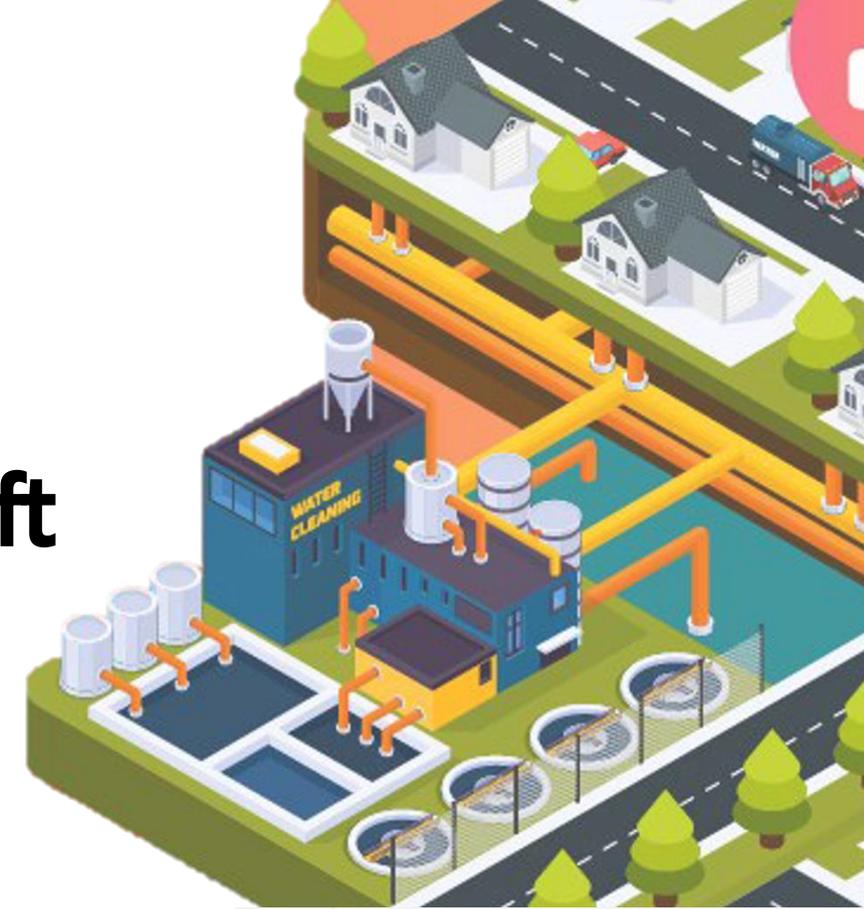


Onsite Wastewater Treatment and Recycling Regulations – 2023 – Draft



V. Srinivas Chary, Director, ASCI & CEO, WASH Innovation Hub, India

Presentation at 11th International Conference on Decentralized Wastewater Treatment in Asia, Ministry of Environment, Government of Japan, 28th October, 2023

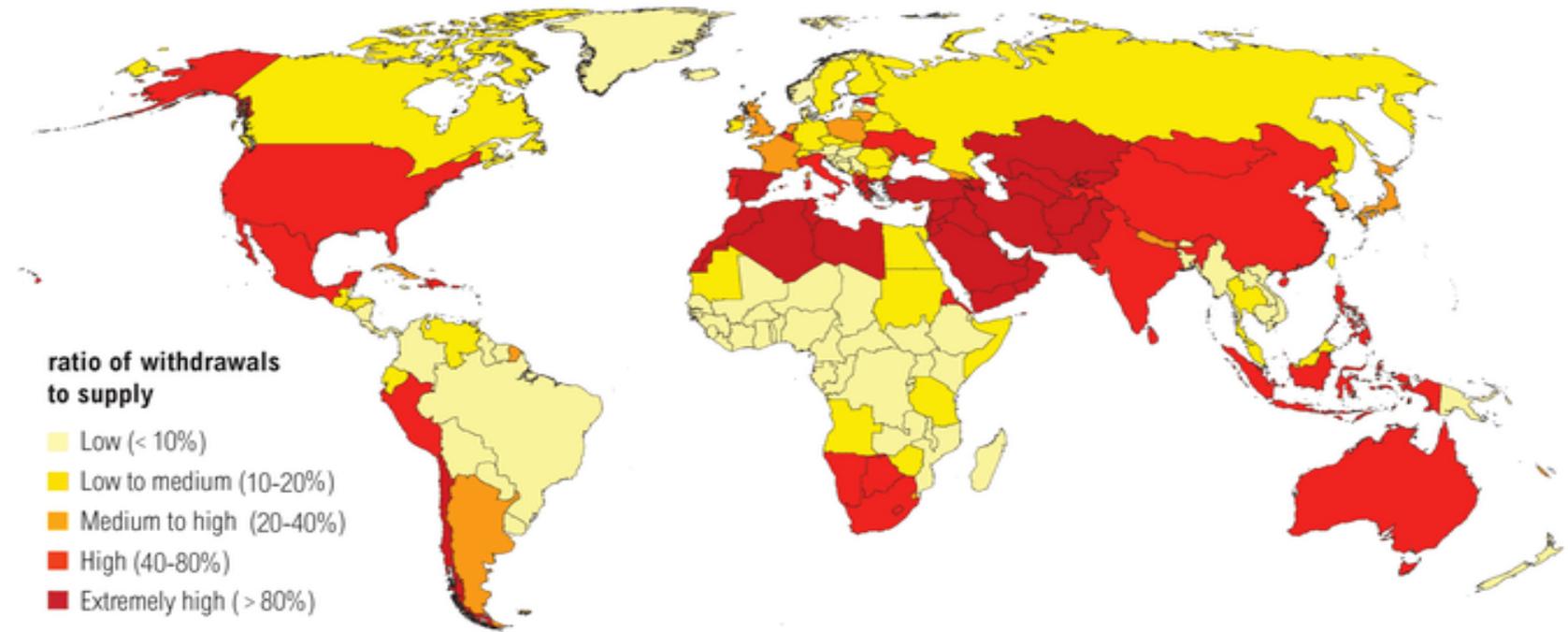


Global Water Scenario - Increasing demand Vs decreasing availability

By 2050, there will be an **80%** increase in water demand in cities.



