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Status and Management Practices for the Conservation of

FRESH DRINKING WATER in Chandigarh

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Status and Management Practices for the Conservation of Fresh Drinking Water in Chandigarh

"Raheem Rahiman paani raakhiye bin paani sab sun
Paani gaye na oobare moti, manus, chun."

These lines possess a dual interpretation, one of which Raheem sheds light on the significance of water conservation, implying that nothing can exist without water. Water is not merely a substance; it is the very essence of life, an intricate tapestry that weaves through existence itself. It is both the cradle and conduit of life, an indispensable cornerstone for humanity. Without water, the grand mosaic of existence would cease to exist. According to National Oceanic and Atmospheric Administration (NOAA) the ocean constitutes about 97% of water on earth the remaining three percent is distributed in many different places, including glaciers and ice, below the ground, in rivers and lakes, and in the atmosphere. Access to most freshwater sources is challenging for humans. At present, about 10% of the world's freshwater supplies are used for maintaining health and sanitation, whereas agriculture account for about 70% and industries about 20% of the word's freshwater supplies (Shiklomanov, 1997). In this delicate balance, the importance of water becomes undeniably clear. It is the elixir of life, the quiet sustainer of our existence, and the silent witness to the human journey on this watery planet.

India, a nation that houses 18% of the world's population, finds itself at the crossroads of a dire water dilemma. Despite its vast populace, it possesses a mere 4% of the globe's water resources. This stark disproportion paints India as one of the world's most water-stressed countries, where the battle for water's sustenance rages on.

(https://www.worldbank.org/en/country/india/brief/world-water-day-2022-how-india-is-addressing-its-water-needs) .

Predictions indicate that by 2030, India's water demand will double the available supply, resulting in severe scarcity affecting millions and causing around a 6% GDP loss. A significant portion of Indians already experience extreme water stress, according to the NITI Aayog's 2018 report. (https://economictimes.indiatimes.com/news/economy/agriculture/by-2030-indias-water-demand-to-be-twice-the-available-supply-indicating-severe-water-scarcity-report/articleshow/64679218.cms?from=mdr). Given the precarious condition of freshwater availability, it becomes crucial to grasp the present state of freshwater resources for effective conservation and management. This understanding is essential to skilfully address the rising demand.

CURRENT STATUS OF DRINKING WATER IN CHANDIGARH

Presently, Chandigarh's water service area is 114 sq.km- which comes under MCC. Until 1983, Chandigarh solely used groundwater from the tube wells. Later, Bhakra main canal's surface water supplemented supply which stems from Bhakra dam over Sutlej River. Water from the Canal is carried in Phases. Phase 1 to 4 carry 58 MGD water while phase 5-6* carry 29 MGD of water to the city. UT is divided into different zones based on water supply. Each zone has its own separate waterworks which include 12,26,32,37,39,52, Manimajra-I (MM-I) and Manimajra-II (MM-II) (Table 1 & Figure 1) fed by main Water Works-39 at Kajauli. Before the distribution of the water, the canal water is treated at a water treatment plant at Water Works-39 and 12. Slum areas get water through stand posts and tankers.

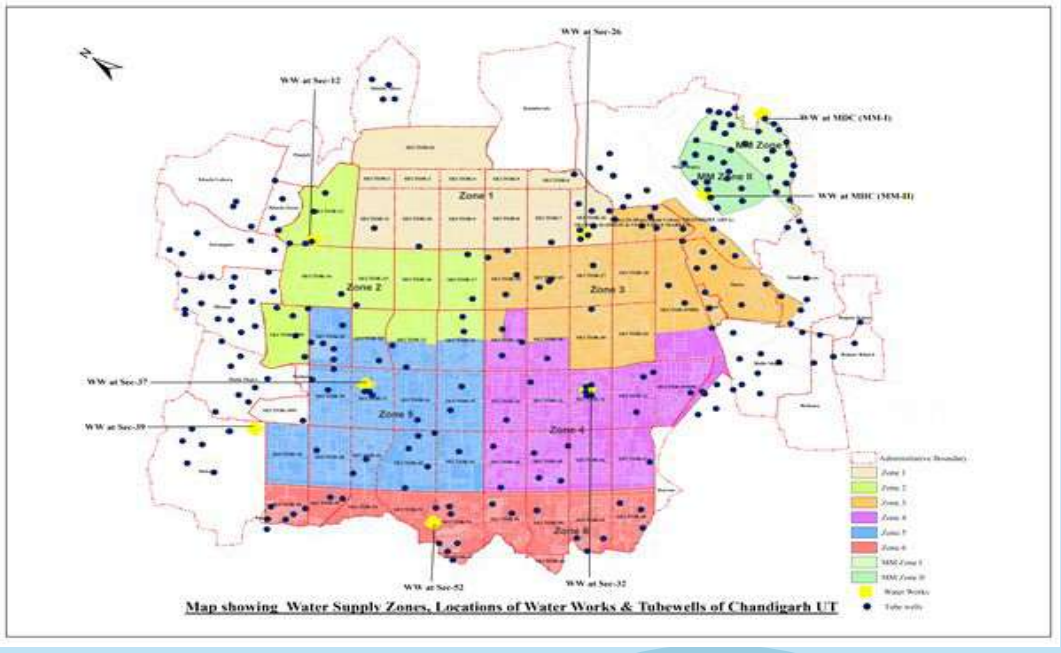
Table 1: Details of water supply across Chandigarh

