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Citizens Thirst for Change Safeguarding Amravati's Drinking Water Resources from Legal Rights to Reality

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ABSTRACT

Amravati, located in Western Maharashtra, India, has a variety of water resources for agricultural, domestic, and industrial purposes, but those resources are under threat. Therefore, careful planning and careful management will be necessary to ensure use in this area. Amravati has a long tradition of cultural practice, but the pace of urbanization and industrialization has some real challenges to safeguarding the drinking water supplies of the community. The Amravati area is experiencing a rapid population increase, and in some situations, water management can be improved. Consequently, providing local residents with clean, safe drinking water is becoming increasingly difficult. Access to clean, safe drinking water is absolutely necessary for the health and survival of any community. The safeguarding of clean, safe drinking water is especially important in a city that is highly dependent on water as a primary resource. At the same time, there are significant challenges to meeting this lawful right. According to the Central Ground Water Board, Amravati, like many other communities of Maharashtra, is increasingly water scarce, and already suffering from declining water levels. Protection and management of drinking water resources for sustainability are priority issues for the next generation.The present-day water crisis in Amravati is attributable to the rapid urbanization, over consumption and forms of degrading infrastructure which

continues to diminish the community's capacity for accessing clean drinking water. The local authority has endeavored to address the seriousness of the current crisis by launching community-based water conservation initiatives, enforcing stricter groundwater regulations and starting water body regeneration projects. Infrastructure development is essential since it involves the pooling of funds for water treatment plants, pipelines and storage to ensure universal access to clean drinking water while simultaneously dealing with the challenge of urbanization and population growth. The important part to drinking water in Amravati is to ensure the identity of safety. The legal codes of practice and codes of conduct must be firmly adhered to, to include communities and engage actively through ongoing sustainable water management principles. The legal aspect has to be addressed for all to have equal experience to clean, safe drinking water.

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Introduction

Amravati, located within the Vidarbha region of the Indian state of Maharashtra, is the 9th largest city within Maharashtra, and the 2nd largest in Vidarbha. It is the administrative headquarters of Amravati District and Amravati Division. Amravati has been selected for the Smart Cities Mission. The city is widely known for the historical Ambadevi Temple and has played an important historic role. Amravati is considered an emerging educational and industry hub in Maharashtra ranked at 7th position. Considering the rich history of the city during the freedom struggle, Amravati is a pilgrimage city and a key city to the on-going Maharashtra development. Amravati continues to increase in strategic importance, culturally and economically in the regional and state context.Known historically as "Umbravati," Amravati derived its name from the ancient godess Ambadevi temple. The ancient origins of the city can be traced back as far as 1097, when Rishabhanatha the Jain tirthankara had a marble statue of himself erected in the city. In the 13th century Amravati was under the rule of the Hindu King of Devagiree. However, a famine in the 14th century caused the inhabitants to flee to Gujarat and Malwa.After several years, they came back to a thinly populated Amravati. The city flourished under the

leadership of Ranoji Bhosle, following the treaties of Devgaon and Anjangaon Surji, and the successful conquest of Gavilgad.

The district's administrative framework is primarily divided into six sub-divisions, that are further fractions by fourteen talukas, each strategically locating administrative unit in the region. Within the Amravati sub-division, the talukas of Amravati, Bhatukali and Nandgaon Khandeshwar, all contribute to the development of local governance. At the same time, the Daryapur sub-division is reflected in the two prominent talukas of Daryapur and Anjangaon, illustrating local governance. Then, in what could be deemed the Achalpur sub-division, the local and large talukas of Achalpur and Chandur Bazar contribute economic and social development, vulnerability, opportunity, etc. Then in the Morshi sub-division, the type of local governance takes place in Warud and Morshi talukas, contributing their own compounding situations. And, while also depicting its diverse administrative unit, the Dharni sub-division encompasses tohse talukas of Dharni and Chikhaldara, where the districts needs are attended to, and challenges and opportunity improved with diverse administrative characteristics. Finally, the Chandur (Railway) sub-division encapsulates Chandur (Railway), Tiosa and Dhamangaon talukas, contributing both historically and contemporarily to the growth of local governance, regional priorities.

Geography

Amravati District, located almost at an equal distance from the cotton growing places, serves as a major junction dividing the region into two basins, the Purna basin to the West and the Wardha basin to the East. This district, which occupies an extensive geographical area of 12212 sq kilometers, covers only 3.97% of Maharashtra's area. Geographically, the district is located in a region that extends between approximately 20°32' and 21°46' north latitude and about 76°37' and 78°27' east longitude. The bedrock rock this district is zoned at an average altitude of 343 meters (approximately 1125 feet). The district is located next to several neighboring districts such as Betul District in the northern part of Madhya Pradesh state. It is bordered on the northeastern tipping of Nagpur, to the east of Chhindwara and Wardha to the northeastern tipping, the southern bound of Yavatmal and the southwestern boundary of Washim, the western boundaries of Akola and to the west of Buldana district.

