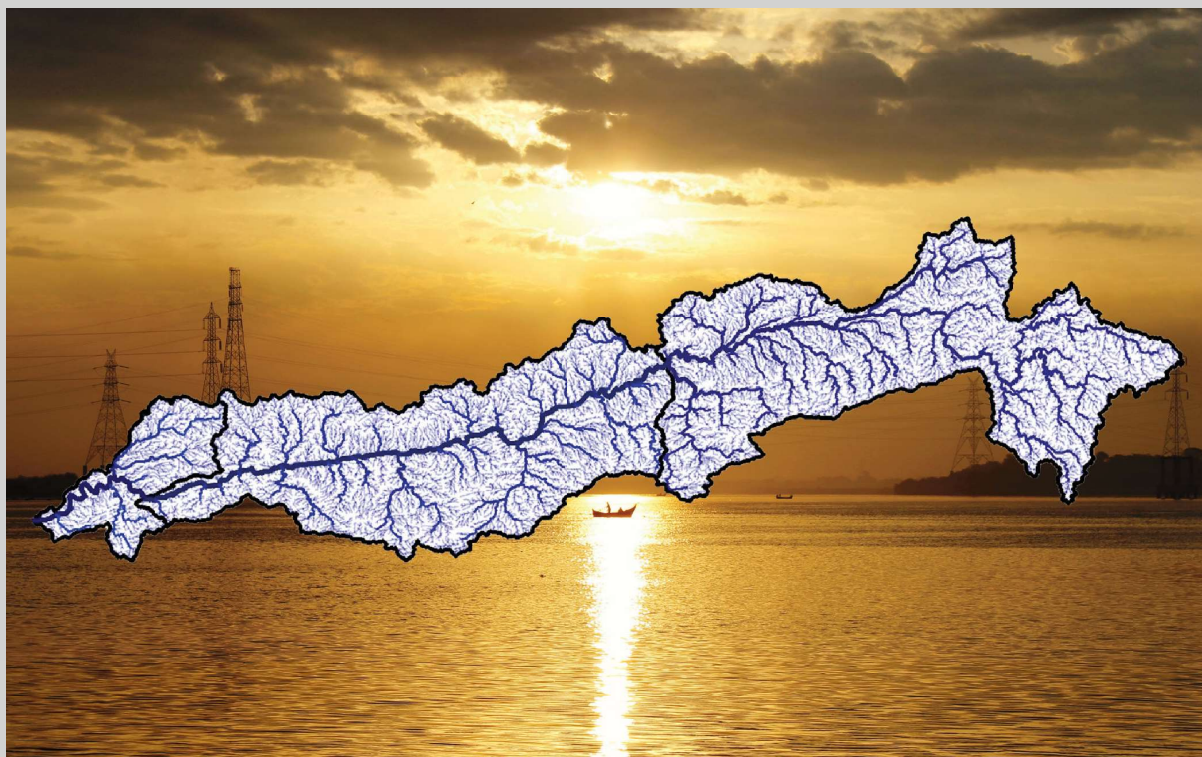




National River Conservation Directorate

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



DEMOGRAPHY OF NARMADA RIVER BASIN

SEPTEMBER 2024



Centres for Narmada River Basin Management Studies



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National River Conservation Directorate (NRCDD)

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.

www.nrcd.nic.in

Centres for Narmada River Basin Management Studies (cNarmada)

The Centre for Narmada River Basin Management 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 (NRCDD). 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

Centre for Ganga River Basin Management and Studies (cGanga)

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 (NRCDD) in 2024. We gratefully acknowledge the individuals who provided information and photographs for this report.

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जल शक्ति मंत्री
भारत सरकार

Minister for Jal Shakti
Government of India

संदेश

मानव सभ्यता का विकास नदियों के किनारे हुआ है, और इसे सुरक्षित रखने के लिए नदियों का संरक्षण अत्यंत आवश्यक है। भारत की नदियों के स्वास्थ्य और सुरक्षा के लिए 2019 में संसद के संयुक्त सत्र में राष्ट्रपति ने गंगा नदी के उदाहरण पर अन्य प्रमुख नदियों के बेसिन प्रबंधन की आवश्यकता पर बल दिया था। इस उद्देश्य की पूर्ति हेतु छह प्रमुख नदियों के बेसिन प्रबंधन में सी-गंगा के समग्र समन्वय से 12 प्रतिष्ठित शैक्षणिक संस्थाओं को शामिल करने का निर्णय लिया गया। राष्ट्रीय नदी संरक्षण निदेशालय द्वारा संचालित कंडीशन एसेसमेंट एंड मैनेजमेंट प्लान (कैप) प्रोजेक्ट नदियों के समग्र बेसिन प्रबंधन को साकार करने का प्रयास है।

नदियों के संरक्षण और उनके प्रबंधन के लिए इस तरह की पहल से न केवल हमारे प्राकृतिक संसाधनों का बचाव होगा, बल्कि स्थानीय समुदायों के जीवन और संस्कृति को भी संरक्षित किया जा सकेगा। यह अत्यंत हर्ष का भविष्य है कि इस प्रोजेक्ट के तहत तैयार की गई “रिवर एट ए ग्लान्स” रिपोर्ट का लोकार्पण होने जा रहा है। जैसे किसी व्यक्ति के बाह्य स्वरूप से उसकी पुरी पहचान नहीं होती, वैसे ही नदी के व्यवहार और चुनौतियों को सिर्फ मुख्यधारा से नहीं समझा जा सकता। इसके लिए नदी के इतिहास, उसके किनारे बसे नगरों और गांवों की संस्कृति, सहायक नदियों और उस क्षेत्र के भूगोल को भी समझाना पड़ता है। इसी रिपोर्ट के जरिए नदी की पूरी प्रकृति, उसकी चुनौतियाँ, सहायक नदियाँ और आसपास के क्षेत्रों की सांस्कृतिक-भौगोलिक स्थिति को समझने के जो कोशिश की गई है, वह बहुत महत्वपूर्ण है।

हमें विश्वास है कि यह रिपोर्ट नदी, जल और पर्यावरण के क्षेत्र में काम करने वाले व्यक्तियों, संस्थाओं और हितकारकों के लिए अत्यधिक उपयोगी साबित होगी। रिपोर्ट के प्रकाशन और लोकार्पण के इस विशेष अवसर पर बधाई।


सीआर पाटील





जल शक्ति राज्य मंत्री
भारत सरकार, नई दिल्ली

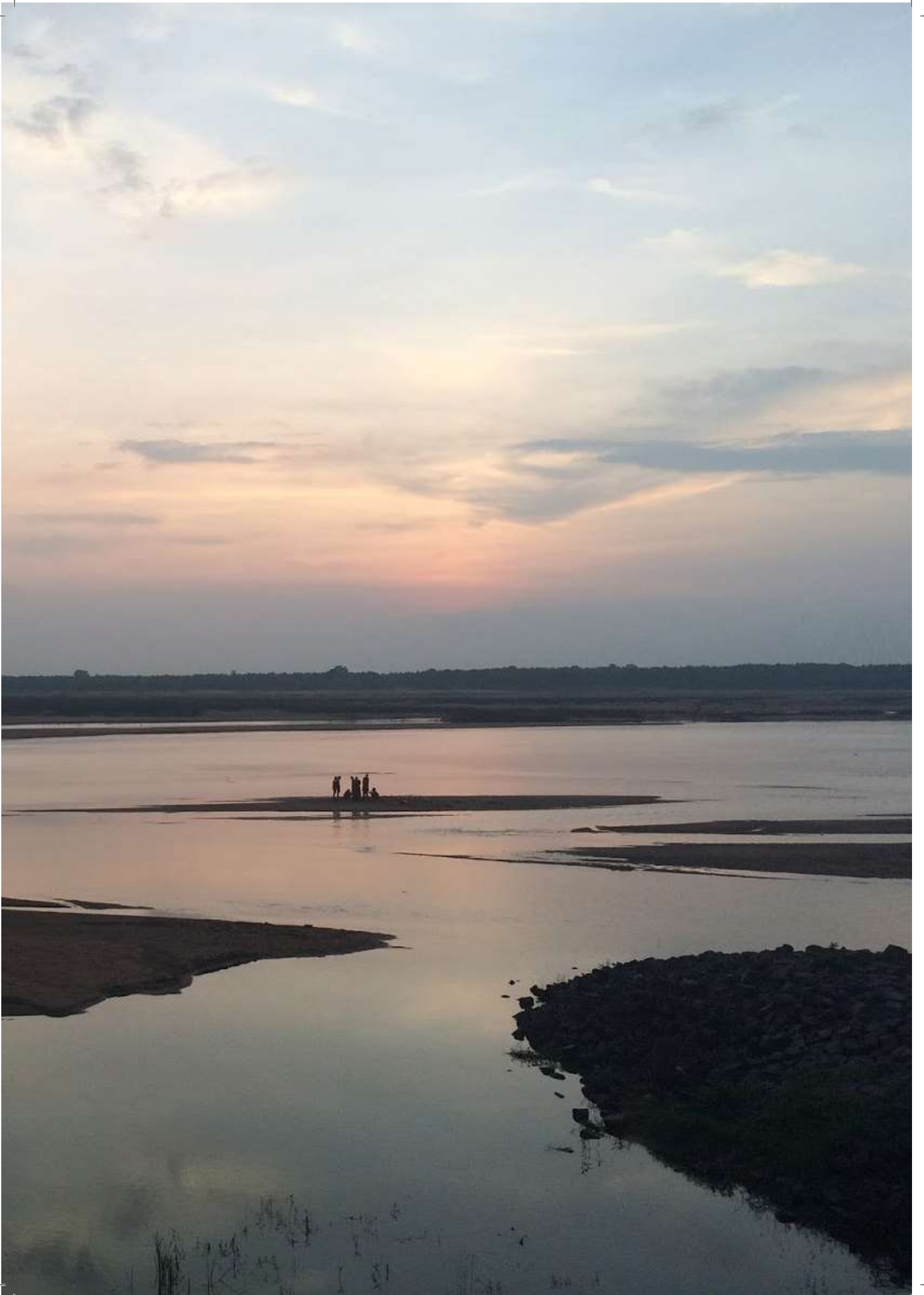
Minister of State for Jal Shakti
Government of India, New Delhi

संदेश

नदियां हमारे जीवन के लिए अत्यावश्यक संसाधन हैं और उनका पर्यावरणीय, सामाजिक, और आर्थिक महत्व भी बहुत अधिक है। नदियों का संरक्षण भविष्य की पीढ़ियों के लिए जीवन की गुणवत्ता सुनिश्चित करने की दिशा में एक महत्वपूर्ण कदम है। देश की छह प्रमुख नदियों के बेसिन प्रबंधन के लिए शीर्ष तकनीकी शिक्षण संस्थाओं के सहयोग से राष्ट्रीय नदी संरक्षण निदेशालय का कैप (कंडीशन एसेसमेंट एंड मैनेजमेंट प्लान) प्रोजेक्ट संरक्षण के लिए वर्तमान सरकार की प्रतिबद्धता दर्शाता है। भारत सरकार के नमामि गंगे मिशन के अंतर्गत किये प्रयासों से आज गंगा नदी के पुनर्जीवन को वैश्व मान्यता मिल चुकी है। उम्मीद है की ऐसी ही सफलता हमें कैप प्रोजेक्ट में भी मिलेगी।

रिवर बेसिन जनसांख्यिकी (डेमोग्राफिक) रिपोर्ट को देखकर हार्दिक प्रसन्नता हुई। कम समय में विस्तृत रिपोर्ट तैयार करने के लिए सभी सदस्यों को बधाई। जनसांख्यिकी रिपोर्ट न केवल हमें वर्तमान के बारे में अवगत कराता है, बल्कि इस रिपोर्ट को देखकर भविष्य की चुनौतियों और अपेक्षाओं का भी अनुमान लगाया जा सकता है। यह रिपोर्ट शासन, प्रशासन शिक्षण के लिए एक अहम् दस्तावेज है।

डा. राज भूषण चौधरी



PREFACE

In an era of unprecedented environmental change, understanding our rivers and their ecosystems has never been more critical. This report provides an overview of the Narmada River and its basin, describing its characteristics, economic and social importance, and the challenges of managing the river. As we explore the various facets of the Narmada River system, we equip readers with the knowledge necessary to appreciate and protect this important water body.

In the following pages, readers will find detailed data about the Narmada River and its basin. The data presented describes the demographic characteristics of the river basin, the topography of the regions the river flows through, the basin region's climate, and the river's flow characteristics. The report also looks at how the people residing in the basin interact with the river. This includes information about the region's economic activities and the river's social and historical significance.

This report also explains the current and future challenges of managing the Narmada River and the basin region. These are related to the management of dams, water scarcity, pollution, deforestation, biodiversity, and broader climate change concerns. The information in the report is important for environmental professionals, policymakers, social activists, and other stakeholders in the river system.

We sincerely thank the numerous contributors, including project staff who have provided immense support. We hope this report will catalyse constructive engagement with the multi-faceted challenges facing the Narmada River and help build a sustainable future for the river and the people who live along it.

As you delve into this preliminary report, we invite you to embrace the opportunities and challenges that lie ahead.

cNarmada and cGanga

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1. Basin Overview

The Narmada River basin is the ninth largest in India, covering a large geographical area of approximately 97,162 square kilometres. This river basin spans four Indian states: Chhattisgarh, Madhya Pradesh, Gujarat, and Maharashtra, covering significant portions of the central and western regions of the country. The Narmada River, sometimes called Madhya Pradesh's lifeline, originates from Amarkantak and travels 1,312 kilometres to the west before emptying into the Gulf of Khambhat, Arabian Sea. The Narmada River flows 1077 km in Madhya Pradesh, 74 km in Maharashtra, and 161 km in Gujarat. In addition to being large, the basin is essential to the region's ecology, society, and economy. The river benefits millions in its basin by providing essential water for drinking, agriculture, and hydropower.

The Narmada River Basin has a total population of 20,799,195 and spans several states and districts. The Upper Basin is home to 8,603,425 individuals, the Middle Basin to 9,126,886, and the Lower Basin to 2,689,365. The Upper Basin spans 16 districts in Madhya Pradesh and two districts in Chhattisgarh. The Middle Basin spans 25 districts in Madhya Pradesh, two districts in Gujarat, and two districts in Maharashtra. The Lower Basin spans six districts in Gujarat, 1 in Madhya Pradesh and 1 in Maharashtra. However, only portions of these districts are inside the basin areas. These districts are varied in their economic, demographic, social, and geographical characteristics. The population distribution is uneven. Many regions have high population densities, while others are relatively sparsely populated. The areas also have various cultural traditions and social systems influencing local administration and community life. The districts feature a variety of terrains, including river valleys, fertile plains, and forested hills, which present varied environmental challenges and opportunities within the Narmada River Basin.

The regional economy is predominantly agricultural, with crops like cotton, sugarcane, and rice being the major contributors. Despite this economic prevalence, the region faces challenges such as rural poverty, limited access to education and healthcare, and environmental concerns stemming from industrial pollution and deforestation. These issues underscore the region's need for sustainable development and balanced growth. These districts offer a unique blend of natural resources, cultural diversity, and economic potential.

1.1 Data and Methodology

The spatial definition of the basin is hydrologically determined, and it is not in alignment with the administrative boundaries such as states, districts, or blocks. This mismatch challenges the application of socio-economic data typically collected at the district or state level. The report uses geo-coded data¹ to match the basin boundaries wherever possible. Geo-coded data allows for a more appropriate analysis of the demographic features of the region. Whenever geo-coded data is unavailable, the report relies on districts or clusters of districts

¹ Socioeconomic High-resolution Rural-Urban Geographic Platform for India (SHRUG) (Asher, Lunt, Matsuura, & Novosad, 2021)

from various publicly available surveys. The report will appropriately indicate when the data is at the basin or district levels (or clusters of districts). Census data is unavailable after 2011, which presents a challenge for analysing current demographic characteristics. The report uses administrative data and reliable sample surveys to overcome this data constraint.

The following are the datasets that are used in this report: Census of India (1991, 2001, 2011) (Office of the Registrar General and Census Commissioner, India, 2011), Mission Antyodaya (2020) (Ministry of Rural Development, Government of India, 2020), National Family Health Survey (2015-16, 2019-20) (IIPS, 2022), Sample Registration System (2020) (Office of the Registrar General and Census Commissioner (India), 2022), Periodic Labour Force Survey (2022- 23) (NSSO, 2023), and the Household Consumption Expenditure Survey (2022-23) (NSSO, 2024). For Census of India and Mission Antyodaya data, we rely on geo-coded data from the Socioeconomic High-resolution Rural-Urban Geographic Platform for India (SHRUG) (Asher, Lunt, Matsuura, & Novosad, 2021).

2. Administrative Divisions

2.1 Administrative Divisions: Upper Narmada Basin

The Upper Narmada Basin, spanning 18 districts in Madhya Pradesh (16) and Chhattisgarh (2), presents a diverse geographical distribution in terms of area coverage within the basin (Table 1). The districts are entirely within the Basin but are partially within the basin. Among these districts, Mandla stands out as the largest, with an area of 6,722.82 square kilometres under the basin, followed by Narsinghpur (5,004.57 sq. km), Dindori (4,706.48 sq. km), Jabalpur (4,675.56 sq. km), and Hoshangabad (4,631.51 sq. km). 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 crucial regions for water management and environmental conservation initiatives. In contrast, Umaria, with only 11.59 square kilometres under the basin, is the smallest district, followed by Rajnandgaon (88.47 sq. km), Sehore (360.77 sq. km), Sagar (407.82 sq. km), and Damoh (469.95 sq. km) (Figure 1). These variations in district size within the basin underscore the diverse contributions that different regions make to the basin's environmental and hydrological frameworks.

Table 1. District-wise Area Under Upper Narmada Basin (Source: Authors' calculation based on SOI administrative boundaries.)

Sl. No.	Districts	Basin Area	Total Area	% 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	3.90
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*	4494.10	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	3492.10	11744.69	29.73
16	Seoni	2270.84	8774.41	25.88
17	Balaghat	2294.95	9253.50	24.80
18	Anuppur	534.67	3847.69	13.90

** Districts are part of both the Upper and Middle Narmada Basins and their area is shown in the respective basins.*

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 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, highlighting the varying levels of geographical integration these districts have with the basin's ecological system.

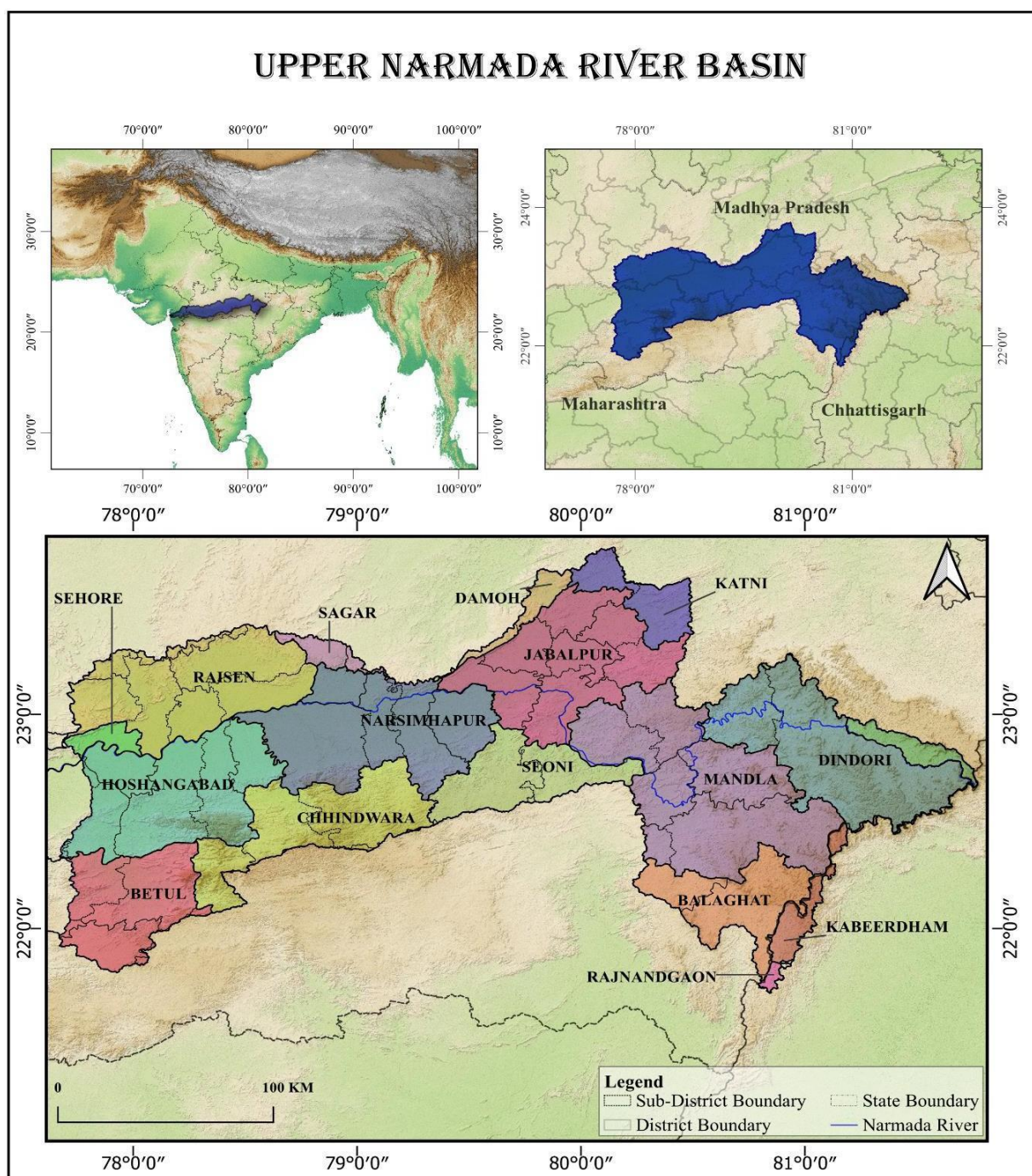


Figure 1. Upper Narmada Basin: Administrative Divisions
(Source: Customization based on Survey of India Administrative Boundaries)

For smooth and efficient administrative functioning, districts are subdivided into smaller units known as sub-districts or tehsils. Appendix 1 provides an overview of the number of sub-districts in various districts across Chhattisgarh and Madhya Pradesh. 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. This suggests that these districts are smaller in terms of administrative divisions or population. The variation in the number of sub-districts likely reflects differences in geographic size, population, and governance needs across the districts.

2.2 Administrative Divisions: Middle Narmada Basin

The Middle Narmada Basin spans 19 districts across three states: Madhya Pradesh, Gujarat, and Maharashtra (Figure 2). 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, the 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 sq. km), Khandwa (6604.53 sq. km), and Dewas (4011.53 sq. km), which indicates their prominent roles in the Narmada Basin. Smaller but still notable contributions come from Barwani (3909.05 sq. km), Sehore (2875.90 sq. km), and Harda (3258.21 sq. km), emphasizing their involvement in the basin's geography. On the other hand, districts like Betul (1024.05 sq. km), Indore (1009.18 sq. km), and Hoshangabad (2044.73 sq. km) show more limited contributions to the Narmada Basin. Bhopal, with a very small area of 3.14 sq. km, and Jhabua, contributing just 26.55 sq. km, have minimal engagement in the basin (Table 2).

Table 2. District-wise Area Under Middle Narmada Basin (Source: The authors' calculation is based on SOI administrative boundaries)

Middle Narmada Basin				
Sl. No.	Districts	Basin Area	Total Area	% 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	441.00	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	90.50
13	Khargone	7722.99	8243.85	93.68
14	Raisen	116.85	8413.52	1.39
15	Sehore	2875.90	6544.36	43.94
Gujarat				
16	Chhota Udepur	170.69	7559.93	2.26
17	Narmada	303.20	2859.11	10.60
Maharashtra				
18	Dhule	9.91	7142.96	0.14
19	Nandurbar	1601.26	5906.35	27.11

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

In Gujarat, Chhota Udepur (170.69 sq. km) and Narmada (303.20 sq. km) have relatively small basin areas, reflecting their lesser involvement compared to the central districts of Madhya Pradesh. Similarly, Maharashtra has minor contributions, with Nandurbar providing 1601.26 sq. km and Dhule only 9.91 sq. km, further highlighting the dominance of Madhya Pradesh in the Narmada Basin's geography.

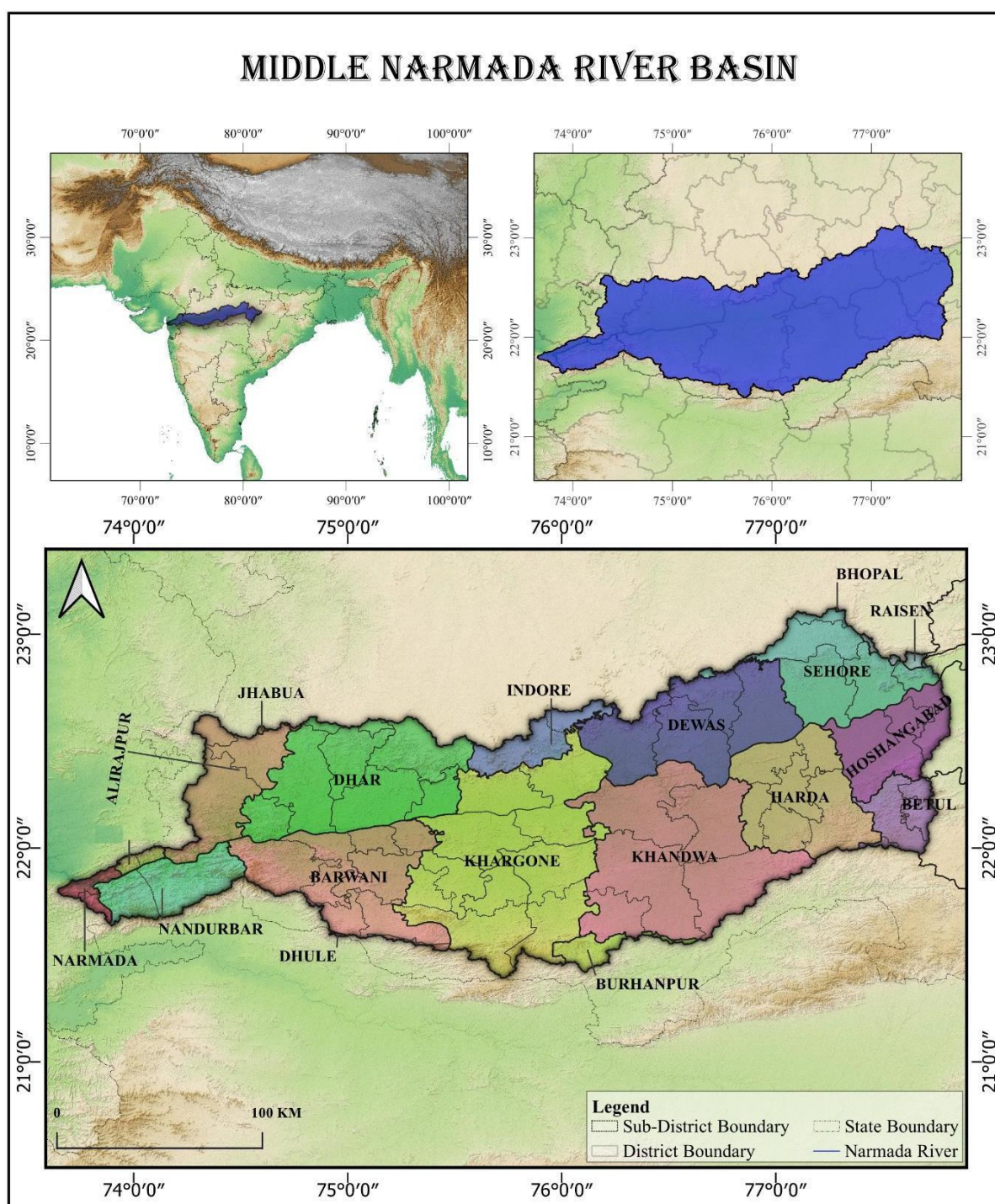


Figure 2. Middle Narmada Basin: Administrative Divisions
 (Source: Customization based on Survey of India Administrative Boundaries)

Table 2 also shows the percentage of total area covered by various districts within the Middle Narmada Basin across Madhya Pradesh, Gujarat and Maharashtra. Madhya Pradesh leads significantly, with Harda (98.24%), Khargone (93.68%), and Khandwa (90.50%) having the highest proportions of their areas within the basin. Other notable districts include 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 Udepur (2.26%) and Narmada (10.60%) representing small fractions of their areas in the basin. Maharashtra has a

minor presence as well, with Nandurbar at 27.11% and Dhule at a negligible 0.14%. Overall, Madhya Pradesh dominates the Narmada Basin's geographical area, while Gujarat and Maharashtra contribute much less.

The above-mentioned districts of the Middle Narmada Basin have also been divided into several sub-districts (Tehsil) for smooth operational and planning purposes. In Madhya Pradesh, there are 15 districts with notable variations in sub-districts. Barwani and Khargone lead with nine sub-districts each, while Dhar and Sehore have 7. On the other hand, Bhopal and Burhanpur have only one, indicating a simpler administrative structure. In Gujarat, both Chhota Udepur and Narmada have two sub-districts. In Maharashtra, Dhule has one sub-district, and Nandurbar has three in the Middle Narmada Basin. It is essential to mention that a few of these subdistricts are also part of the Upper Narmada Basin (Appendix 2).

2.3 Administrative Divisions: Lower Narmada Basin

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. Figure 3 shows the administrative boundaries on a map.



Figure 3. Administrative map of the lower sub-basin of the Narmada River, showing tehsil, district, and state boundaries.

Table 3. Lower Narmada Basin Delineation (Census 2011)

State/District Names (includes only basin areas)	Total Area in District (sq km)	Area in Basin (sq km)	Share in Basin (%)
Gujarat			
Bharuch	3,563.4	1,651	31.7
Dohad	3,488.0	140	3.9
Narmada	382.5	2,146.3	84.9
Panch Mahals	4,955.5	164.1	3.2
Surat	3,857.0	214.5	5.3
Vadodara	3,622.3	3,914.3	51.9
Madhya Pradesh			
Alirajpur	2,034.1	1,159.6	36.3
Maharashtra			
Nandurbar	4,775.3	43.4	0.9

The data presented here are sub-basin-level estimates that include only regions within the spatial definition of the sub-basin (Office of the Registrar General and Census Commissioner, India, 2011) (Asher, Lunt, Matsuura, & Novosad, 2021).

2.4 Major Towns and Urban Local Bodies (ULBs)

Apart from the administrative divisions mentioned in Section 2, there are further subdivisions for rural and urban areas known as urban local bodies (ULBs) and rural local bodies. In the context of urban local bodies, there are 38 urban local bodies in the Upper Narmada Basin (Figure 4) and 54 urban local bodies in the Middle Narmada Basin (Figure 5). Clearly, the Middle Narmada Basin contains a greater number of urban local bodies than the Upper Narmada Basin. The Middle Narmada Basin stands out not only for having the highest number of Urban Local Bodies (ULBs) but also for being home to several major towns (Figure 6 and Figure 7). A detailed list of district-wise urban local bodies and their type has been provided in Appendix 3 and Appendix 4.

When planning for the conservation and management of the Narmada Basin, the density and number of these towns are significant factors to consider, as they not only accommodate a substantial portion of the population but also generate materials that can negatively impact the basin's health. On the one hand, towns have a high demand for water; on the other hand, they contribute considerable amounts of sewage to the rivers.

