25/02/25	19/05/23	19/05/23	19/05/23
Source of Water Sample	Tap Water of Gulsmbhaj Bus Depot	Tap Water Of Natarbhai Rajubhai Vasava Bhagyad	Filter Water At Filter Plant	Nr Amratrao Security House No. - 7	Nr Bhagwan Kunchchai Mistry House	Nr Bharkhada Gorana Khapera House
Village	Ankleshwar	Ankleshwar	Anklesh war	Ankleshwa r	Ankleshwar	Ankleshwar
Habitation	Ankleshwar	Ankleshwar	Anklesh war	Ankleshwa r	Ankleshwar	Ankleshwar
Taluka				Ankleshwa r	Ankleshwar	Ankleshwar
District	Bharuch	Bharuch	Bharuch	Bharuch	Bharuch	Bharuch
APHA, AWWA, 9221-D Presence - Absence Coliform Test @ 37°C	A	A	A	A	A	A
APHA, AWWA, 9221-D Presence - Absence E-Coli Test @ 37°C	A	A	A	A	A	A
MPN of coliform per 100 ml of	<2	<2	<2	<2	<2	<2

sample at 37°C						
MPN of Faecal coliform per 100 ml of sample at 44°C	<2	<2	<2	<2	<2	<2
Free Chlorine (PPM)	Nil	Nil	Nil	Nil	Nil	Nil
OPINION FOR POTABILITY:	FIT	FIT	FIT	FIT	FIT	FIT

Source: Ankleshwar Municipality

Table 23. Chemical Report at Filter Plant of Ankleshwar dated 24/02/2025

Sr. No.	Parameter	Unit	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source (Max)	Reference Method	Analytical Value
1	Colour	Hazen	5	15	APHA (23rd Ed.) 2017), Method 2120 C	<1
2	Odour		Agreeable	Agreeable	IS 3025 Part 8 (Reaffirmed 2017)	Agreeable
3	Taste		Agreeable	Agreeable	IS 3025 Part 8 (Reaffirmed 2017)	Agreeable
4	Turbidity	NTU	1	5	APHA (23rd Ed.) 2017), Method 2130 B	0.79
5	pH at 25°C		6.5 to 8.5	No relaxation	APHA (23rd Ed.) 2017),	7.18

					Method 4500 H+B	
6	Total Dissolved Solids	mg/l	500	2000	APHA (23rd Ed.) 2017), Method 2540 C	181
7	Total Hardness (as $CaCO_3$)	mg/l	200	600	APHA (23rd Ed.) 2017), Method 2340 C	180
8	Calcium (as Ca)	mg/l	75	200	APHA (23rd Ed.) 2017), Method 3500 Ca-B	19
9	Magnesium (as Mg)	mg/l	30	100	APHA (23rd Ed.) 2017), Method 3500 Mg-B	24
10	Chloride (as Cl)	mg/l	250	1000	APHA (23rd Ed.) 2017), Method 4500 Cl-B	89
11	Sulphate (as SO_4)	mg/l	200	400	APHA (23rd Ed.) 2017), Method 4500 SO_4-E	13.08
12	Nitrate (as NO_3)	mg/l	45	No relaxation	APHA (23rd Ed.) 2017), Method 4500 NO_3-B	0
13	Fluoride (as F)	mg/l	1	1.5	APHA (23rd Ed.) 2017), Method 4500 F-C	0.09

14	Total Alkalinity (as $CaCO_3$)	mg/l	200	600	APHA (23rd Ed.) 2017), Method 2320 B	52

Source: Ankleshwar Municipality

6.3 Rajpipla City

Rajpipla, a prominent and historically significant town in Gujarat's Narmada district, holds a strategic geographical position. It is located approximately 65 kilometres from the monumental Sardar Sarovar Dam and lies in close proximity to the perennial Narmada River, which defines much of the region's hydrography. The town's topography is generally undulating, with surrounding plains and some elevated areas, characteristic of the central Gujarat landscape. While specific micro-climate data for Rajpipla isn't detailed here, the region typically experiences a hot semi-arid climate, characterised by hot summers, a monsoon season (generally July to September), and mild winters. This climate, coupled with the seasonal nature of rainfall, underscores the critical importance of reliable water sources. Beyond the Narmada River itself, the town might be influenced by smaller local rivers, seasonal streams, or a network of ponds that contribute to its local water cycle, though their primary role in formal water supply may vary. This advantageous geographical position further places Rajpipla within the command area of the Narmada Project, providing it with crucial access to this vital water lifeline via the extensive canal distribution system. This pivotal connection has, over the years, significantly supported the town's domestic, agricultural, and economic water requirements, playing a key role in its sustained development.