The land use pattern of Amravati district represents an interesting distribution of land use across its entire area of 12212 sq km. Of this total size of land area, a significant amount consists of forest cover in the district that is measured at 3577 sq km. The forest area provides severely needed ecological gains and home to many various flora and fauna in the region. In the 12212 sq km area, there is a substantial

cultivable area of 7407 sq km, which suggests there could be a rich agricultural potential food production. This illustrates a complex/interesting relationship between forest area versus cultivable land area/region, both of which contribute to the ecological uniqueness of the area, and to environment in general.

The Deccan Trap dominates the North-Eastern region of Maharashtra, comprising approximately 75% of the regional landscape, with the remaining 25% consisting of Purna alluvium. One significant element is that alluvium covers an overall area of 3053 square kilometers, of which 1562 square kilometers fall into a saline zone or poor quality. This has resulted in the groundwater in the area under utilized for drinking and irrigation purposes. Furthermore, an extensive amount of irrigation within the northeastern region of the district is dedicated to the growing of orange fruit, illustrating the area's agricultural diversity and productivity.

Objective of the Research

The research aims to assess Amravati's potable water profile in its current state, and assess hazards to sustainability and quality. Using assessment results, the research aims to develop action plans and solutions towards achieving access to safe drinking water for all.

Research Focus - The research will assess the sources of drinking water in Amravati, such as groundwater, surface water, and any others that may be sources. Emphasis will be placed on the distribution of drinking water and the associated treatment processes. The assessment will also determine the quality of drinking water with contaminants, pollutants, and health implications.

Research Methodology

Leveraging a mixed-method approach deepened the work's responses to the research question. Qualitative and quantitative methods were combined to provide a wide variety of perspectives regarding drinking water resources in Amravati and measuring current conditions using diverse data types from literature reviews, surveys, and interviews. The analysis of the data was conducted with a sophistication that included statistical approaches that added insights on gaps, challenges, and possibilities of securing legal rights to safe drinking water in Amravati by recognizing implementation occurs within the context of the resource state and constraints faced by the population in securing the legal rights; thus, the circumstances or fabric of drinking water resources tell a rich story that helped us understand ways to secure these legal rights.

Climate Rainfall and Temperature

The climate in Amravati is classified as tropical wet and dry, varying between extremes in temperature during the course of the year. The winters are cool, summer's extreme hot and monsoons start from June to October. The area experiences a hot and dry climate with rainfall generally from the southwest monsoon rain of 700-800 mm. Summer temperature can reach as high as 46°C, the winter temperatures can drop to 5-9°C highlighting the variety of climate in the area.

River and Drainage Pattern

The drainage and river coverage in the area helps you understand the main ecosystem, of which there are a collection of rivers. The Tapi River has some meanderings and is a significant waterway for irrigation, the Purna River is noted for aquatic biodiversity and vegetation surrounding the river, the Wardha River is important for sustaining various wildlife habitats and support local agriculture.

1. Tapi River

The area of Tapi River basin is estimated to land area of 65145 square kilometers, or slightly, two percent of all of land area. The basin spans across the states of Maharashtra (51,504 square kilometers), Madhya Pradesh (9,804 square kilometers), and Gujarat (3,837 square kilometers).In addition to the Betul and Burhanpur districts of Madhya Pradesh and the Surat and Tapi district of Gujarat, the basin is mostly located in the northern and eastern districts of Maharashtra state, namely Amravati, Akola, Buldhana, Washim, Jalgaon, Dhule, Nandurbar, and Nashik districts.

2. Purna River

The Purna River flows through the southwestern part of the district, while the Tapti River drains the northwest. Further significant rivers include Shahanoor and Chandrabhaga. A successful introduction and cultivation of Musali and Cherry has been achieved in the Chikhaldara Hills.The Purna river originates within the Satpudas region of the Betul district of Madhya Pradesh, near Bhainsdehi. The district is entered after a flow of approximately 50 km in a general southerly and south-easterly direction. It traverses the district in a southwesterly orientation, forming two sections: one through the Achalpur taluka and the other along the border between the Amravati and Daryapur talukas. Ultimately, it curves towards the west, providing the demarcation of the district, and proceeds to merge with the Tapti River near Muktainagar in Jaligon district. The Pedhi is the sole notable tributary on the left bank of the Purna River. The initial major tributary on the right bank is the Arna River. Immediately

following is a diminutive river referred to as the Bodi. The subsequent tributary, the Chandrabhaga, holds significant importance as it flows in a broad south-westerly trajectory to converge with the Purna. An important right bank affluent of the Chandrabhaga River is the Bhuleshwari River. The Shahanur, together with its derivative, the Bordi, is the westernmost tributary of the Purna River that holds considerable importance within the district.

3. Wardha River

A number of short tributaries flowing within the district receive the Wardha river, which originates at Multai in Madhya Pradesh and serves as the eastern boundary of the district. Streams Maru and Chargar are significant tributaries that converge with Wardha. Tapi River runs parallel to the northwestern border of the district. Its tributaries include Khardu, Sipna, Dewa, and Dhulghat. The region exhibits a dendritic drainage pattern, whereas the Purna alluvium displays a parallel to sub-parallel drainage pattern and is characterized by its nearly flat terrain.