Zone	Location of Water works	Sectors Covered
1	Water works 26 (Kirloskar side)	1 to 11 and Secretariat, High Court, Rock Garden
2	Water works 12	12,14,15,16,17,18,22-A&B, 21-A, PGI, Panjab University, 25,23,24
3	Water works Sector-26 (Jyoti side)	19,26,27,28, Industrial Area Phase-I (Part), 20-A&B, 21-B, 30-A&B, Bapu Dham colony, Colony No. 4, Sanjay Colony
4	Water works Sector 32	31,32,33,34,44,45,46, Industrial Area Phase-I (Part), Industrial Area Phase II, 20 C&D, 21-C&D
5	Water works Sector 37	22-C&D,23,24,25,29,30-C&D, 35,36,37,38,39,40,41,42&43
6	Manimajra-I Manimajra-II	Old population of Manimajra town, Shivalik Enclave, Motor Market, Indira Colony, Subhash Nagar etc. Modern housing complex, Rajeev Vihar, Pipliwala, Mariwala, Shanti Nagar, Govindpura etc
7	Water works- 52	44 (Stump), 48,61 & 63
8	Water Work -39	Adjacent Areas such as 38 West

Source: Municipal Corporation of Chandigarh, 2017

Note* The water provided by Phase 5-6 acts as a substitute for the groundwater. In order to decrease dependence on groundwater, tube wells will be gradually phased out over the next 5-7 years. This decision is based on the fact that the current supply of 87 MGD of surface water is sufficient to meet the fresh water needs of the entire Union Territory.

Figure 1: Map showing Chandigarh water supply zones, location of water works and tube wells



Source: Chandigarh Smart City Limited

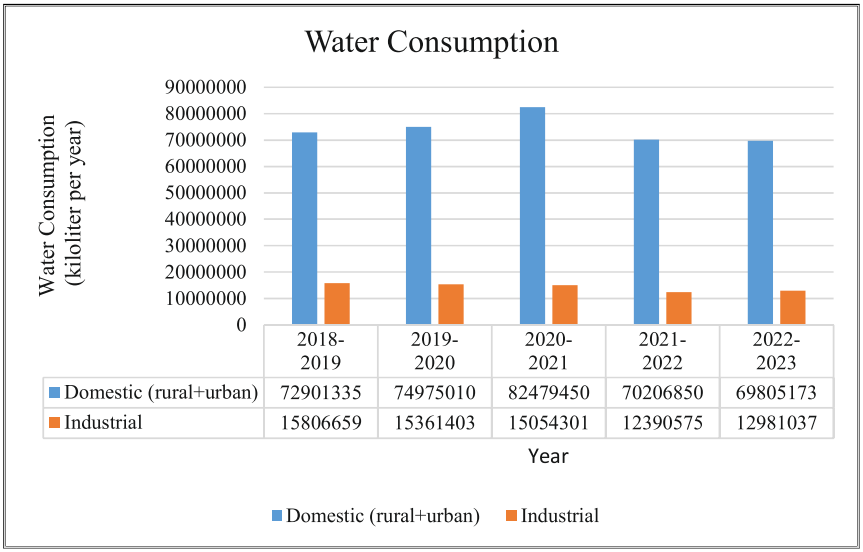
METERED/ UNMETERED CONNECTIONS

Between 2018-19 and 2022-23, the number of metered connections rose from 168,815 to 180,686. However, the diligent work of Chandigarh's municipal corporation has notably reduced unmetered connections from 4,532 (2018-19) to 2,135 in 2022-23 (Executive Engg., MCPH, Div 2 Chandigarh).