6.3.1 Water Supply Distribution Network

The water supply distribution network in Rajpipla comprises a complex system designed to meet the city's growing demand. The main transmission lines vary in diameter and material, including ductile iron (DI), mild steel (MS), and high-density polyethylene (HDPE) pipes. These pipelines are in mixed condition, with some sections being newly installed while others are older and prone to leaks, leading to water losses. Within the city, the water distribution system features a combination of radial and grid layouts, aimed at optimizing efficient delivery across various zones. Pipe materials and diameters are selected based on the local needs of each area, and the city is divided into multiple water supply zones, each managed independently to ensure adequate pressure and consistent supply. Rajpipla has a steadily increasing number of household and commercial water connections, though exact figures are not specified in the available data. At present, the city receives intermittent water supply, with residents receiving water only during specific hours of the day. Nonetheless, efforts are ongoing to transition toward a 24x7 continuous water supply system, which would significantly enhance service levels, reliability, and user convenience.

The city's water storage infrastructure consists of a combination of overhead tanks and ground-level reservoirs, used to store treated water before it is distributed to end users, though detailed information regarding their capacities and structural conditions has not been provided. Based on an updated estimated population of 38,000 as of 2021, and applying the national urban benchmark of 135 liters per capita per day (LPCD), the total daily water demand in Rajpipla is approximately 5.13 million liters per day (MLD). This marks an increase from the previously calculated 4.725 MLD for a population of 35,000. Despite this growing demand, the city continues to face a demand-supply gap, clearly reflected in the intermittent supply pattern, although the exact shortfall cannot be quantified due to a lack of detailed supply data.

Additionally, the sewerage and wastewater management system in Rajpipla is underdeveloped. The city generates around 4.5 MLD of sewage from its current population but lacks a functional sewage collection system, resulting in zero MLD being formally collected or treated. Historically, untreated sewage was discharged into the Kerjan River, posing environmental and health risks. However, the Rajpipla Nagar Palika has now ceased this discharge and has started using untreated wastewater for non-potable municipal uses like street cleaning and maintenance. To address the treatment deficit, a Sewage Treatment Plant (STP) with a capacity of 5.5 MLD is under construction, as reflected in recent municipal tenders. The proposed STP aims to meet both current and future sewage treatment needs, ensuring that wastewater is properly managed as the city continues to develop.

Strategic planning, investment in upgrading infrastructure, expanding the sewer network, and promoting efficient water and wastewater management practices are essential for closing both the water supply and sewage treatment gaps. These efforts will be crucial for achieving sustainable urban growth, protecting water resources, and ensuring the health and well-being of Rajpipla's residents in the future.

6.3.2 Pipeline Network of the city

The water supply network layout of Rajpipla city, as shown in the map, demonstrates a well-structured and extensive pipeline infrastructure distributed across all 18 municipal wards. The red lines indicate the existing water supply pipelines, which are efficiently designed to serve both densely populated urban centers and peripheral developing zones. The network consists of a combination of primary mains, sub- mains, and tertiary distribution lines, which are interconnected in a grid and looped formation to ensure consistent water pressure and service reliability.

The central and northern parts of the city—covering Wards 1 to 8—comprise older, well-established residential and commercial areas. These zones are characterized by a dense concentration of pipelines, suggesting a high service demand and mature infrastructure. Key areas within these wards include Tekra Faliya, Lal Tower, and Town Hall, each of which is equipped with a major Elevated Storage Reservoir (ESR). Tekra Faliya ESR-1 has a capacity of 6.9 lakh litres and is located in the northwestern sector. Town Hall ESR-2, centrally positioned, has a capacity of 4.25 lakh litres. Lal Tower ESR-3, situated towards the southwestern portion of the network, holds 5 lakh litres. These ESRs form a critical part of the city's water supply system, providing gravitational flow to their respective distribution zones.