Sr. no	River	% of slope	Length	Altitude range
1	Tapi	1.6%	48 km.	381m to 305 m
2	Purna	1.7%	105 km	425m to 245 m
3	Wardha	1.3%	173 km	487 m to 259 m

The Amravati District in Maharashtra is home to several rivers and their tributaries, including Burshi, Surkhi, Tigria, Khandu, Khapra, Sangiya, Gadaga, Vaan, Wardha, Vidarbha, Bor, Pak Nala, Maru, Narha, Chargar, Shahanoor, Bembala, Saanpan, and Bicchan, contributing to the region's water resources and ecosystem.

Dams In Amravati

In Amravati District, there are a total of 40 major dams serving various purposes. These dams play a crucial role in water management and irrigation in the region. Some of the prominent dams in the district include Mandwa, Jutpani, Berda, Salai, Khari, Sarabardi, Gaolandoh, Rabhang, Mogarda, Bobdoh,

Sawalikheda, Sapan, Gondvihir, Khatijapur, Gondwagholi, Chandrabhaga, Shahanoor, Tongalphodi, Sawarpani, Khirkund, Purna, Chargad, Upper Wardha, Jamgaon, Wai, Pusli, Satnoor, Shekhadari,

Sr.No	Taluka Wise number of water Supply Sources

Keka tpur, Dastapur, Dahigaon Dhanora, Malegaon, Ghatkhed, Amdori, Saraswati, Baslapur, Malkhed, Takali, Lower Wardha, and Lower Pedhi dams. These dams collectively contribute to water storage, flood control, and providing water for agricultural activities, benefiting the local communities and fostering sustainable development in the district. The strategic placement of these dams ensures efficient water distribution and utilization, enhancing overall water resource management and resilience in the face of changing climatic conditions.

Location of the Project(s)	Upper Wardha	Purna	Chandrabhaga
Catchment Area sq.km.	4302	390.79	104.64
Target Command Area sq.km.	830	62.75	70.13

Importance Safeguarding Drinking Water Resources for Citizens

Amravati is a city mainly dependent on its water resources, and as such, ensuring that clean drinking water is available to its citizens is not only desirable but a must for the good quality of life for the citizens. While there are legal rights that outline the framework for safe water provision, translating these rights into actual delivery poses a myriad of daunting challenges, therefore raising a dire need for in-depth studies that ensure protection and preservation of the drinking water resources of Amravati. Communities worldwide face numerous challenges due to water shortage, contamination, and inequitable distribution.

Clean drinking water availability is able to maintain good public health, sustainable development, and furtherance of human rights. This right to water comes from international law; as such, translation of this legal right into concrete action is necessary towards the goal of safe, sufficient, and affordable access to sources of water by all citizens.

1	Amravati	109
2	Achalpur	100
3	Anjangaon Surji	12
4	Bhatkuli	70
5	Chandur Bazar	80
6	Chandur Railway	120
7	Chikhaldara	259
8	Daryapur	13
9	Dhamangaon Railway	197
10	Dharni	241
11	Morshi	102
12	Nandgaon Khandeshwar	188
13	Tiwsa	110
14	Warud	131

Amravati District-wise percentage of samples having EC >3000 µS/cm.

Sr.No	District	No. of Samples collected (NHS 2022-23)	No. of Samples (EC >3000 µS/cm)	(%) Samples (EC >3000 µS/cm)
1	Amravati	49	2	4.08

Amravati District-wise percentage of samples having Chloride >1000 mg/l in Maharashtra.

Sr.No	District	No. of Samples collected (NHS 2022-23)	No. of Samples Cl >1000 (mg/l)	% of Samples Cl >1000 (mg/l)
1	Amravati	49	1	2.04

Amravati District-wise percentage of wells having Nitrate > 45 mg/l

Sr.No	District	No. of Samples collected (NHS 2022-23)	No. of Samples NO3 > 45 (mg/l)	% Samples NO3 > 45 (mg/l)
1	Amravati	49	27	55.10

Details of number of locations partly affected with Uranium> 0.03 mg/l (>30µg/l) and the maximum values of Uranium in Amravati Districts of Maharashtra

Sr.No	District	Maximum value of Uranium observed (in µg/l)	
		2019	2022
1	Amravati	9.78	17.01

Locations having Chloride > 1000 mg/l in ground water in Amravati districts of Maharashtra

Sr.No	State	District	Location	Long	Lat	Cl mg/l
1	Maharashtra	Amravati	Yevda	77.4586	20.9947	1560

Locations having Nitrate > 45 mg/litre in different districts of Maharashtra.