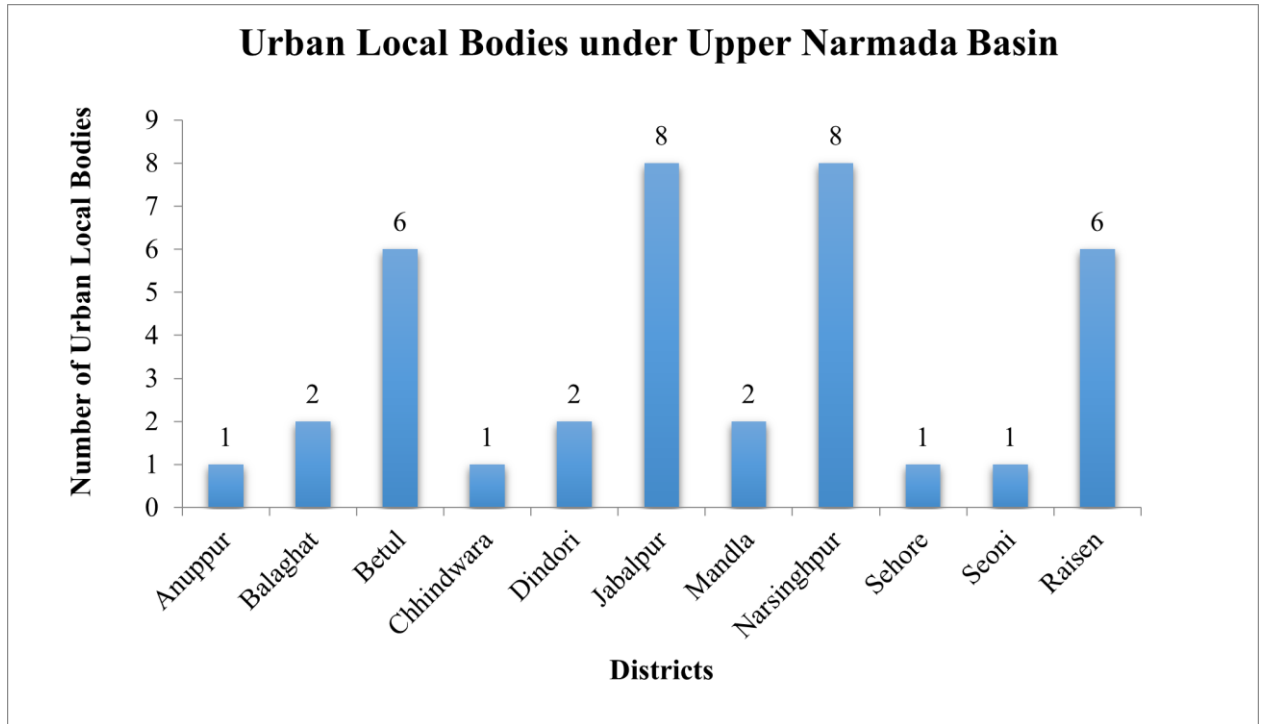


Figure 4. District-wise Urban Local Bodies, Upper Narmada Basin
(Source: Census of India, 2011)

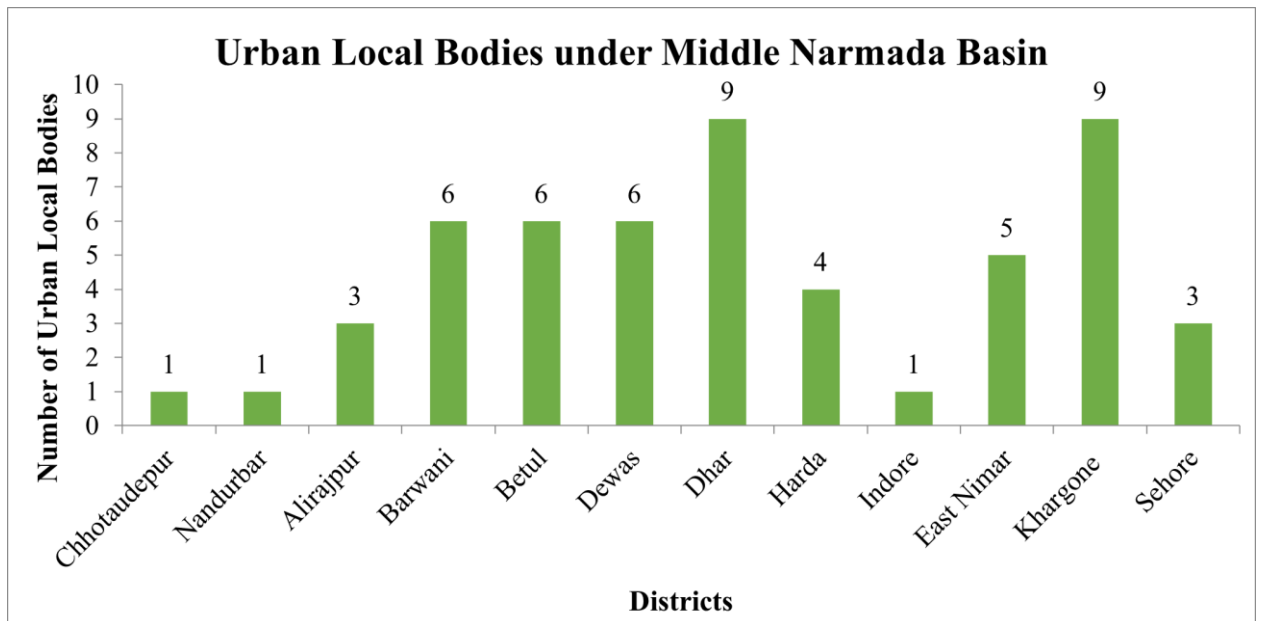


Figure 5. District-wise Urban Local Bodies, Middle Narmada Basin
(Source: Census of India, 2011)

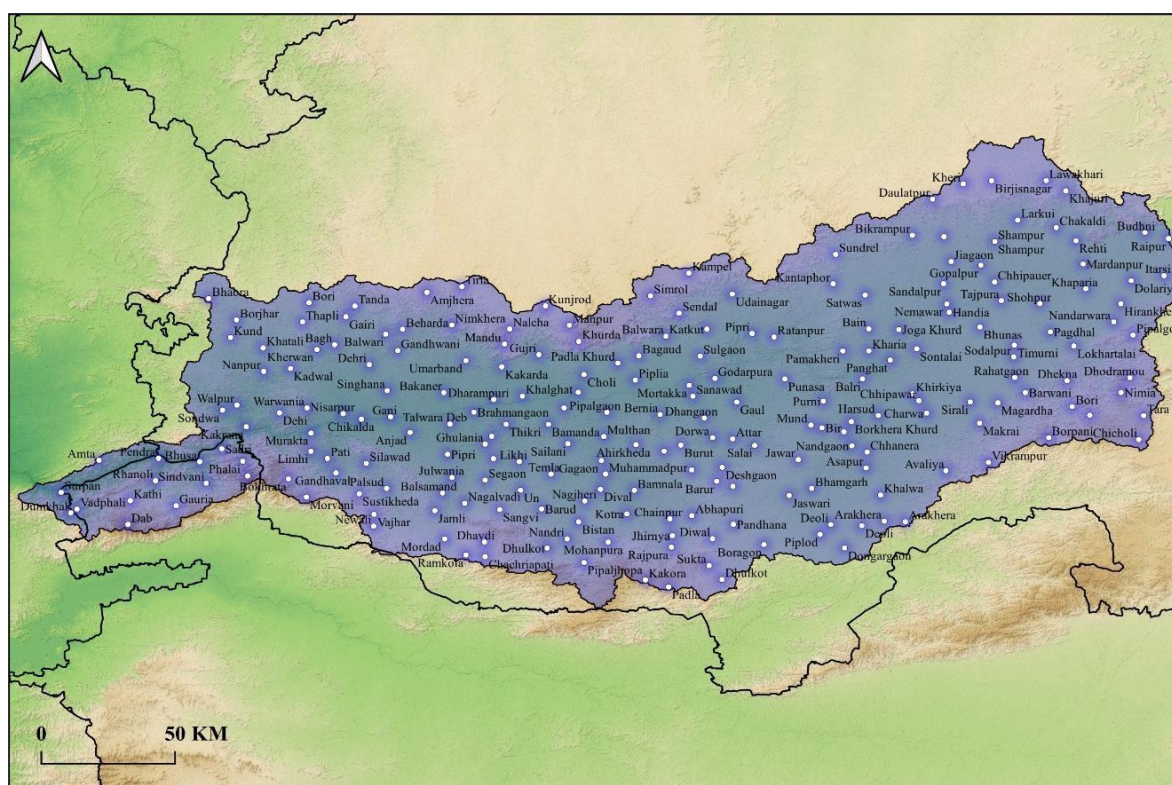
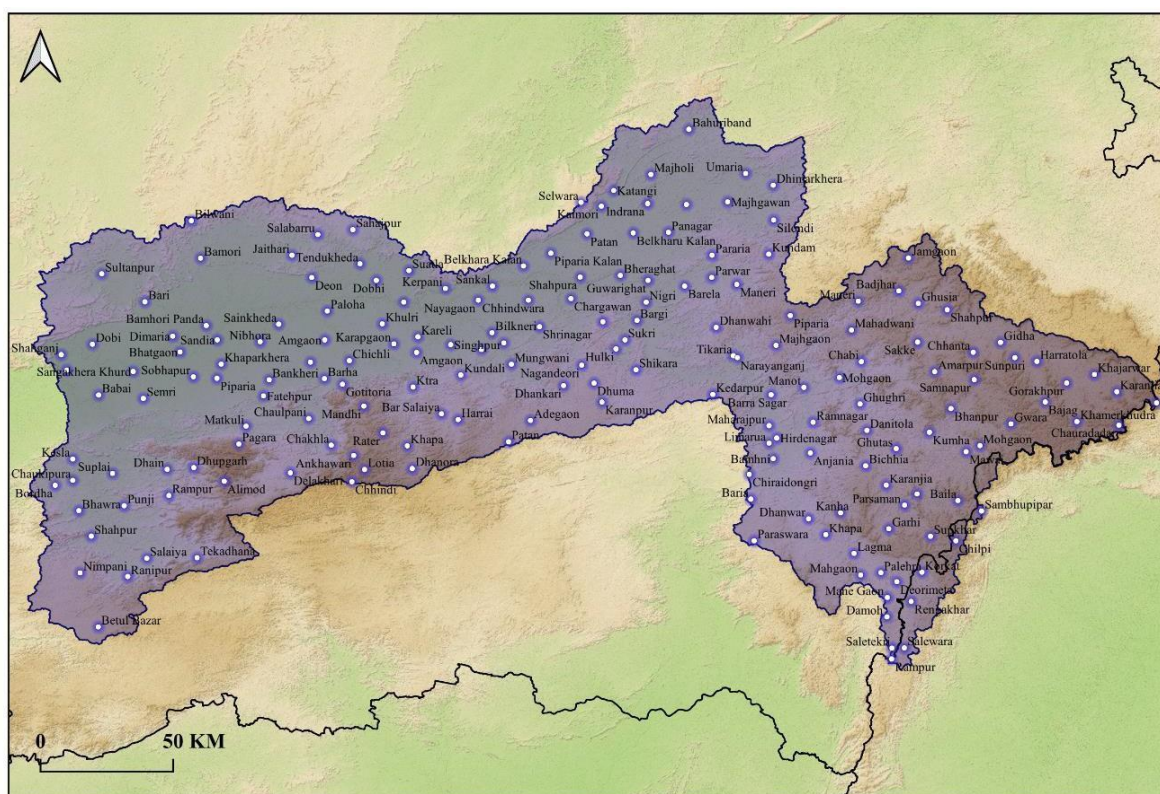


Table 4 provides an overview of towns in the Lower Basin area, categorizing them by town

class (I-VI)² and the presence of ULBs. The data encompasses 23 towns across districts in Gujarat (Bharuch, Narmada, and Vadodara) and Madhya Pradesh (Alirajpur), with population figures based on the 2011 census. These towns are classified into six categories (I to VI), although only five classes appear in this table.

Notably, the majority of towns (15) fall under Class III, IV, or V, indicating smaller population sizes. In contrast, only three towns - Anklesvar, Bharuch, and Rajpipla - have a Class I or III designation and are governed by municipalities. Most towns (17) lack ULBs.

Table 4. Towns in Lower Basin by Class and Urban Local Body

Basin Level					
Town Name	State	District	Population (‘000s) (2011)	Town Class	Urban Local Body
Andada	Gujarat	Bharuch	16.7	IV	-
Anklesvar	Gujarat	Bharuch	114.2	I	Municipality
Bhadkodara	Gujarat	Bharuch	13.2	IV	-
Bharuch	Gujarat	Bharuch	172.3	I	Municipality
Bhavra	Madhya Pradesh	Alirajpur	11.0	IV	-
Bholav	Gujarat	Bharuch	24.6	III	-
Bodeli	Gujarat	Vadodara	12.2	IV	-
Chhota Udepur	Gujarat	Vadodara	25.8	III	Municipality
Dediapada	Gujarat	Narmada	9.0	V	-
Gadkhol	Gujarat	Bharuch	25.3	III	-
Jetpur	Gujarat	Vadodara	7.9	V	-
Jhadeshwar	Gujarat	Bharuch	28.1	III	-
Kavant	Gujarat	Vadodara	9.6	V	-
Kevadiya	Gujarat	Narmada	6.8	V	-
Maktampur	Gujarat	Bharuch	10.7	IV	-
Nandelav	Gujarat	Bharuch	13.6	IV	-
Nasvadi	Gujarat	Vadodara	8.1	V	-
Rajpipla	Gujarat	Narmada	34.8	III	Municipality
Sanjali	Gujarat	Bharuch	5.3	V	-
Sarangpore	Gujarat	Bharuch	16.7	IV	-
Sherpura	Gujarat	Bharuch	5.7	V	-

Towns are located in basin areas, as per the spatial definition of a lower basin.

² According to the 2011 Census of India, towns are classified into six categories (I-VI) based on population size: Class I (100,000+), Class II (50,000-99,999), Class III (20,000-49,999), Class IV (10,000-19,999), Class V (5,000-9,999), and Class VI (less than 5,000).

3. Distribution of Population

The distribution of population plays an important role in the health of the river and its basin. It is important to understand population distribution to determine which areas require specific planning to address environmental issues related to the river basin. However, most population data is available according to administrative units such as nation, state, district, sub-district, and village levels. This makes it difficult to obtain population data aligned with basin boundaries. To address this issue, this report utilizes SHRUG³ geospatial data, which provides village-level boundaries with census codes. This process has enabled us to obtain basin-level data for further analysis.

The Narmada River basin holds a population of around 20.8 million (20,799,195). Approximately 83% of this population resides in Madhya Pradesh, underscoring the basin's significance to the state's demographic and economic activity. Gujarat comprises 14.47% of the basin's population, whereas Maharashtra and Chhattisgarh provide 1.52% and 0.35%, respectively (Table 5). Figure 8 provides a state-wise distribution of population as per the basin boundaries.

Table 5. Narmada Basin: State-wise distribution of population
(Source: Calculated from Census of India, 2011 and SHRUG)

<i>Name of the States</i>	<i>Population</i>	<i>Share of the Total Population (%)</i>
<i>Chhattisgarh</i>	72163	0.35
<i>Gujarat</i>	2,689,365	14.47
<i>Madhya Pradesh</i>	17397596	83.00
<i>Maharashtra</i>	317789	1.52

3.1 Population Distribution: Upper Narmada Basin

The population data reveals a significant demographic disparity between Madhya Pradesh and Chhattisgarh. Madhya Pradesh holds a substantial population of 8,531,262, making it a major demographic force in the region. In contrast, Chhattisgarh has a considerably smaller population of just 72,163 as it shares a small area with the upper basin (Figure 8). When combined, the total population across both states amounts to 8,603,425, with Madhya Pradesh comprising the vast majority of this figure. This pronounced disparity in population sizes highlights the varying scales of these states, which can have important implications for resource allocation, governance, and regional planning.

³ Socioeconomic High-resolution Rural-Urban Geographic Platform for India (SHRUG) Asher et al. (2021)

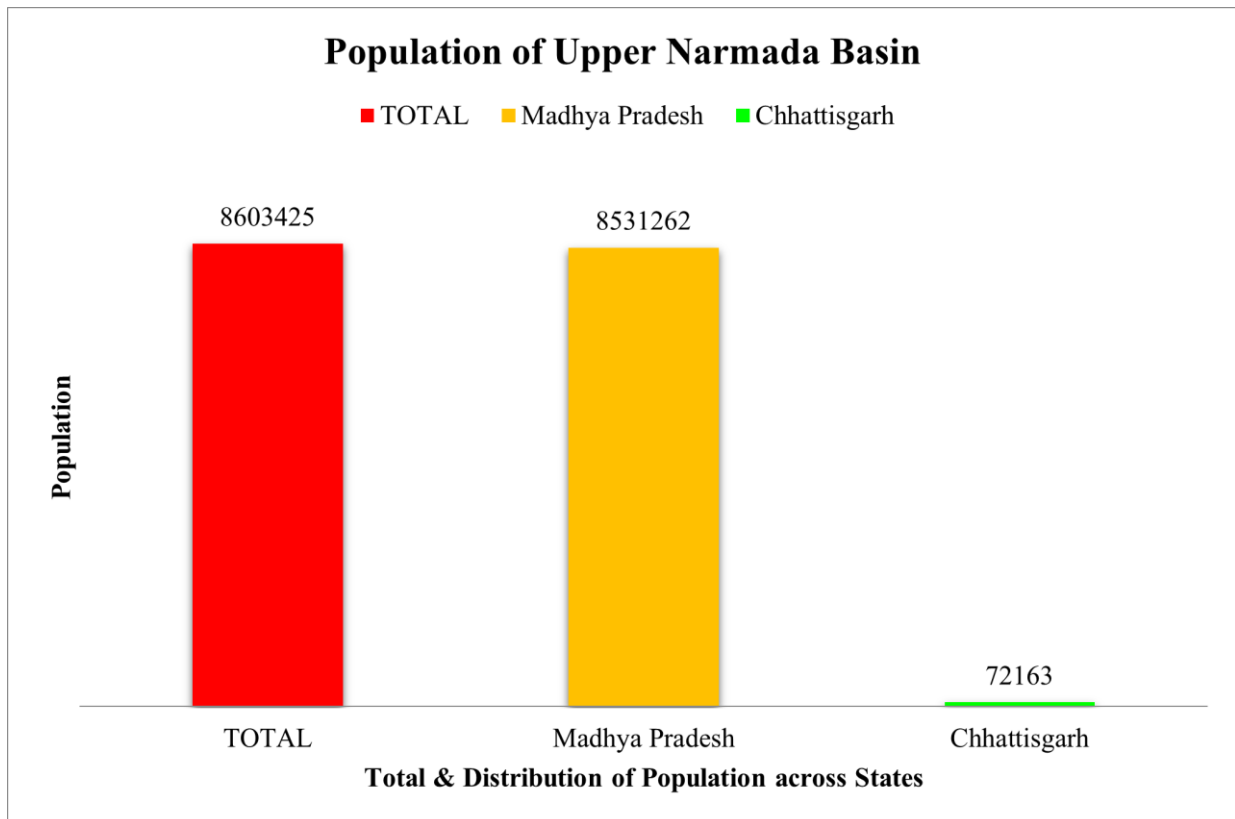


Figure 8. Total and State-wise Population of Upper Narmada Basin
(Source: Census of India, 2011)

District-wise population distribution within the Upper Narmada Basin highlights significant demographic concentrations across various districts in Madhya Pradesh and Chhattisgarh. Jabalpur stands out as the most populous district, housing 2,425,715 residents, making it a central hub within the basin. Following closely, Narsimhapur contains a population of 1,077,182, reinforcing its significance in the region. Mandla, with 914,427 residents, and Hoshangabad, with 703,092, also contribute notably to the overall demographic landscape. Other districts such as Raisen (682,636), Betul (627,667), and Dindori (601,517). Seoni and Chhindwara, with populations of 319,103 and 316,153, respectively, further bolster the basin's demographic density. Meanwhile, Balaghat's population stands at 316,049 and Katni at 253,587, both highlighting their roles in supporting the basin's overall population (Figure 9).

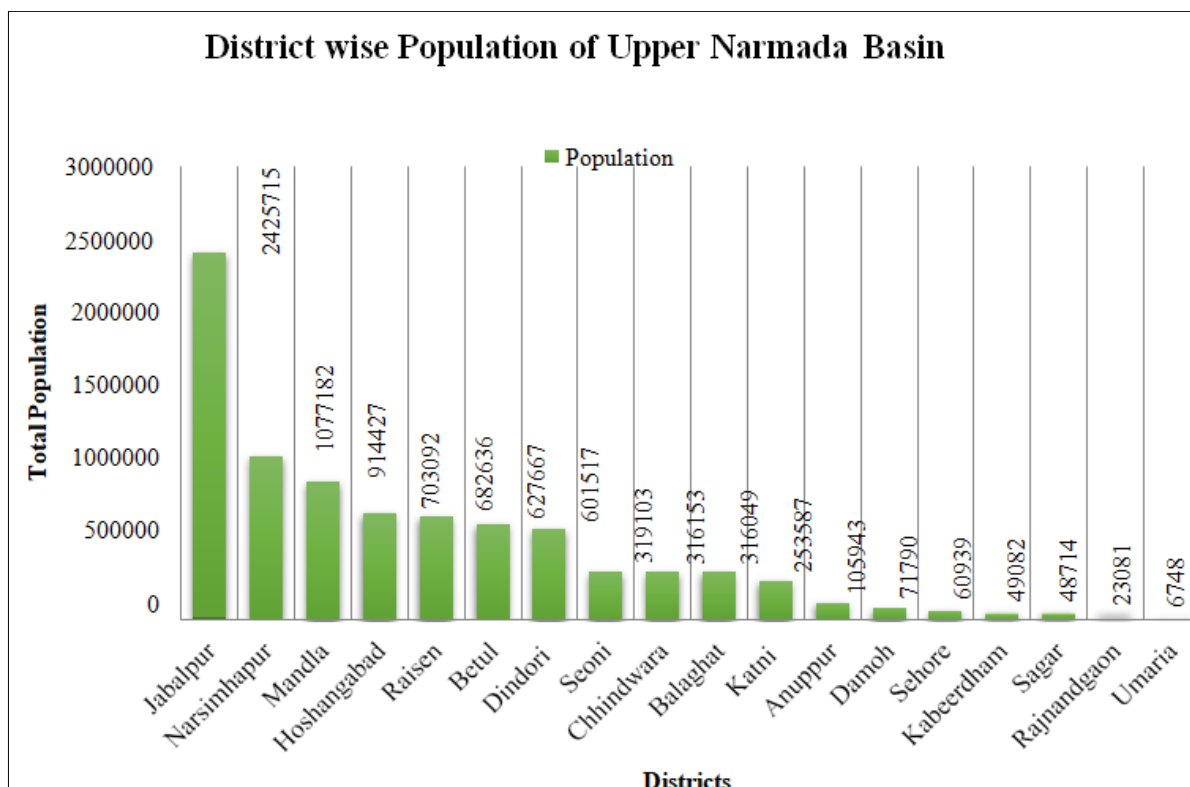


Figure 9. Upper Narmada Basin: District-wise Population Distribution
(Source: Census of India, 2011)

In contrast, some districts show significantly lower populations, such as Sehore (60,939) and Sagar (48,714), which reflect a disparity in demographic density across the basin. Chhattisgarh adds to the population count with Kabeerdham (49,082) and Rajnandgaon (23,081), although these figures are relatively modest compared to their Madhya Pradesh counterparts. Umari, in Madhya Pradesh, has the lowest population within the basin at just 6,748 residents, underscoring the need for focused development strategies in such areas. This variability emphasizes the importance of targeted planning and resource management to address the basin-related challenges and opportunities.

3.2 Social Composition: Upper Narmada Basin

The social composition is important for the planning and management of any region or basin, especially in a diverse country such as India. Knowing the diverse social groupings, including caste and tribal communities, is crucial for devising policies that guarantee equal resource access, inclusive growth, and social cohesion. In areas like the Narmada Basin, recognizing the distinct socioeconomic requirements of various population groups facilitates more efficient governance and planning. This strategy mitigates inequities and guarantees that underprivileged populations are not neglected in developmental efforts.

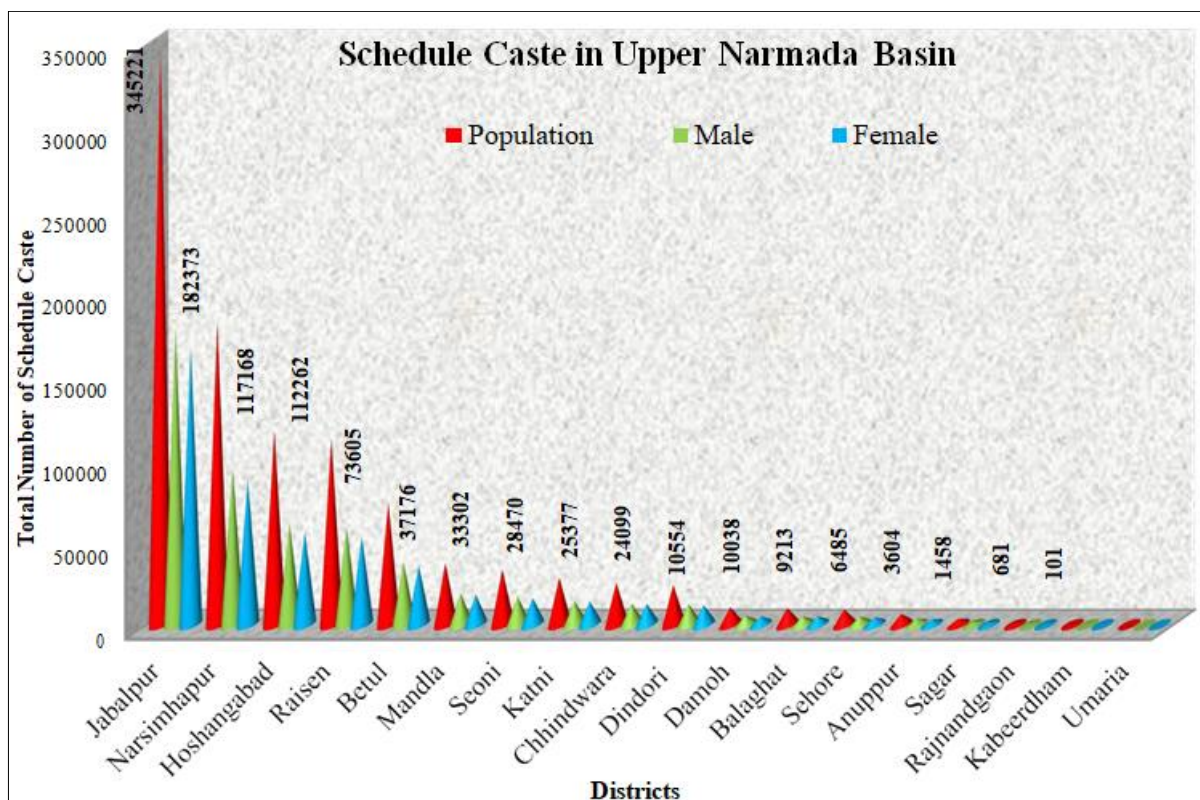


Figure 10. Upper Narmada Basin: District-wise Distribution of SC Population
(Source: Census of India, 2011)

The total population of Scheduled Castes (SC) within the Upper Narmada Basin is distributed across various districts in Madhya Pradesh and Chhattisgarh. Jabalpur leads with 345,221 SC individuals, including 178,379 males and 166,842 females, representing a substantial portion of the SC population in the region. Narsimhapur follows with 182,373 individuals, with 95,166 males and 87,207 females, while Hoshangabad contributes 117,168 SC individuals, including 61,386 males and 55,782 females. Raisen adds 112,262 SC individuals, with a fairly balanced male-to-female ratio (59,085 males and 53,177 females). Betul, with 73,605 SC individuals, continues this trend, while Mandla has 37,176 SC individuals, showing a slightly smaller population but still a meaningful demographic presence.

Seoni, Katni, Chhindwara, and Dindori, with populations of 33,302, 28,470, 25,377, and 24,099, respectively, show moderate contributions to the SC population in the basin. The smaller districts, such as Damoh (10,554), Balaghat (10,038), and Sehore (9,213), also add to the regional total, though with fewer SC individuals. Anuppur and Sagar contribute relatively smaller SC populations, with 6,485 and 3,604, respectively. The districts from Chhattisgarh, Rajnandgaon (1,458) and Kabeerdham (681) have the lowest SC populations in the region, with only 101 SC individuals reported in Umaria (Figure 10).

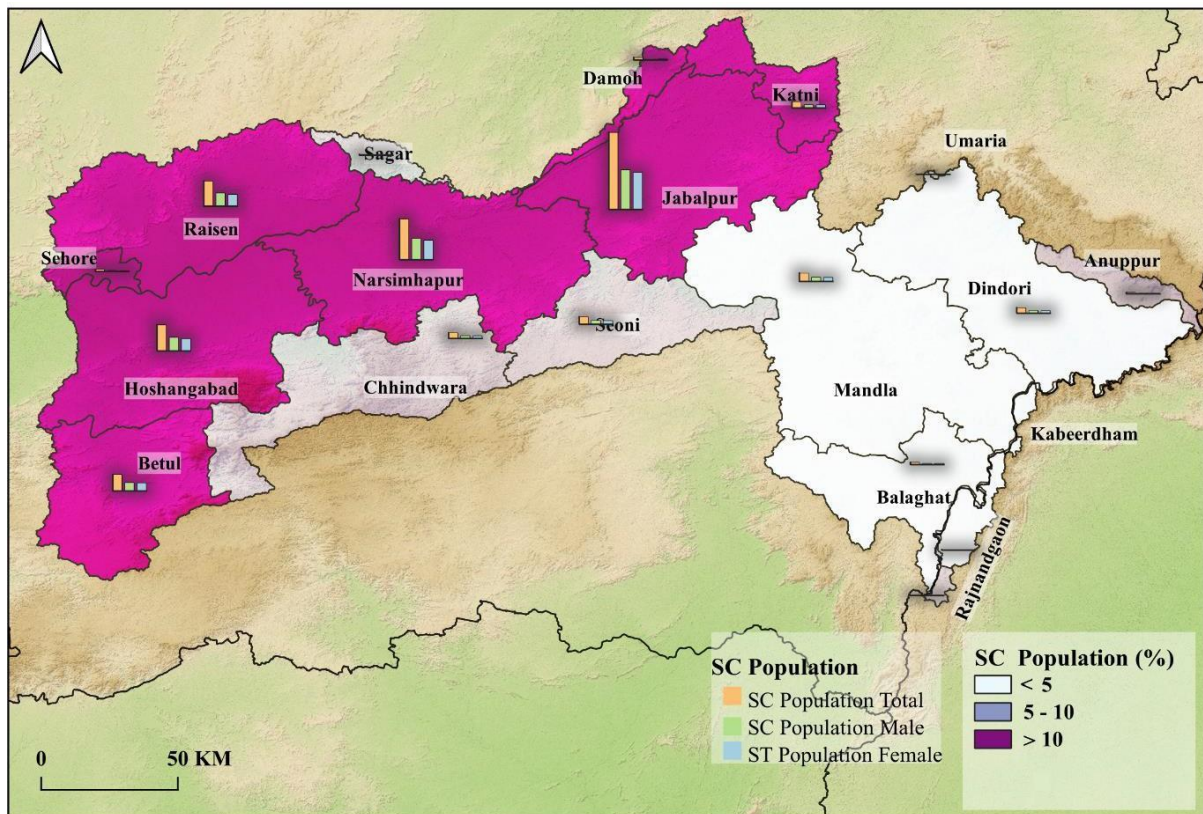


Figure 11 Upper Narmada Basin: District-wise SC Population Distribution
(Source: Census of India, 2011)

Figures 10 and 11 reveal that districts like Jabalpur and Narsimhapur have significantly high SC populations. Others, particularly in Chhattisgarh, exhibit much smaller SC communities. The total SC population is distributed unevenly across the basin, reflecting both demographic concentration and rural dispersal across the states of Madhya Pradesh and Chhattisgarh.

In terms of the Scheduled Tribe (ST) population, the Upper Narmada Basin reflects a significant portion of the population across various districts. Mandla and Dindori districts have the highest tribal populations, with 544,343 and 392,932 individuals, respectively, making them crucial areas for focused tribal development and resource allocation. Other districts such as Jabalpur, Betul, and Chhindwara also have large tribal populations exceeding 200,000, indicating the need for targeted social programs. Districts like Seoni, Balaghat, and Narsimhapur each have tribal populations ranging from 140,000 to 170,000, underscoring their importance within the region's demographic profile. In contrast, smaller tribal populations are found in districts like Umaria, Damoh, and Sehore, with populations below 20,000 (Figure 12).

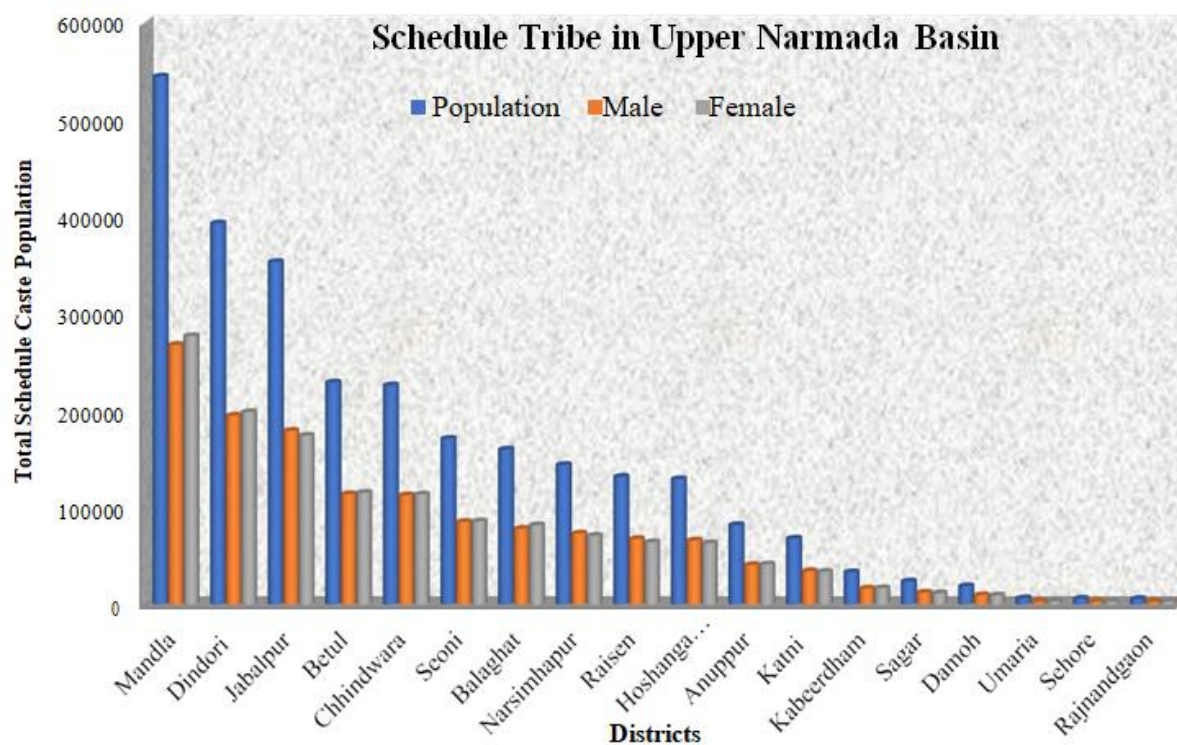


Figure 12. District-wise ST Population, Upper Narmada Basin
(Source: Census of India, 2011)

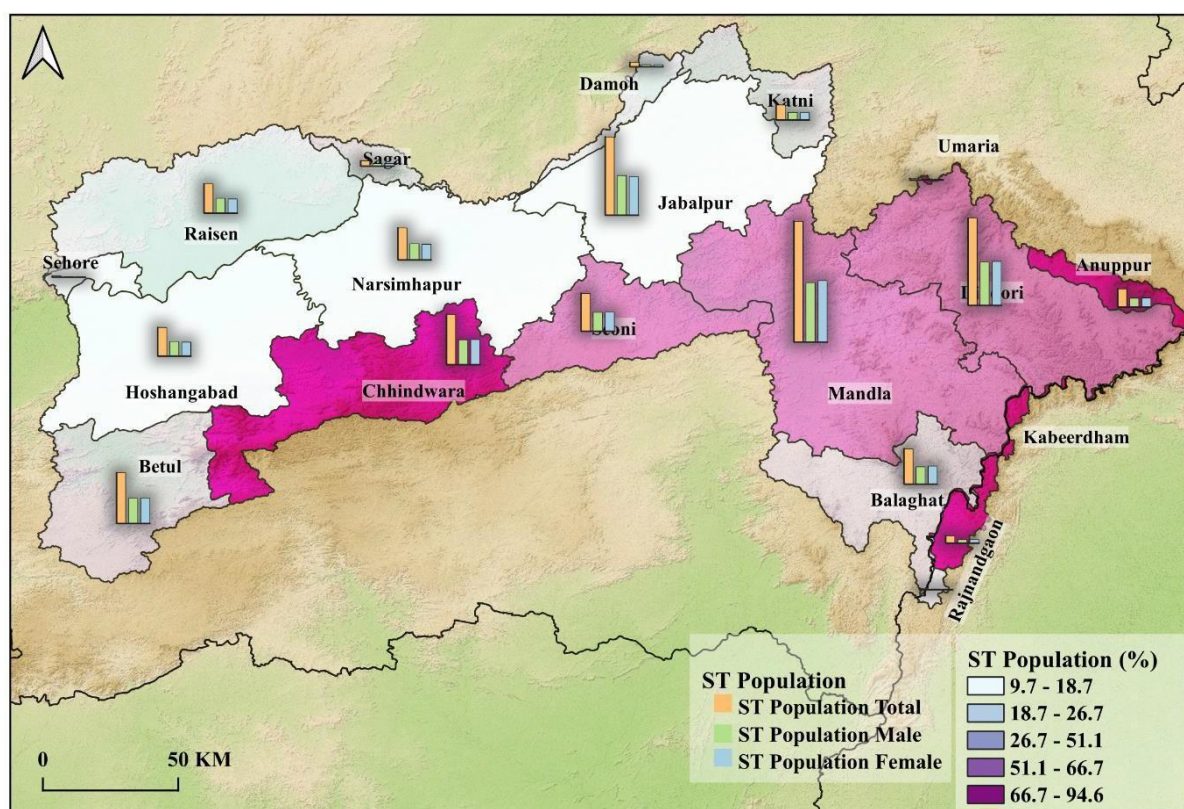
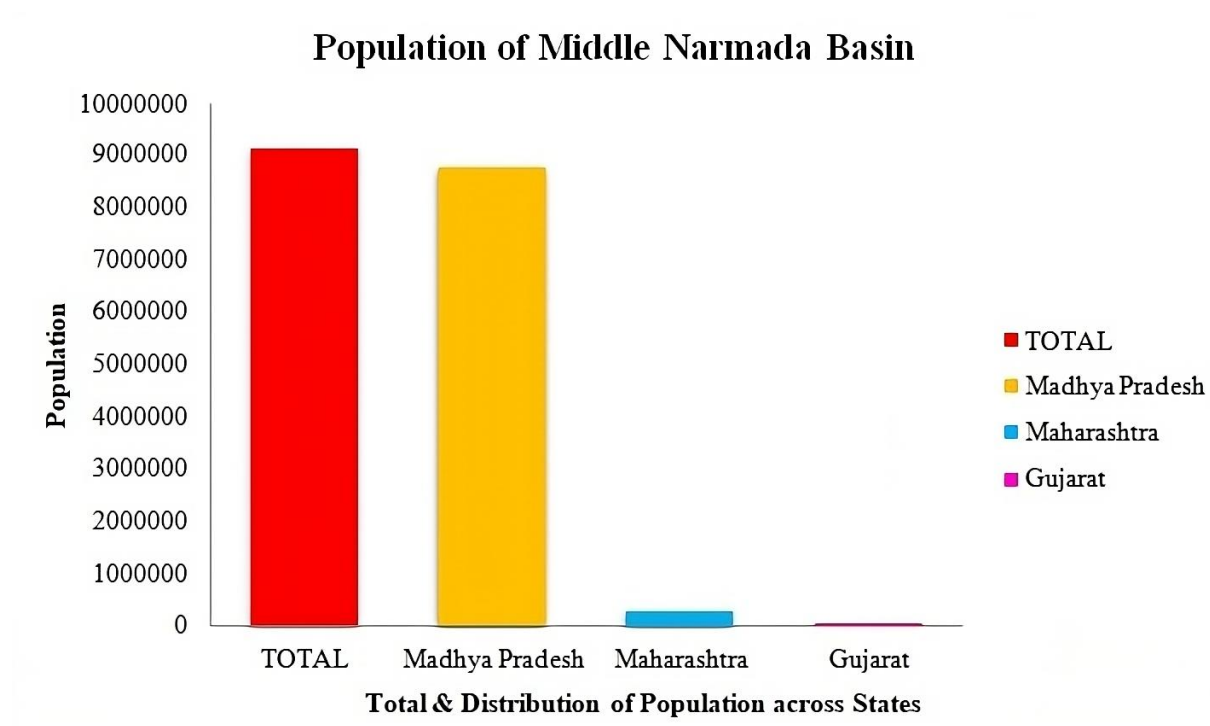


Figure 13. Upper Narmada Basin: Distribution of ST Population
(Source: Census of India, 2011)

In Chhattisgarh, the tribal population is notably smaller, with Kabeerdham and Rajnandgaon having populations of 33,202 and 5,726 respectively (Figure 13). These numbers emphasize the varying degrees of tribal presence in the basin and the necessity of region-specific approaches to social and economic planning for these communities. Overall, the diversity and distribution of the tribal population across the Upper Narmada Basin highlight the importance of integrating their unique cultural and economic needs into regional planning and management efforts.