Water Stress by Country: 2040



ratio of withdrawals to supply

- Low (< 10%)
- Low to medium (10-20%)
- Medium to high (20-40%)
- High (40-80%)
- Extremely high (> 80%)

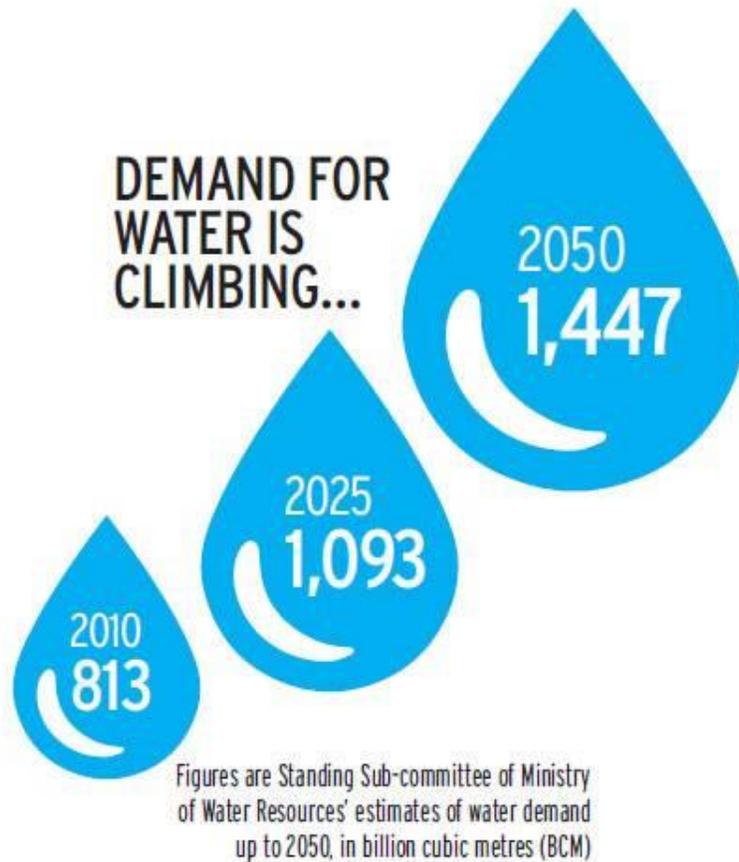
NOTE: Projections are based on a business-as-usual scenario using SSP2 and RCP8.5.

For more: ow.ly/RiWop

 WORLD RESOURCES INSTITUTE

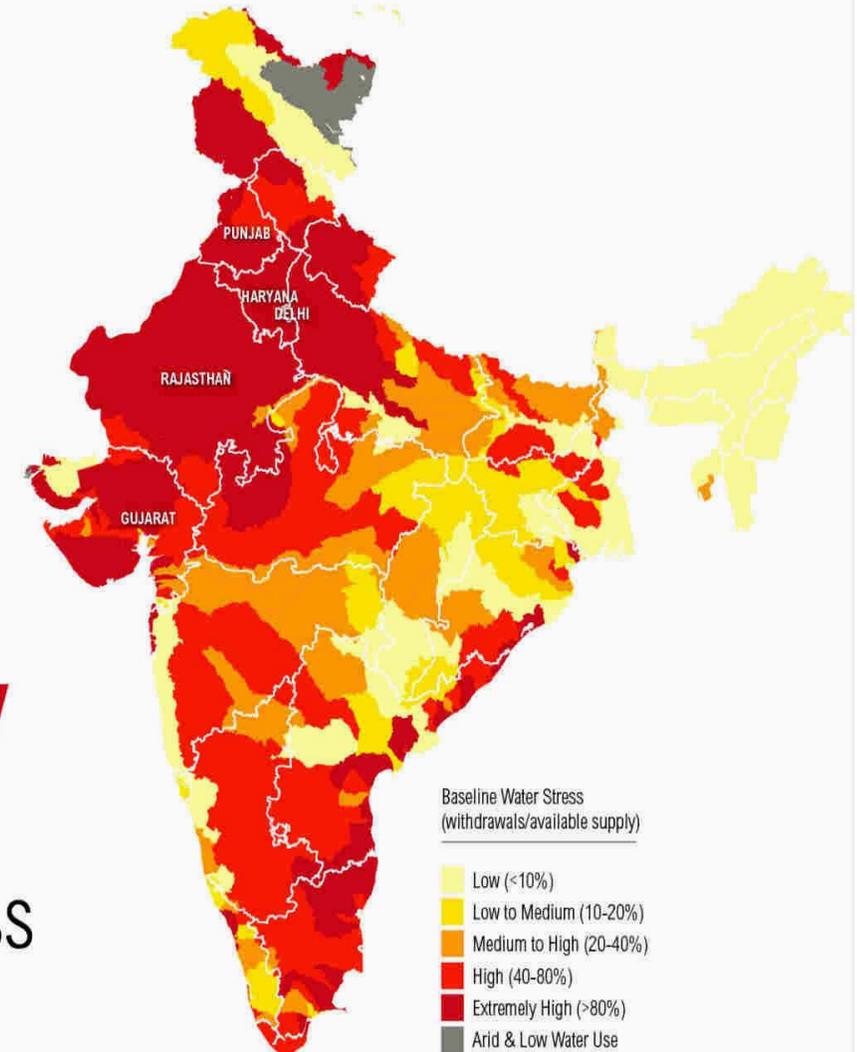
Globally, India is ranked as the 13th most water-stressed country.