Sr.No	State	District	Location	Long	Lat	NO3 mg/l
1	Maharashtra	Amravati	Anjansingi	78.1347	20.9167	47.6
2	Maharashtra	Amravati	Ashtagaon	77.925	21.3083	48.2
3	Maharashtra	Amravati	Belteki	77.9258	20.755	47.6
4	Maharashtra	Amravati	Chandas	78.3444	21.4372	49.6
5	Maharashtra	Amravati	Chandur Railway	77.9667	20.8167	47.4
6	Maharashtra	Amravati	Chicholi	77.9444	21.36	48.1
7	Maharashtra	Amravati	Dapori1	78.0514	21.3833	47.8
8	Maharashtra	Amravati	Ghatlarki	77.8081	21.3336	47.9
9	Maharashtra	Amravati	Khanapur	77.9542	21.3153	47.7
10	Maharashtra	Amravati	Kurha	78.05	20.9333	45.9
11	Maharashtra	Amravati	Loni	78.1903	21.3764	48.3
12	Maharashtra	Amravati	Lontek-1	77.7072	20.9081	49
13	Maharashtra	Amravati	Mahuli	77.7667	20.7333	46.9
14	Maharashtra	Amravati	Mozari	78.0011	21.0506	48.9
15	Maharashtra	Amravati	Nimbhari	77.3125	21.05	49.6
16	Maharashtra	Amravati	Pala	78	21.3861	47.6
17	Maharashtra	Amravati	Pathrot-2	77.365	21.2144	49.6
18	Maharashtra	Amravati	Rithpur	77.8167	21.2417	49
19	Maharashtra	Amravati	Saiwada	77.8692	21.3319	48.2
20	Maharashtra	Amravati	Samda Kasmpur	77.2631	20.9269	49
21	Maharashtra	Amravati	Sendurjana	78.1	20.6833	45.1
22	Maharashtra	Amravati	Shivni1	77.8522	20.6306	48.5
23	Maharashtra	Amravati	Temburkheda1	78.2389	21.4972	46.7
24	Maharashtra	Amravati	Teosa	78.0681	21.0836	47.7
25	Maharashtra	Amravati	Walgaon	77.7	21.0167	46.6
26	Maharashtra	Amravati	Warud	78.2667	21.4667	46.7
27	Maharashtra	Amravati	Yevda	77.4586	20.9947	49.8

Amravati district is prioritizing the provision of clean drinking water to its residents by diligently checking water samples from various sources. Over the months spanning from April to February, a total of 19,124 water samples were collected from 1523 villages in the district for thorough testing. Among these samples, a notable 598 were determined to be contaminated, prompting immediate action from the Zilla Parishad Health Department. Consequently, the concerned Gram Panchayats have been issued directives to undertake essential measures aimed at purifying the water supply within the affected areas. As part of these efforts, the 839 Gram Panchayats in the district are actively involved in implementing urgent purification protocols. Notably, Amravati district comprises a total of 1687 villages, with the health department proactively overseeing water quality assurance initiatives

throughout the region. The meticulous laboratory testing conducted on the collected water samples serves as a crucial step in ensuring the safety and well-being of the residents. Looking ahead to the period between April 2023 and February 2024, there remains a strong commitment to continue this rigorous sampling and testing process to safeguard public health and address potential contamination risks effectively.

Amravati Taluk wise number of contaminated water samples.

Legal Framework Protection of Water Resources

The city of Amravati possesses a legal framework regarding water resource management, with the inclusion of the Water Act, 1974, concerning prevention and control of pollution and the Environment Protection Act, 1986, these two laws ensure the rights of citizens. The main challenge remains in how to efficiently implement these frameworks. Legal frameworks that govern the rights to water are extremely vital in ensuring that everyone has clean and safe drinking water. These frameworks provide guidelines, control, and mechanisms for the protection and management of water sources and utilization of water. Besides that, they can also declare the right to water as a fundamental human right. Such a legal framework strikes a balance among different conflicting interests by incorporating principles of sustainability, equity, and environmental protection to ensure the long-term availability of drinking water resources. They ensure that the governance structures, mechanisms of monitoring,

Sr.No	**Taluk wise number of contaminated water samples Amravati. April 2023 and February 2024**	
1	Amravati	76
2	Achalpur	13
3	Anjangaon Surji	14
4	Bhatkuli	50
5	Chandur Bazar	12
6	Chandur Railway	15
7	Chikhaldara	69
8	Daryapur	05
9	Dhamangaon Railway	78
10	Dharni	06
11	Morshi	106
12	Nandgaon Khandeshwar	19
13	Tiwsa	80
14	Warud	55
	Total	598

and enforcement provisions are instituted transparently and make stakeholders accountable, thereby opening opportunities for citizen participation in the management of water resources.

Station wise Trend In WQI (2011-23) Surface water Amravati District

District	Station Code	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	Quality	CAGR %
Amravati	2695	52	46	49	38	45	62	54	60	65	72	72	69	Quality Improved	3.39
Amravati	2700	62	45	81	53	51	70	64	Dry	73	73	76	75	No Significant Change	-0.73

Current Threats to Drinking Water Resources

The availability and quality of the drinking water resources in Amravati are threatened by certain aspects: industrial discharge, agricultural runoff, and incompetent waste disposal practices are polluting the waters, contaminating them, and creating health hazards for those relying on such sources. Unsustainable extraction of groundwater for agricultural, industrial, and domestic purposes is done at the expense of falling water tables and depletion of aquifers, thereby causing scarcity and a fight over the limited supplies of water. Climate change continues to worsen the situation through erratic weather patterns, prolonged droughts, and unpredictable trends in rainfall. Encroachment and deforestation in watersheds and catchment areas disrupt natural habitats and compromise the sustainability of sources of drinking water. Exigent urbanization, misappropriation consumption, and retrograde infrastructure systems have given a boost to the water crisis in Amravati, leading to an acute scarcity of water and problems in the water distribution network. Amravati focuses on the quality of drinking water and identification of threats such as pollution and contamination. The citizens are interested in taps providing clean water to all, particularly the poor and disadvantaged sections, who already bear a heavy load of socio-economic disparities. The environmental impact includes subsidence due to extraction of water from the ground, causing structural damage and pollution into water sources through industrial discharges.