3.3 Population Distribution: Middle Narmada Basin

The total population of the Middle Narmada Basin is 9,126,886, with the majority residing in Madhya Pradesh, which accounts for 8,775,439 people. Maharashtra contributes a population of 303,178, while Gujarat has a smaller share, with 48,269 individuals. This distribution highlights the dominance of Madhya Pradesh in terms of population density within the basin, making it the primary focus for regional planning, infrastructure development, and resource management (Figure 14). The relatively smaller populations in Maharashtra and Gujarat suggest differing regional dynamics and possibly distinct socio-economic needs across the states within the basin.



**Figure 14. Total and State-wise population of Middle Narmada Basin
(Source: Census of India, 2011)**

In terms of district-wise population distribution across districts in the Middle Narmada Basin, it reveals significant variation as Khargone has the largest population, with 1,834,133 people, making it the most densely populated district in the basin. Dhar follows closely with 1,440,006 residents, while Khandwa and Barwani also show substantial populations of 1,282,756 and

1,103,143, respectively. These districts form the core population hubs within the basin.

In contrast, some districts such as Bhopal (1,457) and Raisen (8,803) contribute relatively smaller populations. Among the districts outside Madhya Pradesh, Nandurbar in Maharashtra has a notable population of 300,444, while Gujarat's Narmada district hosts 29,979 people (Figure 15). These figures indicate that while Madhya Pradesh overwhelmingly dominates the population of the Middle Narmada Basin, with several districts exceeding half a million residents, there are smaller yet important demographic contributions from Maharashtra and Gujarat. This diverse population distribution highlights the need for region-specific development and management strategies across different districts within the basin.

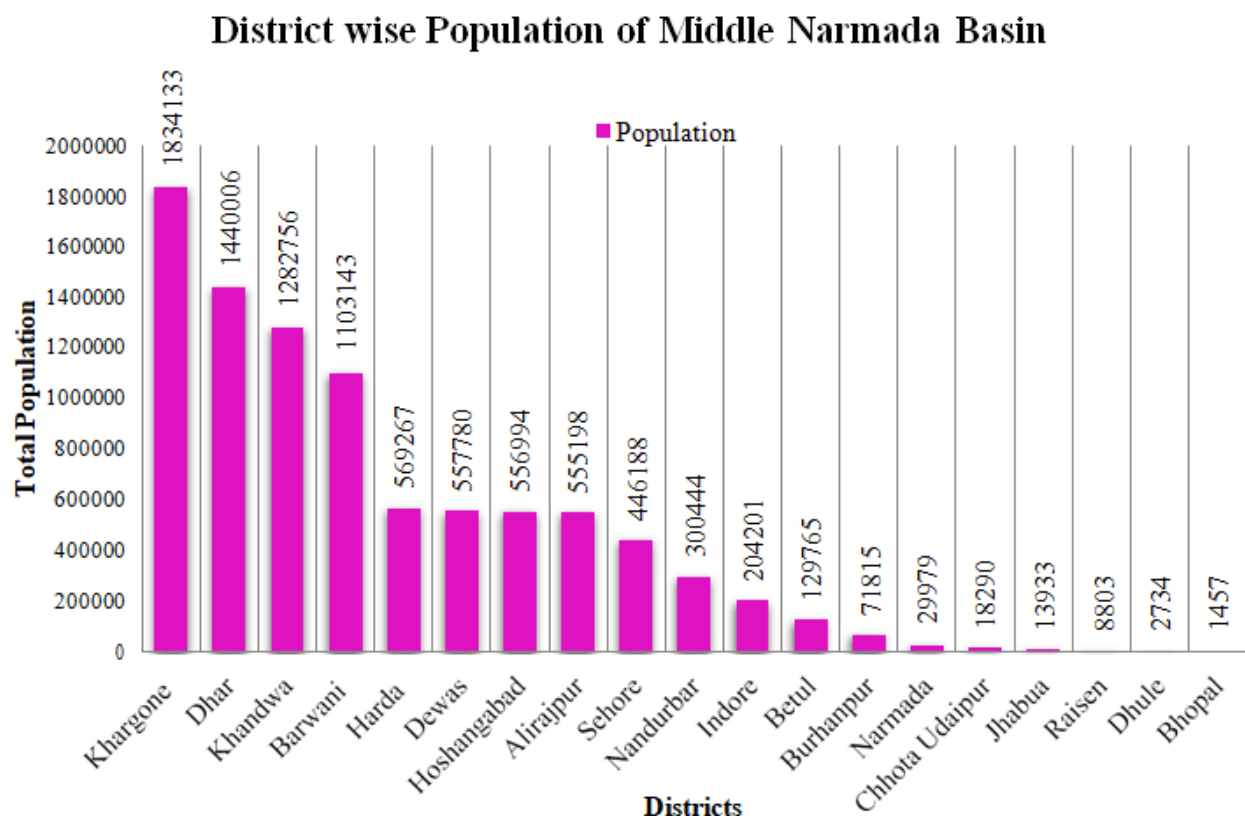


Figure 15. District-wise Population Distribution, Middle Narmada Basin
(Source: Census of India, 2011)

3.4 Social Composition: Middle Narmada Basin

Figure 16 provides a detailed breakdown of the Scheduled Caste (SC) population in the Middle Narmada Basin across various districts, showing both total population and gender distribution. The highest SC population is found in Khargone, where 206,803 individuals reside, with 105,848 males and 100,955 females. Khandwa follows with 155,961 SC individuals, also showing a fairly balanced male (80,357) to female (75,604) ratio. Other significant SC populations are present in Harda (92,758), Hoshangabad (89,424), and Dhar (73,269), indicating the prominence of these communities in these districts.

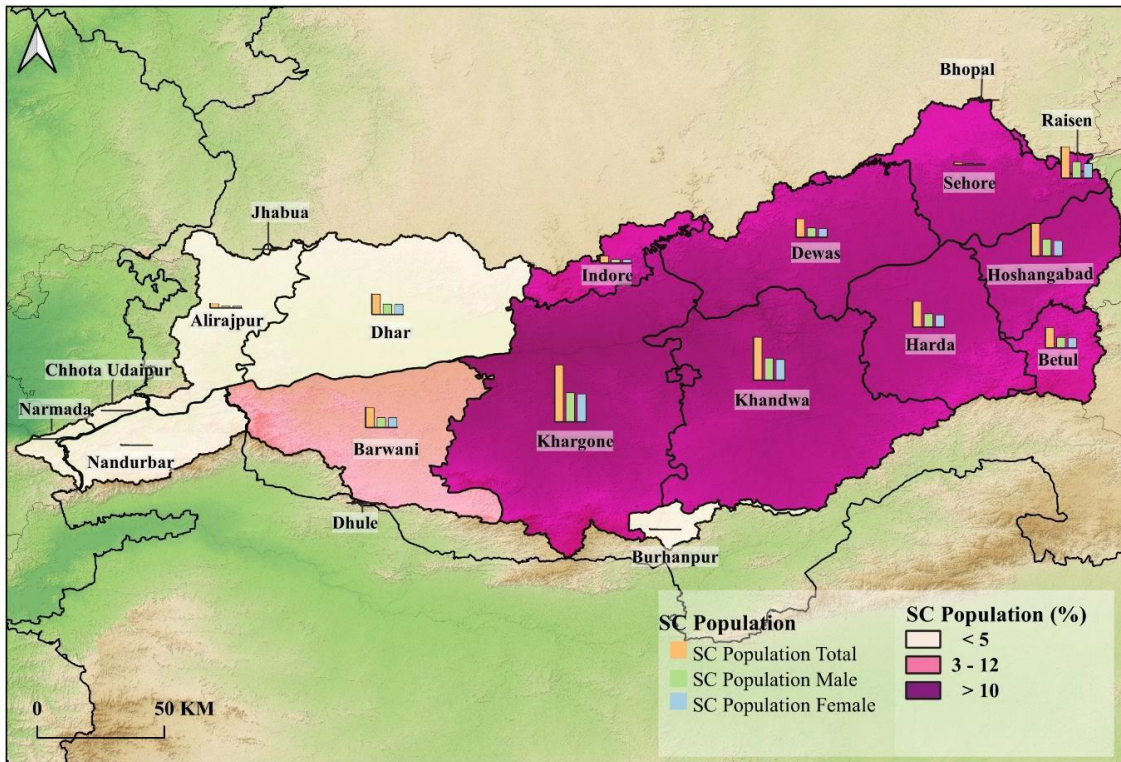


Figure 16. District-wise Distribution of SC Population, Middle Narmada Basin
(Source: Census of India, 2011)

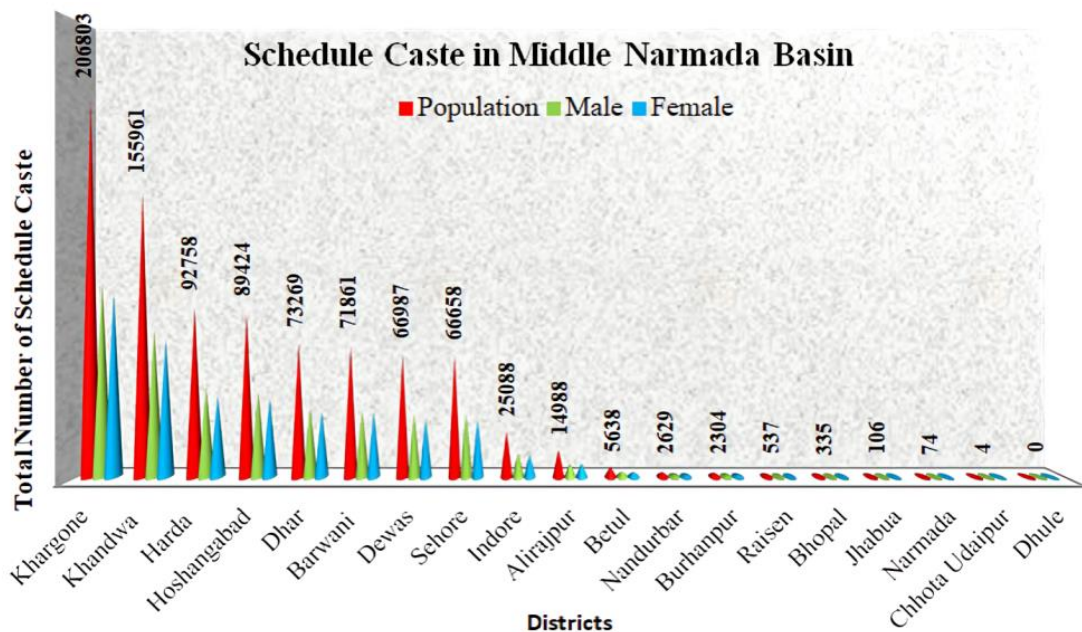


Figure 17. Middle Narmada Basin: Population Distribution of SC Population
(Source: Census of India, 2011)

Districts like Sehore (66,658) and Dewas (66,987) also host notable SC populations, reflecting their demographic importance. On the other end of the spectrum, districts such as Jhabua (106), Bhopal (335), and Raipur (537) have much smaller SC populations. Interestingly, some regions, like Dhule in Maharashtra, report no SC population at all, while districts in Gujarat,

such as Narmada and Chhota Udepur, have minimal SC representation, with only 74 and 4 individuals, respectively. The overall trend suggests that the SC population is concentrated in a few large districts, particularly in Madhya Pradesh, while other areas, especially in Maharashtra and Gujarat, have either very small or non-existent SC communities. This uneven distribution has important implications for policy formulation, resource allocation, and social services within the basin. See Figure 17 for the district-wise percentage of the SC population.

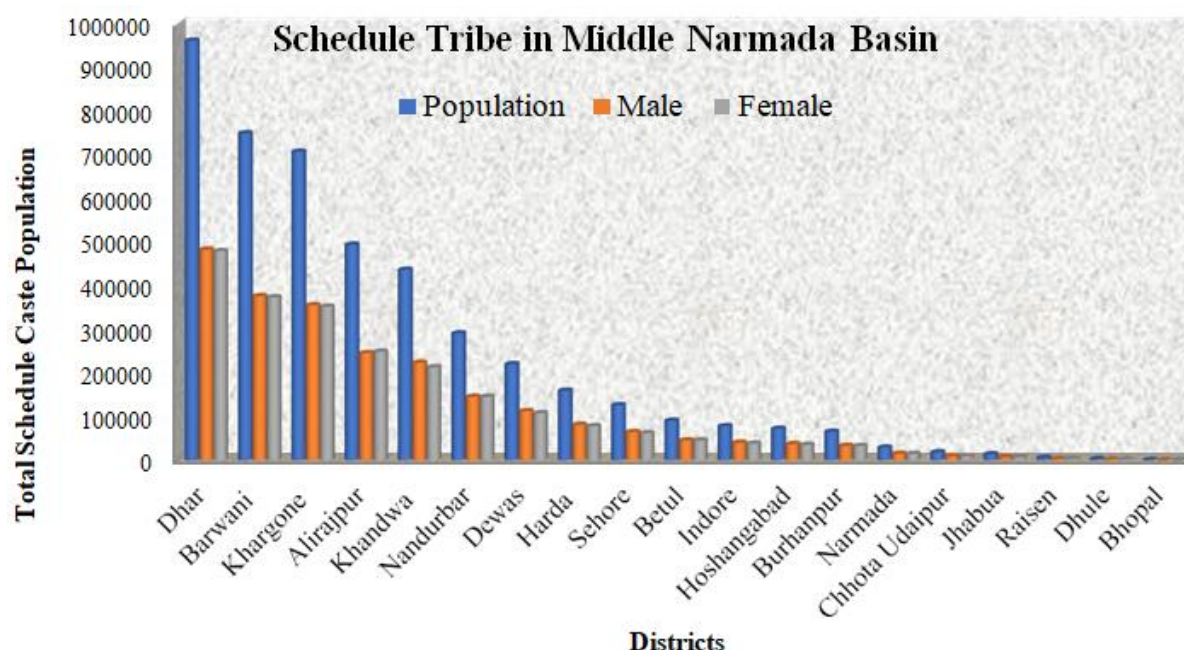


Figure 18. District-wise Distribution of ST Population, Middle Narmada Basin
(Source: Census of India, 2011)

Upper and Middle Narmada Basin both are home to a significant Scheduled Tribe population spread across many districts. It is also important to observe the Scheduled Tribe population in the Middle Narmada Basin. Figure 18 provides an analysis of the Scheduled Tribe (ST) population across different districts in the Middle Narmada Basin, with a breakdown by gender (male and female). The largest ST populations are found in districts like Dhar, with 961,297 individuals (482,262 males and 479,035 females); Barwani, which has 749,003 (375,795 males and 373,208 females); and Khargone, with 706,778 (355,061 males and 351,717 females). These three districts form the core of ST populations in the region, reflecting a significant tribal presence. Alirajpur also has a substantial ST population, with 493,892 individuals (245,285 males and 248,607 females), followed by Khandwa with 436,235 individuals. These districts demonstrate a relatively balanced male-to-female ratio, consistent across the majority of the districts (Figure 19).

In Maharashtra, Nandurbar has the highest ST population, with 290,676 individuals (145,365 males and 145,311 females), showing the prominence of tribal communities in this region as well. Gujarat districts like Narmada (29,051) and Chhota Udepur (18,249) have smaller but still notable ST populations, reflecting the spread of tribal communities beyond Madhya

Pradesh. Smaller districts such as Bhopal (379), Jhabua (13,757), and Raisen (5,348) have much lower ST populations, indicating a lesser tribal presence. Similarly, Dhule in Maharashtra also has a smaller ST population of 2,733 individuals.

3.5 Population Distribution: Lower Narmada

The report presents data from the Census of India 2011 (Table 6), administrative estimates for rural areas for 2020 (Table 8), and the projected estimates of Census 2011 data for 2021 and 2031 (Table 34)

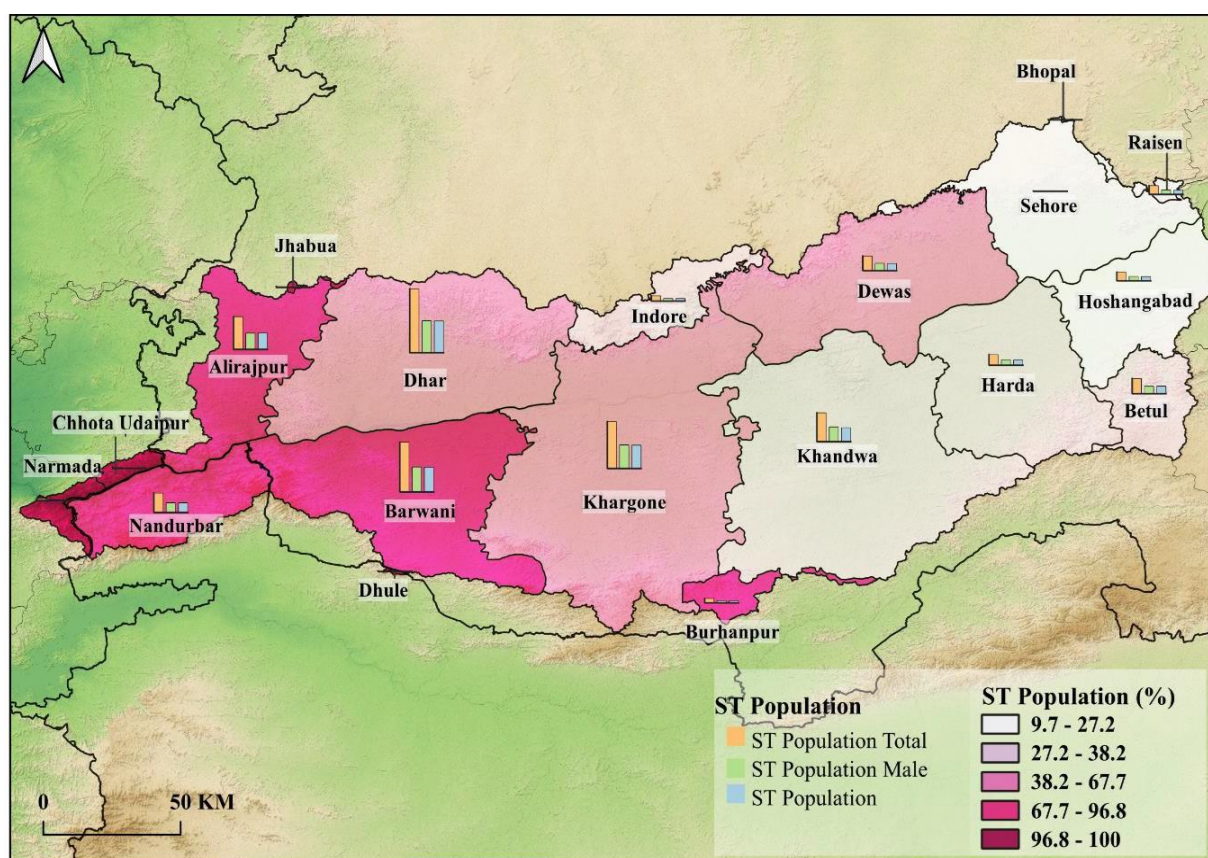


Figure 19. Middle Narmada Basin: Distribution of ST Population
(Source: Census of India, 2011)

Table 6 provides demographic data for the Lower Narmada Basin region across Gujarat, Madhya Pradesh, and Maharashtra using Census of India 2011 data. Gujarat has a basin area of 8,179.7 sq. km and a population of 26.9 lakhs, with a decadal growth rate of 18% and an average population density of 319.3 persons/sq. km. This density is higher than Gujarat's state average of 308 persons/sq. km.

Table 6. Lower Narmada Basin Demography (Census 2001, 2011)

Basin Level				
State/District Names (includes only basin areas)	Land Area (sq. km)	Population (2011) (in Lakhs)	Decadal Growth Rate (%)	Population Density (2011) (persons/sq. km)
Gujarat (state)	1,96,024	604.4	19.2	308
Gujarat (basin area)	8179.7	26.9	18.0	319.3
Bharuch	1631.6	9.0	17.6	550.1
Dohad	123.2	0.3	21.5	218.3
Narmada	2144.3	4.8	12.2	222.3
Panch Mahals	164.1	0.5	17.3	334
Surat	214.5	0.6	24.1	291.1
Vadodara	3902	11.7	15	300.1
Madhya Pradesh				
Alirajpur	1159.6	2.3	20.6	196.5
Maharashtra				
Nandurbar	35	0.1	43.4	291.8

The data presented here are sub-basin-level estimates that include only regions within the spatial definition of the sub-basin (Office of the Registrar General and Census Commissioner, India, 2011) (Asher, Lunt, Matsuura, & Novosad, 2021).

The most recent administrative data that provides population estimates only for rural parts of India, from 2020, was collected as part of Mission Antyodaya. These are not census-type surveys that collect data from households but surveys that are conducted at the Gram Panchayat level. The estimates of the population, therefore, must be considered with these caveats.

The data in Table 7 is only for the rural parts of the lower basin. The rural part of the lower sub-basin in Gujarat has a rural land area of approximately 6,766 sq. km and a population of 19.8 lakhs, with a 12.8% growth rate from 2011 to 2020. The population density stands at 263.2 persons per sq. km. Down to the district level, Bharuch, Dohad, Narmada, Panch Mahals, Surat, and Vadodara show varying land areas, populations, growth rates, and population densities.

Notably, Bharuch has the highest population density at 295.9 persons per sq km (which was true according to the full population of 2011 data as well). The table also provides data for Madhya Pradesh's Alirajpur and Maharashtra's Nandurbar districts, which have significantly smaller land areas and populations than Gujarat's districts.

Table 7. Lower Narmada Basin Rural Demography (Mission Antyodaya, Census 2011)

Basin Level					
	Land Area	Population		Growth Rate (%)	Population Density
State/District Names (includes only basin areas)	(sq. km)	2011 (Lakhs)	2020 (Lakhs)	2011 to 2020	2020 (persons/sq. km)
Gujarat (state)	1,25,584.9	290.8	311.5	11.4	262.2
Gujarat (basin area)	6766.0	17.8	19.8	12.8	263.2
Bharuch	1236.5	3.7	4.0	9.1	295.9
Dohad	97.4	0.2	0.2	28	196.9
Narmada	1711.2	3.3	3.6	7.6	193.4
Panch Mahals	164.1	0.5	0.6	1.5	333
Surat	210.2	0.6	0.7	17.2	277.5
Vadodara	3346.6	9.5	10.8	13.4	282.4
Madhya Pradesh					
Alirajpur	115.8	0.3	0.4	47.8	245.4
Maharashtra					
Nandurbar	35.0	0.1	0.1	14.6	290.8

The data presented here are sub-basin-level estimates that include only regions within the spatial definition of the sub-basin (Ministry of Rural Development, Government of India, 2020) (Office of the Registrar General and Census Commissioner, India, 2011) (Asher, Lunt, Matsuura, & Novosad, 2021).

Table 8. Lower Narmada Basin: Rural and Urban Population Shares (%) (Census 2011)

Basin Level		
State/District Names (includes only basin areas)	Urban	Rural
Gujarat (state average)	42.6	57.4
Gujarat (basin average)	20.9	79.1
Bharuch	49.8	50.2
Dohad	0.0	100.0
Narmada	10.6	89.4
Panch Mahals	0.0	100.0
Surat	0.0	100.0
Vadodara	5.4	94.6
Madhya Pradesh		
Alirajpur	4.8	95.2
Maharashtra		
Nandurbar	0.0	100.0

The data presented here are sub-basin-level estimates that include only regions within the spatial definition of the sub-basin (Office of the Registrar General and Census Commissioner, India, 2011) (Asher, Lunt, Matsuura, & Novosad, 2021).

Table 8 shows the rural and urban population distribution for the Lower Narmada Basin. Gujarat has a significant urban population in the basin (20.9%) and a larger rural population (79.1%). Madhya Pradesh has a relatively small urban population (4.8%) compared to its rural population (95.2%). In Gujarat, Bharuch district has the largest urban population (4,46,683), and Vadodara district has the largest rural population (11,07,661). Dohad, Panch Mahals, Surat, and Nandurbar are entirely rural, as reported in the basin region. The rural population dominates the distribution in most districts, except for Bharuch, where the urban population is significant.

3.6 Social Composition: Lower Narmada Basin

Table 9 describes the lower Narmada basin's population composition, revealing significant variations in social group shares across districts, according to Census 2011 data.

Scheduled Tribes comprise a substantial portion of the population, particularly in Narmada (79.2%), Dohad (73.1%), Alirajpur (89.5%), and Nandurbar (99.1%). In contrast, Scheduled Castes make up a relatively smaller share, ranging from 0% in Nandurbar to 5.3% in Alirajpur. Other Groups, including Other Backward Classes, dominate in Surat (92.4%) and Bharuch (63.2%). Notably, the basin average differs significantly from the state average in Gujarat, with Scheduled Tribes accounting for 65.6% of the basin population versus 14.8% statewide. These disparities highlight the unique demographic characteristics of the Lower Narmada Basin regions.

Table 9. Lower Narmada Basin: Social Group Shares (%) in Total Population Distribution (Census 2011)

Basin Level			
State/District Names (includes only basin areas)	Scheduled Tribes	Scheduled Castes	Other Groups
Gujarat (state average)	14.8	6.74	78.5
Gujarat (basin average)	65.6	2.1	32.3
Bharuch	33	3.8	63.2
Dohad	73.1	2.2	24.8
Narmada	79.2	1.7	19.1
Panch Mahals	40.4	1.4	58.1
Surat	92.4	0.6	7
Vadodara	75.6	2.8	21.6
Madhya Pradesh			
Alirajpur	89.5	5.3	5.2
Maharashtra			
Nandurbar	99.1	0	0.9

The data presented here are sub-basin-level estimates that include only regions within the spatial definition of the sub-basin. Other Groups refer to the rest of the population, including Other Backward Classes (Office of the Registrar General and Census Commissioner, India, 2011) (Asher, Lunt, Matsuura, & Novosad, 2021).

Table 10 presents the social group composition in India based on data from PLFS (2022-23). The table compares the percentage distribution of STs, SCs, OBCs, and Others across two regions: South Eastern Gujarat (NSS Region) and the rest of Gujarat, alongside national averages. Notably, South Eastern Gujarat, which includes the lower Narmada River basin, has a distinct composition with 31.6% STs, 6.9% SCs, 28.8% OBCs, and 31.9% Others. In contrast, the rest of Gujarat has a significantly lower ST population (3.5%) and a higher OBC proportion (49.0%). At the national level, the composition is 14.5% STs, 17.0% SCs, 39.9% OBCs, and 28.0% Others.

Table 10: Social Group Composition (%) (PLFS 2022-23)

Regions (Clusters of Districts)	Clusters of Districts			
	Scheduled Tribes (STs)	Scheduled Castes (SCs)	Other Backward Classes (OBCs)	Others
South Eastern Gujarat (NSS Region)	31.6	6.9	28.8	31.9
Rest of Gujarat	3.5	11.3	49.0	35.7
All-India	14.5	17.0	39.9	28.0

** South Eastern Gujarat NSS Region is a cluster of districts that corresponds broadly to the spatial definition of the lower basin of the Narmada River but includes regions that are technically outside the spatial definition (NSSO, 2023). The small category of "Not reported" is not shown but is included when calculating the shares.*

Comparing Table 9 and Table 10 reveals distinct differences in social group compositions across various regions. Notably, the percentage of Scheduled Tribes (STs) in the Lower Narmada Basin (Table 9) varies significantly from district to district. Table 10 shows a more aggregated view, with South Eastern Gujarat (NSS Region) having 31.6% STs. Both sources show that ST populations are highly concentrated in the lower Narmada basin.

A key difference between the two tables is the availability of data on OBCs. In Table 9, OBCs are included within the broader "Others" category, whereas Table 10 reports OBCs separately.

South Eastern Gujarat (NSS Region) has 28.8% OBCs in Table 8, suggesting that the Others group in Table 10 likely included a large proportion of OBCs.

Differences in data sources (Census 2011 vs. PLFS 2022-23) and regional definitions (Lower Narmada Basin vs. South Eastern Gujarat NSS Region) are difficult to directly compare, but they help clarify the nature of population distribution by explicitly accounting for OBC proportions.

3.7 Population Density

In river basins, population density can play a major role in influencing the hydrological, ecological, and socioeconomic dynamics of the area. Population density can have a major effect on river basins, influencing everything from land use patterns and environmental health to water availability and quality. A higher population density frequently results in a higher need for water for industrial, agricultural, and residential uses.

3.8 Population Density: Upper Narmada Basin

The population density data for districts within the Upper Narmada Basin provides critical insights into the demographic landscape of the region, comprising both Madhya Pradesh and Chhattisgarh (Figure 20). Umaria shows the highest population density at 582 individuals per square kilometre, indicating a significant concentration of inhabitants that may necessitate focused urban planning and resource allocation strategies. Following closely, Jabalpur has a density of 519, reinforcing its status as a major urban centre and highlighting the need for infrastructure improvements and public services in densely populated areas.

Moderate population densities are observed in several districts, such as Katni (219), Betul (214), and Narsimhapur (215), which may suggest a growing demand for basic services and infrastructure as these areas continue to develop. Meanwhile, Rajnandgaon, with a density of 261, also points to a need for balanced planning to cater to both urban and rural populations.

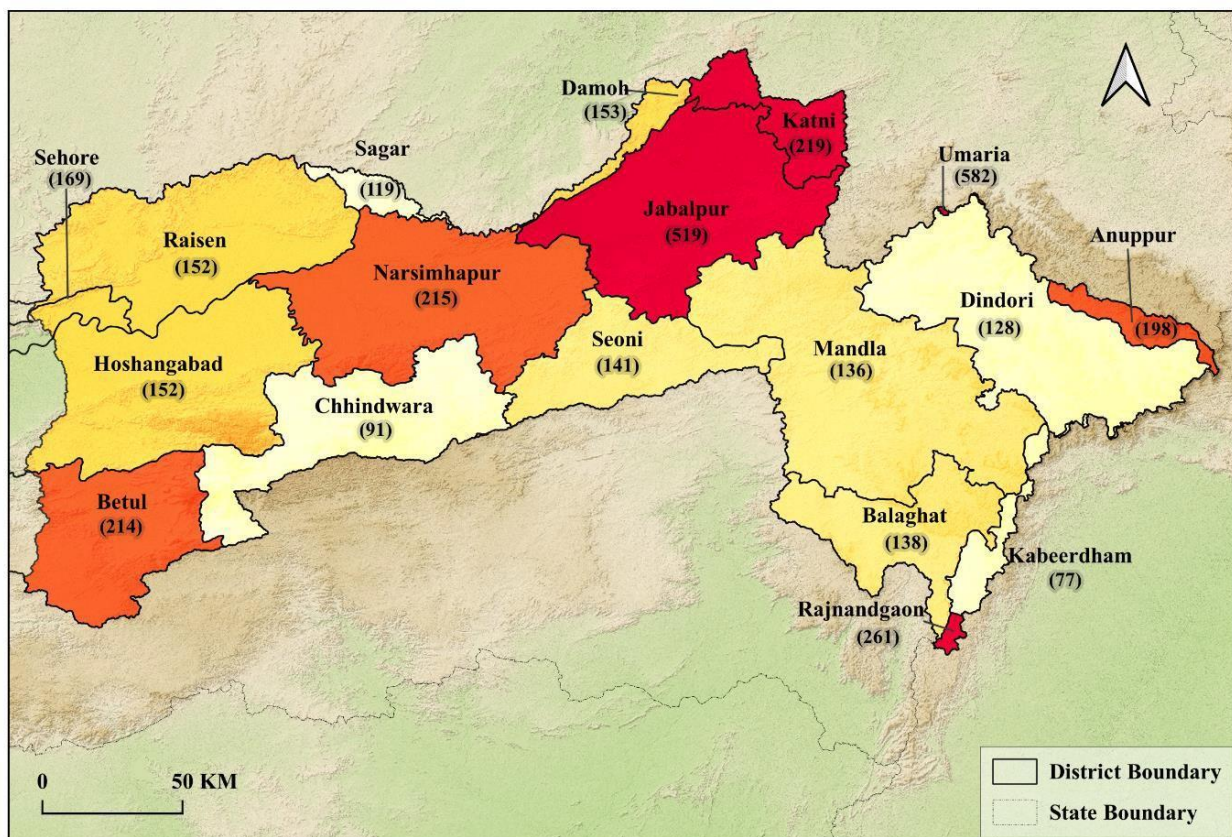


Figure 20. Upper Narmada Basin: Population Density (Source: Census of India, 2011)

In contrast, Kabeerdham stands out as the least densely populated district at 77 individuals per square kilometre, indicating a more dispersed settlement pattern that may present challenges in terms of service delivery and infrastructure development. Seoni (141) and Dindori (128) reflect similarly low densities, while Damoh (153) and Hoshangabad (152) display slightly higher figures, suggesting varying levels of population pressure and potential demands on local resources.

Chhindwara (91) and Mandla (136) further illustrate this variability, underscoring the necessity for tailored policies to address specific local needs. Additionally, Sagar (119) and Harda (not listed but in the dataset) may also require focused attention to ensure adequate service provision in these less densely populated areas.