India Water Scenario - Increasing demand Vs decreasing availability



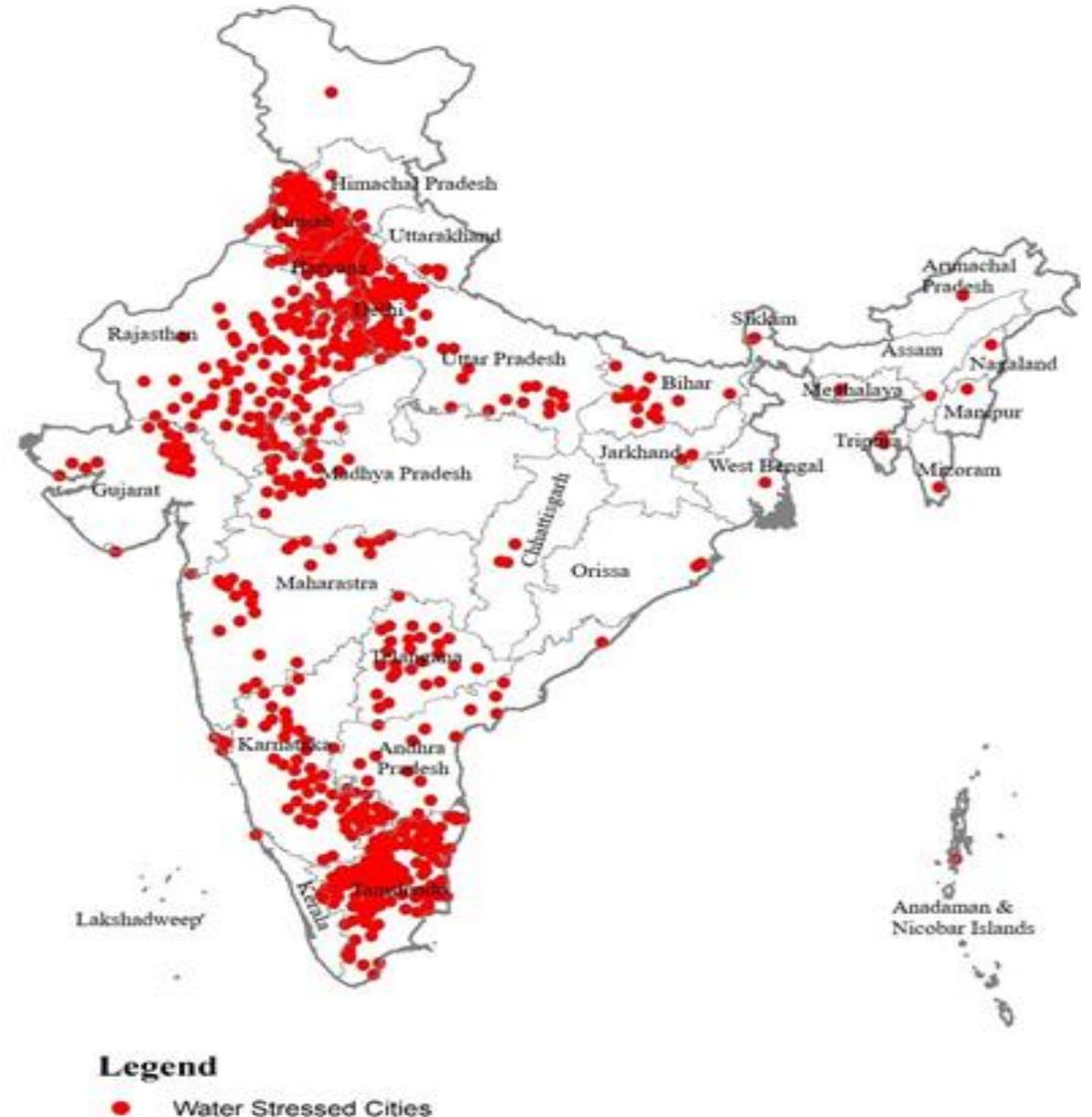
Extreme stress on groundwater - Limited availability of alternate sources