Water quality data of NHS 2022-23 for basic parameters for all the districts of Maharashtra (Unconfined Aquifer)

District	Location	Latitude	Longitude	pH	EC	TDS	TH	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U	SAR	RSC
					µS/cm	mg/l												µg/l		
Amravati	Mahuli	20.733	77.767	7.63	1057	676	350	100	24	74	6.7	0	305	121	64	47	0.42	1.32	1.71	-2
Amravati	Warud	21.467	78.267	7.62	1183	757	450	112	41	59	0.4	0	397	85	71	47	0.43	2.33	1.21	-2.5
Amravati	Sendurjana	20.683	78.100	7.63	826	529	325	78	32	41	1.9	0	330	50	36	45	0.50	0.96	0.98	-1.1
Amravati	Pohra	20.886	77.875	7.57	808	517	350	76	39	25	0.8	0	403	18	24	23	0.35	0.84	0.59	-0.4
Amravati	Kurha	20.933	78.050	7.71	836	535	325	66	39	46	0.5	0	256	82	46	46	0.39	0.88	1.10	-2.3
Amravati	Chandur Railway	20.817	77.967	7.78	1234	790	425	50	73	84	10.0	0	360	124	88	47	0.44	1.18	1.78	-2.6
Amravati	Teosa	21.084	78.068	7.74	892	571	325	78	32	59	1.5	0	214	110	65	48	0.18	0.52	1.43	-3
Amravati	Devgaon	20.683	78.151	7.61	686	439	255	52	30	33	0.9	0	207	64	45	8	0.36	0.59	0.89	-1.7
Amravati	Chicholi	21.360	77.944	7.68	1487	952	520	120	53	99	13.3	0	403	191	89	48	0.53	1.16	1.88	-3.8
Amravati	Khanapur	21.315	77.954	7.82	1684	1078	425	110	36	147	66.2	0	476	238	84	48	0.37	2.47	3.10	-0.7
Amravati	Ashtagaon	21.308	77.925	7.76	1042	667	350	100	24	52	10.8	0	238	110	67	48	0.53	2.12	1.20	-3.1
Amravati	Saiwada	21.332	77.869	7.78	1168	748	460	110	45	62	2.9	0	354	121	75	48	0.51	1.70	1.25	-3.4
Amravati	Pimpri	21.361	77.868	7.80	659	422	190	40	22	39	19.9	0	226	50	48	9	0.49	0.22	1.23	-0.1
Amravati	Pala	21.386	78.000	7.83	1249	799	350	82	35	102	2.7	0	305	170	60	48	0.55	1.78	2.38	-2
Amravati	Hiwarkheda	21.393	78.084	7.80	1042	667	360	78	40	50	1.7	0	275	92	51	43	0.35	0.86	1.14	-2.7
Amravati	Loni	21.376	78.190	7.69	1570	1005	640	70	113	83	0.9	0	506	188	77	48	0.27	2.71	1.43	-4.5
Amravati	Anjansingi	20.917	78.135	7.78	1180	755	250	60	24	87	90.2	0	348	103	61	48	0.22	0.77	2.40	0.7
Amravati	Sirasgaon (Kasba)	21.328	77.683	7.82	564	361	220	50	23	23	0.9	0	232	18	23	25	0.20	0.15	0.67	-0.6
Amravati	Dapori1	21.383	78.051	7.77	1124	719	370	80	41	80	1.4	0	348	103	50	48	0.48	1.37	1.81	-1.7
Amravati	Temburkheda1	21.497	78.239	7.80	1297	830	535	150	39	45	0.4	0	372	131	80	47	0.51	1.33	0.84	-4.6
Amravati	Shivni1	20.631	77.852	7.83	1161	743	250	52	29	69	96.0	0	287	149	54	48	0.30	1.09	1.90	-0.3
Amravati	Belteki	20.755	77.926	7.88	854	547	325	70	36	49	0.6	0	366	39	33	48	0.41	1.36	1.19	-0.5
Amravati	Amner_old	21.392	78.401	8.00	1233	789	445	100	47	84	1.4	0	610	78	17	29	0.27	2.31	1.72	1.1
Amravati	Chandas	21.437	78.344	7.73	2127	1361	840	140	119	91	1.5	0	409	464	82	50	0.33	7.41	1.37	-10.1
Amravati	Umerkhed	21.422	78.100	7.93	819	524	300	66	33	50	5.0	0	311	53	44	33	0.51	0.66	1.26	-0.9
Amravati	Ghatlarki	21.334	77.808	7.80	809	518	310	64	36	42	0.4	0	207	110	38	48	0.39	0.51	1.05	-2.8
Amravati	Wadala Fatehpur	20.665	77.713	7.55	766	490	300	68	32	31	0.7	0	122	156	51	25	0.25	0.51	0.77	-4
Amravati	Walgaon	21.017	77.700	8.13	2798	1791	430	76	58	395	13.1	0	1056	291	50	47	0.54	7.45	8.28	8.7
Amravati	Chandur Bazar	21.233	77.733	7.99	1208	773	340	74	38	117	0.3	0	549	85	42	30	0.43	1.08	2.76	2.2
Amravati	Silona	21.433	77.417	7.70	451	289	200	44	22	12	0.5	0	195	14	16	25	0.34	0.12	0.38	-0.8
Amravati	Chunkhedi	21.567	77.417	7.60	418	267	170	28	24	9	0.6	0	195	14	7	2	0.18	0.00	0.30	-0.2
Amravati	Rithpur	21.242	77.817	7.67	1524	975	400	90	43	135	3.0	0	171	333	52	49	0.67	5.78	2.93	-5.2
Amravati	Bhokarbardi	21.514	76.781	7.90	947	606	190	50	16	105	1.2	0	427	32	23	39	0.59	1.34	3.32	3.2
Amravati	Kolkaz	21.500	77.204	7.62	405	259	175	40	18	10	0.5	0	183	21	10	2	0.25	0.00	0.31	-0.5
Amravati	Lawada	21.533	77.033	7.83	581	372	250	52	29	13	0.5	0	171	64	21	23	0.22	0.00	0.35	-2.2