3.9 Population Density: Middle Narmada Basin

The population density data for the Middle Narmada Basin highlights significant variation across districts in Madhya Pradesh, Gujarat, and Maharashtra, underscoring the diverse demographic characteristics of the region. Jhabua has the highest population density at 525 individuals per square kilometer, reflecting a concentrated population that likely places considerable demand on local resources and services. Similarly, Bhopal, the capital city, exhibits a high density of 465, emphasizing the urban pressure on infrastructure and public amenities. In contrast, the district of Sehore stands out with the lowest population density of just 19 individuals per square kilometer, suggesting a more dispersed settlement pattern and potentially limited demands for urban infrastructure. Other districts such as Alirajpur (261) and Dhar (291) show moderate population densities, indicating the need for balanced resource management strategies to cater to both urban and rural populations (Figure 21). Maharashtra's Nandurbar and Dhule have densities of 188 and 276, respectively, contributing to the regional diversity in population distribution. Meanwhile, districts like Barwani (282) and Kargone (237) within Madhya Pradesh also exhibit notable population densities that may require focused development initiatives. Betul (159) and Khandwa (194) further illustrate the variability in density within the basin.

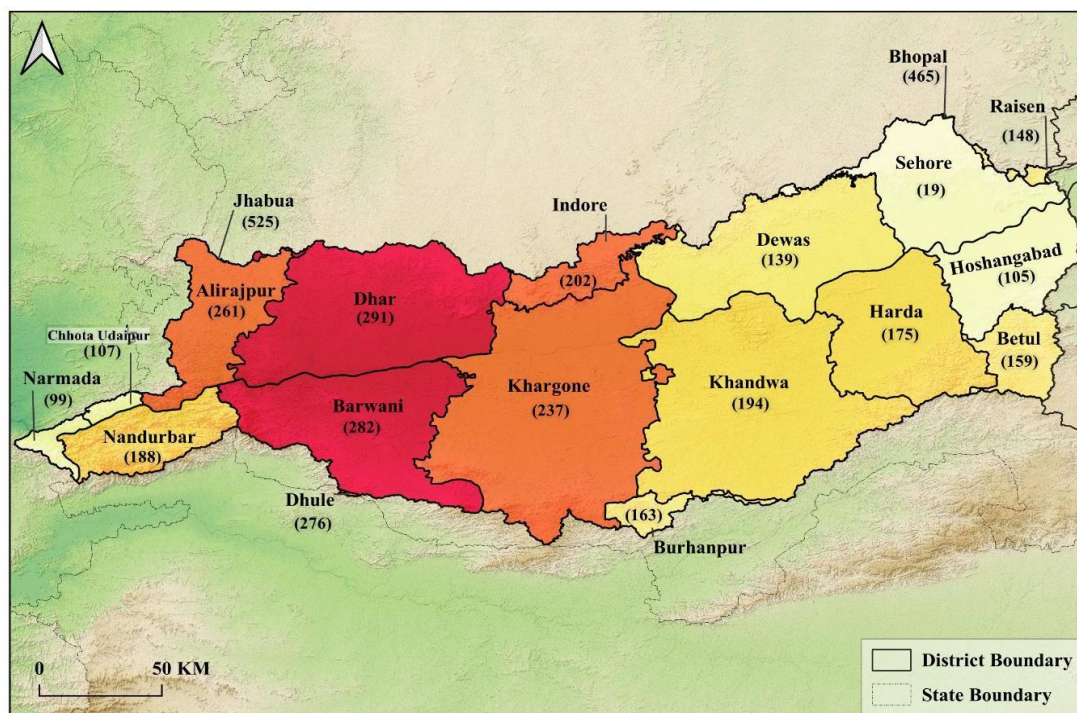


Figure 21. Middle Narmada Basin: Population Density (Source: Census of India, 2011)

Gujarat's Narmada district, with a density of 99, reflects a lower concentration of inhabitants, emphasizing the need for strategic planning to enhance service delivery and infrastructure in less populated areas. Overall, the analysis of population density in the Middle Narmada Basin reveals critical insights that can inform planning and management efforts, ensuring that resources are allocated effectively and sustainably across diverse districts.

3.10 Population Density: Lower Narmada Basin

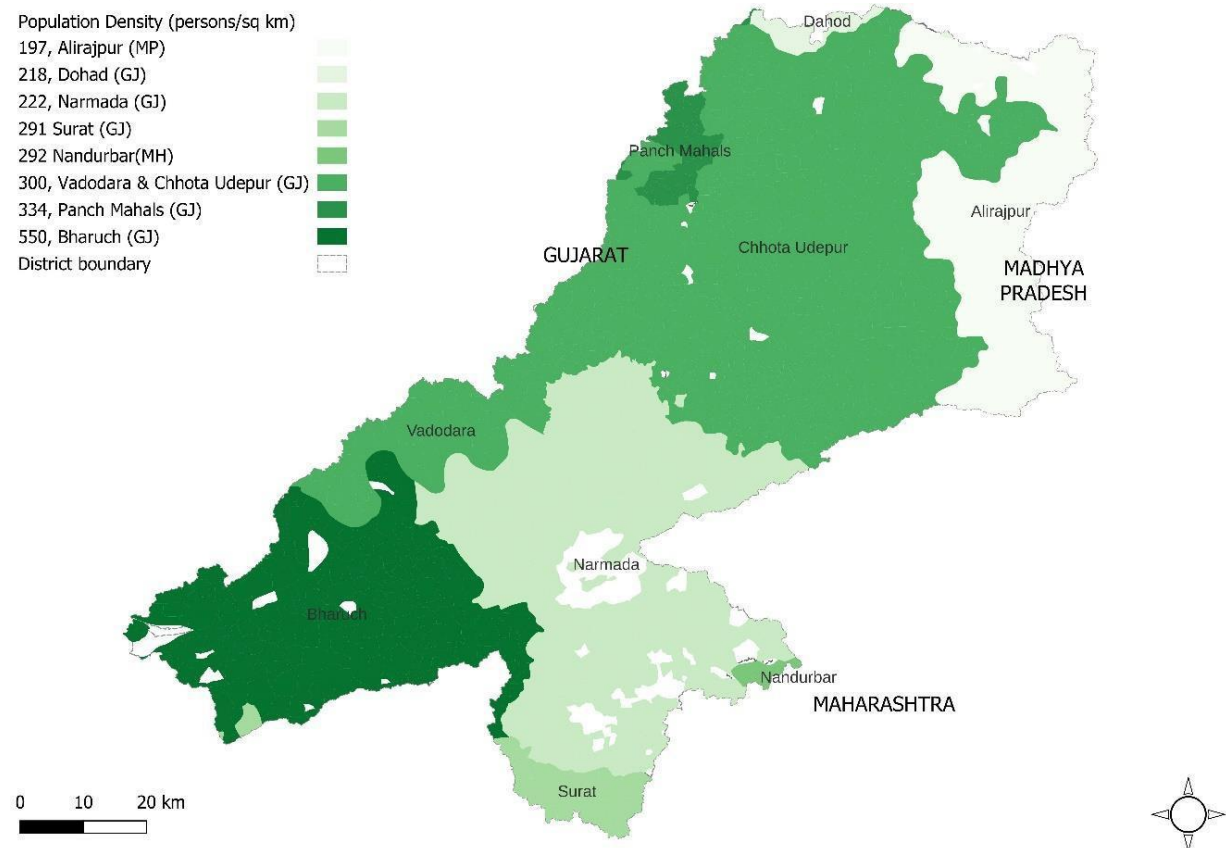


Figure 22. Population density (persons/sq km) of the lower sub-basin of the Narmada River, showing basin regions within districts.

District-wise analysis reveals varying demographics. Bharuch has the highest population density of 550.1 persons/sq km (see Figure 22), exceeding the state average. Vadodara has a significant population of 11.7 lakhs and a moderate population density of 300.1 persons/sq km. Other districts in Gujarat, such as Narmada (222.3 persons/sq km) and Dohad (218.3 persons/sq km), have lower population densities.

In Madhya Pradesh, Alirajpur district has a population of 2.3 lakhs, a high decadal growth rate of 20.6%, and a relatively low population density of 196.5 persons/sq km. Maharashtra's Nandurbar district has a small land area of 35 sq km and a population of 0.1 lakhs.

4. Demographic Characteristics

4.1 Upper Narmada Basin: Age Structure

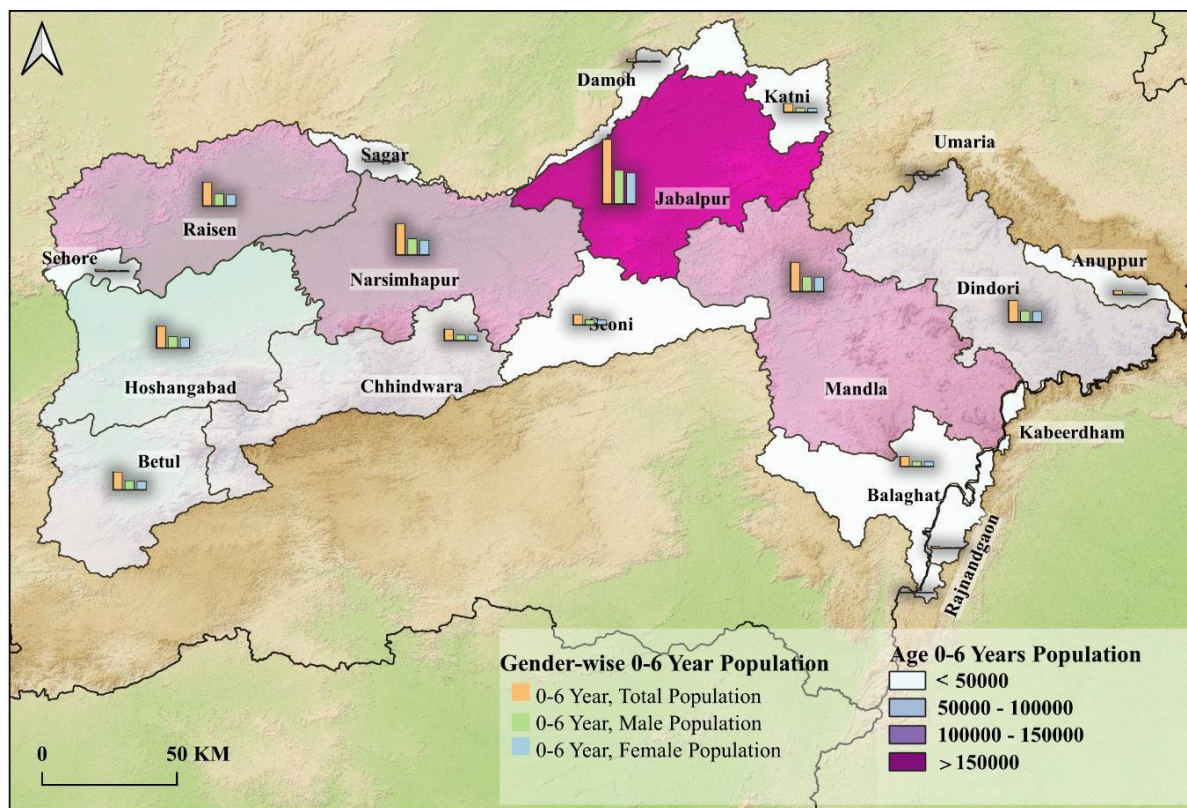


Figure 23 presents the 0-6-year total male and female population across all the districts in the Upper Narmada Basin. Across most districts, there is a noticeable trend of slightly more boys than girls in this age group.

In smaller districts like Umaria, with a child population of 1,251, the male and female numbers are nearly balanced. Similarly, districts like Seoni and Sehore show a slight male majority, with 45,401 children in Seoni and 8,295 in Sehore. Sagar, with a total of 7,475 children, also shows a similar pattern. Rajnandgaon and Kabeergham demonstrate more balanced ratios, with 3,695 and 8,605 children, respectively, and Kabeergham has slightly more girls than boys. Larger districts such as Jabalpur and Raisen show a significant child population, with 291,362 children in Jabalpur and 106,374 in Raisen, both presenting a male majority. Narsimhapur and Mandla also have substantial numbers, with 140,341 and 130,900 children, again showing a higher number of boys. Similarly, districts like Hoshangabad (98,646 children) and Chhindwara (50,538 children) follow the same trend of more boys than girls.

In Betul and Balaghat, with 79,998 and 43,888 children, respectively, the male dominance continues, though the gender gap is less pronounced. Anuppur, a smaller district with 16,237 children, also reflects this pattern.

4.2 Middle Narmada Basin: Age structure

In terms of the Middle Narmada Basin, the district of Jhabua has a relatively small child population of 2,997, with a nearly equal distribution of males (1,504) and females (1,493), indicating a balanced demographic for children in this region. In contrast, Alirajpur has a significantly larger child population of 112,397, where males (56,906) slightly outnumber females (55,491), though the ratio remains fairly balanced. Similarly, Chhota Udepur in Gujarat has a small child population of 4,413, with an almost equal number of males (2,210) and females (2,203).

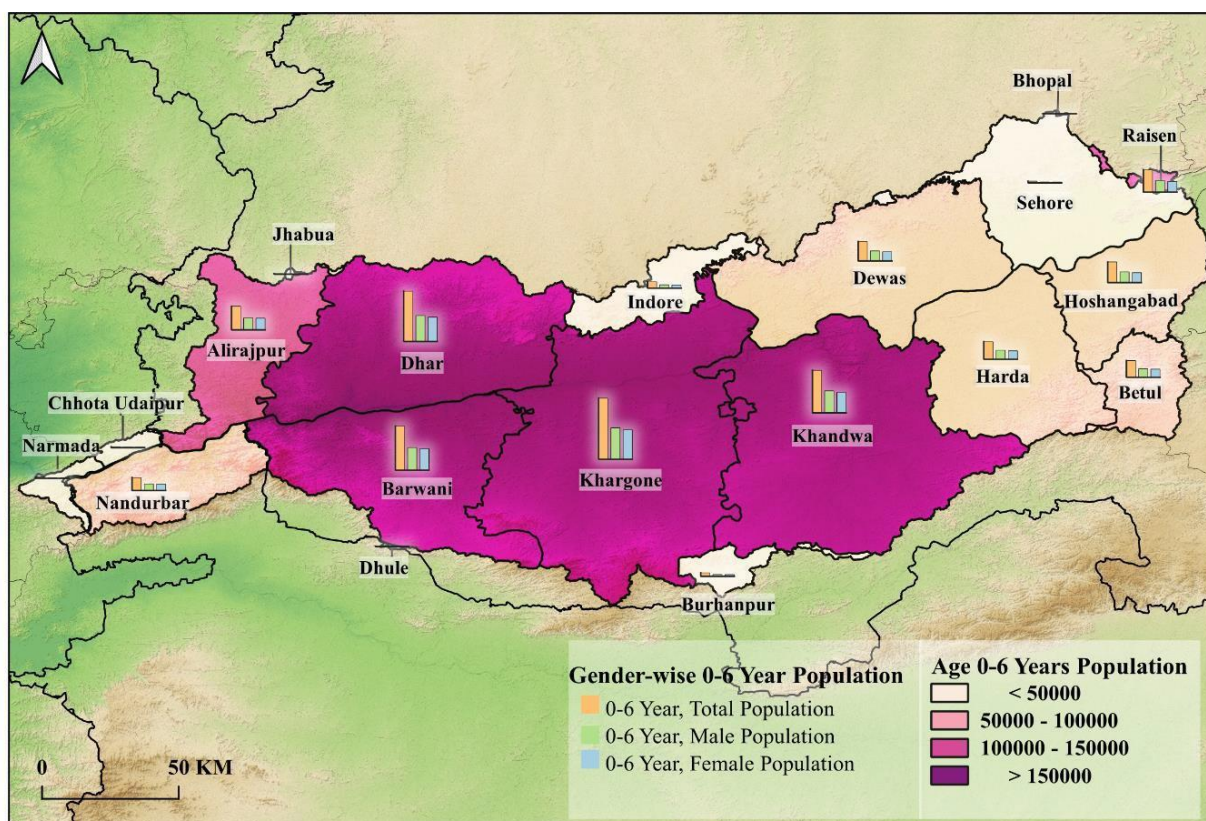


Figure 24 shows that in Nandurbar, Maharashtra, the child population is 61,599, with males (31,177) outnumbering females (30,422). Dhar stands out with a considerably large 0-6 year population of 239,794, where males (123,608) outnumber females (116,186), showing a slightly male-dominant child population. Barwani follows closely with a child population of 210,444, also exhibiting a male majority, with 108,095 males compared to 102,349 females. On the other hand, Dhule has one of the smallest child populations, with only 587 children and a slight male majority (318 males to 269 females). Burhanpur presents a child population of 16,776, with males (8,576) marginally outnumbering females (8,200). Similarly, Narmada in Gujarat has a child population of 5,975, with a slight male majority (3,034 males and 2,941 females). Betul has a child population of 79,998, where males (40,935) surpass females (39,063). Khargone reports one of the highest child populations at 291,403, with a significant

male dominance as 150,279 males outnumber 141,124 females.

Indore has a smaller child population of 30,508, though it also shows a notable male majority, with 15,844 males compared to 14,664 females. Sehore has a relatively small child population of 8,295, with 4,287 males and 4,008 females, maintaining a fairly balanced ratio. Lastly, Bhopal has the smallest child population in the dataset, with only 217 children, where males (112) slightly outnumber females (105).

Overall, the 0-6 year population across the Upper and Middle Narmada Basin shows a general trend of a higher number of boys compared to girls, though some districts display more balanced gender ratios. This data is crucial for planning future services for young children ensuring equitable resource allocation in education, healthcare, and social services across the region.

4.3 Lower Narmada Basin: Age Structure

The population age structure data reveals a relatively youthful population with a gradual decline in proportions across age groups (Figure 25). The population age structure shows a gradual decline in proportions across age groups. The distribution is fairly even between males and females, with slight variations across age ranges. Approximately 29.5% of the population falls within the youth category (0-14 years), while the working-age population (15-59 years) constitutes around 60.6%. The elderly population (60 and above) accounts for 9.9%.

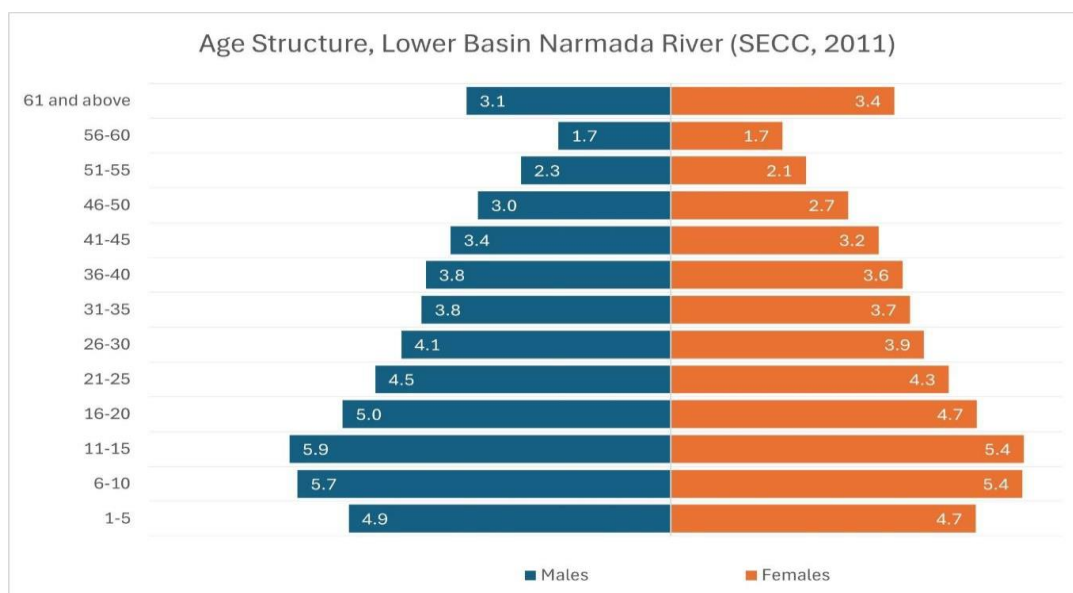


Figure SEQ Figure * ARABIC 25. Age structure of population in Lower Narmada

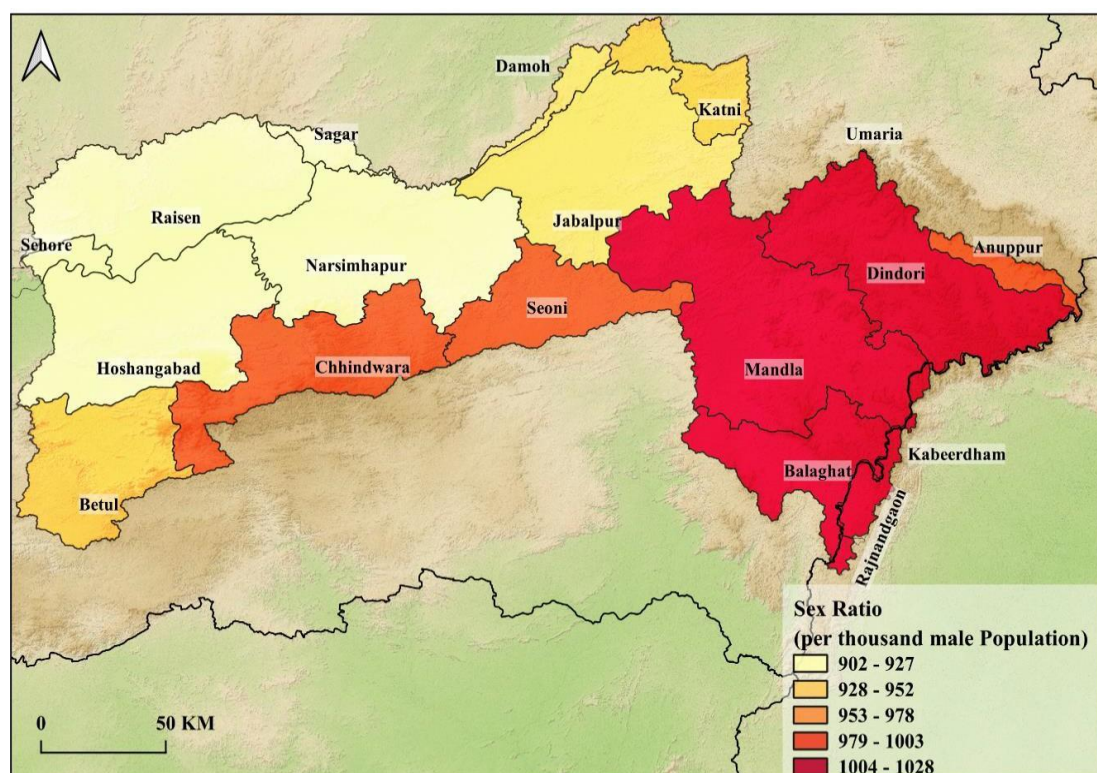
**The statistic at the end of each bar represents a percentage of the total population in the lower basin region (Ministry of Rural Development, Government of India, 2011) (Asher, Lunt, Matsuura, & Novosad)*

These demographic trends have significant implications for policy and resource allocation. Education and healthcare services should prioritize the large youth population while the working-age population drives economic growth. Meanwhile, elderly care and pension systems must prepare for the growing 60+ age group. The dependency ratio⁴, calculated as the sum of youth and elderly populations divided by the working-age population, is approximately 64.7%. This means about 64.7% of the working-age population supports the dependent population, comprising 48.7% youth dependency and 16.3% elderly dependency.

4.4 Upper Narmada Basin: Status of Sex Ratio

The sex ratio across districts within the Upper Narmada Basin varies significantly, revealing notable demographic patterns. Balaghat records the highest sex ratio at 1,028, indicating a larger female population compared to males, followed closely by Rajnandgaon (1,020) and Kabeerdham (1,014), where females also outnumber males. Other districts like Mandla (1,009), Dindori (1,003), and Umaria (1,013) show a nearly balanced population with a slight female majority, highlighting a favourable demographic parity in these regions.

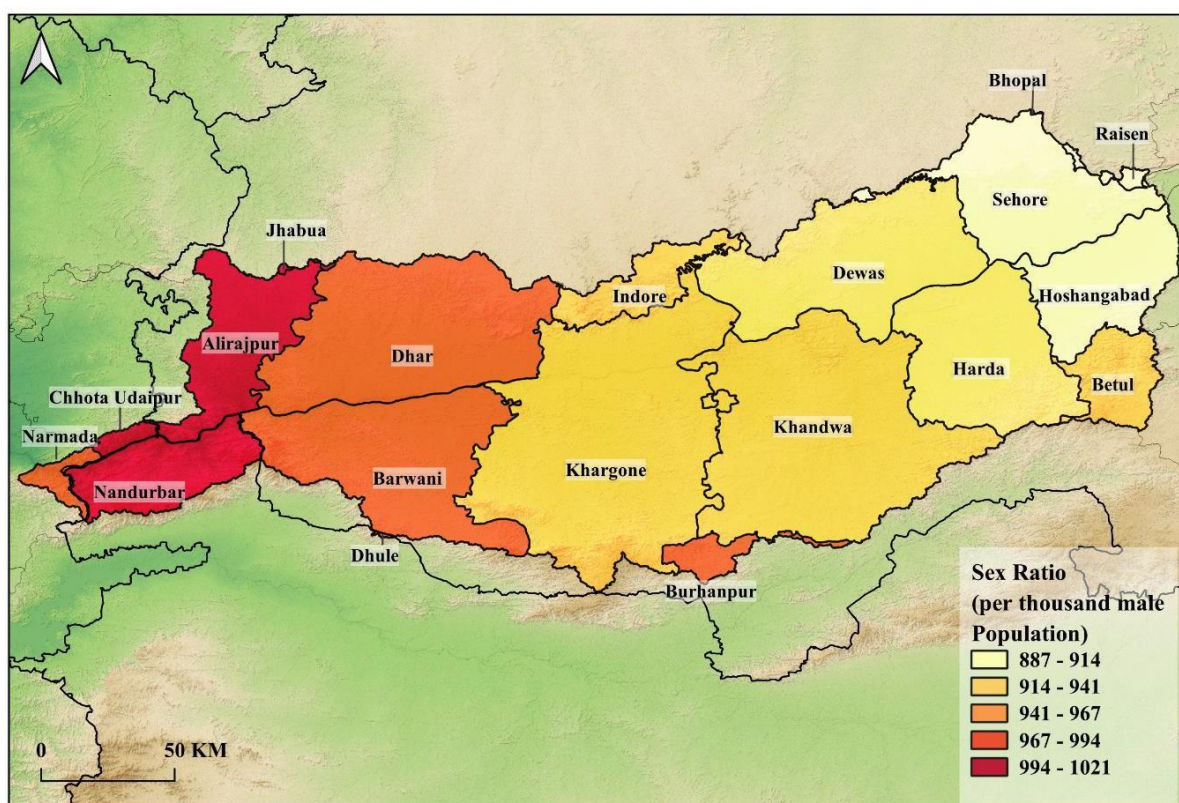
On the other hand, districts like Anuppur (994), Chhindwara (990), and Jabalpur (928) exhibit a sex ratio of just below 1,000, indicating a slightly higher male population. Districts such as Sehore (902) and Sagar (908) present the lowest sex ratios, where the female population is significantly smaller compared to males. Similarly, Betul (966) and Katni (956) reflect a male-dominant demographic (Figure 26).



4.5 Middle Narmada Basin: Status of Sex Ratio

Figure 27 uncovers the sex ratio across districts in the Middle Narmada Basin and shows notable variations. Jhabua leads with the highest sex ratio of 1,021, indicating a female-dominant population. Similarly, Alirajpur records a sex ratio of 1,009, reflecting a balanced or slightly female-majority population. Districts such as Chhota Udepur and Nandurbar, both with a sex ratio of 998, show near-equal numbers of males and females. Several districts maintain relatively high sex ratios but with a slight male dominance. These include Dhar and Barwani (both 980), Dhule (978), Burhanpur (976), and Narmada (975), reflecting a balanced demographic with a marginal male majority. However, districts like Betul (966), Khargone (965), and Indore (948) show a more significant male-dominated population. In districts like Khandwa (942), Dewas (938), and Harda (935), the male population is noticeably higher than the female population.

The sex ratio declines further in districts such as Hoshangabad (911), Raisen (908), and Sehore (902), where there is a substantial male majority. The lowest sex ratio is observed in Bhopal, at 887, indicating a pronounced male predominance in the population.



4.6 Lower Narmada Basin: Sex Ratio

This part of the report presents data on the sex ratio and child sex ratio from two sources. Table 11 is based on NFHS (2015-16 and 2019-20), and Table 12 uses the Census of India 2011. NFHS data provides more recent data at the district and state levels, while the Census of India data is older and provides a more granular assessment of the basin.

Table 11 presents data on sex ratio and child sex ratio for the Gujarat and Madhya Pradesh districts, based on the NFHS 2015-16 and 2019-20. Gujarat's overall sex ratio improved from 950 to 965 females per 1,000 males between 2015-16 and 2019-20, while the child sex ratio (girls per 1,000 boys born in the last five years) increased from 906 to 955. District-level variations are notable. Bharuch and Dohad showed favourable sex ratios, with Bharuch's child sex ratio significantly improving from 1037 to 1112. Narmada and Surat districts exhibited lower sex ratios, although Surat's child sex ratio saw a substantial increase from 684 to 890. Vadodara's 2019-20 data had a remarkably high child-sex ratio of 1186. In Madhya Pradesh, Alirajpur maintained a relatively high sex ratio and child sex ratio across both survey periods.

**Table 11. Sex Ratio of Population and Child Sex Ratio (born in last five years)
(NFHS, 2015-16, 2019-20)**

State/District Names	District Level			
	Sex Ratio 2015-16	Sex Ratio 2019-20	Child Sex Ratio 2015-16	Child Sex Ratio 2019-20
Gujarat (State)	950	965	906	955
Bharuch	973	960	1037	1112
Dohad	1104	1047	1036	1013
Narmada	997	1006	851	853
Panch Mahals		969	NA	879
Surat	881	912	684	890
Vadodara		953		1186
Madhya Pradesh (State)	948	970	927	956
Alirajpur	1,023	1,008	950	942

Note: Sex ratio is the number of females for every 1,000 males. Child sex ratio is the ratio of girls for every 1,000 boys born in the last five years (IIPS, 2022).

Table 12 According to the 2011 Census data, the sex ratio and child sex ratio (0-6 years) vary across districts within the Narmada River basin. At the state level, Gujarat's average sex ratio is 918 females per 1000 males, with a child sex ratio of 890. However, the basin-specific average reveals a more favourable ratio, with 961.3 females per 1000 males and a child sex ratio of 931.5. District-wise analysis reveals notable variations. Surat and Alirajpur districts exhibit high sex ratios, with 993 and 1020 females per 1000 males, respectively. Similarly, their child-sex ratios are among the highest, at 987 and 988. Other districts, such as Dohad, Narmada, and Vadodara, also display relatively balanced sex ratios. In contrast, the Panch Mahals district reports a lower sex ratio of 943 and a child sex ratio of 886. Bharuch and Nandurbar districts also show relatively lower child sex ratios, at 911 and 908, respectively. These statistics highlight regional disparities in sex ratios within the Narmada River basin, emphasizing the need for targeted interventions to address gender imbalance.

The two tables (Table 11 and Table 12) provide valuable insights into the sex ratio and child sex ratio across districts in Gujarat, Madhya Pradesh, and Maharashtra. Table 5, based on

National Family Health Survey (NFHS) data (2015-16 and 2019-20), reveals improvements in sex ratios and child sex ratios over time. Table 12 derived from Census 2011 data, offers a historical benchmark for sex ratios and child sex ratios (0-6 years) at the basin level.

A notable analytical point emerges when examining temporal changes in child-sex ratios. Unlike overall sex ratios, which are relatively slow to change, child sex ratios demonstrate greater sensitivity to shifts in societal attitudes, policies, and economic conditions. For instance, Gujarat's state-level child sex ratio improved significantly from 906 (2015-16) to 955 (2019-20) in Table 11. Meanwhile, Table 12 shows a lower child-sex ratio of 890 in 2011, underscoring the progress made in the subsequent years. The Census data also highlights varying basin-level child sex ratios, such as Bharuch's 911 and Surat's 987, which can inform targeted interventions.

Table 12. Sex Ratio of Population and Sex Ratio at 0-6 years (Census 2011)

State/District Names (includes only basin areas)	Basin Level	
	Sex Ratio	Child Sex Ratio (0-6 years)
Gujarat (state average)	918	890
Gujarat (basin average)	961.3	931.5
Bharuch	924	911
Dohad	995	921
Narmada	949	935
Panch Mahals	943	886
Surat	993	987
Vadodara	964	949
Madhya Pradesh		
Alirajpur	1020	988
Maharashtra		
Nandurbar	956	908

The data presented here are sub-basin-level estimates that include only regions within the spatial definition of the sub-basin (Office of the Registrar General and Census Commissioner, India, 2011) (Asher, Lunt, Matsuura, & Novosad, 2021).

This comparison highlights the child-sex ratio's responsiveness to change, making it a valuable indicator for tracking progress in addressing gender disparities. By combining NFHS and Census data, policymakers can assess long-term trends, identify areas of improvement, and refine strategies to promote gender equality.

5. Socio-economic Characteristics

Socio-economic characteristics denote the social and economic aspects of individuals and groups within a society. These characteristics involve variables including income level, education, occupation, employment status, household size, and access to resources such as healthcare and housing. They assist in identifying the quality of life, living standard, and social as well as economic condition of individuals. For example, the educational level can affect career prospects, whereas income determines access to good healthcare, housing, and other important services. These elements, like educational status, employment scenario, and economic conditions are essential for evaluating development, inequality, and the general welfare of communities.

5.1 Health Status: Upper and Middle Narmada Districts

Table 13 presents data on maternal and infant deaths reported across various districts during the period from April 2018 to March 2019.

Table 13. Maternal Deaths and Infant Mortality Rate
(Source: Maternal and Child Health Programme, MP, 2018-19)

<i>District</i>	<i>Probable Maternal Deaths (Annual)</i>	<i>No. of Maternal Deaths</i>	<i>% MD reported</i>	<i>Probable Infant Deaths (Annual)</i>	<i>No. of Infant Deaths</i>	<i>% Infant Deaths reported</i>
ALIRAJPUR	32	31	98	1235	385	31
ANUPPUR	70	33	47	1375	363	26
BALAGHAT	103	31	30	2474	499	20
BARWANI	85	55	65	3403	1151	34
BETUL	89	26	29	2483	752	30
BHOPAL	116	177	153	2539	1818	72
BURHANPUR	33	22	68	1331	505	38
CHHINDWARA	127	48	38	3573	924	26
DAMOH	131	34	26	2885	323	11
DEWAS	66	21	32	2110	446	21
DHAR	102	25	24	3366	954	28
DINDORI	58	13	22	1560	390	25
HARDA	35	7	20	1005	285	28
HOSHANGABAD	65	20	31	1759	370	21
INDORE	129	89	69	2905	1048	36
JABALPUR	143	131	92	2785	1006	36
JHABUA	48	19	40	1856	529	29
KATNI	97	51	52	2569	880	34
KHANDWA	57	21	37	2331	567	24
KHARGONE	91	58	64	3114	920	30
MANDLA	73	24	33	2017	464	23
NARSINGHPUR	78	109	139	1970	441	22
RAISEN	89	40	45	2790	416	15
SAGAR	238	64	27	5106	551	11
SEHORE	87	8	9	2669	585	22
SEONI	99	38	39	2688	490	18
UMARIA	80	13	16	1329	547	41

The number of maternal deaths (MD) and infant deaths (ID), along with their respective percentages (% MD and % ID), are highlighted for each district. Bhopal reported the highest number of maternal deaths (177) with a significant percentage of 153%, and also the highest number of infant deaths (1,818) with 72%. This indicates a concerning situation in terms of both maternal and infant mortality. Jabalpur and Indore follow with relatively high numbers of maternal deaths (131 and 89, respectively) and infant deaths (1,006 and 1,048, respectively), each having a high percentage of infant deaths, around 36%. Districts like Barwani, Khargone, and Katni also have elevated numbers of both maternal and infant deaths, with Barwani showing 55 maternal deaths and 1,151 infant deaths, accounting for 34% of the infant mortality rate in the district. On the lower end, districts like Harda, Umaria, and Sehora have significantly fewer maternal and infant deaths, though Harda and Umaria still report moderately high percentages of infant deaths (28% and 41%, respectively). In summary, Bhopal, Jabalpur, and Indore have the highest reported maternal and infant deaths, reflecting potential healthcare challenges in those districts. Other districts like Barwani, Khargone, and Katni also show higher mortality rates, while some districts such as Harda and Sehora have fewer deaths but still noteworthy percentages. It is important to mention that the data shown in Table 13 is not limited to only basin boundaries but accounts for the whole district's geographical area.