Moving towards the eastern side of the city, Wards 9 to 13 include expanding residential neighbourhoods that are covered with a systematic pipeline network laid out in a more modern and grid-based pattern. These areas are served by the GEB Office ESR-4, with a capacity of 4.6 lakh litres, ensuring adequate supply to the adjoining sectors. The pipelines in these wards reflect recent urban planning efforts, accommodating present needs and anticipating future growth.

In the southern and southeastern sectors, Wards 14 to 18 represent emerging and partially rural areas that are gradually being integrated into the urban framework. These zones also have pipeline coverage aligned along main roads and internal streets, ensuring equitable distribution. The network in these wards is strategically looped to reduce stagnation and enhance flow consistency.

Across all wards, the water supply system is supported by the optimal placement of the four ESRs, which are critical for maintaining pressure zones and balancing daily water demand. The overall layout ensures that both core city areas and peripheral developments have access to a reliable and scalable water supply infrastructure.

7 Conclusion and Challenges

The demands of growing agriculture, urbanization, industrialization, and population growth are placing an increasing pressure on the Narmada River basin's water supplies, which are at a critical juncture. In terms of water sources of the basin, the report reveals that significant disparities in drinking water access across Madhya Pradesh districts in the Narmada basin. Rural households in districts like Sagar, Damoh, Dewas, Barwani, Jhabua, Dindori, and Mandla continue to rely heavily on wells and handpumps, reflecting limited piped water infrastructure. Urban centers like Indore and Jabalpur have far better tap water access, with the majority of urban households connected to piped supply, though rural areas in these districts still lag behind. Even in Bhopal, nearly all tap connections are concentrated in urban areas, with rural households largely excluded. This widespread urban-rural divide highlights the urgent need to expand piped water networks in rural and tribal regions to ensure equitable access to safe drinking water.

Given that agriculture is the primary consumer of water in the basin, demand-side management should focus on promoting efficient irrigation methods. Districts such as Khandwa, Khargone, and Hoshangabad, which support large areas of irrigated farmland, should adopt micro-irrigation, precision farming, and scheduling practices to reduce wastage. Technological innovation and targeted investments are essential to address the water requirement related challenges. The data reveal that many districts face rising water demand but will need sustainable infrastructure, such as smart meters, leak detection systems, and GIS-based monitoring tools should be deployed to enhance operational efficiency and accountability. Likewise, expanding decentralized water treatment systems and solar-powered pumps can provide reliable, sustainable drinking water solutions in remote areas.

Major Challenges

One of the primary challenges encountered while preparing this report on water demand and supply was the lack of comprehensive basin-level data, particularly sector-specific information such as water usage for industrial and agricultural purposes. Most available datasets are aggregated at the state level or pertain only to major cities with municipal corporations, leaving significant gaps in understanding water demand and supply patterns across rural and inter-district areas of the basin. This lack of detailed, disaggregated data limits the precision and depth of the report's findings and constrains the ability to recommend targeted, evidence-based interventions.

To mitigate this challenge in the future, it is essential to establish a basin-wide data collection and monitoring framework that integrates inputs from district administrations, irrigation departments, industrial bodies, and agricultural agencies. Encouraging collaboration among state water resources departments, central agencies like the Central Water Commission, and local institutions can help standardize data collection methods and ensure regular updates. Incorporating remote sensing, GIS tools, and digital reporting platforms can further enhance the accuracy and granularity of basin-level datasets, enabling more comprehensive and actionable assessments of water demand and supply dynamics.