Amravati	Nimbhari	21.050	77.313	8.14	2854	1827	345	80	35	426	4.4	0	1080	277	46	50	1.22	17.01	9.97	10.8
Amravati	Pathrot-2	21.214	77.365	7.59	1020	653	450	96	51	33	1.2	0	183	199	48	50	0.27	2.33	0.68	-6
Amravati	Samda Kasmpur	20.927	77.263	7.78	3034	1942	410	100	39	399	1.7	0	214	780	41	49	0.29	4.81	8.56	-4.7
Amravati	Brahmanwada (Thadi)	21.321	77.736	7.81	673	431	225	30	36	38	1.2	0	256	32	28	27	0.26	0.16	1.10	-0.3
Amravati	Kharapi	21.338	77.571	7.73	647	414	270	48	36	23	0.4	0	262	32	28	41	0.27	0.31	0.60	-1.1
Amravati	Yevda	20.995	77.459	7.92	6284	4022	650	92	102	1155	5.6	0	781	1560	47	50	0.20	3.31	19.70	-0.2
Amravati	Lontek-1	20.908	77.707	8.09	1363	872	335	60	45	146	0.5	0	506	103	56	49	0.86	3.79	3.46	1.6
Amravati	Mozari	21.051	78.001	7.76	827	529	290	50	40	61	0.5	0	256	103	40	49	0.53	1.45	1.57	-1.6
Amravati	Amravati_University	20.937	77.804	7.97	616	394	225	50	24	18	0.7	0	262	21	21	3	0.34	0.00	0.51	-0.2
Amravati	karaigaon	21.408	77.202	7.87	669	428	250	40	36	26	0.3	0	256	35	20	39	0.27	0.20	0.73	-0.8
Amravati	chikhaldara	21.404	77.330	7.67	505	323	210	48	22	12	0.3	0	153	43	31	43	0.18	0.00	0.37	-1.7
Amravati	Dhamni	21.354	77.441	7.75	500	320	210	34	30	15	0.2	0	214	21	29	15	0.25	0.07	0.44	-0.7
Amravati	Khandukheda	21.577	77.450	7.81	381	244	175	40	18	10	0.3	0	214	4	11	2	0.20	0.00	0.33	0
Amravati	Shignapur	20.952	77.498	8.23	1640	1050	425	100	43	179	1.1	0	610	202	48	31	0.37	4.19	3.77	1.5

Ground Water Recharge

The city of Amravati is facing a critical water crisis due to rapid urbanization and industrial growth putting a strain on natural water sources. Implementing effective ground water recharge techniques, such as rainwater harvesting and recharge wells, is crucial to replenish underground water reservoirs and ensure a sustainable drinking water supply. The current annual ground water extraction rates reflect over exploitation caused by increasing population and industrial activities.

Dynamic Ground Water Resources Of India, 2023																	
Maharashtra																	
S. No.	Name of District	Ground Water Recharge					Total Natural Discharges	Annual Extractable Ground Water Resource	Current Annual Ground Water Extraction				Annual GW Allocation for Domestic Use as on 2025	Net Ground Water Availability for future use	Stage of Ground Water Extraction (%)
		Monsoon Season		Non-monsoon Season		Total Annual Ground Water Recharge			Irrigation	Industrial	Domestic	Total			
		Recharge from rainfall	Recharge from other source	Recharge from rainfall	Recharge from other source										

			s		s										
1	Amravati	53675.55	4839.13	1228.12	26844.89	86587.70	6273.28	80314.42	69502.23	0.00	4247.00	73749.28	5082.99	18803.37	91.83

The assessment of Amravati's drinking water resources reveals various zones indicating the state of water availability and strain on resources. These zones range from safe areas with sustainable water supply to over-exploited regions facing severe scarcity. Safe zones meet population needs without resource strain, ensuring a secure water supply. Semi-critical areas signal potential future scarcity, highlighting the importance of implementing water-saving measures like rainwater harvesting. Critical zones pose a threat to clean water access, emphasizing the need for immediate conservation efforts and exploring alternative sources. Over-exploited regions face acute water crises, demanding urgent action to prevent groundwater depletion and environmental damage. Saline areas present unique challenges due to high water salinity, necessitating specialized solutions.