5.2 Health Status: Lower Narmada Basin

Table 14 provides vital statistics on birth, death, and infant mortality rates in Gujarat and Madhya Pradesh based on the 2020 Sample Registration System (SRS) data. Gujarat's state average birth rate stands at 19.3 per 1,000, with a death rate of 5.6 per 1,000 and an infant mortality rate of 23 per 1,000 live births.

Table 14. Birth, death and infant mortality rates (SRS 2020)

Cluster of Districts Level			
State/NSS Divisions	Birth Rate	Death Rate	Infant Mortality
Gujarat (state average)	19.3	5.6	23
South Eastern (includes lower sub-basin regions)	21.0	5.6	22
Plains Northern	18.3	5.7	24
Dry Areas	20.3	5.0	24
Saurashtra	17.4	5.5	21
Madhya Pradesh (state average)	24.1	6.5	43
Malwa (includes lower sub-basin regions)	24.0	6.0	41

The data presented here are at the National Sample Survey Division level, which comprises clusters of districts. The birth rate is the number of live births during the year divided by the mid-year population and multiplied by 1,000. The death rate is the number of deaths during the year divided by the mid-year population and multiplied by 1,000. Infant mortality is the number of infant deaths during the year divided by the number of live births during the year

multiplied by 1,000 (Office of the Registrar General and Census Commissioner (India), 2022). Breaking it down further, we see varying rates across different regions within Gujarat. For these statistics, there is no representative data at the district or basin level, and we are relying on regional-level information, which includes districts as well. For instance, South Eastern Gujarat⁵ (which is the basin region) has a higher birth rate of 21 per 1,000, while Saurashtra has the lowest birth rate at 17.4 per 1,000. In contrast, Madhya Pradesh has a significantly higher birth rate of 24.1 per 1,000 and an infant mortality rate of 43 per 1,000 live births. The data is aggregated at the National Sample Survey Division level, which comprises clusters of districts.

Table 15 presents child health indicators for districts in Gujarat and Madhya Pradesh based on NFHS data from 2015-16 and 2019-20. The table reports percentages of children under five years old who are stunted (height-for-age), wasted (weight-for-height), and underweight (weight-for-age). This data is presented at the district level. Gujarat's statewide averages show minimal changes, with stunting rates remaining around 39%, wasting rates decreasing slightly from 26.4% to 25.1%, and underweight rates increasing from 39.3% to 39.7%. District-level data reveals varying trends: Bharuch and Narmada show minimal changes, while Dohad's stunting rate worsened from 44.4% to 55.3%. Surat's stunting rate increased from 30% to 36.1%. Alirajpur district in Madhya Pradesh, however, saw a notable increase in stunting rates from 34.6% to 48.6%. Some districts (Panch Mahals and Vadodara) have missing data for 2015-16.

Table 15. Child Health Indicators (NFHS 2015-16, 2019-20)

State/District	District Level					
	Stunting (%)		Wasting (%)		Underweight (%)	
	2015-16	2019-20	2015-16	2019-20	2015-16	2019-20
Gujarat (State)	38.5	39.0	26.4	25.1	39.3	39.7
Bharuch	41.5	40.9	29.4	24.5	44.2	45.5
Dohad	44.4	55.3	24.9	27.8	50.8	53
Narmada	47.4	47.2	35.8	23	53.6	52.8
Panch Mahals	NA	47.1	NA	35.7	NA	51.9
Surat	30	36.1	26.2	26	36.1	32.5
Vadodara	NA	42.3	NA	20.1	NA	39.9
Madhya Pradesh	42.0	35.7	25.8	19.0	42.8	33.0
Alirajpur	34.6	48.6	15.4	32.9	31.6	52.4

Notes: Stunting: Children under five years who are stunted (height-for-age) (%); Wasting: Children under five years who are wasted (weight-for-height) (%); Underweight: Children under five years who are underweight (weight-for-age)18 (%). The data here is at the district level, which includes regions technically outside the spatial definition of the basin areas (IIPS,

⁵ The districts in South Eastern Gujarat NSS Region include Panch Mahals, Dohad, Vadodara, Narmada, Bharuch, The Dangs, Navsari, Valsad, Surat, Tapi, Chhota Udepur, and Mahisagar.

2022). NA = data not available

5.3 Educational Status

Education is key to the betterment of people and their regions. Educated and literate individuals can play a significant role in the conservation of river basins. However, it is important to note that tribal people, regardless of their educational status, have historically shown a deep concern for nature due to their long-standing relationship with it.

5.4 Upper Narmada Basin: Literacy Rate

Figure 28 presents literacy rates for various districts across Madhya Pradesh and Chhattisgarh, revealing significant variation in literacy levels within the Upper Narmada Basin region. The literacy rate is a key indicator of human development and has implications for economic growth, social progress, and planning initiatives in the basin. Jabalpur, with the highest literacy rate of 71.51%, stands out as the most literate district, indicating a relatively well-developed educational infrastructure and better access to literacy programs. It is followed by Narsimhapur (65.76%) and Betul (63.77%), both demonstrating solid progress in educational attainment. These districts may serve as benchmarks for literacy improvement in the region (Table 16).

In contrast, districts such as Umaria (43.66%) and Kabeerdham (48.37%) have significantly lower literacy rates, which suggest barriers to education, potentially including geographical isolation, lack of infrastructure, or socio-economic challenges. These areas may require targeted interventions, such as enhanced schooling facilities and adult education programs, to address the literacy gap.

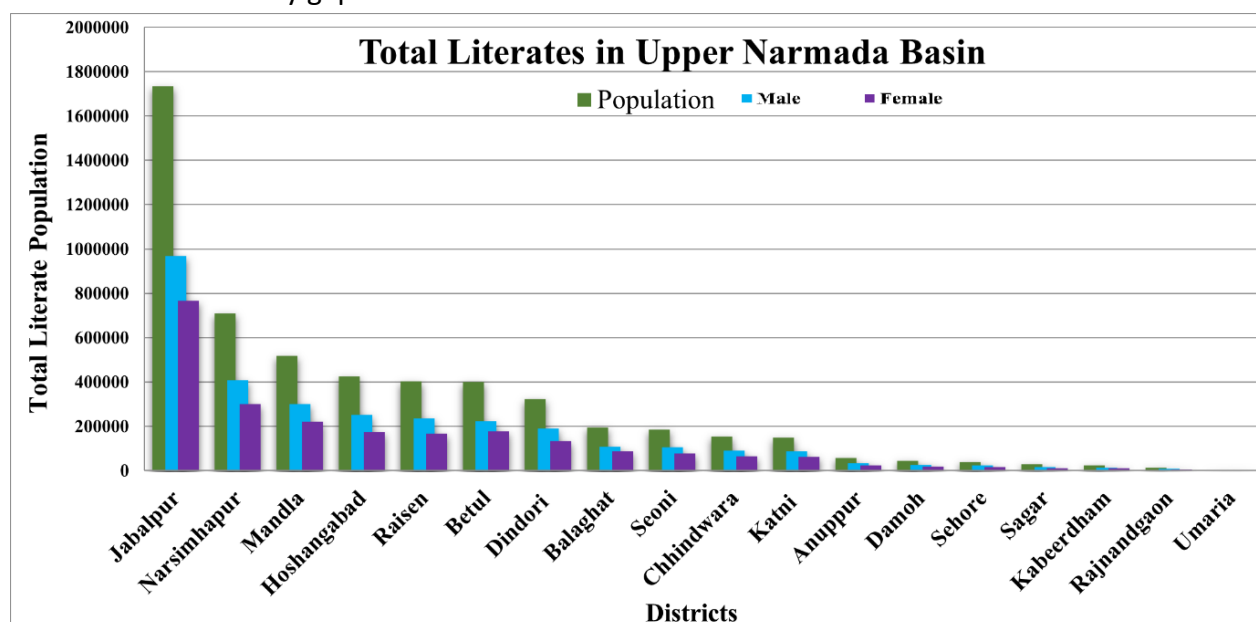


Figure 28. Upper Narmada Basin: Literate Population (Source: Census of India)

Mid-tier districts like Mandla (56.70%), Seoni (57.80%), and Damoh (61.31%) indicate moderate literacy levels, showing potential for further improvement but still lagging behind the top-performing areas. The data suggests that while some districts are performing well,

there remains a substantial need to focus on literacy improvement, particularly in the more rural and underdeveloped districts of the Upper Narmada Basin.

The report now relies on NSS regions to get a more updated picture of education. These NSS regions include portions of districts that are not part of the basin, and even some districts that are not within the basin are included in the analysis. In the case of the Upper Narmada Basin, there are eighteen districts (Table 1) that fall under five different NSS regions. Of these, one region—the Mahanadi Basin—falls within Chhattisgarh, while the remaining four regions—Vindhya Region, Central Region, South Region, and South West Region—are part of Madhya Pradesh. On the other hand, the Middle Narmada Basin falls under five regions. Of these, one region—the Inland Northern Region—lies in Maharashtra, one region—the South Eastern Region—falls in Gujarat, and three regions—the Central Region, Malwa Region, and South West Region—are part of Madhya Pradesh.

Table 16. Upper Narmada Basin: District-wise Literacy Rate
(Source: Calculated from Census of India, 2011)

Sr. No.	Districts	Literacy Rate	Male Literacy Rate	Female Literacy Rate
Chhattisgarh				
1	Kabeerdham	48.37	56.78	40.08
2	Rajnandgaon	54.68	66.00	43.59
Madhya Pradesh				
3	Anuppur	52.49	61.36	43.57
4	Balaghat	61.30	68.78	54.02
5	Betul	63.77	69.94	57.38
6	Chhindwara	48.53	55.91	41.08
7	Damoh	61.31	68.89	53.18
8	Dindori	53.58	63.13	44.06
9	Hoshangabad	60.60	68.46	51.97
10	Jabalpur	71.51	76.89	65.71
11	Katni	59.07	68.07	49.66
12	Mandla	56.70	65.74	47.74
13	Narsimhapur	65.76	72.64	58.28
14	Raisen	59.10	66.05	51.44
15	Sagar	56.41	64.19	47.85
16	Sehore	63.19	71.76	53.69
17	Seoni	57.80	65.83	49.59
18	Umaria	43.66	52.40	35.02

It is noteworthy that the South Eastern NSS Region (in Gujarat) covers most of the Lower

Narmada Basin.⁶

This report analyzes only those NSS regions that cover a larger part of the basin. However, a few incorporated NSS regions also include some districts, such as Vidisha in the Upper Basin, that are not part of the basin. On the other hand, it excludes several districts—Dewas, Dhar, Indore, Jhabua, Alirajpur, Umaria, Anuppur, Rajnandgaon (Madhya Pradesh), Kabeerdham (Chhattisgarh), and Nandurbar, Dhule (Maharashtra)—which are partially within the basin.

In terms of the educational profile of the Upper Narmada Basin, based on the NSS regions, Figure 29 reveals that the percentage of individuals with no formal education is higher in the South and Central NSS region (25.2%) compared to the rest of Madhya Pradesh (22.15%). There is a slight difference in those literates without formal education, with 0.02% in the South and Central region and 0.08% in the rest of Madhya Pradesh. Similarly, the "Literate: Others" category shows minimal representation in the South and Central region (0.05%) compared to 0.62% in the rest of Madhya Pradesh.

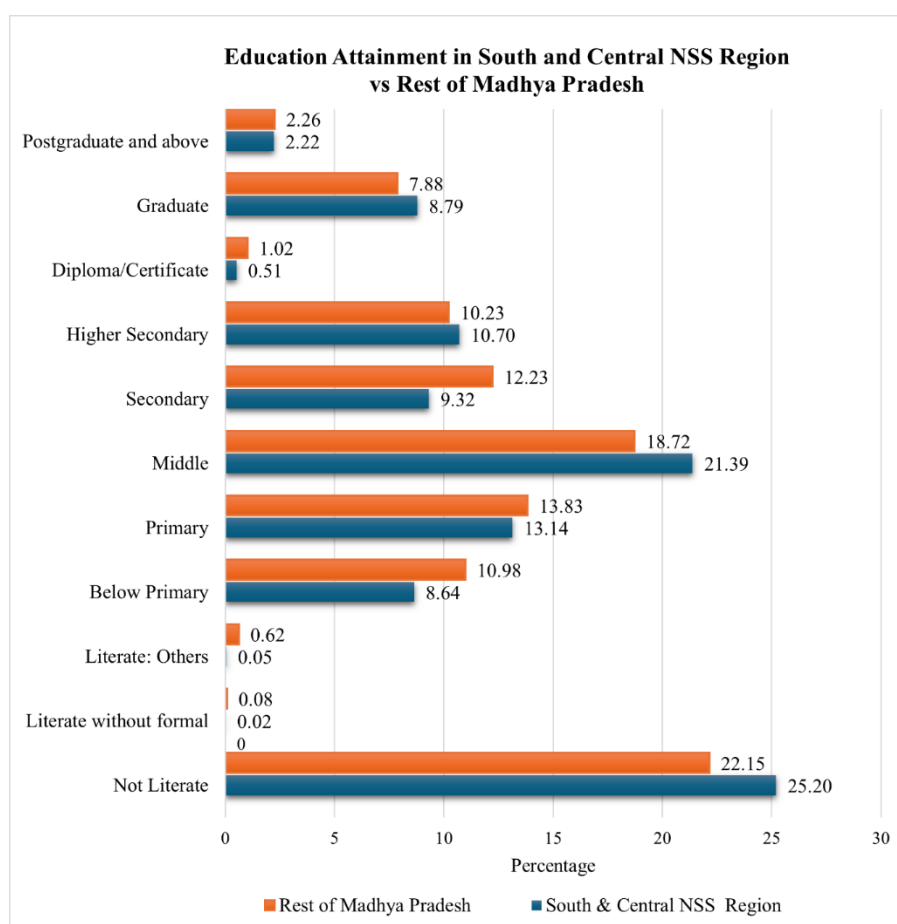


Figure 29. Education attainment in South & Central NSS Region of Madhya Pradesh
(Source: PLFS 2022-23, NSSO, 2023)

When it comes to formal education, the South and Central region has a lower percentage of individuals with below-primary education (8.64%) compared to the rest of Madhya Pradesh

(10.98%). However, the difference is smaller for primary education, with 13.14% in the South and Central region and 13.83% in the rest of Madhya Pradesh. Middle-level education is more prevalent in the South and Central region (21.39%) compared to the rest of Madhya Pradesh (18.72%).

In terms of higher educational attainment, the percentage of individuals with secondary education is lower in the South and Central region (9.32%) compared to 12.23% in the rest of Madhya Pradesh. Higher secondary education percentages are comparable, with 10.7% in the South and Central region and 10.23% in the rest of Madhya Pradesh.

Diploma or certificate holders are relatively few in both regions but slightly higher in the rest of Madhya Pradesh (1.02%) compared to 0.51% in the South and Central region. Graduate-level education shows a slight advantage for the South and Central region (8.79%) compared to 7.88% in the rest of Madhya Pradesh. Postgraduate education is nearly the same across both regions, with 2.22% in the South and Central region and 2.26% in the rest of Madhya Pradesh.

5.5 Middle Narmada Basin: Literacy Rate

Figure 30 presents literacy rates, along with male and female literacy figures, for various districts in the Middle Narmada Basin, covering regions in Gujarat, Madhya Pradesh, and Maharashtra. The literacy trends reveal significant disparities between male and female literacy, as well as between different districts.

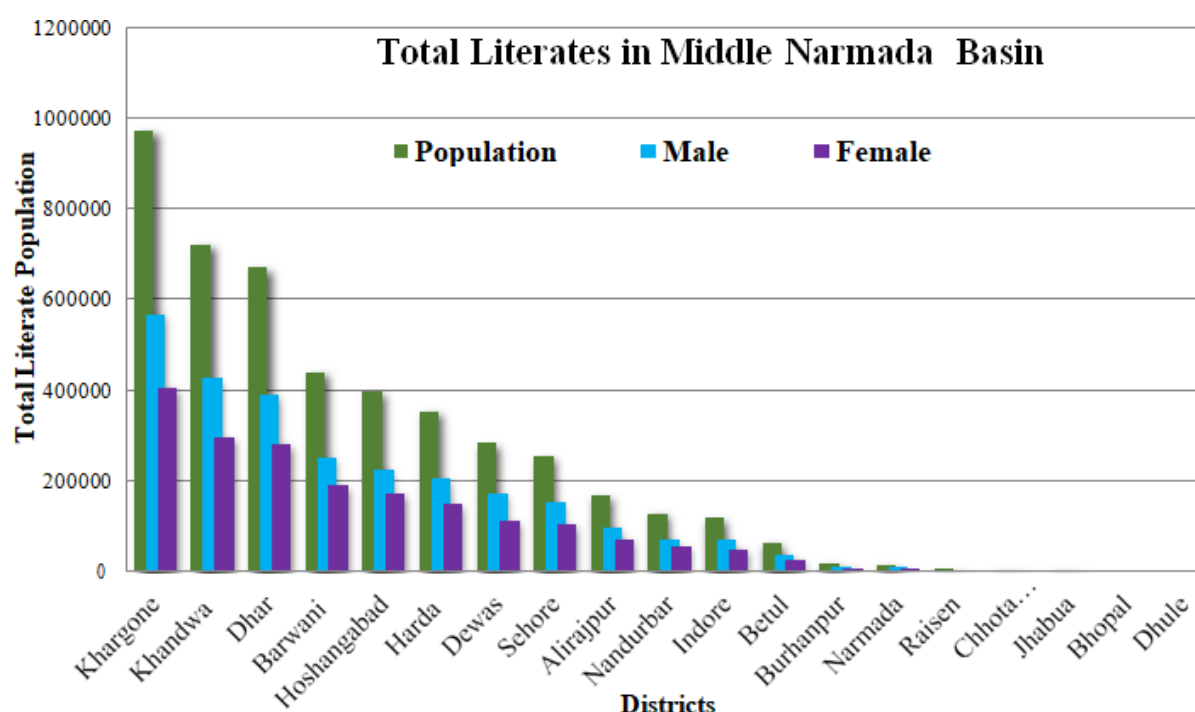


Figure 30. Middle Narmada Basin: Literate Population (Source: Census of India, 2011)

In Gujarat, Chhota Udepur has an alarmingly low overall literacy rate of 18.73%, with a notable gender gap (male literacy at 22.53% and female literacy at 14.92%). Narmada performs

better, with an overall literacy rate of 43.91%, but still shows a considerable gap between male (53.85%) and female literacy (33.72%) (Table 17).

In Madhya Pradesh, districts like Alirajpur (30.03%) and Burhanpur (22.77%) exhibit some of the lowest literacy rates, with marked differences between male and female literacy, particularly in Burhanpur where female literacy lags at 17.39% compared to 28.02% for males. Barwani and Jhabua also fall in the lower range, with literacy rates of 39.79% and 23.85%, respectively, and large gender gaps (Table 17).

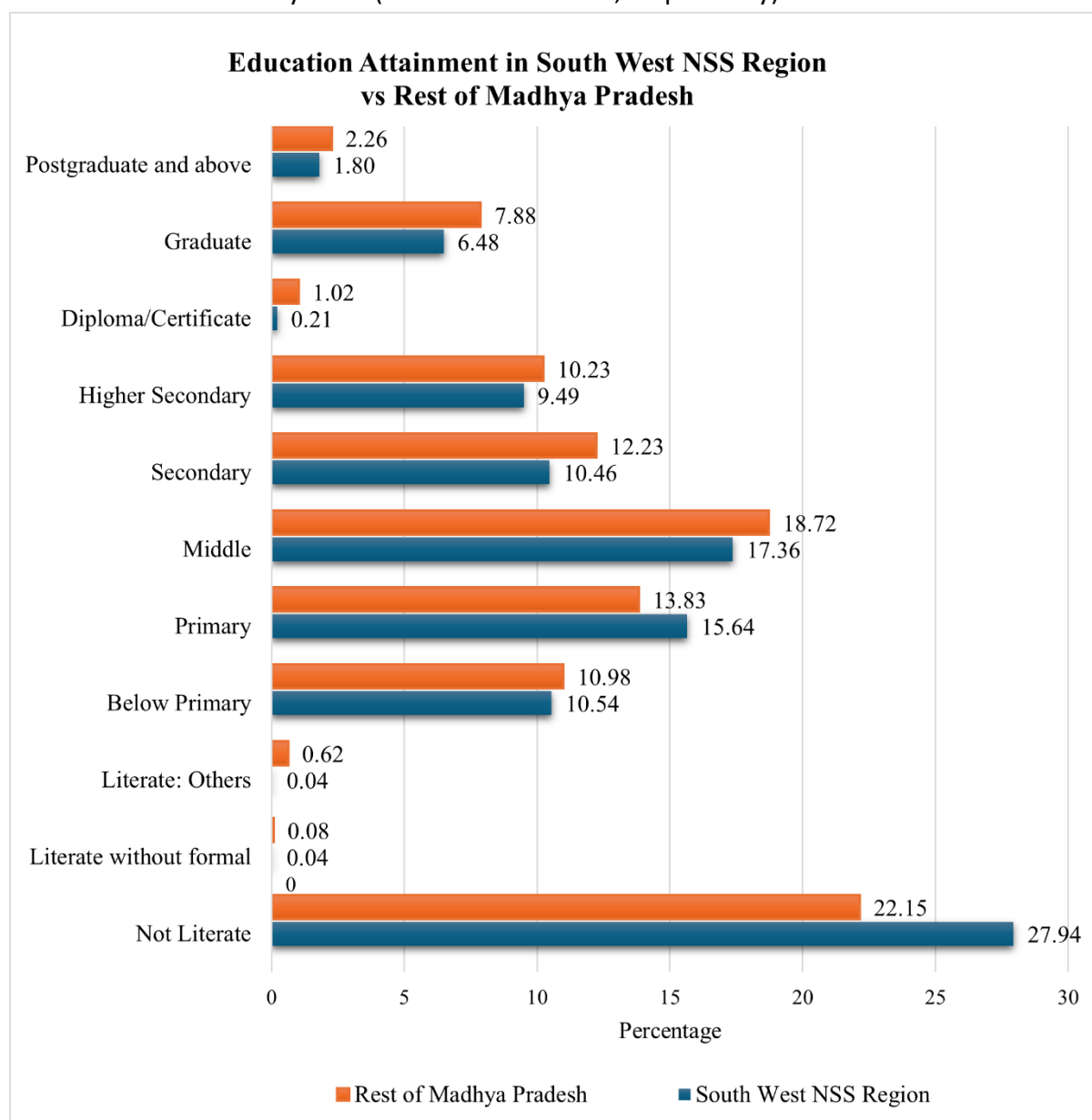
On the higher end of the spectrum, Hoshangabad stands out with a literacy rate of 71.25%, with more balanced male (77.26%) and female (64.71%) literacy rates, followed by Harda (61.84%) and Bhopal (54.50%), though these districts also show a gender disparity. Notably, Indore (57.65%) and Sehore (57.00%) report moderate literacy rates, though the female literacy rate lags behind in both districts.

**Table 17. Middle Narmada Basin: District-wise Literacy Rate
(Source: Calculated from Census of India, 2011)**

Sl. No.	Districts	Literacy Rate	Male Literacy Rate	Female Literacy Rate	In
Gujrat					
1	Chhota Udepur	18.73	22.53	14.92	
2	Narmada	43.91	53.85	33.72	
Madhya Pradesh					
3	Alirajpur	30.03	34.55	25.56	
4	Barwani	39.79	44.88	34.60	
5	Betul	48.70	56.29	41.00	
6	Bhopal	54.50	63.21	44.67	
7	Burhanpur	22.77	28.02	17.39	
8	Dewas	50.63	59.36	41.32	
9	Dhar	46.51	53.55	39.32	
10	Harda	61.84	69.16	54.00	
11	Hoshangabad	71.25	77.26	64.71	
12	Indore	57.65	65.75	49.10	
13	Jhabua	23.85	28.81	18.99	
14	Khandwa	56.15	64.39	47.40	
15	Khargone	53.00	60.78	44.94	
16	Raisen	52.85	59.07	46.23	
17	Sehore	57.00	65.35	47.88	
Maharashtra					
18	Dhule	10.24	11.22	9.25	
19	Nandurbar	42.34	47.56	37.11	

Maharashtra, Dhule has a strikingly low literacy rate of 10.24%, which is concerning, with both male (11.22%) and female literacy (9.25%) rates near the bottom of the overall trends.

Nandurbar (42.34%) performs somewhat better but still displays a significant gap between male and female literacy rates (47.56% and 37.11%, respectively).



**Figure 31. Education attainment in South West NSS Region of Madhya Pradesh
(Source: PLFS 2022-23 (NSSO, 2023))**

Educational profiles, as shown in Figure 31, reveal that The South West NSS region has a higher percentage of individuals with no formal education (27.94%) compared to the rest of Madhya Pradesh (22.15%). The percentage of those literate without formal education and under the "Literate: Others" category is minimal in both regions but slightly higher in the rest of Madhya Pradesh.

For formal education, a larger percentage of individuals in the South West region have completed primary education (15.64%) compared to the rest of Madhya Pradesh (13.83%). However, middle-level and secondary education are more common in the rest of Madhya Pradesh (18.72% and 12.23%, respectively) compared to the South West region (17.36% and

10.46%). Higher educational attainment is generally lower in the South West region. The rest of Madhya Pradesh has a higher percentage of diploma/certificate holders (1.02% vs. 0.21%) and graduates (7.88% vs. 6.48%). Postgraduate education follows a similar trend, with 2.26% in the rest of Madhya Pradesh compared to 1.8% in the South West region.

Overall, the rest of Madhya Pradesh shows higher levels of secondary, diploma, and postgraduate education, while the South West region has a larger proportion of individuals with primary-level education and a higher illiteracy rate.

5.6 Lower Narmada Basin: Literacy and Educational Status

Table 18 shows that literacy rates in the Lower Narmada Basin varied significantly across districts. Gujarat's state average literacy rate was 79.3%, with males at 87.2% and females at 70.7%. However, the basin-level literacy rate in Gujarat was lower, at 56.4%, with males at 64.4% and females at 48.2%. District-wise, Bharuch had the highest literacy rate (73.8%), while Dohad had the lowest (39.8%). Other districts in Gujarat, such as Narmada (64%), Panch Mahals (53.4%), Surat (58%), and Vadodara (49.5%), also showed varying literacy rates.

Table 18 Literacy Rates (%) (Census 2011)

State/District Names (includes only basin areas)	Basin Level		
	Literacy (Males)	Literacy (Females)	Literacy (Population)
Gujarat (State average)	87.2	70.7	79.3
Gujarat (basin level)	64.4	48.2	56.4
Bharuch	78.3	68.9	73.8
Dohad	48.1	31.5	39.8
Narmada	71.5	56.1	64
Panch Mahals	64.0	42.1	53.4
Surat	66.2	49.8	58
Vadodara	58.0	40.7	49.5
Madhya Pradesh			
Alirajpur	27.1	18.7	22.8
Maharashtra			
Nandurbar	51	39.8	45.5

The data presented here are sub-basin-level estimates that include only regions within the spatial definition of the sub-basin (Office of the Registrar General and Census Commissioner, India, 2011) (Asher, Lunt, Matsuura, & Novosad, 2021).

In neighbouring states, Madhya Pradesh's Alirajpur district had a notably low literacy rate of 22.8%, with males at 27.1% and females at 18.7%. Maharashtra's Nandurbar district had a literacy rate of 45.5%, with males at 51% and females at 39.8%. These disparities highlight significant regional differences in literacy levels within the Lower Narmada Basin.

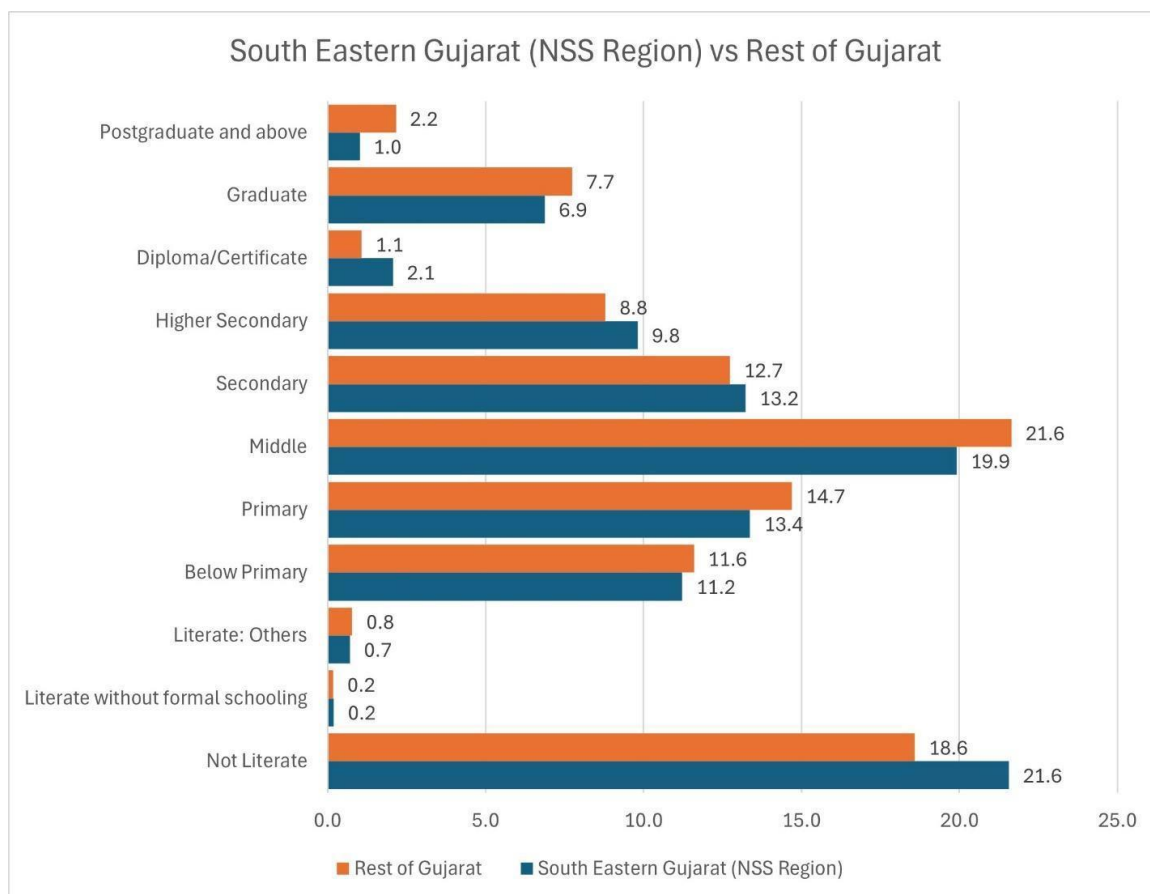


Figure 32. Education attainment in South Eastern Gujarat* (NSS Region)

**a cluster of districts that includes the lower basin of the Narmada River, compared to the rest of Gujarat. These are unweighted sample proportions from PLFS 2022-23 (NSSO, 2023).*

The education profile of Gujarat's Lower Basin and the rest of the state reveals significant differences in literacy rates and educational attainment (Figure 32). According to estimates from the Periodic Labour Force Survey (PLFS) 2022-23⁷, approximately 21.6% of individuals in the Lower Basin have no formal education, compared to 18.6% in the rest of Gujarat.

Regarding formal education, primary and middle-level education are most prevalent in both regions. Around 45% of individuals in both areas have completed primary or middle-level education. Specifically, 13.4% in the Lower Basin and 14.7% in the rest of Gujarat have completed primary education, while 19.9% and 21.6%, respectively, have completed middle-level education.

Higher education attainment varies between the two regions. Graduate degrees are slightly more common in the rest of Gujarat (7.7%) than in the regions that cover the Lower Basin (6.9%). Postgraduate and above degrees are also more prevalent in the rest of Gujarat (2.2%) compared to the region with Lower Basin (1.0%). These differences indicate that the rest of Gujarat has a slightly higher literacy rate and educational attainment than the South Eastern

⁷ The districts in South Eastern Gujarat NSS Region include Panch Mahals, Dohad, Vadodara, Narmada, Bharuch, The Dangs, Navsari, Valsad, Surat, Tapi, Chhota Udepur, and Mahisagar.

Gujarat region.

5.7 Migration

Migration is a crucial component of demography that significantly impacts population growth in any region. Sometimes, even with a low birth rate, cities and regions can experience substantial population growth due to high levels of migration. While making conservation plans for a river basin, it is crucial to investigate patterns of migration to check how migrated counts impact the carrying capacity of a basin. In the context of this report, data reveals that Narmada Basin accommodates migrants from various states of India. Although, migration data is available up to district level, not specifically for river basin, it provides noteworthy insights to understand migration pattern. Figure 33 shows migration trends in the districts of Upper and Middle Narmada Basin excluding districts of Gujrat, Maharashtra and Chhattisgarh. The figure reveals that Maharashtra and Uttar Pradesh account for the highest number of migrants, with approximately 145,000 and 119,000 individuals, respectively. The significant migration is largely attributable to their physical proximity to Madhya Pradesh and economic incentives that encourage individuals to pursue jobs in Madhya Pradesh. Chhattisgarh, a neighbouring state, exhibits a substantial migrant population of over 42,000, presumably affected by like circumstances.