8. Applications

The report on water demand and supply for the Narmada River Basin, supported by comprehensive data, figures, and district-level analysis, holds significant practical applications for regional water governance, infrastructure planning, and sustainable development. By integrating geographic, demographic, administrative, and hydrological datasets, the report enables stakeholders to take an evidence-based approach to managing water resources across multiple sectors and states. The use of population distribution data, drawn from Census records, aids in estimating current and future water demand on a district-wise basis, allowing for strategic forecasting up to 2031 and beyond. Standard benchmarks like LPCD (liters per capita per day) are used to ground these projections in policy frameworks such as those from CPHEEO and Jal Jeevan Mission, offering a practical basis for municipal and rural water supply planning. Figures related to infrastructure—such as the number, type, and storage capacities of 324 dams, canal lengths, and the layout of city-specific distribution networks in Bharuch, Ankleshwar, and Rajpipla—serve as critical inputs for evaluating service gaps, system efficiency, and future expansion needs. Moreover, visual representations like maps and diagrams of the Narmada Main Canal and its branching networks help decision-makers and engineers conceptualize inter-basin transfers, irrigation reach, and command area management. By capturing disparities in urban-rural access to tap water, as well as reliance on traditional sources like handpumps and wells, the report highlights infrastructural inequities, especially in tribal and remote districts, prompting more inclusive policy design. Importantly, the report's granular analysis of drinking water sources, surface water bodies, and dam-related storage capacities facilitates integrated water resource management (IWRM), ensuring coordination among agriculture, industry, domestic supply, and ecological needs. Lastly, this document offers planners, administrators, and conservation agencies a ready blueprint for synchronizing water supply infrastructure with demographic shifts, thereby laying the foundation for long-term sustainability, climate resilience, and equitable water distribution in the Narmada River Basin.

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Appendix 1: Upper and Middle Narmada Basin: Distribution of source of Drinking Water in the Major Towns

Town Name	No. of Households	Tap	Handpump	Tubewell	Well	Tank, Pond, Lake	River, Canal	Spring	Any other
Shahgarh	2730	611	1046	131	941	0	0	1	0
Bina -Etaw	8403	6369	1368	547	98	2	0	2	17
Bina Rly Colony	1508	1485	20	2	0	0	0	1	0
Banda	4524	3225	601	132	470	35	0	1	60
Bamora	1292	255	891	36	67	42	0	0	1
Khurai	7064	2167	3837	590	394	0	1	1	74
Karrapur	1817	743	252	64	757	0	1	0	0
Shahpur	1973	540	887	14	527	0	1	0	4
Sagar (M Corp.)	37301	18168	4691	4270	9541	111	2	12	506
Sagar Cantt (CB)	4751	2724	282	85	1627	13	0	1	19
Rajakhedi (CT)	3354	733	1487	423	673	0	0	0	38
Makronia Buzurg (CT)	2476	235	804	435	758	0	0	0	244
Rahatgarh	4069	1875	414	182	1503	4	79	2	10
Garhakota (M)	4770	2574	1390	336	353	0	114	3	0
Dhana	2259	1387	502	13	357	0	0	0	0
Rehli	4369	3232	554	58	322	0	153	2	48
Deori	4072	2538	530	93	876	0	3	0	32
Hatta	5080	2852	1539	113	389	0	183	1	3
Patharia	3075	305	1965	111	690	0	0	0	4
Hindoria	2570	26	293	38	2205	8	0	0	0
Damoh (M)	23415	10333	5563	980	5861	39	8	30	601
Bansatar Kheda	965	162	473	13	267	0	50	0	0
Tendukheda	2155	1092	805	19	239	0	0	0	0
Chandia	2495	1271	195	25	923	0	81	0	0
Umaria	5091	3535	438	11	898	1	172	0	36
Pali	4080	1821	466	230	1541	0	18	1	3
Nowrozabad	4338	2771	145	15	1132	33	216	25	1
Khand	2646	1493	663	38	442	0	10	0	0
Beohari	3494	1461	708	39	1262	11	13	0	0
Jaisinghnagar	1695	359	106	8	1202	0	7	2	11
Shahdol	14508	5880	1711	916	5861	20	45	1	74
Bijuri	5559	3547	761	5	959	208	0	74	5
Kotma	5251	2598	1120	90	1248	14	0	26	155
Burhar	3329	1190	722	98	1281	35	0	0	3
Dhanpuri	7938	6604	297	165	837	8	11	0	16
Amlai	6201	3825	360	29	1943	6	7	5	26
Dola	2123	1028	173	1	661	240	0	0	20
Kelhauri	2149	1462	122	5	537	7	16	0	0
Badra	967	494	139	1	324	9	0	0	0
Bangawan	4206	3677	192	5	312	0	0	0	20
Pasan	5940	4989	111	8	764	11	47	1	9