54%
of India
Faces
**High to
Extremely
High**
Water Stress



Water Scenario – Urban India

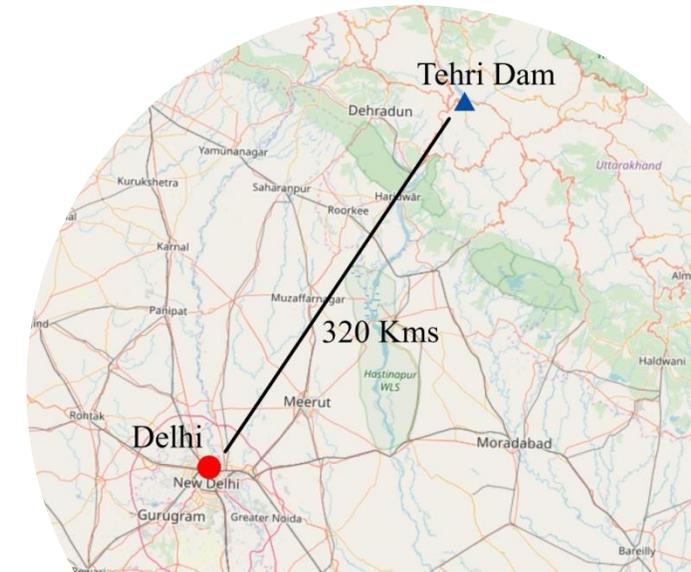
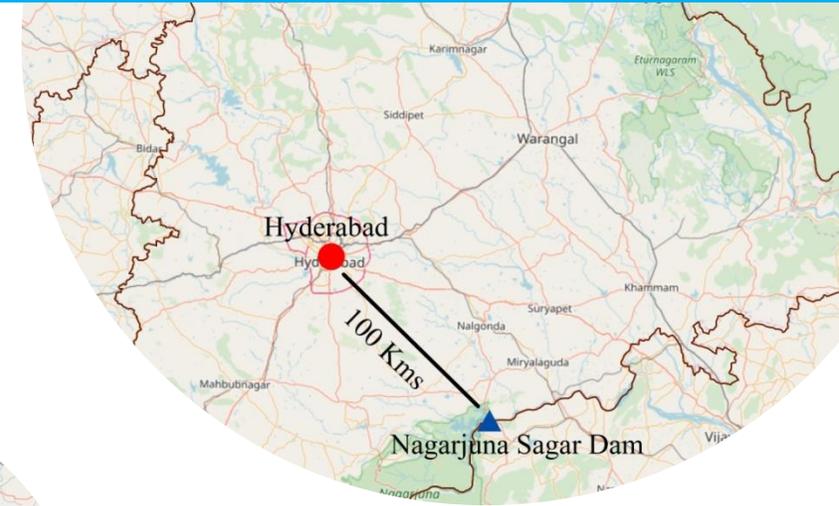
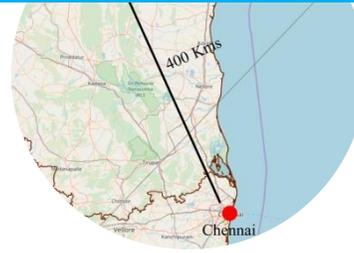
- 21 cities will run out of groundwater by 2030, affecting around 100 million people (NITI Aayog)
- 40 per cent of India's population will have no access to drinking water by 2030.



Urban Water Scenario - India

Increasing dependence on distant sources of water

- Large cities are sourcing water from **distant surface water sources**
- Very **costly to transport water** over long distances



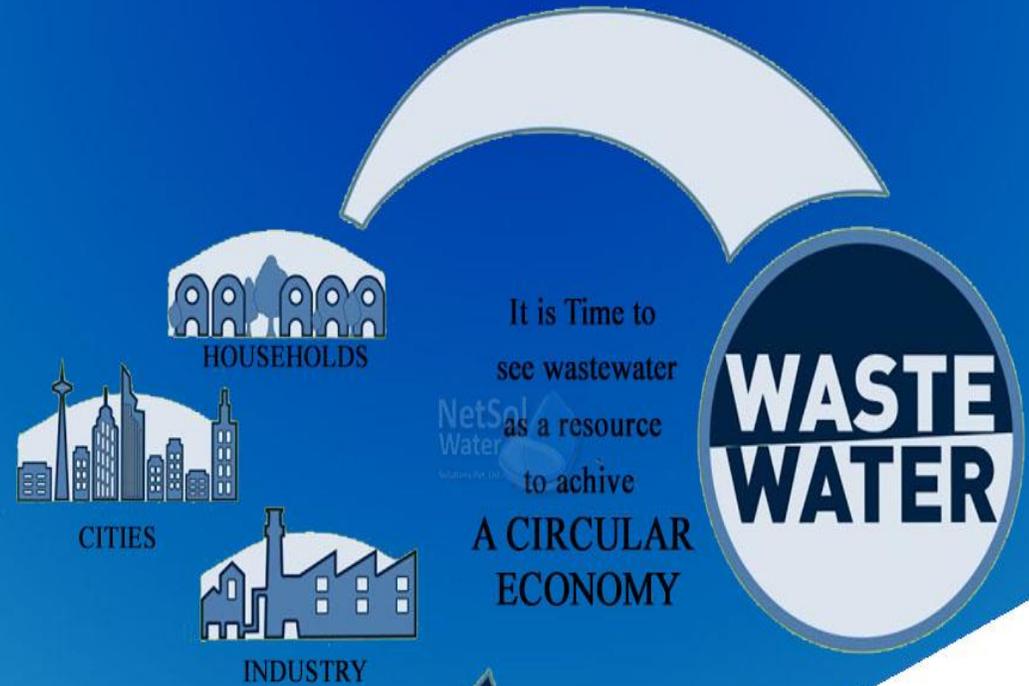
Climate Change will compound the water stress

- Cities can be significantly **impacted** by climate change – hence, adapting to climate change and building resilient communities to withstand its impacts - is the need of the hour.
- Cities significantly contribute to greenhouse gas emissions and can help mitigate climate change.
- Cities have to explore **environmentally sustainable and resilient solutions** to climate change.