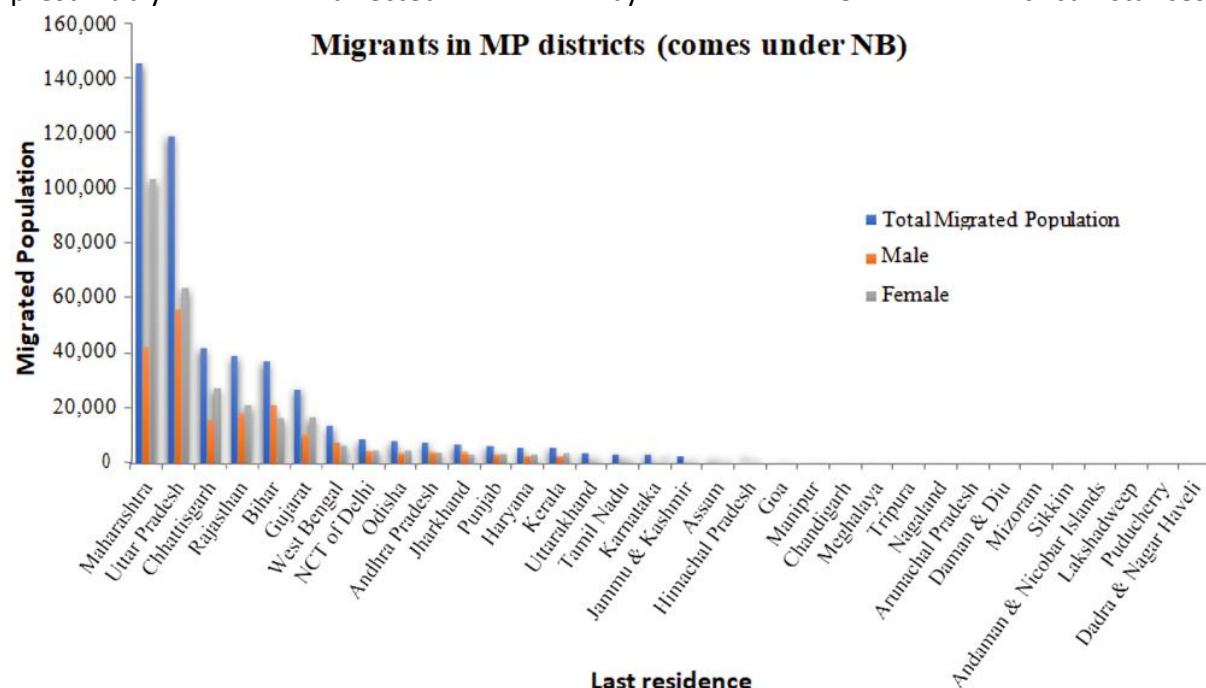


Figure 33. Number of Migrants in Narmada Basin Districts and their Last Residence (Source: Census of India, 2011)

States such as Rajasthan, Bihar, and Gujarat also possess significant migrant populations, varying from 26,000 to 38,000 individuals. These states either border Madhya Pradesh or are in close proximity, facilitating migration. Conversely, more distant states like West Bengal, Delhi, and Odisha yield a lower number of migrants. Their migration figures fluctuate between approximately 8,000 and 13,000, maybe influenced by economic prospects yet restrained by

the increased distance from Madhya Pradesh. Smaller states and union territories, including Goa, Manipur, and Sikkim, yield minimal migration, with figures below 500. The limited migration from these areas can be ascribed to geographic distance and cultural disparities. The data indicates a distinct trend whereby states in proximity to Madhya Pradesh, particularly those with attached borders, contribute a greater volume of migrants. Migration appears predominantly influenced by economic considerations, with regions exhibiting poorer local economies or elevated population pressures generating a greater influx of migrants. States and territories that are more distant or possess robust local economies demonstrate reduced levels of migration into Madhya Pradesh. However, due to the unavailability of other than district-level data, these figures do not reveal the actual scenario of migration within the Narmada Basin boundary.

5.8 Working Population in Upper Narmada Basin

Figure 34 shows the total working population in the Upper Narmada Basin and provides insights into the demographic composition of various districts in Madhya Pradesh and Chhattisgarh. The district of Jabalpur has the highest total working population at 987,093, with a significant male population of 695,210 compared to 291,883 females. This indicates a robust workforce but also highlights a substantial gender disparity in employment opportunities. Similarly, Mandla and Narsimhapur show considerable populations of 492,662 and 472,172, respectively, with Mandla having a relatively balanced gender distribution (male: 261,965, female: 230,697), while Narsimhapur has a more pronounced gender gap (male: 319,316, female: 152,856). Dindori follows with a total population of 332,238, with a slightly higher number of females (159,082) compared to males (173,156), suggesting a healthier gender balance relative to other districts. In contrast, Hoshangabad and Betul report total working populations of 280,363 and 275,914, respectively, both showcasing a significant gender disparity, particularly in Hoshangabad, where only 82,641 females are part of the workforce compared to 197,722 males. The districts of Raisen, Seoni, and Balaghat exhibit similar trends, with males consistently outnumbering females in the workforce. For example, in Raisen, the male population is 189,156, while female participation is significantly lower at 77,863. Chhindwara and Katni also reflect this trend, though with lower total populations, highlighting the ongoing challenges of gender disparity in employment across the region. The data from Anuppur (total population: 60,398) and Damoh (total population: 32,790) indicates limited workforce participation, particularly with only 29,346 females in Anuppur and 11,958 in Damoh.

In Chhattisgarh, Kabeerdham shows a total working population of 26,189 with a near balance between males and females, while Rajnandgaon and Umaria present very low total populations of 12,691 and 2,912, respectively, further underscoring regional disparities in workforce size. Figure 35 provides detailed accounts of district-wise main and marginal with the total working population.

Since the Census of India 2011 provides data only on the total working population, including main and marginal workers, and the data is more than ten years old, it is important to also consider the PLFS data, which is available by NSS regions. While the data by NSS regions may not perfectly represent the Narmada Basin, it can still be useful for understanding the current scenario of the working population in the basin.

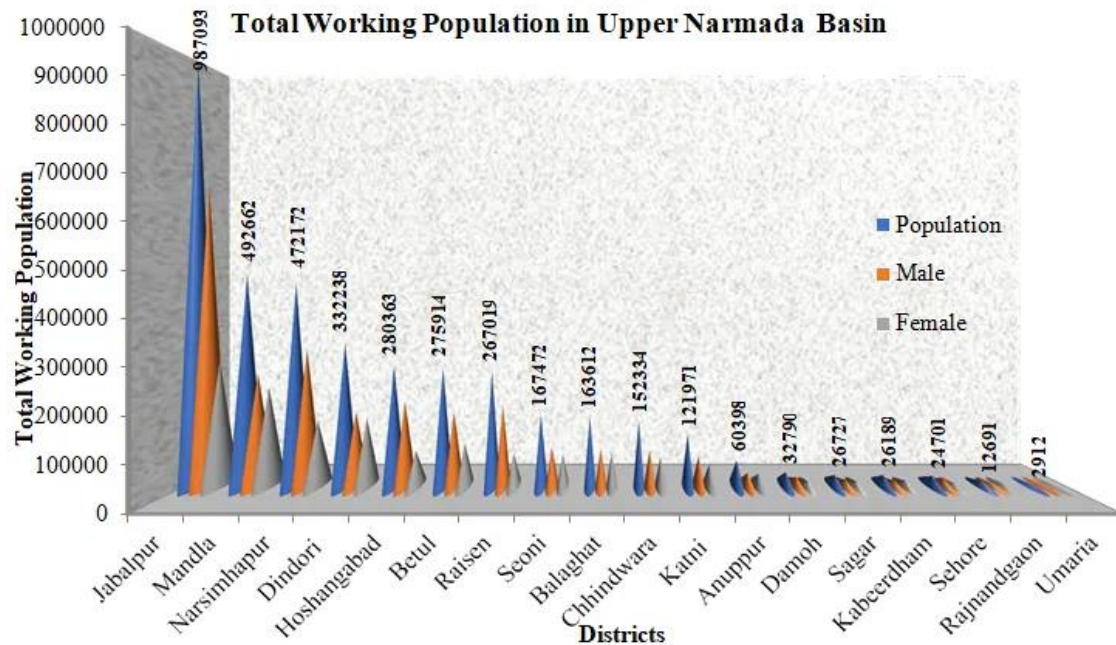


Figure 34. Upper Narmada Basin: Working Population (Source: Census of India, 2011)

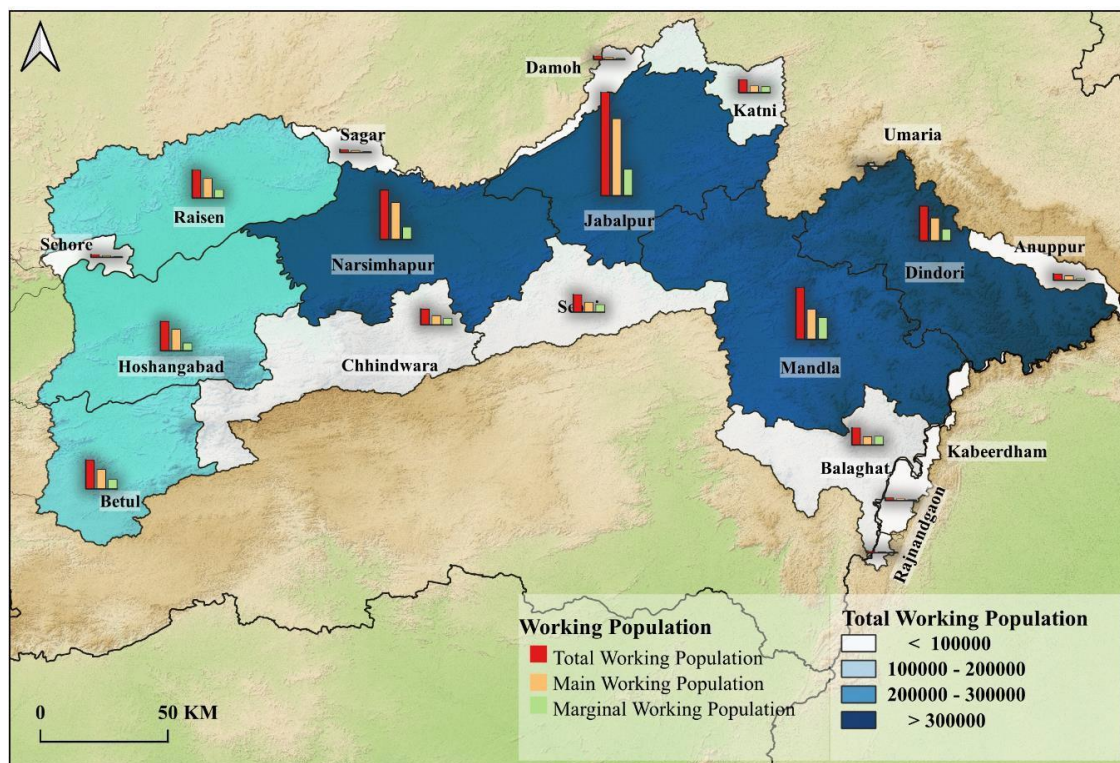


Figure 35. Upper Narmada Basin: Working Population (Source: Census of India, 2011)

Table 19, which covers the larger part of the Upper Basin, presents employment and unemployment data for the South & Central NSS Region and the rest of Madhya Pradesh, based on PLFS 2022-23. It highlights several notable trends as self-employment (SE) remains a significant mode of work in both regions, although its nature differs slightly. In the South & Central NSS Region, 27.31% of individuals are self-employed (either as own account workers, employers, or unpaid helpers), compared to 27.83% in the rest of Madhya Pradesh. Own account workers are slightly more common in the rest of Madhya Pradesh (18.81%) than in the South & Central region (16.21%), while the proportion of unpaid helpers is higher in the South & Central region (10.25%) compared to 7.18% in the rest of Madhya Pradesh.

Regular salaried or wage employees represent 14.59% of the workforce in the South & Central region, slightly lower than the 15.95% seen in the rest of Madhya Pradesh. Casual wage labor is a significant category as well, with 10.75% of workers in the South & Central region and 9.95% in the rest of Madhya Pradesh. The majority of casual labourers in both regions are engaged in other work rather than public works.

Table 19. Upper Basin Principal Status of Employment and Unemployment (%)
(Source: PLFS 2022-23)

Clusters of Districts		
Employment/Unemployment Status	South & Central MP NSS Region*	Rest of MP
Self-Employed in Household Enterprise: Own Account Worker	16.21	18.81
Self-Employed in Household Enterprise: Employer	0.85	1.84
Self-Employed in Household Enterprise: Unpaid Helper	10.25	7.18
Regular salaried/Wage employee	14.59	15.95
Casual wage labour: public works	0.17	0.32
Casual wage labour: Other work	10.58	9.63
Not working, willing and looking for work	2.80	3.05
Attending Edu Institution	15.07	15.89
Domestic duties only	19.08	18.00
Domestic and free collection for HH use	8.23	7.32
pensioners, remittance receivers	0.28	0.92
Not working due to disability	0.69	0.74
Others (including begging, prostitution, etc.)	1.19	0.28

* South and Central Madhya Pradesh (MP) NSS Region is a cluster of districts that corresponds broadly to the spatial definition of the upper basin of the Narmada River but includes regions that are technically outside the spatial definition (NSSO, 2023).

Table 20. Upper Basin: Major Sectors of Employment (%) (PLFS 2022-23)

Clusters of Districts		
Sectors of Employment (NIC 2008 sections)	South and Central NSS Region *	Rest of Madhya Pradesh
A. Agriculture and Allied	45.85	35.31
B. Mining and Quarrying	0.67	0.40
C. Manufacturing	10.07	12.36
D-E. Electricity, Gas, Water Supply	0.72	0.79
F. Construction	10.87	12.14
G-I. Trade, Hotels, Restaurants	16.65	21.38

* South and Central Madhya Pradesh NSS Region is a cluster of districts that corresponds broadly to the spatial definition of the upper basin of the Narmada River but includes regions that are technically outside the spatial definition (NSSO, 2023).

A higher percentage of individuals in the South & Central region are involved in domestic duties only (19.08%) compared to the rest of Madhya Pradesh (18.00%). Education is also a notable category, with 15.07% of people in the South & Central region attending educational institutions, which is slightly lower than the 15.89% in the rest of the state.

Unemployment rates, measured by those willing and looking for work, stand at 2.80% in the South & Central region and 3.05% in the rest of Madhya Pradesh, indicating a slightly higher unemployment rate in the rest of the state. Smaller categories (such as pensioners and individuals not working due to disability) show low but similar figures across both regions.

In the case of sector-wise employment, Agriculture and allied activities dominate employment in both regions, but the South and Central NSS Region has a significantly higher percentage (45.85%) of the workforce engaged in this sector compared to 35.31% in the rest of Madhya Pradesh (Table 20).

Table 20 also shows that manufacturing is more prominent in the rest of Madhya Pradesh, accounting for 12.36% of employment compared to only 10.07% in the South and Central NSS Region. Similarly, trade, hotels, and restaurants play a larger role in the rest of Madhya Pradesh, employing 21.38% of the workforce, compared to 16.65% in the South and Central region.

Construction contributes notably to employment in both regions, with 10.87% of the workforce in the South and Central region and a slightly higher 12.14% in the rest of Madhya Pradesh.

Other services (NIC sections J-S) show a modest difference between the two regions, employing 15.17% in the South and Central region and 17.62% in the rest of Madhya Pradesh.

Mining and quarrying, as well as electricity, gas, and water supply, account for small percentages in both regions, each contributing less than 1%.

5.9 Working Population in Middle Narmada Basin

In the Middle Narmada Basin, Figure 36 reveals that Khargone leads with the highest total working population of 876,859, comprising 508,311 males and 368,548 females. This indicates a relatively larger male workforce compared to females, reflecting a common trend throughout the basin. Following Khargone, Dhar has a substantial population of 676,062, with a gender distribution that shows a significant male majority (381,604 males versus 294,458 females).

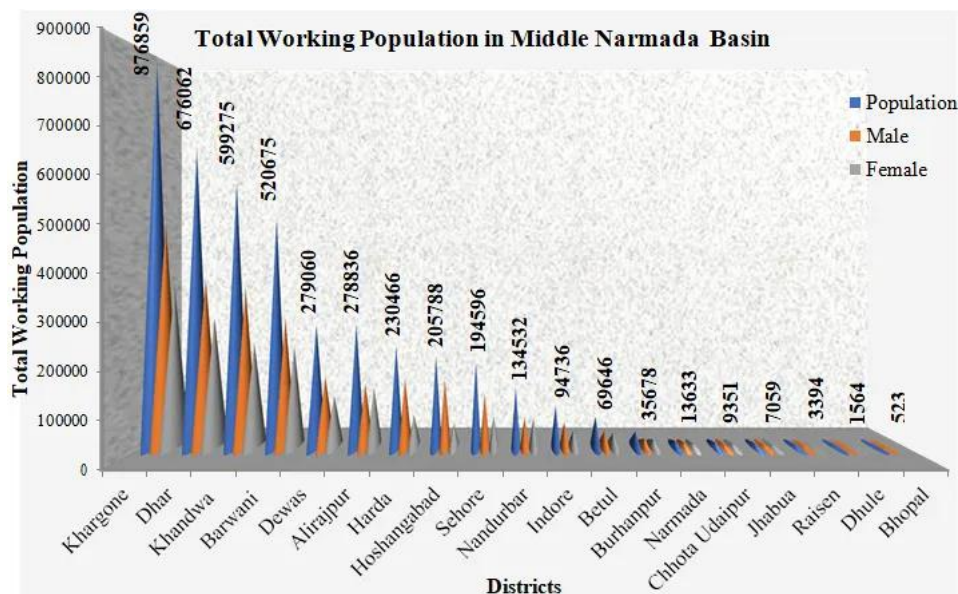
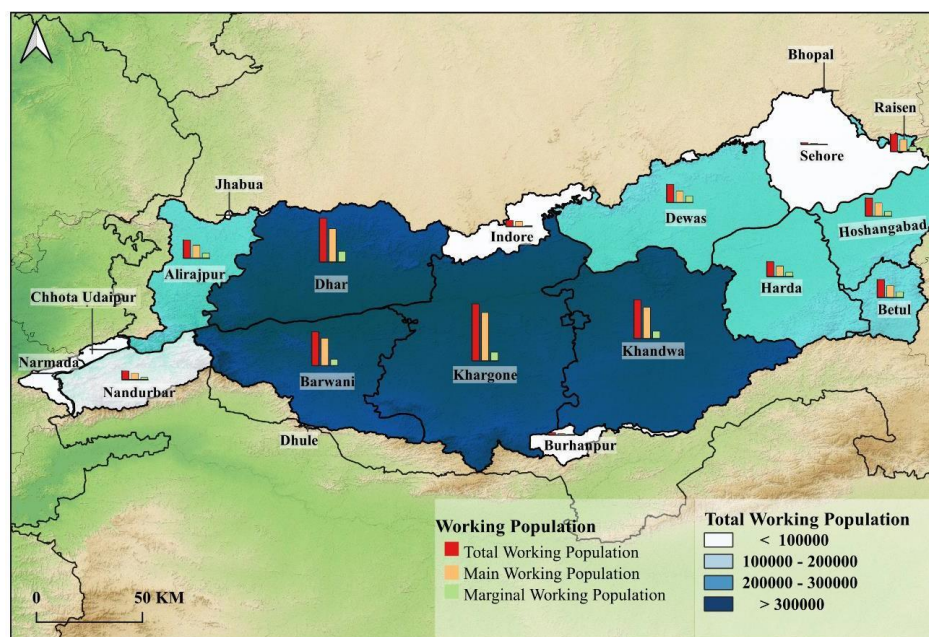


Figure 36. Middle Narmada Basin: Working Population

Similarly, Khandwa has 599,275 total workers, with a male population of 362,286 and 236,989 females, again illustrating the pattern of gender disparity in employment opportunities. Barwani and Dewas report working populations of 520,675 and 279,060, respectively, with Barwani showing a higher proportion of males (292,496) compared to females (228,179). In Dewas, the male workforce also outnumbers the female workforce (161,014 males to 118,046 females). The district of Alirajpur has a total population of 278,836, with 144,246 males and 134,590 females, indicating a closer balance than observed in other districts, though males still hold a slight majority. Conversely, Harda shows a more pronounced gender disparity, with 156,528 males compared to only 73,938 females, resulting in a significant gap in workforce participation. Hoshangabad presents similar trends, with 205,788 total workers—153,242 males and just 52,546 females—indicating a strong gender imbalance in labour participation. In contrast, the populations in Nandurbar (Maharashtra) and Chhota Udepur (Gujarat) are relatively smaller, with 134,532 and 9,351 total workers, respectively. Nandurbar has a male population of 67,837 and a female population of 66,695, reflecting a relatively balanced workforce. However, Chhota Udepur has a noticeable disparity, with 4,636 males and 4,715

females, though the total is quite low. Jhabua and Raisen display very low working populations of 7,059 and 3,394, respectively, with Jhabua slightly favouring females (3,621) over males (3,438), while Raisen has a stark contrast with 2,260 males and only 1,134 females. The districts of Burhanpur, Dhule, and Bhopal report minimal total working populations, further emphasizing the trends seen in the larger districts. Burhanpur has a total of 35,678, with a male workforce of 18,487 and 17,191 females, indicating a moderate gender balance. Dhule and Bhopal have even smaller populations of 1,564 and 523, respectively, with Bhopal's workforce being predominantly male population (Figure 37).



The analysis of the total working population in the Upper and Middle Narmada Basin reveals significant gender variations across districts, with a predominance of male workers in nearly all areas. This imbalance poses challenges for inclusive economic development and highlights the need for targeted interventions to enhance female workforce participation and promote gender equity in employment opportunities. Addressing these disparities through education, skills training, and policy reforms could play a crucial role in achieving a more balanced workforce in both the basin.

Table 21, which covers most of the Middle Basin, provides employment and unemployment data for the South-West NSS Region and the rest of Madhya Pradesh, based on PLFS 2022-23, highlighting some key differences between the two regions.

Self-employment (SE) is prominent in both regions, but its composition varies. In the South-West region, a higher percentage of individuals (36.27%) are engaged in self-employment, either as own account workers, employers, or unpaid helpers, compared to 27.84% in the rest of Madhya Pradesh. Notably, unpaid helpers make up a significantly larger portion in the South-West region (16.98%) than in the rest of the state (7.18%), although the proportion of own-account workers is similar across both regions. The share of employers, however, is much lower in the South-West (0.24%) than in the rest of Madhya Pradesh (1.85%).

Regular salaried or wage employment is more common in the rest of Madhya Pradesh (15.95%) compared to only 9.98% in the South-West region. Casual wage labour, reflected in "other work," shows similar proportions in both regions—8.64% in the South-West and 9.63% in the rest of Madhya Pradesh.

Unemployment, represented by those not working but looking for work, is lower in the South-West region (1.83%) compared to 3.06% in the rest of Madhya Pradesh. Educational participation is fairly consistent across both regions, with 14.85% in the South-West region and 15.89% in the rest of Madhya Pradesh attending educational institutions.

A higher percentage of individuals in the South-West region are involved in domestic and free collection activities (14.73%) compared to 7.33% in the rest of Madhya Pradesh. However, fewer individuals in the South-West region are exclusively engaged in domestic duties (11.44%) compared to 18.01% in the rest of the state. Smaller categories like pensioners and those not working due to disability show relatively low percentages, with similar trends across both regions.

Table 21. Middle Basin: Principal Status of Employment and Unemployment (%) (PLFS 2022-23)

Clusters of Districts		
Employment/Unemployment Status	South West MP NSS Region	Rest of Madhya Pradesh
SE: Own Account Worker	19.05	18.81
SE: Employer	0.24	1.85
SE: Unpaid Helper	16.98	7.18
Regular salaried/Wage employee	9.98	15.95
Other work	8.64	9.63
Not working, willing and looking for work	1.83	3.06
Attending Educational Institution	14.85	15.89
Domestic duties only	11.44	18.01
Domestic and free collection for HH use	14.73	7.33
pensioners, remittance receivers	0.06	0.93
Not working due to disability	0.67	0.75
others (including begging, prostitution, etc.)	1.52	0.28

** South-west NSS (National Sample Survey) region of Madhya Pradesh NSS Region is a cluster of districts that corresponds broadly to the spatial definition of the middle basin of the Narmada River but includes regions that are technically outside the spatial definition (NSSO, 2023). SE = Self-employed*

Table 22 provides sector-wise employment data for the South-West NSS Region and the rest of Madhya Pradesh. Agriculture and allied activities are the dominant employment sectors in the South-West region, with a significantly higher proportion (58.06%) of the workforce employed in this sector compared to 35.33% in the rest of Madhya Pradesh. This suggests a

more agriculture-dependent economy in the South-West region.

Manufacturing plays a much smaller role in the South-West region, with only 4.65% of the workforce employed in this sector, compared to 12.38% in the rest of Madhya Pradesh. This indicates a lower level of industrial activity in the South-West region. The construction sector

Clusters of Districts		
Sectors of Employment (NIC 2008 sections)	South West NSS NSS Region*	Rest of Madhya Pradesh
A. Agriculture and Allied	58.06	35.33
B. Mining and Quarrying	0.41	0.40
C. Manufacturing	4.65	12.38
D-E. Electricity, Gas, Water Supply	0.41	0.79
F. Construction	7.13	12.15
G-I. Trade, Hotels, Restaurants	17.25	21.33
J-S. Other Services	12.09	17.62

also shows a notable difference, with 7.13% of the workforce engaged in construction in the South-West region, compared to 12.15% in the rest of Madhya Pradesh.

Trade, hotels, and restaurants employ 17.25% of the workforce in the South-West region, which is slightly lower than the 21.33% in the rest of Madhya Pradesh. Similarly, the other services sector (NIC sections J-S) accounts for 12.09% of employment in the South-West region, compared to 17.62% in the rest of Madhya Pradesh. Mining and quarrying, along with electricity, gas, and water supply, represent small employment sectors in both regions, each contributing less than 1% to total employment.

Table 22. Middle Basin Major Sectors of Employment (%) (PLFS 2022-23)

**South-West Madhya Pradesh NSS Region is a cluster of districts that corresponds broadly to the spatial definition of the middle basin of the Narmada River but includes regions that are technically outside the spatial definition (NSSO, 2023).*

5.10 Working Population and Employment Characteristics in Lower Narmada Basin

According to the 2011 Census data, the working population and worker participation rates (WPR) in the Lower Narmada Basin vary across districts (Table 23). The Worker Participation Rate (WPR) - calculated as the working population divided by the total population - indicates the proportion of people engaged in economic activities, reflecting the basin's labour market structure. A higher WPR suggests a larger workforce and potential economic growth, while a lower WPR indicates labour market challenges.

At the national level, the workforce participation rates were 53.26% for males and 25.51% for females in 2011. In comparison, Gujarat's average working population, which consists of 180.8 lakh males and 67.8 lakh females, has WPRs of 56.6% for males and 26.6% for females, closely mirroring the national averages. However, within the basin area, Gujarat's working

population is significantly smaller, with 8.1 lakh working males and 4.5 lakh working females and higher WPRs of 58% and 41.2%. Notably, the female WPR in the basin area exceeds the national average, indicating higher female participation in the workforce.

Table 24 shows that according to PLFS 2022-23, the principal status of employment and unemployment in South Eastern Gujarat and the rest of Gujarat reveals distinct patterns. Self-employment dominates in both regions, with approximately 28.7% of individuals in South Eastern Gujarat and 31.3% in the rest of Gujarat engaged in household enterprises, either as own account workers, employers, or unpaid helpers.

**Table 23: Working Population (lakhs) and Worker Participation Rates (%)
(Census 2011)**

State/District Names (includes only basin areas)	Basin Level					
	Working Males	Working Females	Working Persons	WPR (Males)	WPR (Females)	WPR (Persons)
Gujarat (State average)	180.8	67.8	248.6	56.6	26.6	42.2
Gujarat (basin level)	8.1	4.5	12.5	58.0	41.2	49.8
Bharuch	2.7	0.8	3.5	57.7	18.7	39
Dohad	0.1	0.1	0.1	54.8	52.6	53.7
Narmada	1.4	0.9	2.3	57.5	39.1	48.5
Panch Mahals	0.2	0.1	0.3	60.1	47	53.7
Surat	0.2	0.1	0.3	58.6	47.5	53.1
Vadodara	3.5	2.4	5.9	59.2	42	50.8
Madhya Pradesh						
Alirajpur	0.6	0.6	1.1	51.6	48.7	50.2
Maharashtra						
Nandurbar	0.0	0.0	0.0	45.5	49.5	47.5

The data presented here are sub-basin-level estimates that include only regions within the spatial definition of the sub-basin (Office of the Registrar General and Census Commissioner, India, 2011) (Asher, Lunt, Matsuura, & Novosad, 2021). The worker participation rate is the working population divided by the population.

Table 24. Lower Basin: Principal Status of Employment and Unemployment (%)
(PLFS 2022-23)

Clusters of Districts		
Employment/Unemployment Status	South Eastern Gujarat NSS Region*	Rest of Gujarat
Self-Employed in Household Enterprise: Own Account Worker	20.0	19.2
Self-Employed in Household Enterprise: Employer	1.3	2.3
Self-Employed in Household Enterprise: Unpaid Helper	7.4	9.8
Regular salaried/Wage employee	24.1	19.4
Casual wage labour: public works	0.3	0.0
Casual wage labour: Other work	9.8	7.3
Not working, willing and looking for work	1.6	1.5
Attending Edu Institution	11.2	11.7
Domestic duties only	19.3	23.1
Domestic and free collection for HH use	3.8	3.6
pensioners, remittance receivers	0.4	0.6
Not working due to disability	0.6	0.8
Others (including begging, prostitution, etc.)	0.4	0.6

* *South Eastern Gujarat NSS Region is a cluster of districts that corresponds broadly to the spatial definition of the lower basin of the Narmada River but includes regions that are technically outside the spatial definition (NSSO, 2023).*

Regular salaried or wage employees comprise 24.1% of the workforce in South Eastern Gujarat, slightly higher than the 19.4% in the rest of Gujarat. Casual wage labourers account for 10.1% of South Eastern Gujarat and 7.3% in the rest of Gujarat, with the majority engaged in other work rather than public works

A significant proportion of individuals in both regions are engaged in domestic duties only, with 19.3% in South Eastern Gujarat and 23.1% in the rest of Gujarat. Attending educational institutions is another major category, accounting for 11.2% in South Eastern Gujarat and 11.7% in the rest of Gujarat.

Unemployed persons are 1.6% in South Eastern Gujarat and 1.5% in the rest of Gujarat, reporting willingness to work but currently looking for employment. Other categories, such as pensioners, remittance receivers, and those not working due to disability, account for smaller percentages.

These statistics provide valuable insights into the employment landscape of Gujarat, highlighting regional differences and the need for targeted policy interventions. By employment sectors (Table 25), agriculture and allied activities dominate both regions, employing 36.7% of the workforce in South Eastern Gujarat and 39.0% in the rest of Gujarat. Manufacturing is the second-largest sector, accounting for 25.4% of employment in South Eastern Gujarat and 21.2% in the rest of Gujarat. Trade, hotels, and restaurants constitute another significant sector, employing 15.4% in South Eastern Gujarat and 18.2% in the rest of Gujarat. Other notable sectors include construction, which accounts for 7.7% of employment in South Eastern Gujarat and 5.3% in the rest of Gujarat, and other services (NIC sections J-S), which employ 14.0% and 14.7%, respectively. Mining and quarrying, as well as electricity, gas, and water supply, contribute relatively small percentages to employment in both regions, at less than 1.5% each.

These statistics highlight the reliance on agriculture and manufacturing in both regions, underscoring the need for policies supporting these sectors and promoting diversification. Notably, key sectoral differences emerge between South Eastern Gujarat and the rest of Gujarat. South Eastern Gujarat exhibits higher manufacturing employment, with a 4.2 percentage point difference, and greater construction employment, with a 2.4 percentage point difference. These two characteristics are likely driven by Surat and Vadodara industrial clusters that are in South Eastern Gujarat NSS region but are technically outside the spatial definition of the lower basin of the Narmada River. Conversely, the rest of Gujarat has a higher proportion of employment in trade and hospitality, exceeding South Eastern Gujarat by 2.8 percentage points.

Table 25. Lower Narmada Basin: Major Sectors of Employment (%) (PLFS 2022-23)

Sectors of Employment (NIC 2008 sections)	Clusters of Districts	
	South Eastern Gujarat NSS Region*	Rest of Gujarat
A. Agriculture and Allied	36.7	39.0
B. Mining and Quarrying	0.1	0.4
C. Manufacturing	25.4	21.2
D-E. Electricity, Gas, Water Supply	0.7	1.2
F. Construction	7.7	5.3
G-I. Trade, Hotels, Restaurants	15.4	18.2
J-S. Other Services	14.0	14.7

** South Eastern Gujarat NSS Region is a cluster of districts that corresponds broadly to the spatial definition of the lower basin of the Narmada River but includes regions that are technically outside the spatial definition (NSSO, 2023).*

Presenting data from multiple sources and aspects provides a comprehensive understanding of employment trends and labour market dynamics. Table 23, Table 24, and Table 25 illustrate this necessity, combining Census 2011 data on WPR with PLFS (2022-23) data on employment and unemployment status, as well as major sectors of employment.

The Census data highlights the structural features of the labour market, such as worker participation rates, which are relatively slow to change. For instance, female WPR differences between the basin and non-basin regions, as seen in Table 23, are likely to persist, making the Census estimates fairly reliable even today. These underlying patterns are sticky and less prone to rapid fluctuations.

In contrast, employment and unemployment status, as well as occupational shifts, are more fluid and require closer tracking. Table 24 and Table 25 address this need, providing insights into the current state of employment, unemployment, and sectoral distribution. The PLFS data reveals dynamic changes in the labour market, such as shifts in self-employment, regular salaried jobs, and casual wage labour.

By combining these data sources, policymakers can gain a deeper understanding of the labour market. This enables them to identify areas for targeted interventions, refine strategies to promote employment and equality and track progress over time. Moreover, this multi-faceted approach facilitates comparison with national or regional averages, providing context for local trends. Additionally, policymakers can explore specific sectors or demographics, such as the impact of agricultural shifts on rural employment or the representation of women in various industries. Ultimately, this comprehensive perspective informs more effective policy decisions, driving economic growth and social development.

6. Distribution of Economic Activity

This section looks at the distribution of economic activity across the lower basin of the Narmada River using available tools. According to various rich economic studies, nightlights are a good measure of local economic growth (Henderson, Storeygard, & Weil, 2012). This is particularly useful when gross domestic product or associated indicators are difficult to construct at local levels. It is important to understand how economic activity is distributed along the lower basin of the Narmada River, and night light data can help policymakers and researchers in this regard. We show two snapshots over two years of the lower basin to see how economic activity has changed over a decade. Brighter regions imply higher local economic growth. In the figure, the regions shaded as yellow are urban areas, which tend to be more densely populated and are sites of intense economic activity and, hence, are brighter.

Figure 38 shows changes in economic activity in the upper sub-basin of the Narmada River between 2012 and 2021. There is one large urban cluster centred around Jabalpur City, which shows increased economic activity, along with a wider area showing changes in economic activity.

Figure 39 shows changes in economic activity in the middle sub-basin of the Narmada River between 2012 and 2021. The middle basin region is the least urbanised and shows only marginal changes in economic activity between 2012 and 2021.

Figure 40 shows changes in economic activity over time in the lower sub-basin of the Narmada River between 2012 and 2021. Right away, we can see that Bharuch is the region with the

most economic activity in the entire lower basin of the Narmada River. The regions around it have also exhibited intense economic activity in the 2021 snapshot. However, the rest of the basin is mostly rural and forested, with lower night light intensity. However, there are generalised changes from darker shades to lighter shades of purple. All these are indicative that economic activity has increased, albeit unevenly.