WATER CONSUMPTION

Figure 2 provides an elaborate depiction of water consumption in Chandigarh's Domestic and Commercial/Industrial sectors.

Figure 2: Water Consumption by Domestic and Industrial sectors



Source: Executive Engg., MCPH, Div 2, Chandigarh.
Superintending Engineer, MCPH Circle, Chandigarh. (M.C, Sector-17).

DRINKING WATER QUALITY AND TREATMENT

Chandigarh's water is adequately treated prior to distribution, ensuring its safety for consumption. Continuous testing of the supplied water eliminates the necessity for using Reverse Osmosis (RO) water purifiers, as stated by the Municipal Corporation of Chandigarh. The raw water in Chandigarh is treated at the water treatment plant (Water Works-39 and 12) before its distribution. The treatment includes alum dosing, flocculation, settling, filtration and chlorination. The water is tested using scientific methods for standard physico-chemical and biological parameters before its distribution.

SERVICE LEVEL BENCHMARKS

According to the Ministry of Housing and Urban Affairs (MoHUA), Government of India guidelines, the status of water supply in a state or union territory is assessed using standard service level indicators which are represented in Table 2. As seen from the table, Chandigarh met the benchmark for five out of nine indicators. The extent on non-revenue water is more than the benchmark indicating the need for plugging of leakages. Further free water supply to slum areas contributes to unaccounted for water (UFW) thereby negatively affecting the extent of non-revenue water. The cost recovery in water supply services and efficiency in addressing consumer complaints needs improvement. The quality of water supplied as per the required standards. The per capita water supply of 245 lpcd exceeds the benchmark of 135 lpcd.

Surface water: From Phase I to IV = 58 MGD

From Phase V to VI = 29 MGD

Ground Water: From 230 tube wells = 23 MGD

FUTURE PROJECTIONS AND WATER REQUIREMENTS

The Figure 3 shows a detailed description of the current and prospective water scenario in Chandigarh. It highlights an understandable comparison between the demands of drinking water over the years, which is most likely to increase, keeping in view the constant demand and unnecessary exploitation of water resources. It projects more than 129% increment in population of the city from 2011 to 2036. The demand for water in Chandigarh has increased considerably owing to its highly dense population structure. It is estimated that by 2036 water demand will be 670.12MLD (Million Liters per day) which is 38.5% higher than the 2011 demand of 484.08 MLD. The trend indicates that if we meet service level benchmarks and reduce drinking water wastage to 15%, we will have enough water to meet future water demand.