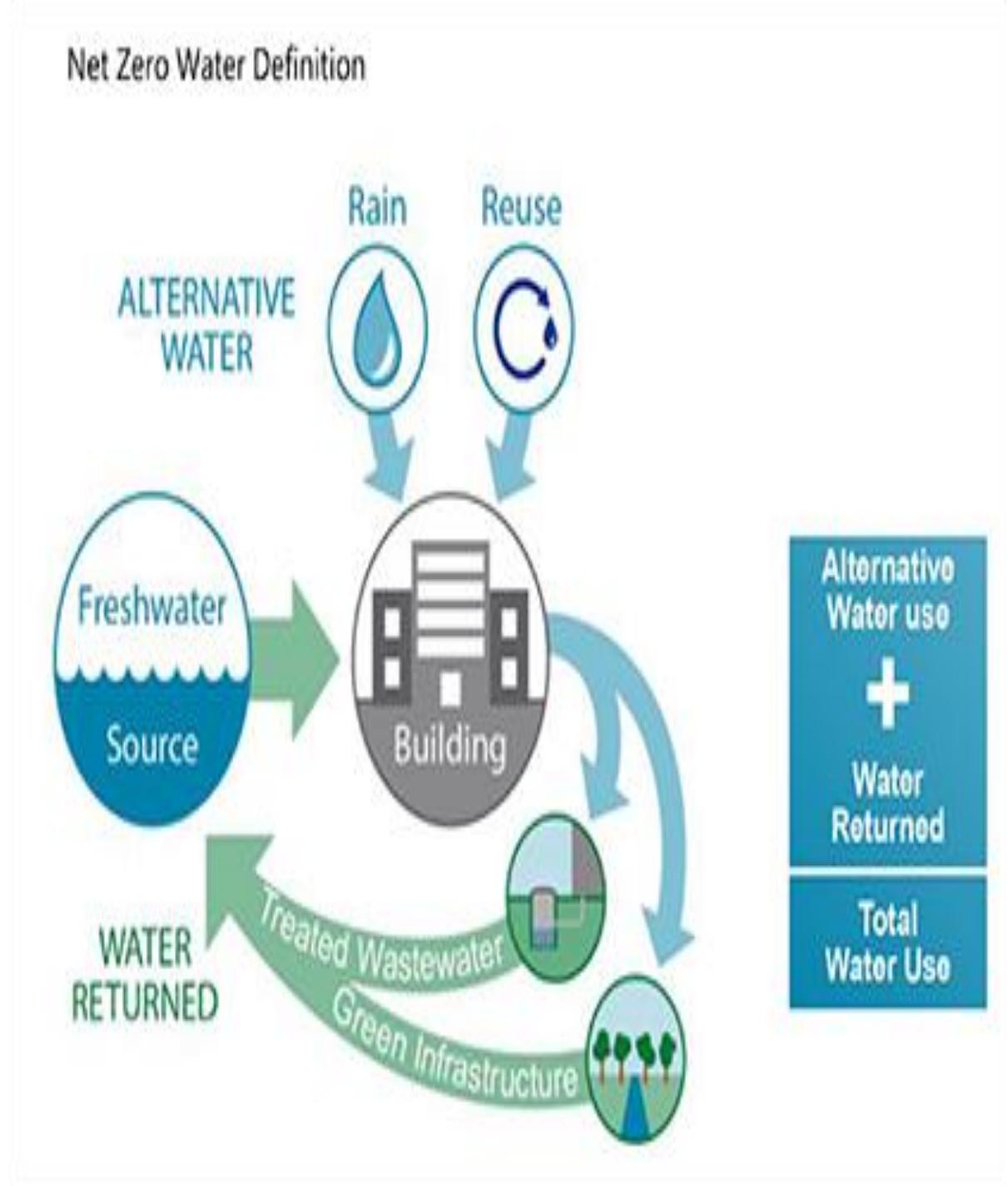
Circularity & Treated Water Reuse

- A transition from the linear model to a circular one for efficient water use and to minimise the losses.
- Circularity focuses on reducing water use and consumption and promotes **Reuse, Recycling, Restoration, and Recovery** of water resources.
- Telangana State (Youngest State in India) introduced circularity in wastewater to reduce water stress and improve environmental quality
- Hyderabad, the state capital, pilot



Reusing Waste Water to Support Circular Economy

- Telangana State envisioned to promote circularity in wastewater
- City level recycling and reuse policy – 2023 (Draft)
- Building level recycling policy – 2023 – Draft
- Towards net zero water built environment
- Inspired by the Jhokasou Act of Japan