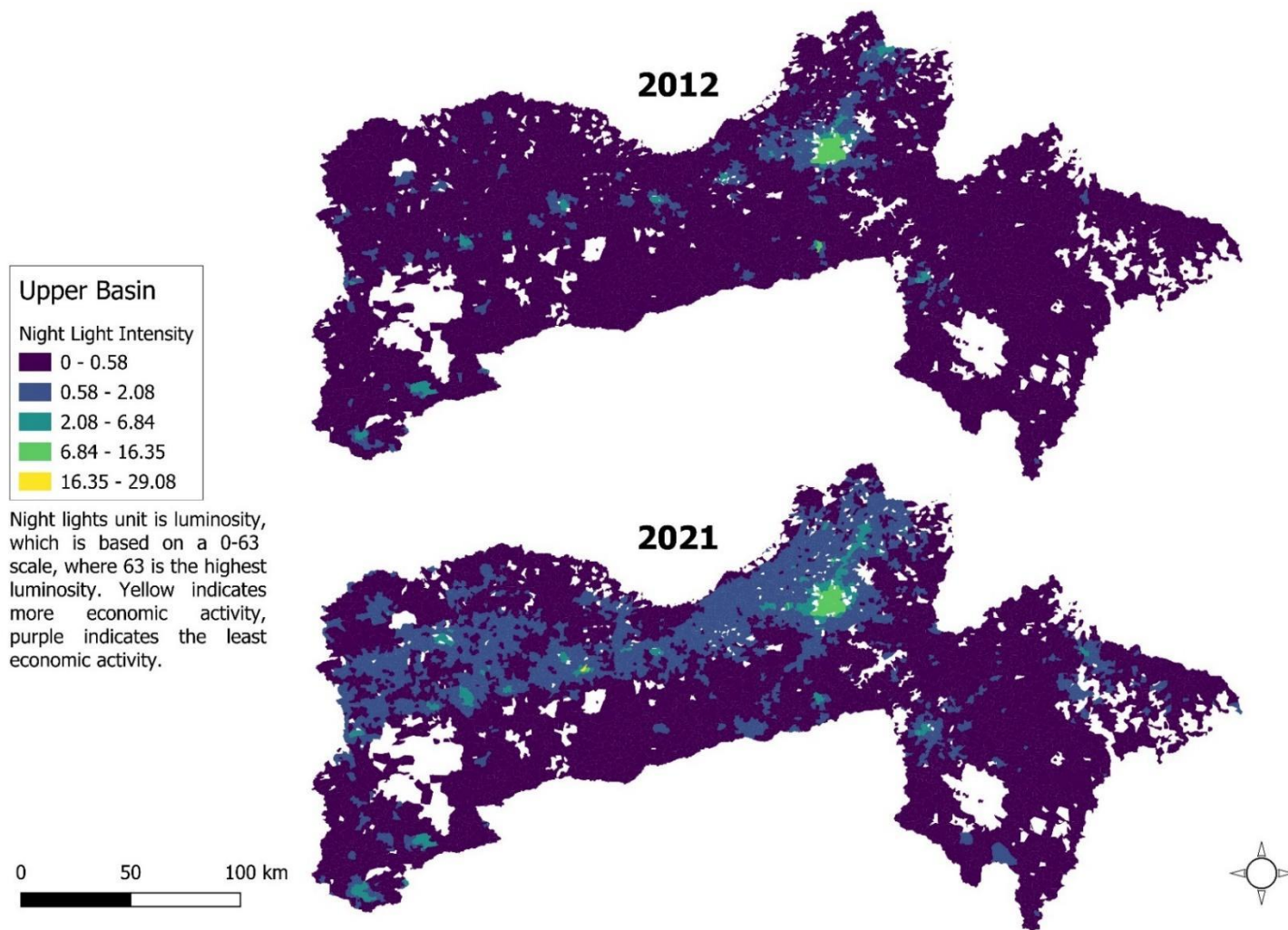


Figure 38. Upper Narmada Basin: Night light intensity in 2012 (top panel) compared to 2021 (bottom panel) (VIIRS annual composite) (Henderson, Storeygard, & Weil, 2011) (Asher, Lunt, Matsuura, & Novosad, 2021)

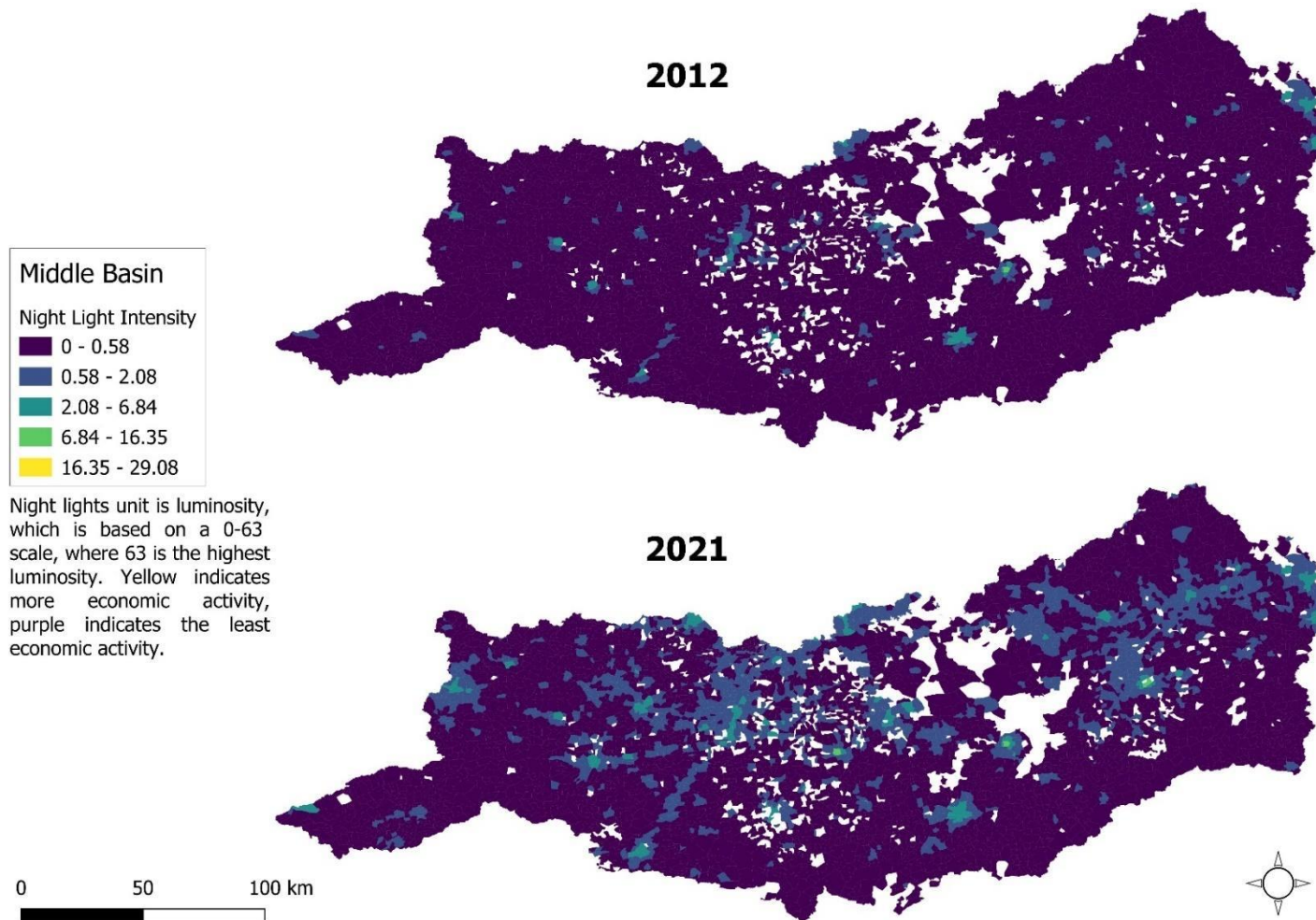


Figure 39: Middle Narmada Basin: Night light intensity in 2012 (top panel) compared to 2021 (bottom panel) (VIIRS annual composite) (Henderson, Storeygard, & Weil, 2011) (Asher, Lunt, Matsuura, & Novosad, 2021)

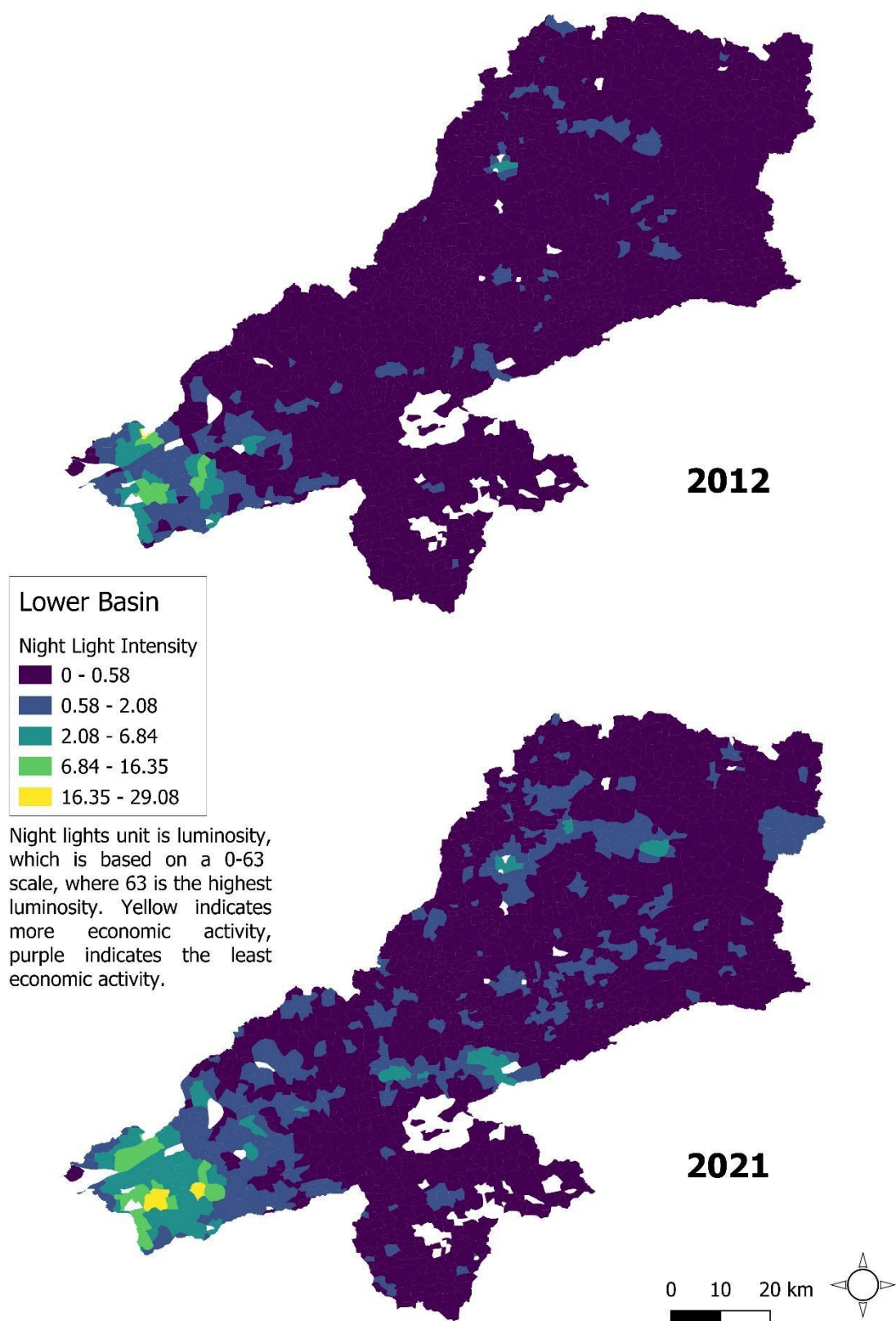


Figure 40: Lower Narmada Basin: Night light intensity in 2012 (top panel) compared to 2021 (bottom panel) (VIIRS annual composite) (Henderson, Storeygard, & Weil, 2011) (Asher, Lunt, Matsuura, & Novosad, 2021)

6.1 Economic Status: GDDP and NDDP

Gross Domestic Product (GDP) and Net Domestic Product (NDP) are two key economic indicators that provide insights into the economic condition of a region. Gross District Domestic Product (GDDP) and Net District Domestic Product (NSDP) provide significant information on how economic prosperity varies in the Upper and Middle Narmada Basin. While most of the data in this report is presented according to basin boundaries, the Gross District Domestic Product (GDDP) and Net District Domestic Product (NDDP) are not available at the basin-specific level. These economic indicators are typically collected at the district level, without distinction for areas that lie within the Upper and Middle Narmada Basin. As a result, the GDDP and NDDP data provided in this section represent the entirety of the districts rather than solely the portions within the basin boundaries. This limitation must be considered when analyzing the economic data for basin management purposes.

6.2 Gross District Domestic Product (GDDP)

Figure 41 provides an overview of the Gross District Domestic Product (GDDP) at constant (2011-12) prices for various districts of the Upper and Middle Narmada Basin. The data demonstrates significant economic growth across districts, despite occasional fluctuations, with districts having major urban centres leading in output. Indore stands out as the largest contributor to the state's economy, with its GDDP growing from ₹2,520,615 lakh in 2011-12 to ₹4,124,431 lakh in 2020-21, despite a slight decline from its peak in 2019-20. Similarly, Bhopal and Jabalpur, two other major urban districts, have shown steady growth. Bhopal's GDDP increased from ₹1,743,006 lakh in 2011-12 to ₹2,959,802 lakh in 2020-21, and Jabalpur's from ₹1,515,711 lakh to ₹2,717,999 lakh over the same period. Districts such as Chhindwara, Sagar, Dhar, and Dewas have also demonstrated notable growth in GDDP. For example, Sagar's GDDP rose from ₹1,034,562 lakh in 2011-12 to ₹1,821,577 lakh in 2020-21, indicating substantial economic improvement. Dhar and Dewas experienced significant gains, with Dhar nearly doubling its GDDP, from ₹876,046 lakh in 2011-12 to ₹1,667,187 lakh in 2020-21, and Dewas increasing from ₹867,208 lakh to ₹1,537,716 lakh in the same period. Several smaller districts, such as Khargone, Katni, and Raisen, show consistent upward trends in GDDP. For instance, Khargone's GDDP rose from ₹593,278 lakh in 2011-12 to ₹1,258,709 lakh in 2020-21, while Katni saw an increase from ₹506,072 lakh to ₹1,095,655 lakh. Raisen also demonstrated growth, moving from ₹590,495 lakh to ₹1,066,962 lakh over the same period. In contrast, some districts show slower economic growth or stagnation. For example, Alirajpur, a predominantly tribal district, saw a fluctuating GDDP pattern, with a peak of ₹322,585 lakh in 2013-14, followed by a decline and slow recovery to ₹292,045 lakh by 2020-21. Dindori and Umariya, both rural districts, displayed moderate growth but still lagged in comparison to urban districts. It is noteworthy that fluctuations observed in some districts during 2020-21 may also reflect the impact of external factors, such as the economic disruptions caused by the COVID-19 pandemic.

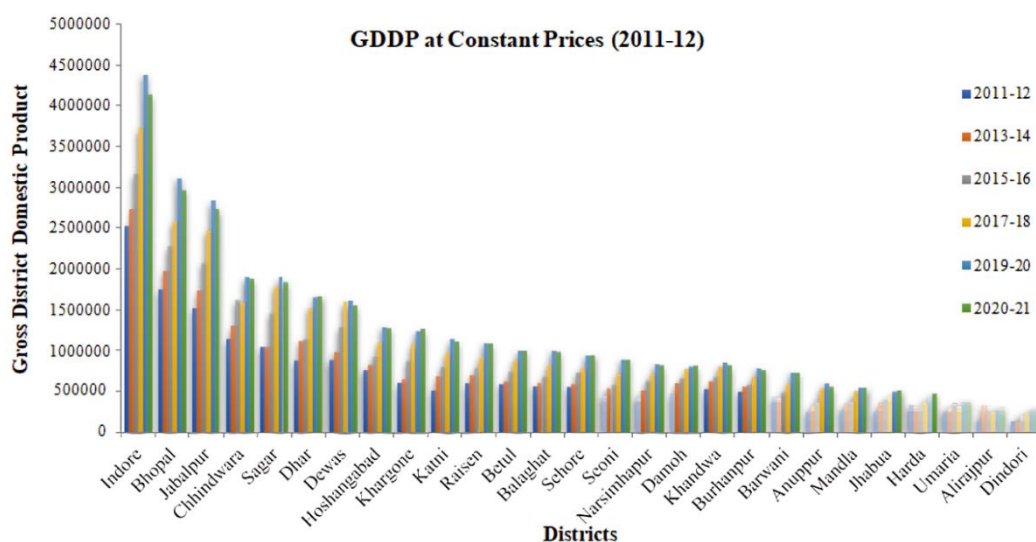


Figure 41 Upper and Middle Narmada Districts' GDDP, Madhya Pradesh (Source: Directorate Of Economics & Statistics, Madhya Pradesh, 2020-21)

Table 26 presents the district-level Gross Domestic Product (GDP) at constant prices (base year 2004-05) for four districts - Bharuch, Vadodara, Panch Mahals, and Surat - spanning seven years (2007-2013). This data provides valuable insights into the economic growth and development of each district during this period. However, small administrative unit GDP data is not very widely available, and this is a constraint.

Notably, the districts exhibit varying GDP growth rates, with Surat leading the way at a Compound Annual Growth Rate (CAGR) of 9.79%. Vadodara district boasts the largest GDP among the four, growing at a CAGR of 7.08%. Meanwhile, Bharuch and Panch Mahals districts demonstrate moderate growth rates of 7.42% and 6.70%, respectively. These findings facilitate comparative analysis and understanding of economic trends across districts, highlighting areas of strength and potential for future development.

**Table 26: District GDP (Millions, Rs.) at Constant Prices (2004-05)
(Source: District Level Data for India, ICRISAT)**

District Level				
Year	Bharuch	Vadodara	Panch Mahals	Surat
2007	90,458	271486	44504	288255
2008	1,00,527	290563	47511	315912
2009	1,12,803	327018	50664	367992
2010	1,27,421	347462	55049	405205
2011	1,32,783	370064	58883	446398
2012	1,38,468	400114	63864	494005
2013	1,49,328	438172	70063	554131
CAGR (%)	7.42	7.08	6.70	9.79

6.3 Net District Domestic Product (NDDP)

Figure 42 shows the status of NDDP at constant prices (2011-12) among districts of Upper and Middle Narmada Basin falling fully or partially under Narmada Basin. Through Figure 33, it is evident that Indore remains the largest economic contributor, with its NDDP rising from ₹2,207,281 lakh in 2011-12 to a peak of ₹3,817,955 lakh in 2019-20, before decreasing slightly to ₹3,523,105 lakh in 2020-21, likely due to the economic impacts of the COVID-19 pandemic. Similarly, Bhopal, another major urban centre, saw a consistent increase from ₹1,539,843 lakh in 2011-12 to ₹2,690,547 lakh in 2019-20 before dropping to ₹2,506,830 lakh in 2020-21. Jabalpur shows a similar trend, with its NDDP increasing from ₹1,340,484 lakh in 2011-12 to ₹2,471,005 lakh in 2019-20, followed by a slight decline to ₹2,322,028 lakh in 2020-21. This reflects a general pattern of robust growth, followed by a slight contraction in the final year, likely due to external economic shocks. It is remarkable that all three districts are big cities with higher urban populations. Several districts with industrial and agricultural bases, such as Chhindwara, Sagar, and Dhar, have also experienced substantial growth over the years. Chhindwara's NDDP increased from ₹1,020,391 lakh in 2011-12 to ₹1,701,280 lakh in 2019-20, with a minor reduction to ₹1,665,628 lakh in 2020-21. Similarly, Sagar saw an increase from ₹932,398 lakh to ₹1,668,471 lakh by 2019-20, followed by a decrease to ₹1,578,077 lakh in 2020-21. Districts such as Hoshangabad, Khargone, and Katni show consistent growth, although at a slower pace compared to larger districts. Hoshangabad's NDDP increased from ₹682,301 lakh in 2011-12 to ₹1,143,686 lakh in 2019-20, while Khargone and Katni followed a similar pattern, with their NDDPs rising from ₹526,206 lakh and ₹449,463 lakh to ₹1,091,327 lakh and ₹1,000,649 lakh, respectively, by 2019-20. In 2020-21, both districts experienced modest increases despite external economic pressures. In contrast, several rural and tribal districts, such as Alirajpur, Dindori, and Mandla, show more modest growth. Alirajpur's NDDP fluctuated, growing from ₹153,803 lakh in 2011-12 to ₹297,914 lakh in 2013-14, then declining to ₹262,117 lakh by 2020-21. Similarly, Dindori's NDDP grew from ₹119,487 lakh to ₹261,141 lakh over the period, and Mandla exhibited moderate growth from ₹259,437 lakh in 2011-12 to ₹470,194 lakh in 2020-21.

Overall, the NDDP data highlights a clear urban-rural divide in terms of economic growth. Larger, urbanized districts such as Indore, Bhopal, and Jabalpur continue to drive economic output, while rural and tribal districts exhibit slower but steady growth. The impact of the COVID-19 pandemic in 2020-21 is evident, with many districts experiencing a slight contraction or slower growth compared to previous years.

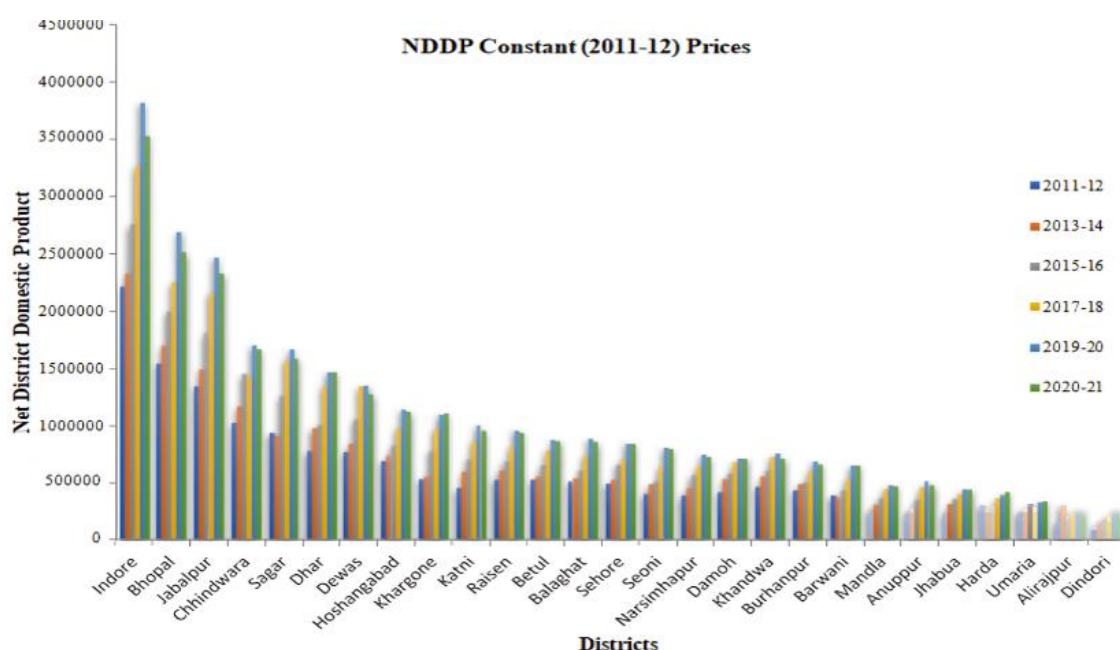


Figure 42 District-wise NDDP, Upper and Middle Narmada Basin, MP
(Source: Directorate Of Economics & Statistics, Madhya Pradesh)

6.4 Earnings and Consumption

Table 27 presents earnings data from the 2022-23 Periodic Labour Force Survey (PLFS) for the South and Central NSS Region (which covers Upper Narmada Basin), the rest of Madhya Pradesh, and All-India averages. The data compares average monthly and daily earnings across different types of employment and genders.

Table 27. Upper Basin Earnings by Broad Nature of Work (Rs.) (PLFS 2022-23)

Regions (Clusters of Districts)	Clusters of Districts					
	Salaried/Regular Wage (per month)		Self Employed (per month)		Casual Wage (per day)	
	Male	Female	Male	Female	Male	Female
South and Central NSS Region	17323.4	15157.94	10425.17	4221.35	273.35	217.4
Rest of Madhya Pradesh	18359.86	13139.21	13129.54	5934.7	342.19	250.72
All-India	20867.58	15983.14	15374.01	5497.31	433.94	270.22

** South and Central Madhya Pradesh NSS Region is a cluster of districts that corresponds broadly to the spatial definition of the upper basin of the Narmada River but includes regions that are technically outside the spatial definition (NSSO, 2023).*

In the South and Central NSS Region, males earned an average of ₹17,323.4 per month from salaried positions, while females earned ₹15,157.94. For self-employed individuals, male earnings were significantly higher at ₹10,425.17 compared to females at ₹4,221.35. Casual wage workers in this region earned ₹273.35 per day for males and ₹217.4 for females.

In the rest of Madhya Pradesh, average earnings for salaried males were ₹18,359.86, slightly higher than the South and Central NSS Region, while females earned ₹13,139.21, indicating a notable gender disparity. Self-employed males in this region earned an average of ₹13,129.54 per month, which is significantly higher than their female counterparts at ₹5,934.7. Casual wage workers earned ₹342.19 per day (males) and ₹250.72 (females).

The All-India averages show a similar trend of gender disparity in earnings across all categories. Salaried males earned an average of ₹20,867.58, while females earned ₹15,983.14. For self-employment, males earned ₹15,374.01, compared to ₹5,497.31 for females. Casual wage earnings per day were ₹433.94 for males and ₹270.22 for females.

In the case of the Middle Narmada Basin, based on the NSS regions, Table 28 provides details on the broad nature of work and the wage rates. In the South West NSS Region, males earned an average monthly salary of ₹16,675.85, while females earned a similar amount of ₹16,505.76, indicating a narrower gender wage gap compared to other regions. For self-employed individuals, males earned ₹12,247.83 per month, significantly more than females, who earned ₹5,571.46. Casual wage workers in this region earned ₹316.04 per day (males) and ₹221.32 (females).

Table 28. Middle Basin Earnings by Broad Nature of Work (Rs.) (PLFS 2022-23)

Regions (Clusters of Districts)	Clusters of Districts					
	Salaried/Regular Wage (per month)		Self Employed (per month)		Casual Wage (per day)	
	Male	Female	Male	Female	Male	Female
South West NSS Region	16675.85	16505.76	12247.83	5571.46	316.04	221.32
Rest of Madhya Pradesh	18099.1	13715.04	12365.33	5612.57	324.03	245.32
All-India	20867.58	15983.14	15374.01	5497.31	433.94	270.22

** South-West NSS Region Madhya Pradesh NSS Region is a cluster of districts that corresponds broadly to the spatial definition of the middle basin of the Narmada River but includes regions that are technically outside the spatial definition (NSSO, 2023).*

In the rest of Madhya Pradesh, average earnings for salaried males were higher at ₹18,099.10, while females earned ₹13,715.04. For self-employed males, the average monthly earnings were ₹12,365.33, with females earning slightly more than in the South West region at ₹5,612.57. Casual wage earnings were also higher in this region, with males earning ₹324.03 per day and females earning ₹245.32. The All-India averages show that salaried males earned ₹20,867.58, while females earned ₹15,983.14. For self-employment, males earned ₹15,374.01, compared to ₹5,497.31 for females. Casual wage earnings per day were ₹433.94 for males and ₹270.22 for females.

Table 29 presents earnings data from the 2022-23 Periodic Labour Force Survey (PLFS), comparing average monthly and daily earnings across different types of employment and genders in various regions. In South Eastern Gujarat, males earned significantly more than females, with average monthly salaries of ₹16,944.7 (salaried) and ₹15,000.8 (self-employed), compared to ₹9,168.4 and ₹4,276.1 for females, respectively. Casual wage workers in this region earned ₹353.8 (males) and ₹229.4 (females) per day. In contrast, the Rest of Gujarat and All-India averages showed similar gender disparities, with All-India averages being ₹20,867.6 (male salaried), ₹15,983.1 (female salaried), ₹15,374 (male self-employed), ₹5,497.3 (female self-employed), ₹433.9 (male casual), and ₹270.2 (female casual) per day.

Table 29: Lower Basin Earnings by Broad Nature of Work (Rs.) (PLFS 2022-23)

	Clusters of Districts					
	Salaried/Regular Wage (per month)		Self Employed (per month)		Casual Wage (per day)	
Regions (Clusters of Districts)	Male	Female	Male	Female	Male	Female
South Eastern Gujarat (NSS Region)	16,944.7	9,168.4	15,000.8	4,276.1	353.8	229.4
Rest of Gujarat	16,323.9	12,097.7	18,070.3	5,876.3	341.8	248.9
All-India	20,867.6	15,983.1	15,374.0	5,497.3	433.9	270.2

* South Eastern Gujarat NSS Region is a cluster of districts that corresponds broadly to the spatial definition of the lower basin of the Narmada River but includes regions that are technically outside the spatial definition (NSSO, 2023).

Table 30 presents data on monthly per capita consumption expenditure from the 2022-23 Household Consumer Expenditure Survey (HCES). The results show significant urban-rural disparities across regions. In South Eastern Gujarat, urban residents reported nearly twice the expenditure of their rural counterparts, at ₹7,198 versus ₹3,896. Similar patterns emerged in the Rest of Gujarat (₹6,202 urban, ₹3,746 rural) and All-India (₹6,459 urban, ₹3,773 rural). These findings highlight substantial differences in consumption patterns between urban and rural areas. South Eastern Gujarat's urban population exhibits relatively higher expenditure, mainly due to the inclusion of Surat and Vadodara in this NSS Region.

Table 30: Monthly Per Capita Consumption Expenditure (Rs.) (HCES 2022-23)

Clusters of Districts		
Regions (Clusters of Districts)	Rural	Urban
South Eastern Gujarat (NSS Region)	3,896	7,198
Rest of Gujarat	3,746	6,202
All-India	3,773	6,459

* South Eastern Gujarat NSS Region is a cluster of districts that corresponds broadly to the spatial definition of the lower basin of the Narmada River but includes regions that are technically outside the spatial definition (NSSO, 2024).

7. Future Projections and Scenarios

Effective policy implementation necessitates future estimates of existing scenarios, such as demographic and economic factors. These forecasts allow policymakers to allocate resources more effectively and formulate plans that tackle challenges significantly. By understanding future changes in population growth, income distribution, and economic development, policies can be customized to adopt sustainable growth and enhance community well-being. In the context of Narmada Basin Management, it is important to have precise knowledge of future population as it plays a measure role in shaping up basin's health. For the future projections of the population, there are two sources available, i.e. Census of India, 2019 Report (*Population projections For India and states 2011 – 2036*) and International Institute for Population Sciences (IIPS) Report (*Projection of District-Level Annual Population by Quinquennial Age-Group and Sex From 2012 To 2031 In India*). The Census of India Report 2019 provide the projected population for each from 2011 to 2036, while the IIPS Report projects the population for the years 2011, 2016, 2021, 2026 and 2031. Thus, the Census of India provides a projected population for not only 2036 but also for each year. However, the IIPS Report disaggregates data up to the district level, while the Census of India Report 2019 shows only state-level projected population. This report uses the Census of India Report, 2019, as it provides the projected population for each year up to 2036.

7.1 Methodology to Obtain Basin-level Projected Population

The Census of India Report 2019 provides the projected population at the state level, but as mentioned earlier, the basin does not follow the political boundaries. This report computes factors for each year based on the state-level projected population to estimate the projected population at the district level (for districts within the basin). These factors are then multiplied by the population of the districts within the basin. The new values are year-wise projected population for each district within the basin. Before conducting this analysis, it was confirmed whether there were any discrepancies or inconsistencies while disagreeing with data at the district level. The calculation incorporates the following steps:

1. The first step involves taking the factor of the state-level projected population and the state-level population of the previous year. For example, Madhya Pradesh's population in 2011 and 2012 was 72,627,000 and 73,863,000 (projected by the Census of India Report, 2019). The factor for the year 2012 has been calculated as $72,627,000 / 73,863,000 = 1.017018464$ (Appendix 5).
2. In the second step, the obtained factor is multiplied by the populations of all 50 districts of Madhya Pradesh.
3. The third step involves scaling up the values obtained in the second step to the state level, allowing us to check if the projected population of the Census of India Report 2019 matches the scaled-up population calculated from the factors. Interestingly, for each year, the obtained values perfectly match the official reports.

After iterating through steps 1 to 3 for each year and confirming that there are no discrepancies between the values from the Census of India Report and the scaled-up values, the same steps have been applied to obtain basin-level projected statistics. Factors for Madhya Pradesh, Chhattisgarh, Gujrat and Maharashtra are provided in Appendix 5, Appendix 6, Appendix 7, and Appendix 8 respectively.

7.2 Population Growth Trend

Understanding population trends is essential for the efficient planning and administration of the Narmada River Basin, as it guides water resource distribution, infrastructure enhancement, and ecological sustainability. As populations grow, especially in densely populated areas, the

demand for water for home, agricultural, and industrial purposes escalates, requiring sustainable allocation systems. Moreover, demographic data helps pinpoint vulnerable regions for flood hazards, informing disaster readiness and infrastructure development. It facilitates improved control of environmental impacts, as rising populations can put larger stresses on ecosystems. Monitoring population trends facilitates informed decision-making to preserve the Narmada River Basin as a sustainable and accessible resource for all users.

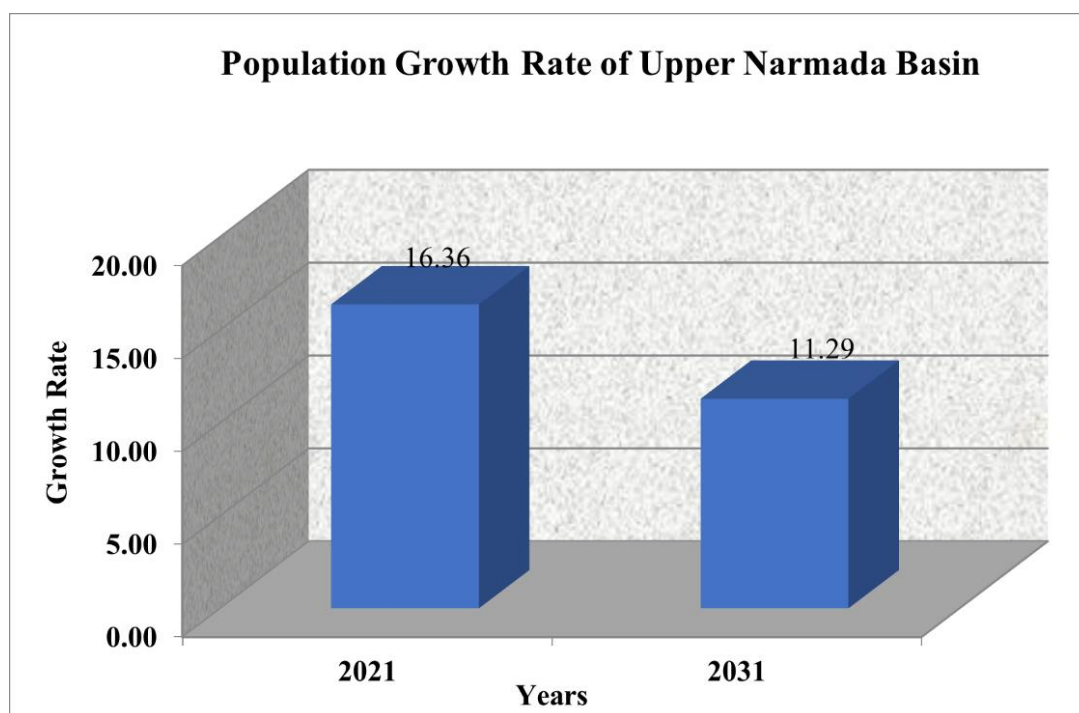


Figure 43. Population Growth in Upper Narmada Basin

(Source: Calculated from Population projections For India and states 2011 – 2036 (2019))

Figure 43 presents data on the projected population and growth rates over a span of two decades, specifically from 2011 to 2031, for the Upper Narmada Basin. The total population recorded in 2011 stands at 8,603,425. By 2021, the total population is expected to be 10,011,141, reflecting a substantial growth rate of approximately 16.37% over the ten-year period. This increase indicates a robust population expansion, which could be attributed to

factors such as natural population growth, migration, and improved healthcare, leading to lower mortality rates. The projected population is expected to be 11,141,004 in 2031, indicating a further increase. However, the growth rate for this decade is anticipated to be around 11.29%, which shows a decline in the growth rate compared to the previous decade. This trend suggests that while the population continues to grow, the rate of growth is slowing down.