Deori	1144	950	38	1	154	0	1	0	0
Devhara	1992	1262	109	5	234	192	0	0	190
Domar Kachhar	2022	1766	190	0	50	5	1	0	10
Anuppur	3145	1570	329	16	1192	1	34	0	3
Jaithari	1505	937	66	11	469	5	4	0	13
Amarkantak	1512	562	9	4	691	2	176	68	0
Bhaurasa	1577	1319	31	124	87	1	0	1	14
Dewas	40634	25279	4034	9550	549	237	3	25	957
Sonkatch	2463	2089	186	183	0	0	4	0	1
Hatpiplya	2569	1059	40	297	654	154	0	1	364
Karnawad	1776	445	635	165	389	142	0	0	0
Bagli	1814	1106	360	215	120	13	0	0	0
Kannod	2664	1879	531	72	171	0	0	0	11
Khategaon	3739	1747	600	1133	209	4	0	1	45
Loharda	1218	496	24	0	697	0	0	0	1
Kantaphod	1593	395	307	23	867	0	0	0	1
Satwas	1838	807	459	46	526	0	0	0	0
Petlawad	2390	2283	40	51	12	0	0	1	3
Thandla	2229	1673	432	85	26	8	0	0	5
Meghnagar	2011	1236	708	33	33	0	0	0	1
Jhabua	5749	4788	769	121	31	30	0	0	10
Ranapur	1862	1727	83	4	6	0	41	0	1
Bhavra	1634	878	553	31	130	0	40	2	0
Jobat	1757	1624	84	23	16	0	0	1	9
Alirajpur	4542	3172	904	137	290	0	33	2	4
Badnawar	3166	2120	528	443	50	0	1	3	21
Rajgarh	2779	2394	28	224	27	46	0	0	60
Sardarpur	1153	993	131	4	6	15	0	0	4
Dhar	12712	8666	1663	1451	293	28	0	7	604
Pithampur	15990	6993	3767	3025	944	383	1	14	863
Bagh	1335	944	316	49	23	0	1	1	1
Mandav	1366	385	192	1	628	120	0	17	23
Manawar	4408	3777	210	45	283	0	16	1	76
Dhamnod	4592	4004	121	69	393	4	0	1	0
Kukshi	3883	2754	326	151	299	205	13	2	133
Dharampuri	2079	1919	98	0	21	1	36	2	2
Runji - Gautampura	2217	1193	899	102	20	0	0	2	1
Sawer	2004	1877	42	74	0	1	0	0	10
Depalpur	2326	1648	331	291	18	2	0	0	36
Mangliya Sadak	1241	351	283	300	4	0	1	0	302
Hatod	1502	604	605	206	18	1	0	1	67
Indore	259240	183203	14079	49523	6123	2088	126	114	3984
Betma	2246	1872	177	118	26	0	0	0	53
Sihansa	848	172	451	138	81	6	0	0	0
Palda	2118	867	756	390	101	1	0	1	2
Rau	3437	2575	227	301	78	174	0	0	82
Mhow Cantt	14973	11640	1134	1246	893	6	4	2	48
Mhowgaon	3695	3141	192	140	160	0	1	1	60
Manpur	1126	733	173	186	23	0	0	0	11