Dynamic Ground Water Resources Of India, 2023												
Maharashtra												
S.No	Name of District	Total No. of Assessed Units	Safe		SemiCritical		Critical		OverExploited		Saline	
			No.	%	No.	%	No.	%	No.	%	No.	%
1	Amravati	14	6	42.86	3	21.43	1	7.14	3	21.43	1	7.14

The water situation in Amravati varies across different zones, from safe regions where supply meets demand without strain, to semi-critical areas showing signs of future scarcity if not addressed promptly. In critical water scarcity zones, there is a severe imbalance between demand and supply, necessitating immediate action in conservation and exploring alternative sources. The most precarious are over-exploited regions facing acute water crises, risking groundwater depletion and environmental damage.

Dynamic Ground Water Resources Of India, 2023										
Maharashtra										
S.No	Name of District	Total Annual Extractable Resource of Assessed Units (in Mcm)	Safe		Semi-Critical		Critical		Over-Exploited	
			Annual Extractable Resource (in Mcm)	%	Annual Extractable Resource (in Mcm)	%	Annual Extractable Resource (in Mcm)	%	Annual Extractable Resource (in Mcm)	%
1	Amravati	803.14	258.33	32.16	203.88	25.39	75.04	9.34	265.90	33.11

Assessing the total recharge-worthy area in square kilometers is crucial for gauging water availability and replenishment capacity in Amravati. Safe areas effortlessly maintain a sustainable water supply, crucial for community water needs. Semi-critical regions show moderate water strain, indicating future scarcity risks that can be mitigated through water-saving measures. Critical areas face significant water security threats, demanding immediate action to avert crises. Over-exploited zones experience severe water scarcity, necessitating intervention to maintain resources for the future. Saline areas with high water salinity levels require tailored solutions like desalination to enhance water quality for consumption, showcasing the need for innovative approaches to overcome water quality challenges in such regions.

Dynamic Ground Water Resources Of India, 2023												
Maharashtra												
S. No	Name of District	Total Recharge Worthy Area of Assessed Units (in sq.km)	Safe		Semi-Critical		Critical		Over-Exploited		Saline	
			Recharge Worthy Area of Assessed Units (in sq.km)	%	Recharge Worthy Area of Assessed Units (in sq.km)	%	Recharge Worthy Area of Assessed Units (in sq.km)	%	Recharge Worthy Area of Assessed Units (in sq.km)	%	Recharge Worthy Area of Assessed Units (in sq.km)	%
1	**Amravati**	8392.39	2819.41	33.59	2105.96	25.09	638.12	7.6	2052.01	24.45	776.89	9.26

A Glimpse of Categorization Assessment Units Into Water Sustainability

Maharashtra's Amravati district stands at a critical juncture when it comes to safeguarding its drinking water resources. The comparison between the categorization of assessment units in 2022 and 2023 reveals the changing dynamics of water availability and extraction patterns in the region.

Categorization Of Assessment Units, 2023							
Maharashtra							
S. No	Name of District	S. No	Name of Semi-Critical Assessment Units	S. No	Name of Critical Assessment Units	S. No	Name of Over-Exploited Assessment Units
1	Amravati	1	Amravati	1	Achlapur	1	Chandur Bazar
		2	Dhamangaon Railway			2	Warud
		3	Nandgaon			3	Morshi

Comparison Of Categorization Of Assessment Units (2023 And 2022)									
Maharashtra									
S. No	Name of District	Name of Assessment Unit	Stage of Ground Water Extraction (%) in 2022	Categorization 2022	Name of District	Name of Assessment Unit	Stage of Ground Water Extraction (%) in 2023	Categorization 2023	Remark
Improved									
1	Amravati	Achlapur	100.88	Over_Exploited	Amravati	Achlapur	96.73	critical	Improved
2	Amravati	Tiwsa	70.32	Semi_Critical	Amravati	Tiwsa	67.32	Safe	Improved

Close monitoring and regulation of extraction rates are essential to prevent depletion and secure a steady supply of clean water for present and future generations. Citizen involvement in advocating for sustainable water management practices and participating in conservation efforts is key to safeguarding Amravati's drinking water resources and ensuring a water-secure future for the city.

Innovative Initiatives and Solutions

Amravati, a city in the Indian state of Maharashtra, is embroiled in a complex water problem representative of the larger issues within the country. Ground waters are over-exploited, and surface water bodies degraded due to increasing demand for water, coupled with climate change and mismanagement at all levels. As a result, agriculture has suffered, communities have found it difficult to avail of drinking water, and traditional sources of water have dried up.

The different initiatives, which have been taken to manage the water crisis in Amravati, comprise advocating water saving, laying stringent rules regarding extraction of water from groundwater, and rejuvenation projects of water bodies. Other contributions by NGOs and community-based organizations are in terms of raising awareness and undertaking sustainable management practices. A multi-faceted approach is indeed needed for long-term water sustainability: improvement of water infrastructure, consumption with responsibility, and investment in innovative solutions like rainwater harvesting and wastewater treatment. The involvement of all stakeholders in collaboration is required. Amravati's water crisis requires a multidimensional approach, with incorporation of legal reforms and policy changes along with innovative solutions, not only to cater to the present-day challenges but also to ensure a sustainable future of its citizens.