Case 1 –Raheja Towers 12C, MindSPACE, Hyderabad

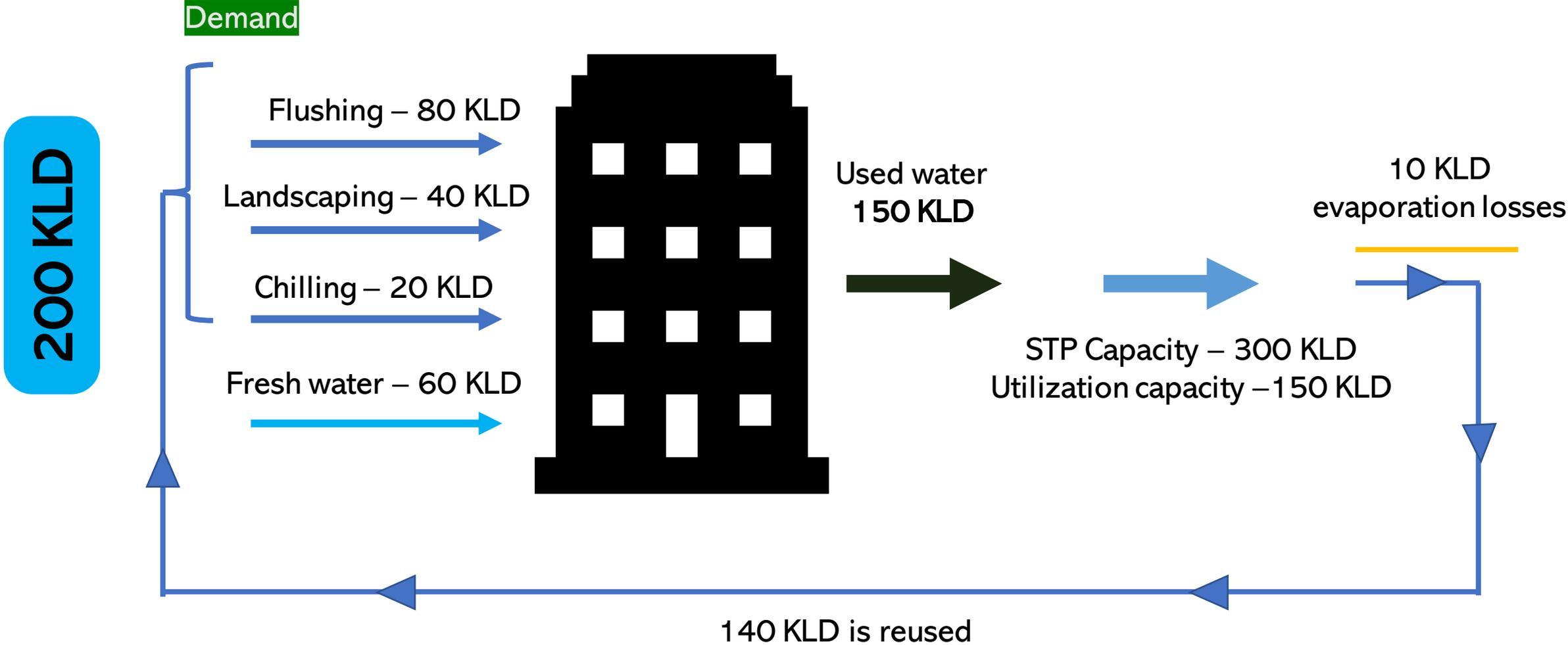


At a glance

Category	Commercial
Total area covered by the establishment	5.5 lakh sq.feet
No. of Occupants	Designed for 5000+ (3 shifts) Currently 40% occupied
Year of establishment	October 2022
STP Capacity	300 KL
Fresh water consumption	60KLD Supplied by HMWSSB @Rs.162 per KL
Used water generated	150 KLD
Utilization capacity of the STP	50%
Current status of STP	Functional
STP technology	Membrane Bioreactor (MBR)
Capital cost	1.2 Cr
O&M cost	1.4 Lakh per month
Reclaimed water capacity	140 KLD
Utilization of treated water	Flushing, Chilling & gardening

WATER BALANCE

Water demand is estimated to 200 KLD at 40% occupancy
(2000+ occupants for 3 shifts)



Case 2 – World Trade Centre, Bangalore

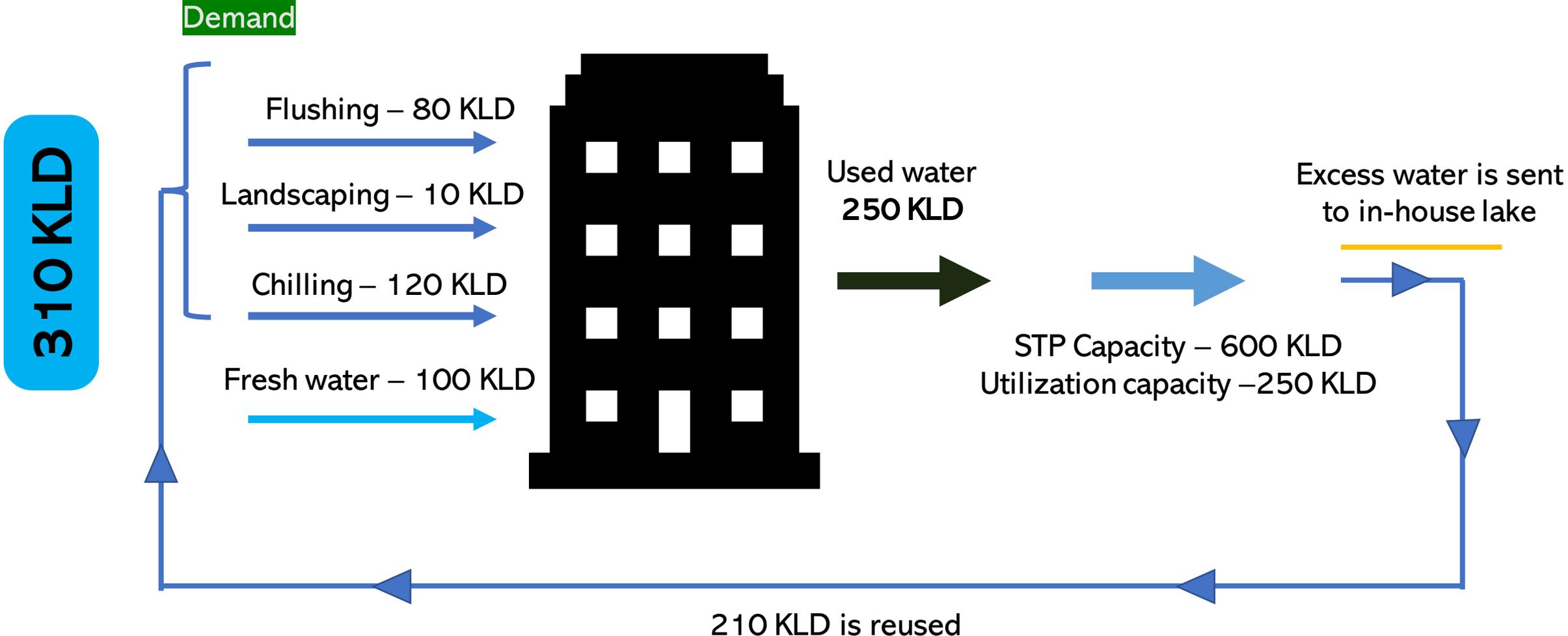


At a glance

Category	Commercial
Total area covered by the establishment	Approx. 2 acres
No. of Occupants	50% (about 4000)
Year of establishment	2010
STP Capacity	600 KLD
Fresh water consumption	100 KLD @ Rs. 85 per KL
Used water generated	250 KLD
Utilization capacity of the STP	250 KLD
Current status of STP	Functional
STP technology	MBBR
Capital cost	
O&M cost	2 lakhs
Reclaimed water capacity	85% (210 KLD)
Utilization of treated water	Chilling, Flushing & Gardening