Barwaha	6160	5008	839	265	40	1	0	2	5
Maheshwar	3442	3173	28	65	128	1	31	10	6
Mandleshwar	2064	1853	101	4	40	8	49	1	8
Sanawad	5808	4931	60	58	752	1	0	0	6
Kasrawad	3579	3253	149	5	32	129	0	0	11
Bhikangaon	2407	2030	115	14	60	0	0	3	185
Khargone	17636	13892	1153	1478	865	19	122	4	103
Anjad	4054	3733	40	181	100	0	0	0	0
Barwani	7269	6776	212	33	211	0	0	0	37
Rajpur	3012	2736	32	60	53	1	0	0	130
Sendhwa	7816	6268	317	687	484	0	0	0	60
Pansemal	1970	1878	32	10	50	0	0	0	0
Khetia	2444	2269	10	50	22	91	0	0	2
Omkareshwar	1303	1185	17	7	18	0	63	1	12
Harsud	2987	2314	272	63	330	8	0	0	0
Mundi	1904	1637	142	36	87	0	1	1	0
Khandwa	28823	24576	405	1941	1502	19	7	8	365
Pandhana	1864	1437	242	6	152	0	6	1	20
Nepanagar	6366	6021	88	28	158	21	49	1	0
Burhanpur	29841	29085	339	139	223	8	28	5	14
Shahpur	3230	3167	30	8	6	0	2	1	16
Berasia	3957	2628	753	152	389	1	0	0	34
Bhopal	268771	222064	21069	19040	3130	1210	43	130	2085
Sehore	15635	9867	2308	1182	2137	1	0	6	134
Jawar	1183	521	448	212	1	0	0	0	1
Ashta	6754	4943	980	419	317	26	42	2	25
Ichhawar	2100	1532	213	27	149	0	0	0	179
Budni	2515	1426	872	91	84	0	39	3	0
Rehti	1695	1039	560	30	38	0	0	0	28
Nasrullaganj	3007	1682	628	575	43	0	0	0	79
Begamganj	5293	1436	2217	395	1218	19	0	0	8
Sanchi	1198	925	171	21	74	6	0	1	0
Gairatganj	1380	916	346	17	100	0	0	1	0
Raisen	5767	3908	1593	208	28	12	10	2	6
Sultanpur	1481	1004	286	28	125	0	30	3	5
Mandideep	7543	6518	156	553	4	159	0	2	151
Udaipura	2250	1149	884	133	80	1	0	0	3
Badi	2828	1264	1286	75	157	0	38	5	3
Obedullaganj	3286	1470	1248	538	10	14	0	1	5
Baraily	4667	1527	2125	884	37	2	1	1	90
Shahpur	799	644	98	3	54	0	0	0	0
Sarni	18922	17397	977	36	425	0	0	16	71
Betul	15528	9499	2720	2888	244	1	1	2	173
Amla	4708	3595	487	190	429	0	1	0	6
Betul Bazar	1628	1065	109	31	414	4	0	0	5
Multai	3993	3338	178	90	370	0	0	0	17
Bhainsdehi	2846	1587	316	40	884	0	0	0	19
Timarni	3232	2664	294	103	149	0	0	1	21
Harda	11130	6914	1726	944	1337	1	2	2	204
Khirkiya	3140	2169	487	225	244	0	0	1	14
Hoshangabad	17420	14581	857	1249	637	1	6	3	86