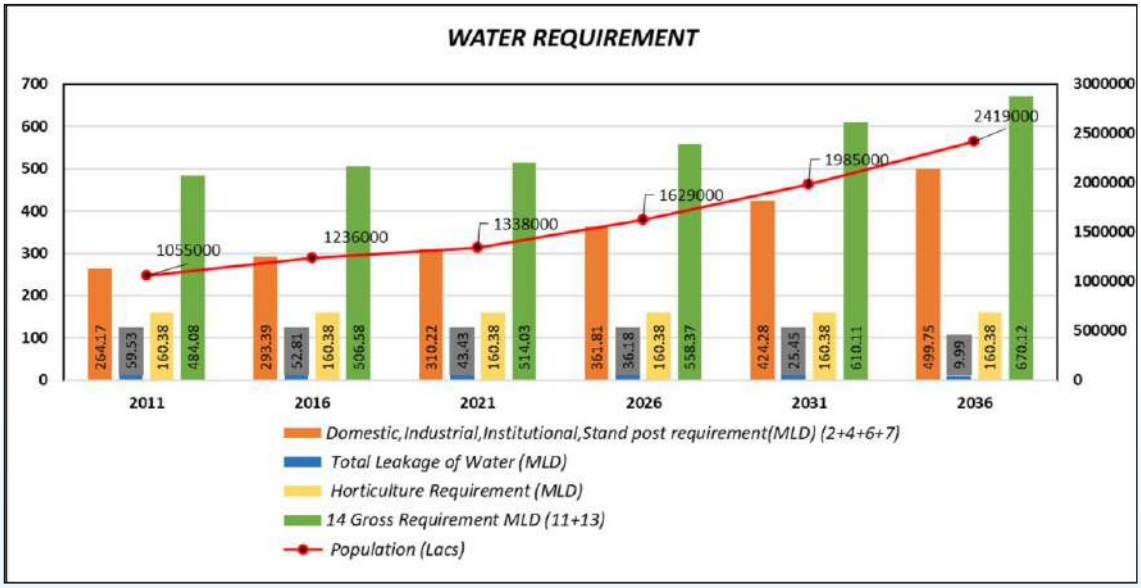


Figure 3: Future projections of water requirements in Chandigarh

Source: Municipal Corporation, Chandigarh

Table 2: Standard Service Level Indicator

S.No.	Indicator (Unit)	Standard Benchmark	Existing as of 2020-21
1	Coverage of water supply (%)	100	100
2	Per capita supply of water (LPCD)	135	245
3	Extent of metering of water connections (HSC)%	100	100
4	Extent of Non-Revenue water (%)	15	28-32
5	Continuity of water supply (hours per day)	24	5 hours in morning and 4 hours in evening (2 hours in afternoon in some pockets)
6	Quality of water supplied (%)	100	100
7	Cost recovery in water supply services (%)	100	52
8	Efficiency in collection of water supply related charges (%)	90	92.25
9	Efficiency in addressing customer complaints (%)	80	78

Source: Chandigarh Smart City Limited

DRINKING WATER CONSERVATION AND MANAGEMENT PRACTICES

1. Sewage Water Treatment

The public health department of the MCC deals with the sewage services within Chandigarh. Chandigarh's well-planned subterranean pipe network which is decentralized and aligned with natural north-to-south slope disposes of city sewage (Figure 4). Proper sewage systems are mandatory for every establishment. The sewage of the city flows under gravity in various pipes of different diameter ranging from 6" to 18" S.W. pipes and 24" * 36" to 66" diameter circular brick sewer. Total sewer length is 1350 km with 8 treatment plants (Table 3 & Figure 5). Trunk lines are designed for 2.2 times peak flow, surpassing standards. Chandigarh has a properly hooded sewage facility in addition to a fully functional treatment facility.

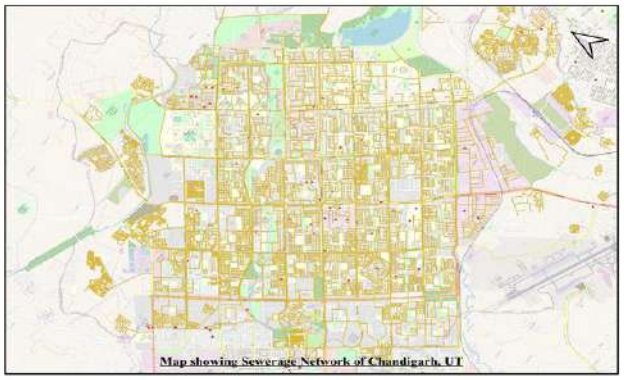


Figure 4: Map showing Sewerage Network of Chandigarh, UT

Source: Chandigarh Smart City Limited

Table 3: Details of STP's and their current status

Location (Technology)	Capacity (MLD)	Present Utilization (MLD)
Diggian (MBBR)	135	117
3 BRD (SBR)	50	45
Maloya (SBR)	22.5	18.9
Dhanas (SBR)	7.5	5
Raipur Kalan-I (UASB)	22.5	22.5 as per scale measurement
Raipur Kalan-II (SBR)	5.6	0.5
Raipur khurd (ASP)	5.6	6.4 as per running of motor.
Kishangarh (MBR)	2	2

Source: CPCC, Chandigarh

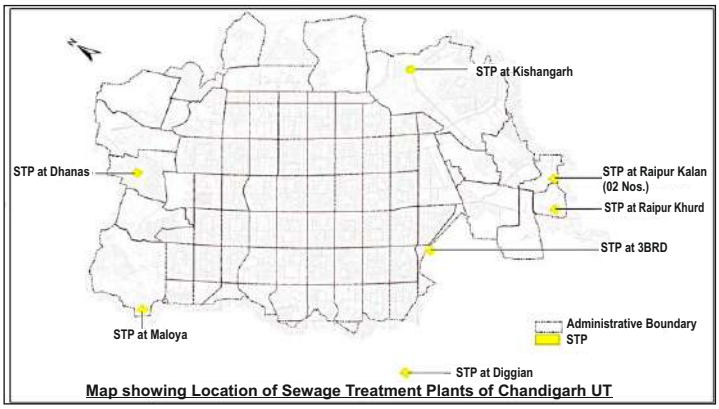


Figure 5: Map of STP's Location of Chandigarh UT

Source: Chandigarh Smart City Limited

In adherence to regulatory guidelines, the quality of treated sewage discharged from different STP outlets is regularly assessed by CPCC. Water samples are collected tested for various parameters such as pH, Temperature, Turbidity, Alkalinity, TDS, Total hardness, Total Alkalinity, Calcium, Magnesium, Sulphate, Nitrate, Fluoride, Chloride, Residual Chlorine, Phosphate, Iron, DO, BOD, COD, Turbidity, TSS, Total coliform and E. coli.