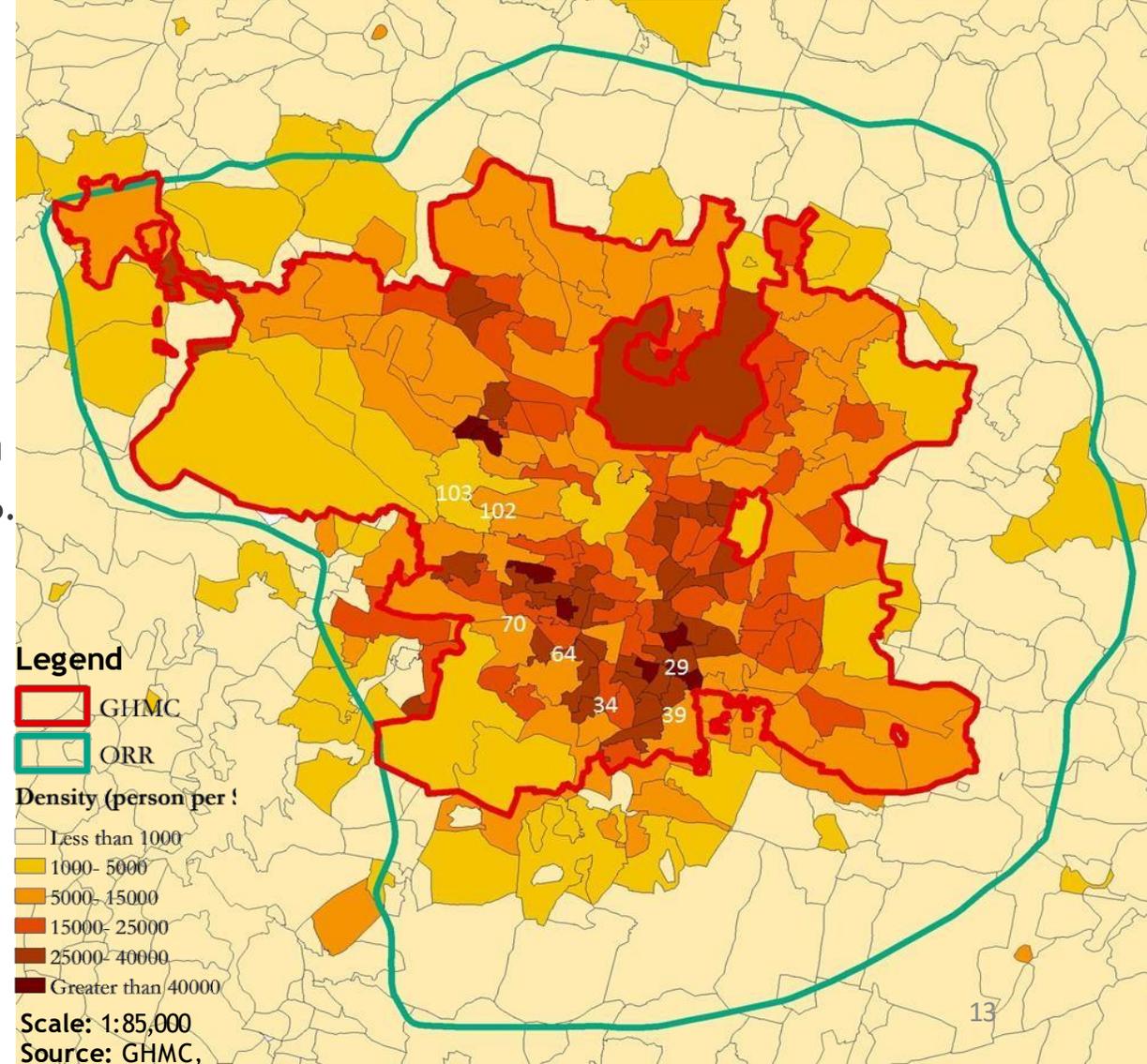
WATER BALANCE

Water demand is estimated to 310 KLD at 50% occupancy (4000+ occupants)