Pipariya	8262	6238	908	790	281	0	3	0	42
Sohagpur	4009	3312	139	25	527	0	3	0	3
Babai	2502	1869	228	35	365	1	0	2	2
Itarsi	16586	11198	2125	2718	424	2	7	1	111
Ordnance Factory Itarsi	2305	2304	1	0	0	0	0	0	0
Meharagoan	816	4	513	105	192	0	0	0	2
Bhilakhedi	2252	1459	629	150	11	0	0	0	3
Pachmarhi Cantt.	2246	2051	143	46	6	0	0	0	0
Seoni-Malwa	4754	2330	994	777	642	0	0	1	10
Kymore	4569	3881	339	86	237	2	0	24	0
Vijayraghavgarh	1392	900	198	28	266	0	0	0	0
Barhi	2224	1161	495	45	522	0	1	0	0
Murwara	34585	20357	8325	3572	2166	8	52	20	85
Majholi	2290	885	1187	50	166	1	0	1	0
Sihora	7389	5665	1223	123	369	1	0	7	1
Katangi	3196	1044	1219	51	880	1	1	0	0
Panagar	4543	3792	529	23	196	0	0	1	2
Patan	2309	2109	80	54	50	0	1	0	15
Pipariya	926	62	676	45	136	0	0	0	7
Bilpura	2438	688	1266	80	397	0	0	7	0
Suhagi	1580	193	1094	278	8	0	0	6	1
O.F Khamaria	2938	2911	26	0	1	0	0	0	0
G.C.F. Jabalpur	3301	3284	11	4	0	1	0	1	0
Vehicle Fac.Jabalpur	2734	2734	0	0	0	0	0	0	0
Manegoan	1857	381	538	192	736	0	0	0	10
Jabalpur	169353	124412	23732	10672	8318	247	313	147	1512
Jabalpur Cantt.	11261	9382	1085	285	483	22	0	0	4
Bhedaghat	349	343	4	2	0	0	0	0	0
Shahpura	2182	1306	643	199	25	1	0	1	7
Barela	2183	1767	7	186	215	0	0	1	7
Chhota Chhindwara	4517	3061	1099	318	12	0	0	0	27
Narsimhapur	10331	7714	1590	737	64	2	0	13	211
Kareli	4431	3290	379	672	32	1	0	0	57
Gadarwara	6928	6070	568	287	1	0	0	0	2
Chichli	1679	399	1168	4	106	1	1	0	0
Shahpura	1922	1183	544	27	167	0	0	1	0
Dindori	3912	2445	392	20	847	4	184	4	16
Deodara	1400	185	642	308	129	1	83	0	52
Mandla	10383	7039	1535	751	312	3	606	2	135
Nainpur	4265	3576	87	113	384	0	103	0	2
Bamhani	2026	1740	122	40	97	3	24	0	0
Harrai	1848	799	810	54	153	0	5	5	22
Amarwara	2279	1737	132	14	391	0	1	0	4
Sethia	965	577	322	1	32	0	0	1	32
Dighawani	1629	1040	211	3	291	84	0	0	0
Sirgora	1720	628	432	223	253	182	2	0	0
Neuton Chikhli Kalan	2109	1082	48	14	916	3	0	44	2

Jata Chhapar	635	400	2	0	218	9	6	0	0
Iklehra	1668	1561	13	7	62	0	0	0	25
Jamai	4278	3206	282	36	752	1	0	1	0
Panara	849	9	600	23	155	0	33	3	26
Kali Chhapar	2260	1502	126	14	400	0	216	0	2
Damua	3263	2825	291	12	88	4	25	6	12
Pal Chaurai	1398	401	200	51	726	20	0	0	0
Bhamodi	804	756	16	0	31	0	0	1	0
Dongar Parasia	7072	5731	125	21	1158	7	16	0	14
Chandameta - Butaria	3288	2744	60	4	335	62	0	81	2
Ambada	1400	893	33	3	411	57	0	1	2
Badkuhi	2252	1802	28	4	351	1	0	66	0
Chaurai Khas	2253	1817	227	3	202	0	0	0	4
Chhindwara	29319	23734	1714	642	3053	3	3	6	164
Sausar	4655	3124	211	36	1282	0	0	1	1
Mohgaon	1988	1906	1	0	80	1	0	0	0
Lodhikheda	1904	1717	46	3	102	0	36	0	0
Pandhurna	8061	7038	87	142	750	3	1	1	39
Ghansor	1183	661	354	1	160	7	0	0	0
Lakhnadon	2882	1425	735	75	511	1	2	108	25
Seoni	17288	13591	2208	408	959	70	0	3	49
Barghat	2230	1692	196	7	334	0	0	0	1
Baihar	3258	26	650	5	2549	4	12	9	3
Malajkhand	6842	2075	2453	22	2254	1	27	7	3
Ukwa	1606	355	226	94	930	0	0	1	0
Hirapur	1257	251	587	20	398	0	0	0	1
Bharbeli	2001	1034	512	34	419	1	0	1	0
Balaghat	14655	9302	1418	240	3613	2	2	1	77
Katangi	2909	1969	329	19	592	0	0	0	0
Waraseoni	4658	2382	850	21	1401	0	0	0	4
Tirodi	1968	222	649	3	1092	2	0	0	0

Source: Census of India, 2001