Table 31 presents the projected population of the Middle Narmada Basin for the years 2021 and 2031. The table reveals that by 2021, the population of the Middle Narmada Basin is expected to be 10,603,431 and 11,787,082 by 2031. In terms of population growth rate, the table reveals that population growth in both basins are identical. This is because the projected population has been calculated using the same factor for all the districts of a state falling under the Upper and Middle Narmada Basin.

Table 31. Projected Population: Middle Narmada Basin
(Source: Calculated from Population projections For India and states 2011 – 2036 (2019))

Year	Total Population	Growth Rate
2011*	9126886	NA
2021	10603431	16.18
2031	11787082	11.16

(*Population for the year 2011 is census population based on Census of India, 2011)

7.3 Upper Narmada Basin: Projected Population

The projected population growth in the Upper Narmada Basin reveals significant demographic changes across various districts for the years 2011, 2021, and 2031. The region has seen steady growth, starting from a baseline population of 8,603,425 in 2011, with the population expected to rise to 10,011,141 by 2021 and further to 11,141,004 by 2031. This growth is accompanied by a balanced increase in both male and female populations. In 2011, the male population stood at 4,412,549, and the female population was 4,190,876. By 2031, these numbers are expected to rise to 5,664,831 males and 5,477,139 females. Among the districts, Jabalpur emerges as the most populous, with 2,425,715 residents in 2011, projected to grow to 2,822,803 in 2021 and further to 3,141,469 by 2031. This rapid growth is followed by Narsimhapur, which had a population of 1,077,182 in 2011, expected to rise to 1,253,516 by 2021 and 1,395,025 by 2031. Other notable districts experiencing significant growth include Hoshangabad, Betul, and Mandla. For instance, Hoshangabad had 703,092 people in 2011, expected to grow to 910,553 by 2031, while Betul's population is projected to rise from 627,667 in 2011 to 812,872 by 2031 (Table 32).

Table 32 also reveals that smaller districts such as Seoni and Damoh are also expected to see population increases, though at a more modest pace. Seoni's population is expected to grow from 319,103 in 2011 to 413,261 by 2031, and Damoh is projected to rise from 71,790 in 2011 to 92,973 in 2031. On the lower end of the spectrum, Umaria, with only 6,748 people in 2011,

is expected to increase modestly to 8,739 by 2031. The gender distribution across all districts shows that the male population consistently outnumbers the female population, with the male-to-female ratio remaining stable throughout the projection period. For example, in Jabalpur, the male population is projected to increase from 1,258,410 in 2011 to 1,615,604 by 2031, while the female population is expected to rise from 1,167,305 to 1,525,814 during the same period. Overall, the Upper Narmada Basin is set to experience a 29.47% population increase between 2011 and 2031, with districts like Jabalpur, Narsimhapur, and Hoshangabad witnessing the most substantial growth.

7.4 Middle Narmada Basin: Projected Population

Table 33 shows that projected population growth in the Middle Narmada Basin from 2011 to 2031 reflects a steady and notable increase across various districts in both Gujarat and Madhya Pradesh, with a few districts in Maharashtra as well. The total population in this region was 9,126,886 in 2011 and is expected to rise to 10,603,431 by 2021 and further to 11,787,082 by 2031. The male population, which was 4,654,625 in 2011, is projected to grow to 5,389,476 in 2021 and reach 5,962,462 by 2031. Similarly, the female population is expected to rise from 4,472,261 in 2011 to 5,214,487 in 2021 and to 5,826,079 by 2031. Among the districts, Khargone is the most populous, starting with 1,834,133 people in 2011, expected to grow to 2,134,380 in 2021, and projected to reach 2,375,329 by 2031. Next is Barwani, with a population of 1,103,143 in 2011, which is expected to rise to 1,283,727 in 2021 and 1,428,647 by 2031. Dhar also exhibits significant growth, with a population of 1,440,006 in 2011, increasing to 1,675,734 by 2021 and further to 1,864,908 by 2031. Other districts, such as Khandwa and Alirajpur, are also seeing a notable increase in population. Khandwa had 1,282,756 people in 2011 and is expected to grow to 1,662,258 by 2031. Meanwhile, Alirajpur, which had a population of 555,198 in 2011, is projected to reach 719,020 by 2031. On the smaller side, districts like Jhabua, Sehore, and Raisen show lower total populations but still follow the growth trend. For instance, Jhabua had a population of 13,933 in 2011, growing to 18,044 by 2031. Sehore, with 446,188 in 2011, is expected to grow to 577,844 by 2031, while Raisen had 8,803 people in 2011, projected to reach 11,400 by 2031.

In Gujarat, Narmada and Chhota Udepur show significant growth. Narmada had 29,979 people in 2011, growing to 34,616 by 2021, while Chhota Udepur is projected to increase from 18,290 in 2011 to 23,583 by 2031. In Maharashtra, Nandurbar had 300,444 people in 2011, and this number is expected to rise to 356,796 by 2031. Thus, the Middle Narmada Basin is expected to experience a steady population growth of about 29.2% from 2011 to 2031. Districts such as Khargone, Barwani, and Dhar will continue to dominate the population landscape, while smaller districts like Jhabua, Sehore, and Raisen will see modest growth. Overall, the population growth within the Upper and Middle Narmada basin may necessitate planning for infrastructure, resource allocation, and public services to support the increasing population, particularly in more populous districts like Jabalpur and Khargone, while also addressing the needs of smaller districts that may require targeted interventions for better development.

Table 32. Upper Narmada Basin Projections
(Source: Calculations based on Population projections For India and states 2011 – 2036 (2019))

Districts		2011			2021			2031		
		Population	Male	Female	Population	Male	Female	Population	Male	Female
Chhattisgarh	Kabeerdham	49082	24368	24714	56668	28092	28575	62866	31149	31719
	<u>Rajnandgaon</u>	23081	11426	11655	26648	13172	13476	29563	14605	14958
Madhya Pradesh	Anuppur	105943	53129	52814	123286	61600	61701	137204	68209	69035
	Balaghat	316049	155818	160231	367786	180662	187193	409305	200046	209442
	Betul	627667	319232	308435	730416	370132	360336	812872	409845	403163
	Chhindwara	316153	158841	157312	367907	184167	183783	409440	203927	205627
	Damoh	71790	37176	34614	83542	43103	40439	92973	47728	45245
	Dindori	601517	300336	301181	699985	348223	351861	779006	385585	393681
	Hoshangabad	703092	367986	335106	818188	426659	391495	910553	472437	438026
	Jabalpur	2425715	1258410	1167305	2822803	1459056	1363728	3141469	1615604	1525814
	Katni	253587	129658	123929	295099	150331	144783	328413	166461	161991
	Mandla	914427	455060	459367	1064118	527616	536665	1184246	584227	600450
	Narsimhapur	1077182	561158	516024	1253516	650631	602856	1395025	720440	674508
	Raisen	682636	357717	324919	794383	414753	379593	884061	459253	424710
	Sagar	48714	25534	23180	56688	29605	27081	63088	32782	30299
	Sehore	60939	32044	28895	70915	37153	33757	78920	41140	37769
	Seoni	319103	161303	157800	371340	187022	184353	413261	207088	206264
	Umaria	6748	3353	3395	7853	3888	3966	8739	4305	4438
Total		8603425	4412549	4190876	10011141	5115865	4895641	11141004	5664831	5477139

*Population as per Census of India, 2011

Table 33. Middle Narmada Basin Projections
(Source: Calculations based on Population projections For India and states 2011 – 2036 (2019))

State	Districts	2011			2021			2031		
		Population	Male	Female	Population	Male	Female	Population	Male	Female
Gujarat	Chhota Udepur									
		18290	9154	9136	21119	10639	10474	23583	11914	11660
	<u>Narmada</u>	29979	15183	14796	34616	17646	16963	38655	19761	18884
Madhya Pradesh	Alirajpur	555198	276401	278797	646084	320471	325710	719020	354856	364423
	Barwani	1103143	557167	545976	1283727	646004	637848	1428647	715316	713659
	Betul	129765	65376	64389	151007	75800	75224	168055	83933	84165
	Bhopal	1457	772	685	1696	895	800	1887	991	895
	Burhanpur	71815	36348	35467	83571	42143	41435	93005	46665	46360
	Dewas	557780	287778	270002	649088	333662	315435	722364	369463	352927
	Dhar	1440006	727104	712902	1675734	843036	832863	1864908	933489	931852
	Harda	569267	294216	275051	662456	341127	321334	737240	377728	359526
	Hoshangabad	556994	290348	266646	648174	336642	311515	721346	372762	348540
	Indore	204201	104821	99380	237629	121534	116103	264454	134574	129902
	Jhabua	13933	6893	7040	16214	7992	8225	18044	8850	9202
	Khandwa	1282756	660403	622353	1492742	765700	727077	1661258	847855	813493
	Khargone	1834133	933440	900693	2134380	1082271	1052253	2375329	1198393	1177319
	Raisen	8803	4535	4268	10244	5258	4986	11400	5822	5579
	<u>Sehore</u>	446188	232916	213272	519229	270053	249159	577844	299028	278773
Maharashtra	Dhule	2734	1382	1352	3027	1535	1492	3247	1649	1598
	Nandurbar	300444	150388	150056	332696	167066	165591	356796	179413	177322
TOTAL		9126886	4654625	4472261	10603431	5389476	5214487	11787082	5962462	5826079

*Population as per Census of India, 2011)

Table 34. Lower Narmada Basin Projections

State	District	2011			2021			2031		
		Population	Male	Female	Population	Male	Female	Population	Male	Female
Gujarat	Bharuch	897495	466492	431003	1036307	542174.2	494131.8	1157225	607146.2	550084.2
	Dohad	26888	13476	13412	31046.65	15662.3	15376.45	34669.24	17539.21	17117.58
	Narmada	453446	232771	220675	523578.6	270535	252997.2	584670.8	302954.9	281645
	Panch Mahals	54807	28207	26600	63283.77	32783.21	30496.09	70667.84	36711.83	33949.27
	Surat	62433	31328	31105	72089.25	36410.56	35660.93	80500.76	40773.85	39698.95
	Vadodara	1155469	588482	566987	1334181	683955.5	650033.3	1489855	765918	723639
Madhya Pradesh	Alirajpur	139958	69218	70740	162869	80254.38	82643.47	181255.3	88865.22	92466.06
Maharashtra	Nandurbar	8337	4253	4084	9231.951	4724.647	4506.803	9900.698	5073.836	4826.093
Total		2798833	1434227	1364606	3232587.221	1666499.797	1565846.043	3608744.638	1864983.046	1743426.153

7.5 Lower Narmada Basin: Projected Population

Table 34 presents population projections for the Lower Narmada Basin, based on 2011 data, for the years 2021 and 2031. The projections are segmented by state, district, and gender. In Gujarat, the districts of Bharuch, Dohad, Narmada, Panch Mahals, Surat, and Vadodara are expected to experience significant population growth, with Vadodara's population projected to increase from approximately 1.16 million in 2011 to 1.33 million by 2021 and 1.49 million by 2031. Similarly, in Madhya Pradesh, Alirajpur district's population is projected to rise from around 140,000 in 2011 to 163,000 by 2021 and 181,000 by 2031. In Maharashtra, Nandurbar district's population is expected to grow from roughly 8,300 in 2011 to 9,200 by 2021 and 9,900 by 2031. It is essential to note that these projections are linear and based on extrapolation of past trends rather than detailed fertility and mortality estimates, which are unavailable for smaller geographical areas. As such, these projections should be interpreted as rough estimates rather than precise predictions, and actual population growth may vary due to factors such as changes in demographic rates, migration, or other socioeconomic factors. These projections provide valuable insights into the demographic changes anticipated in the Lower Narmada Basin over the next two decades.

8. Findings and Summary

Demography and related characteristics are important components that directly affect a river's health. This report highlights various aspects such as administrative divisions, population distribution, population density, sex ratio, health status, urban centres, migration, and economic indicators like GDDP and NSDP. Understanding these aspects is crucial for identifying which parts of the basin require more attention and planning in terms of river management. The report's key findings, with respect to demography, are based on data from the Census of India 2011. The total population of the Narmada River Basin stands at approximately 20.8 million. Madhya Pradesh, which occupies the largest part of the basin, has a population of over 17.3 million. Gujarat, the second-largest state in terms of basin coverage, has just under 3 million people, while Maharashtra and Chhattisgarh have much smaller populations within the basin boundaries.

Analysis of demographic and socio-economic data reveals that the western part of the Middle Narmada Basin and the eastern part of the Upper Narmada Basin provide a home to the tribal population. It is also important to note that these same regions also contain national parks and biosphere reserves (Achanakmar).

Findings on the aggregation of socio-economic indicators, such as employment, sex ratio, literacy rate, and population density, at the district and village level, provide basin-level insights. Further, basin level The aggregation process considers the basin's boundaries, ensuring that the data reflects the unique characteristics of the population living within the basin. This method provides a more accurate representation of demographic trends specific to the river basin, as opposed to general state-level statistics. In conclusion, the report offers

valuable insights into the demographic characteristics of the Narmada River Basin. It highlights the complexities of population distribution, urbanization, and literacy within the basin, providing a foundation for future studies on migration and socio-economic development in the region.

Understanding the region's population distribution, economic activity, health, education, and employment patterns can inform and help target interventions and also plan river management accordingly. Policymakers can prioritize several key areas to address the unique challenges and opportunities in the Narmada River Basin. For instance, improving education, healthcare, economic diversification, and empowering Scheduled Tribes may be crucial focus areas. By analysing these demographics, policymakers can craft tailored policies to promote inclusive economic growth, improve healthcare and education, and enhance the overall well-being of the region's diverse population. This data-driven approach enables more effective resource allocation and development strategies.

The report presents data summaries for the Narmada River Basin related to the demographic and socioeconomic characteristics of the population. It provides the distribution of population and economic activity in the basin region, composition of the population (age, sex, social composition), and socioeconomic information (health, education, employment, earnings, consumption).

Analysing the demographic features of a hydrologically defined basin can be challenging since its boundaries do not align with administrative areas like states, districts, or blocks, which are typically the basis for collecting most of these data. Geo-coded data helps tackle this issue and allows us to match the basin boundaries wherever possible, allowing for a more focused analysis of the region's demographics. When geo-coded data is unavailable, the report relies on data from districts or clusters of districts from publicly available surveys.

According to the 2011 census, the total population in the Upper Narmada Basin and Middle Narmada Basin is 86.03 lakhs and 91.26 lakhs, respectively. On the other hand, the total population of the Lower Narmada Basin is approximately 26.9 lakhs, with a decadal growth rate of 18% (2001-2011) and a population density of 319.3 persons/sq km. The rural population, as per 2020 data, stands at 19.8 lakhs. Urban centres account for 20.9% of the total population, with Bharuch having the highest urban population share (49.8%). District-wise data reveals varying demographic characteristics across all three basins. In the Upper Narmada Basin, Umariya has the highest population density, while in the Middle Narmada Basin, Jhabua has a high density. With respect to the Lower Narmada Basin, Bharuch has the highest population density, Vadodara has the highest population, and the Narmada district exhibits a high decadal growth rate. The population distribution is predominantly rural, except in Bharuch, where the urban population is significant. Madhya Pradesh's Alirajpur district has a relatively low urban population (4.8%). The region has 23 towns with low population size. Only four towns – Anklesvar, Bharuch, Chhota Udepur, and Rajpipla – have municipalities.

The sex ratio and child sex ratio vary across districts. Gujarat's overall sex ratio improved from 950 to 965 females per 1,000 males between 2015-16 and 2019-20. Districts like Bharuch and Alirajpur show favourable sex ratios, while Surat and Narmada exhibit lower ratios at 890 and

853 per 1000 males, respectively. The population composition reveals significant variations in social group shares. Scheduled Tribes comprise a substantial portion (65.6%) of the basin population, particularly in Narmada, Dohad, Alirajpur, and Nandurbar districts.

The Lower Narmada River Basin's economic activity is unevenly distributed, with Bharuch being the hub of economic growth. Nightlight data from 2012 to 2021 reveals increased economic activity, particularly in urban areas. Demographically, the region has a relatively young population, with 29.5% in the 0-14 age group and 60.6% in the working-age population (15-59 years). The elderly population accounts for 9.9%.

The Lower Narmada River Basin's socio-economic characteristics are diverse, with varying vital statistics across regions. Gujarat's birth rate stands at 19.3 per 1,000, death rate at 5.6 per 1,000, and infant mortality rate at 23 per 1,000 live births. However, South Eastern Gujarat (which includes the basin areas) has higher birth rates. This is an approximate assessment, given that South Eastern Gujarat also includes districts outside of the spatial definition of the basin. One would expect death and mortality rates to be higher in the basin regions, given that these regions are predominantly Scheduled Tribe inhabited and show poorer child health outcomes on average.

In terms of child health, Gujarat's stunting rates remain around 39%, wasting rates decreased slightly, and underweight rates increased. District-level data in the basin areas reveals varying trends, with some districts showing worsening stunting rates. Stunting worsened for Dohad from 44.4% to 55.3%, and Surat from 30% to 36.1%. Literacy rates vary significantly, with Gujarat's state average at 79.3%, but basin-level literacy is as low as 56.4%.

The 2011 Census data reveals varying worker participation rates (WPR) across districts in the Lower Narmada Basin. WPR measures the proportion of people engaged in economic activities. Basin-level data shows a higher WPR of 58% for males and 41.2% for females, exceeding national averages. Notably, female participation in the workforce is higher in the basin area (41.2%) than in Gujarat (26.6%) and even the very similar national average (25.5%). To summarise, the Lower Narmada River Basin region is predominantly rural, with 79.1% of its population in rural areas. The population comprises working-age (15-59 years) individuals (60.6%) and children (29.5%). Notably, Scheduled Tribes account for 65.6% of the population. Literacy rates are low in the basin (56.4% for the basin compared to 79.3% for Gujarat state), and child health outcomes, where stunting, wasting, and underweight prevalence are on the higher side. The economy is predominantly agricultural, with self-employment as the most prevalent form of work. Female worker participation rates are relatively high (even higher than the national average).

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Appendix 1. Upper Narmada Basin: Number of Sub-Districts
(Source: Calculated from Census of India, 2011)

Sr.No.	Districts	Number of Sub-districts
Chhattisgarh		
1	Kabeerdham	1
2	Rajnandgaon	1
Madhya Pradesh		
3	Anuppur	1
4	Balaghat	2
5	Betul	5
6	Chhindwara	4
7	Damoh	2
8	Dindori	2
9	Hoshangabad	7
10	Jabalpur	7
11	Katni	2
12	Mandla	6
13	Narsimhapur	5
14	Raisen	8
15	Sagar	2
16	Sehore	1
17	Seoni	4
18	Umaria	1

Appendix 2. Middle Narmada Basin: Number of Sub-Districts
(Source: Calculated from Census of India, 2011)

Sr. No.	Districts	Number of Sub-districts
Madhya Pradesh		
1	Alirajpur	3
2	Barwani	9
3	Betul	3
4	Bhopal	1
5	Burhanpur	1
6	Dewas	5
7	Dhar	7
8	Harda	6
9	Hoshangabad	4
10	Indore	2
11	Jhabua	2
12	Khandwa	5
13	Khargone	9
14	Raisen	1
15	Sehore	7
Gujrat		
16	Chhota Udepur	2
17	Narmada	2
Maharashtra		
18	Dhule	1
19	Nandurbar	3

Appendix 3. Urban Local Bodies, Upper Narmada Basin
(Source: Calculated from Census of India, 2011)

	District Name	No. of ULBs	Urban Local Body Name	Urban Local Body Type
1	Anuppur	1	Amarkantak	Town Panchayat
2	Balaghat	2	Malajkhanda Baihar	Municipality Town Panchayat
3	Betul	6	Betul Sarni Betul Bazar Chicholi Ghodadongri Shahpur	Municipality Municipality Town Panchayat Town Panchayat Town Panchayat Town Panchayat
4	Chhindwara	1	Harrai	Town Panchayat
5	Dindori	2	Dindori	Town Panchayat
			Shahpur Sagar	Town Panchayat
6	Jabalpur	8	Jabalpur Jabalpur Panagar Sihora Barela Bhedaghat Katangi Balaghat Manjholi Jabalpur	Cantonment Board Municipal Corporations Municipality Municipality Town Panchayat Town Panchayat Town Panchayat Town Panchayat
7	Mandla	2	Mandla Bamhni Banjar	Municipality Town Panchayat
8	Narsinghpur	8	Gadarwara Gotegaon Kareli Narsimhapur Chichli Sainkheda Salichauka Tendukheda- Narsimhapur	Municipality Municipality Municipality Municipality Town Panchayat Town Panchayat Town Panchayat Town Panchayat
9	Sehore	1	Shahganj	Town Panchayat
10	Seoni	1	Lakhnadon	Town Panchayat
11	Raisen	6	Badi Bareli Devri/Deori Silwani Sultanpur Udepura	Town Panchayat Town Panchayat Town Panchayat Town Panchayat Town Panchayat Town Panchayat

Appendix 4. Urban Local Bodied, Middle Narmada Basin
(Source: Calculated from Census of India, 2011)

Sr. NO.	District Name	No. of ULBs	Urban Local Body Name	Urban Local Body Type
1	Chhotaudepur	1	Chhota Udepur	Municipality
2	Nandurbar	1	Dhadgaon	Town Panchayat
3	Alirajpur	3	Alirajpur	Municipality
			Bhavra	Town Panchayat
			Jobat	Town Panchayat
4	Barwani	6	Sendhwa	Municipality
			Anjad	Town Panchayat
			Niwali Bujurg	Town Panchayat
			Palsud	Town Panchayat
			Rajpur	Town Panchayat
			Thikri	Town Panchayat
5	Betul	6	Betul	Municipality
			Sarni	Municipality
			Betul Bazar	Town Panchayat
			Chicholi	Town Panchayat
			Ghodadongri	Town Panchayat
			Shahpur	Town Panchayat
6	Dewas	6	Kannod	Town Panchayat
			Kantaphod	Town Panchayat
			Khategaon	Town Panchayat
			Loharda	Town Panchayat
			Nemawar	Town Panchayat
			Satwas	Town Panchayat
7	Dhar	9	Dhar	Municipality
			Manawar	Municipality
			Bagh	Town Panchayat
			Dahi	Town Panchayat
			Dhamnod- Dhar	Town Panchayat
			Dharampuri	Town Panchayat
			Gandhwani	Town Panchayat
			Kukshi	Town Panchayat
			Mandav	Town Panchayat
8	Harda	4	Harda	Municipality
			Khirkia	Town Panchayat
			Sirali	Town Panchayat
			Timarni	Town Panchayat
9	Indore	1	Manpur	Town Panchayat
10	East Nimar	5	Khandwa	Municipal Corporations
			Harsud	Town Panchayat
			Mundi	Town Panchayat
			Omkareshwar	Town Panchayat
			Pandhana	Town Panchayat
11	Khargone	9	Barwaha	Municipality
			Khargone	Municipality
			Sanawad	Municipality
			Bhikangaon	Town Panchayat
			Bistan	Town Panchayat
			Karahi	Town Panchayat
			Kasrawad	Town Panchayat
			Maheshwar	Town Panchayat
			Mandleshwar	Town Panchayat
12	Sehore	3	Budni	Town Panchayat
			Nasrullaganj	Town Panchayat
			Rehti	Town Panchayat

Appendix 5. Factors for District-level Projected Population, Madhya Pradesh
(Source: Population projections For India and states 2011 – 2036 (2019))

Projected Total Population by Sex as on 1st March - 2011 - 2036: Madhya Pradesh* ('000)

Year	MADHYA PRADESH			Factor = Projected Year Population/Current Year Population**		
	Persons	Male	Female	Persons	Male	Female
2011	72,627	37,612	35,015	NA	NA	NA
2012	73,863	38,237	35,625	1.017018464	1.016617037	1.017421105
2013	75,099	38,862	36,236	1.016733683	1.016345425	1.017150877
2014	76,334	39,487	36,847	1.016444959	1.016082549	1.016861685
2015	77,570	40,112	37,458	1.016191998	1.015827994	1.016582083
2016	78,806	40,737	38,069	1.015933995	1.015581372	1.016311602
2017	79,948	41,312	38,637	1.014491282	1.014114932	1.014920276
2018	81,090	41,886	39,204	1.014284285	1.013894268	1.014675052
2019	82,232	42,460	39,772	1.014083118	1.013703863	1.014488318
2020	83,374	43,035	40,339	1.013887538	1.013542157	1.014256261
2021	84,516	43,609	40,907	1.013697316	1.013337981	1.014080666
2022	85,548	44,119	41,429	1.012210706	1.011694834	1.012760652
2023	86,579	44,629	41,950	1.012051714	1.011559646	1.012575732
2024	87,610	45,138	42,472	1.011908199	1.01140514	1.012443385
2025	88,641	45,648	42,994	1.011768063	1.011298684	1.01229045
2026	89,673	46,157	43,515	1.011642468	1.011150543	1.01211797
2027	90,549	46,584	43,966	1.009768827	1.009251035	1.010364242
2028	91,426	47,010	44,417	1.009685364	1.009144771	1.010257927
2029	92,303	47,436	44,867	1.009592457	1.009061902	1.010131256
2030	93,180	47,862	45,318	1.009501316	1.008980521	1.010051931
2031	94,057	48,288	45,769	1.009411891	1.008900589	1.009951895
2032	94,806	48,645	46,161	1.007963256	1.007393141	1.008564749
2033	95,556	49,002	46,554	1.007910892	1.007338884	1.00851368
2034	96,305	49,359	46,946	1.007838336	1.007285417	1.008420329
2035	97,055	49,716	47,339	1.007787758	1.007232724	1.00837132
2036	97,804	50,073	47,731	1.007717274	1.007180787	1.008280699

** Calculated factor

Appendix 6. Factors for District-level Projected Population, Chhattisgarh
(Source: Population projections For India and states 2011 – 2036 (2019))

Projected Total Population by Sex as on 1st March - 2011 - 2036: Chhattisgarh* ('000)

Year	CHHATTISGARH			Factor = Projected Year Population/Current Year Population		
	Persons	Male	Female	Persons	Male	Female
2011	25545	12833	12712	NA	NA	NA
2012	25950	13033	12917	1.015854	1.015585	1.0161
2013	26356	13233	13122	1.015645	1.015346	1.0159
2014	26761	13434	13327	1.015367	1.015189	1.0156
2015	27166	13634	13532	1.015134	1.014888	1.0154
2016	27571	13834	13738	1.014908	1.014669	1.0152
2017	27956	14026	13930	1.013964	1.013879	1.014
2018	28340	14218	14122	1.013736	1.013689	1.0138
2019	28724	14410	14314	1.01355	1.013504	1.0136
2020	29109	14602	14506	1.013403	1.013324	1.0134
2021	29493	14794	14698	1.013192	1.013149	1.0132
2022	29836	14966	14871	1.01163	1.011626	1.0118
2023	30180	15137	15043	1.01153	1.011426	1.0116
2024	30524	15308	15215	1.011398	1.011297	1.0114
2025	30867	15480	15388	1.011237	1.011236	1.0114
2026	31211	15651	15560	1.011145	1.011047	1.0112
2027	31512	15801	15711	1.009644	1.009584	1.0097
2028	31814	15952	15862	1.009584	1.009556	1.0096
2029	32116	16103	16013	1.009493	1.009466	1.0095
2030	32417	16253	16164	1.009372	1.009315	1.0094
2031	32719	16404	16315	1.009316	1.009291	1.0093
2032	32991	16538	16453	1.008313	1.008169	1.0085
2033	33264	16673	16591	1.008275	1.008163	1.0084
2034	33536	16807	16729	1.008177	1.008037	1.0083
2035	33809	16941	16867	1.008141	1.007973	1.0082
2036	34081	17076	17005	1.008045	1.007969	1.0082

** Calculated factors

Appendix 7. Factors for District-level Projected Population, Gujarat
(Source: Population projections For India and states 2011 – 2036 (2019))

Projected Total Population by Sex as on 1st March - 2011 - 2036: Gujarat* ('000)

Year	GUJARAT			Factor = Projected Year Population/Current Year Population		
	Persons	Male	Female	Persons	Male	Female
2011	60440	31491	28948	NA	NA	NA
2012	61383	32007	29376	1.015602	1.016386	1.014785
2013	62327	32523	29804	1.015379	1.016121	1.01457
2014	63271	33039	30232	1.015146	1.015866	1.01436
2015	64214	33555	30659	1.014904	1.015618	1.014124
2016	65158	34071	31087	1.014701	1.015378	1.01396
2017	66084	34577	31507	1.014212	1.014851	1.01351
2018	67010	35083	31927	1.014012	1.014634	1.01333
2019	67936	35588	32347	1.013819	1.014394	1.013155
2020	68862	36094	32768	1.01363	1.014218	1.013015
2021	69788	36600	33188	1.013447	1.014019	1.012817
2022	70648	37066	33581	1.012323	1.012732	1.011842
2023	71507	37532	33975	1.012159	1.012572	1.011733
2024	72367	37998	34369	1.012027	1.012416	1.011597
2025	73227	38464	34762	1.011884	1.012264	1.011435
2026	74086	38930	35156	1.011731	1.012115	1.011334
2027	74855	39341	35514	1.01038	1.010557	1.010183
2028	75624	39752	35872	1.010273	1.010447	1.010081
2029	76393	40163	36230	1.010169	1.010339	1.00998
2030	77162	40574	36588	1.010066	1.010233	1.009881
2031	77931	40986	36946	1.009966	1.010154	1.009785
2032	78608	41348	37260	1.008687	1.008832	1.008499
2033	79285	41711	37574	1.008612	1.008779	1.008427
2034	79962	42074	37888	1.008539	1.008703	1.008357
2035	80639	42437	38202	1.008467	1.008628	1.008288
2036	81316	42800	38516	1.008395	1.008554	1.008219

Source: Population projections For India and states 2011 – 2036 (2019). ** Calculated factors

Appendix 8. Factors for District-level Projected Population, Maharashtra
(Source: Population projections For India and states 2011 – 2036 (2019))

Projected Total Population by Sex as on 1st March - 2011 - 2036: Maharashtra* ('000)

Year	MAHARASHTRA			Factor = Projected Year Population/Current Year Population		
	Persons	Male	Female	Persons	Male	Female
2011	1,12,374	58243	54131	NA	NA	NA
2012	1,13,645	58924	54721	1.01131	1.011692	1.010899
2013	1,14,915	59606	55310	1.011175	1.011574	1.010764
2014	1,16,186	60287	55899	1.01106	1.011425	1.010649
2015	1,17,456	60968	56488	1.010931	1.011296	1.010537
2016	1,18,727	61649	57078	1.010821	1.01117	1.010445
2017	1,19,869	62260	57609	1.009619	1.009911	1.009303
2018	1,21,011	62870	58140	1.009527	1.009798	1.009217
2019	1,22,153	63481	58672	1.009437	1.009718	1.00915
2020	1,23,295	64091	59203	1.009349	1.009609	1.00905
2021	1,24,437	64702	59735	1.009262	1.009533	1.008986
2022	1,25,411	65220	60191	1.007827	1.008006	1.007634
2023	1,26,385	65738	60647	1.007766	1.007942	1.007576
2024	1,27,360	66256	61103	1.007715	1.00788	1.007519
2025	1,28,334	66774	61560	1.007648	1.007818	1.007479
2026	1,29,308	67292	62016	1.00759	1.007758	1.007407
2027	1,30,137	67730	62406	1.006411	1.006509	1.006289
2028	1,30,965	68169	62796	1.006363	1.006482	1.006249
2029	1,31,794	68607	63187	1.00633	1.006425	1.006227
2030	1,32,622	69046	63577	1.006283	1.006399	1.006172
2031	1,33,451	69484	63967	1.006251	1.006344	1.006134
2032	1,34,114	69829	64285	1.004968	1.004965	1.004971
2033	1,34,776	70174	64602	1.004936	1.004941	1.004931
2034	1,35,439	70518	64920	1.004919	1.004902	1.004922
2035	1,36,101	70863	65238	1.004888	1.004892	1.004898
2036	1,36,764	71208	65556	1.004871	1.004869	1.004874

Source: *Population projections For India and states 2011 – 2036 (2019)*. ** Calculated factor

Alternative estimates: Lower Narmada Basin: Projected Population

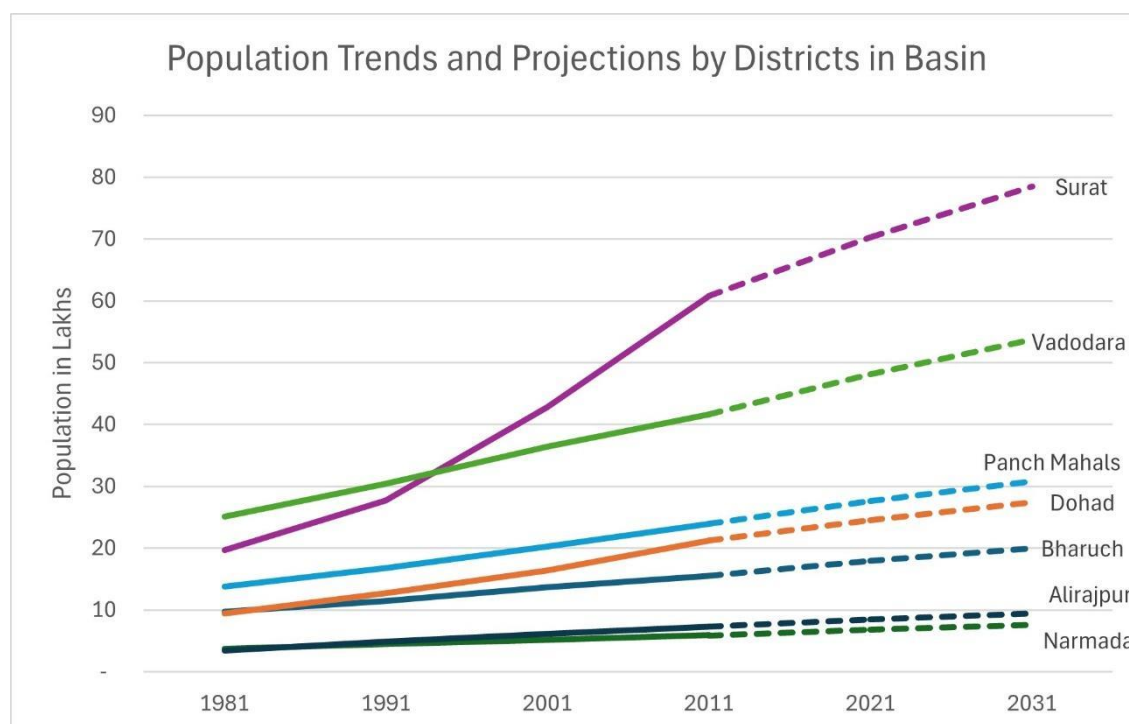


Figure 44 presents trends and projections of population for the lower sub-basin districts in Gujarat and Madhya Pradesh. Surat and Vadodara are the larger districts and show higher growth. This is largely driven by the presence of large urban centres in both districts, which is an important caveat because these cities do not fall in the Narmada basin. The projections shown are essentially extrapolations of past trends and are over-estimates. Based on the relatively high population density in the lower sub-basin of the Narmada River, it would be reasonable to expect population growth rates to taper.





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