Bridging The Gap Challenges And Perspectives

What is required, in fact, is a multi-pronged attack to bridge the gap between the legally entitled right to safe drinking water and the reality of Amravati's drinking water resources. Basic development of infrastructure-including investments in treatment plants and pipelines-is urgently required to keep pace with the rise in demand due to increasing population. Water conservation-through awareness creation-is an imperative for the preservation of water resources. While Amravati has a basic legal framework governing water management, the actual implementation of regulations ensures that the rights of the citizens to clean drinking water are adequately protected. Community participation in decision-making encourages ownership and ensures better conservation practices. Consultation and cooperation by government, local government, community organizations, NGOs, and international agencies can mobilize expertise and resources for handling the challenges involved in safeguarding drinking water resources effectively. All the challenges that the water resources of Amravati are facing today call for the implementation of an Integrated Water Management system in an integrated manner. This integrated system should involve the government, the local authorities, and the

community in the conservation of water through purification and sustainable usage. This involves establishing modern facilities for water treatment, spreading awareness about rainwater harvesting, and advocacy of water conservation methods. Law enforcement should be strictly implemented, investments in water infrastructure need to be carried out, conservation practices need to be encouraged, citizens need to be integrated into the decision-making process, research initiatives need to be supported, and partnerships with NGOs and international agencies need to be established as very crucial in safeguarding Amravati's drinking water for current and future generations.

Policies And Recommendation

For this reason, policies, regulations, monitoring, and enforcement mechanisms have to be effective in order to protect drinking water resources, manage water in a sustainable manner, and equitably distribute resources. Of paramount importance is the attempt to prevent water contamination from different sources, like industrial waste, agricultural runoff, and sewage, through pollution control measures, sustainable practices, and monitoring of water quality. The main emphasis will fall on safeguarding the drinking water resources of Amravati through policy recommendations and practical measures. Recommendations are also to conform to sustainable water management and ensure water security in the future. The community approach and involvement are very important in empowering citizens through the decision-making process and awareness of preserving water resources. Collection of rainwater has been emphasized to act as a supplementing approach to make more water available during lean periods and not put excessive pressure on the existing sources. Campaigns and education to promote awareness on water conservation, along with incentives for water conservation, are badly necessary for the conservation of drinking water resources in Amravati for the coming future years.

Research Beneficial for Society

Research has played a vital role in society by helping to protect drinking water resources through the development and delivery of valued knowledge of the challenges and opportunities. This would also include identification of various water sources, the influence of rapid urbanization and industrialization, and finding ways through which water shortage can be combated in the region of Amravati. This detailed analysis will not only present the present scenario but will also aid various stakeholders with the knowledge needed on how to devise strategies for water management in a

sustainable manner.

Implications of Research

The research implications related to the protection of the drinking water resources of Amravati vary from wider to deeper. In return, diligent research provides an even clearer picture of the legal framework and rights dealing with water resources, enabling the local level to assert their entitlements and seek the application of principles of good water governance. On one side, research helps reveal information on infrastructure and technology for the use of other water sources, such as rainwater harvesting, and treatment for reuse of wastewater. With the introduction of such measures, natural water resources would be relieved relatively, and the people of Amravati would, therefore, be assured of a continuous supply of pure water. In this way, research becomes an essential element for providing a sustainable development course that can raise the life quality of communities by finding appropriate solutions to basic issues like access to water.

Conclusion

The voices of the people of Amravati are now rising into demands for action on the water crisis and a right to clean and accessible drinking water. Saving drinking water resources in Amravati needs a multi-pronged strategy, considering diverging views emanating from the government, environmentalists, and the community. This study further highlights the need to implement best practices in the water management systems and bridge the gaps to secure this resource for present and future generations. The drinking water resources of Amravati must be safeguarded by holistic efforts, including adherence to legal mandates, community participation, infrastructure development, and water conservation. Emphasizing these key points will enable Amravati to undertake sustainable development and ensure clean, safe drinking water for all citizens. In fact, protection of drinking water sources is everybody's business and calls for collaboration and commitment from the stakeholders in every aspect of life in Amravati.

There is no substitute for safety as it comes to Amravati's source of drinking water. As a matter of fact, it stands as a preeminent requisite in continuing to safeguard the community's wellbeing. It is only through continued use of effective research methods that the community will effectively engineer positive and long-lasting changes which better society at large. Amravati City needs to conceptualize and implement holistic water management schemes, whereby its experience can act as a role model for other regions to emulate for the future wherein water security is ensured. The inclusion of legal

frameworks or laws that translate theoretical rights into actual benefits can be of utmost importance in laying the foundation for a more resilient and sustainable water ecosystem in Amravati. To further bolster water supply resilience, both for continuation without break to the present and future generations, cooperation and concerted efforts on the part of all stakeholders become indispensable. The nexus between insightful research, enforceable legal decrees, and tangible, results-driven actions serves as a linchpin in combating the prevailing water crisis, not only in Amravati but in broader contexts as well.

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