Current Status of Tertiary Treated Water (Generation, Utilization and Distribution)

- About 10 MGD treated water is being used in the city to maintain the parks, green belts, fountains in Chandigarh.
- 5000 tertiary treated water connections have also been released to the houses having area 1 Kanal and above institutions, schools etc.
- The DPR under AMRUT is also being prepared to lay out the distribution network in the left-out area, Industrial Area Phase, Chandigarh, to increase the utilization from 10MGD to 20 MGD. The MoHUA has already approved the scheme and released the grant. It will take about 3 years to complete the work of laying of distribution network in the city.

2. Rain & Storm Water Harvesting: Chandigarh has a total rain water harvesting capacity of more than 70% of the total land area. The rainwater harvesting potential of Chandigarh, with an area of 114 sq. km and the average annual rainfall of 1059.3, is calculated to be 60380.1 million Liters or 13241gallons or 36.28 MGD (SoER 2018). The total capacity of

water that would be available for recharge annually is: 58 sq. km (area) x 1059.3 (rainfall) x 0.5 (rainfall coefficient) = 30,720 million litres. Thus, the potential is more than the water pumped out of aquifers and therefore, efficient harvesting of rain water and proper recharging of ground water will go a long way in contributing towards sustainability of water supply. To reduce dependence on ground water a short term legal frame work has been laid by the Administration to make provisions for rain water harvesting mandatory while granting the additional covered area to all plots above 500 sq. m (1 Kanal) area , with Order/Notification dated 16.10.2008 (SoER 2018). Construction of storm water harvesting and ground water recharge structures is also at full swing throughout the city to cover the roads (15.89 sq. km), rooftops of residential areas, (30.19 sq.km) shopping areas (3.97 sq. km), public and institutional (Table 4).

Table 4: Storm Water Harvesting

Storm Water Harvesting Sources	Area Covered (sq.km)
From Roads	15.89
From the Rooftop of Residential areas	30.19
From Public and Institutional Buildings	7.94
From Shopping area	3.97

Source: Ex. Er. Project Public Health Division No. 7, Chandigarh, Chandigarh Housing Board,8, Jan Marg, Sector 9D

INITIATIVES BY CHANDIGARH ADMINISTRATION WITH A VISION

- Bulk generators and even houses where tertiary water supply is available, are asked to use as much as possible tertiary water which will reduce the fresh water consumption.
- The entire city of Chandigarh is linked to a sewerage network, with dedicated pipelines channelling wastewater directly to the sewage treatment facility.
- All wastewater generated across Chandigarh is directed to Terminal Sewage Treatment Plants. Following a directive from the Hon'ble NGT, residential complexes exceeding an area of 10,000 square meters are required to install their own on-site sewage treatment plants.
- Treated water is being distributed to different parks and establishments for their gardening needs. Additionally, infrastructure is being established to extend the distribution of treated water citywide, enabling the supply of approximately 20 MGD of treated wastewater.
- Under Smart City Mission Chandigarh Smart City Limited is upgrading the existing sewage treatment plant with latest technologies to achieve waste water treatment level of 5mg/l for BOD.
- The CPCC conducts regular monthly assessments of STP efficiency, sharing outcomes with relevant authorities for necessary adjustments.
- It is mandatory for the treated industrial effluent to get diverted to Sewage Terminal Treatment Plant and again be treated there. From there, tertiary treated waste water will be supplied to various gardens and institute.
- Sludge from ETPs of Industrial units which is not hazardous is being disposed with municipal waste and sludge which is hazardous in nature is being disposed through Treatment Storage & Disposal Facility (TSDP) Nimbua.
- Municipal Corporation, Chandigarh has banned the use of hand pump for drinking purpose. Tube wells are used for supply of water by MC, Chandigarh.
- In order to create awareness among general public regarding ill effect of improper disposal of waste water, health camps are being organized by Health Department. In future, more such awareness camps will be conducted.
- Executive Committee has been formed to monitor the water quality of river Ghaggar. Concrete action plan is being prepared to ensure that no untreated waste water goes into these choes.

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