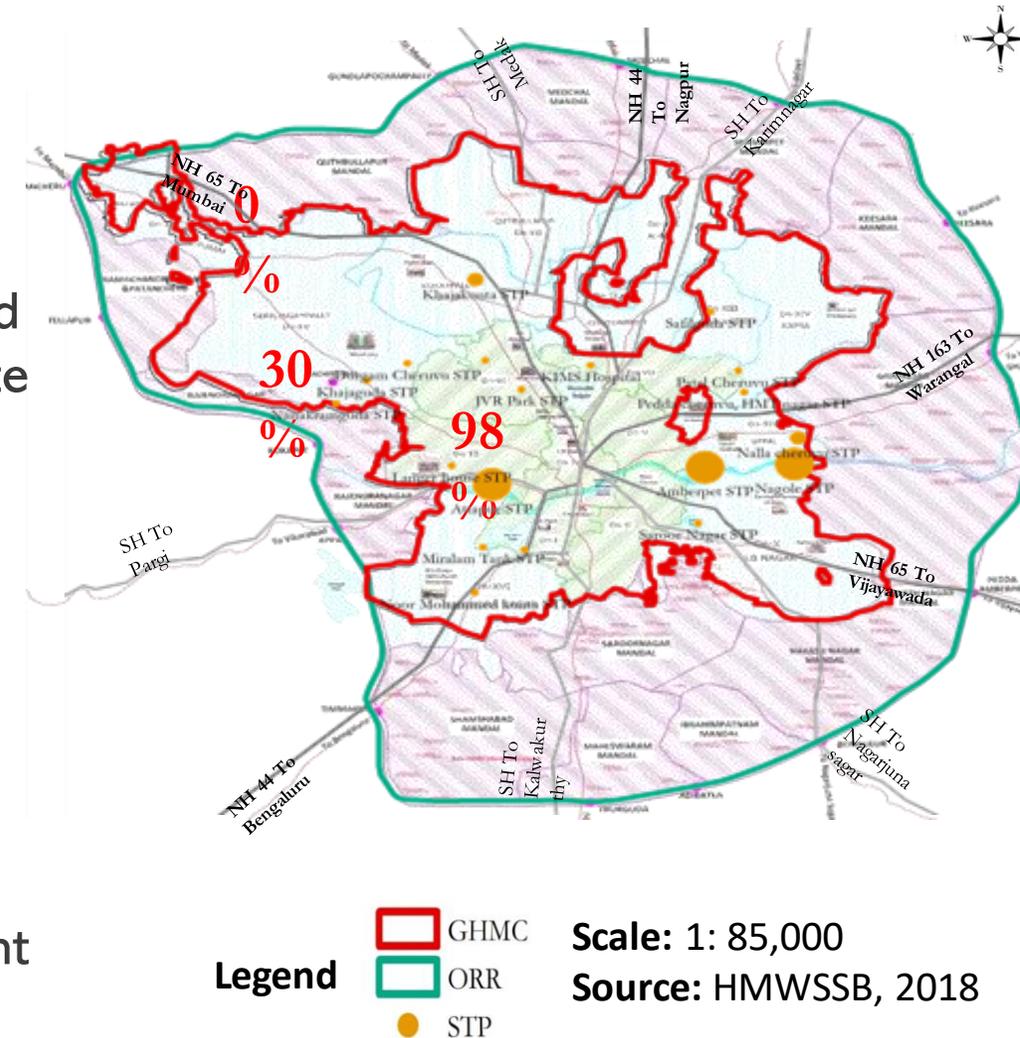
Preamble

- Hyderabad is among the most densely populated cities in India. The core area is saturated, and the growth is experienced in the peripheral areas.
- While the average population growth rate of GHMC during 2001-2011 was around 27 %, the growth in the peripheral areas is at a much higher rate of 63%.
- The city is growing outwards towards the outer ring road (ORR) and beyond.
- The current population in 1650 sq.km area comprising GHMC, areas till ORR and 1 km outside ORR is estimated to be close to be ~1 crore.



Preamble

- Hyderabad city has an underground sewerage network covering ~50% of GHMC (the core area having a coverage of 98% and the rest of the GHMC area having a coverage of 30%).
- The area between GHMC and ORR does not have an organised sewerage network; hence, all the households depend on onsite sanitation systems (OSS), namely septic tanks or twin pit toilets.
- The high-rise residential buildings and commercial and institutional establishments depend on decentralized onsite private sewage treatment plants for the treatment and disposal of waste.
- The estimate indicates that over 1200 private STPs of different capacities are present in HUA.



Onsite Sewage Treatment Plants – Situation Assessment

- Dysfunctional or sub-optimally functional Onsite Wastewater Treatment Systems (OWTS).
- Absence of a system to validate STP designs
- Absence of technology standardisation
- Lack of professional O&M arrangements, unskilled operators
- Lack of proper reporting and documentation
- Reuse standards for treated wastewater and biosolids – not notified
- Weak database
- **Absence of a regulatory framework for effective designing, implementing, and monitoring of onsite wastewater treatment systems**

Intent of the Regulation

- Promote water-neutral buildings
- Encourage circular economy in used water management
- Protect water bodies through effective wastewater treatment
- Reduce water footprint
- Promote climate resilience
- Encourage innovative solutions and transformative technologies

Title, Objective and Applicability of the Regulations

- Title: Onsite Wastewater (Used Water) Treatment and Recycling Regulations - 2023
- Objective: To achieve net water-neutral buildings by promoting on-site wastewater treatment & recycling and through effective monitoring.
- Applicability: New and existing buildings within the Outer Ring Road (ORR) area

Coverage:

1. In the case of new construction for all buildings belonging to the following categories, shall mandatorily install an Onsite wastewater treatment system (OWTS).

- (a) Residential buildings having 25 and above households or residential buildings having 5000 Sq. m and above built-up area, whichever is lower;
- (b) Commercial buildings having 5000 Sq.m and above built-up area;
- (c) Educational establishments/Institutions having 5000 Sq.m and above built-up area;
- (d) Hostel establishment having 5000 Sq.m and above built-up area;
- (e) Healthcare facilities having 25 and above beds or having 5000 Sq.m and above built-up area, whichever is less;
- (f) All Gated communities and townships, irrespective of the area

Coverage

2. In the case of old/existing buildings for all buildings belonging to the following categories, it is mandatory to install an Onsite Wastewater treatment system (OWTS) within a span of two years from the date these regulations come into effect

- (a) Residential buildings having 25 and above households or residential buildings having 5000 Sq. m and above built-up area, whichever is lower;
- (b) Commercial buildings having 5000 Sq.m and above built-up area;
- (c) Educational establishments/Institutions having 5000 Sq.m and above built-up area;
- (d) Hostel establishment having 5000 Sq.m and above built-up area;
- (e) Healthcare facilities having 25 and above beds or having 5000 Sq.m and above built-up area, whichever is less;
- (f) All Gated* communities and townships, irrespective of the area

Coverage

3. For all buildings not belonging to the above categories, all Wastewater outlets shall be connected to the municipal sewer system. Where no municipal sewer system exists within a distance of 50 m, either a well-designed OWTS or an onsite sanitation system conforming to IS 2470 requirements shall be provided within the plot area

Extent of Recycling (from the date of notification of this regulations)

1. Recycling of treated water, complying with the standards notified, shall be mandatory for non-potable uses such as gardening, lawn maintenance, flushing, floor cleaning etc.
2. Dual Plumbing System
 - a) Dual plumbing system for the recycling of treated water for non-potable use shall be mandatory for all new establishments/constructions where OWTS is mandatory.
 - b) Dual plumbing system for the recycling of treated water for non-potable use shall be installed/retrofitted wherever viable in existing buildings where OWTS is mandatory.
 - c) For existing/legacy buildings where installation of a dual plumbing system is not viable, recycling of treated water shall be encouraged for other non-potable uses such as landscaping and floor cleaning and construction activity in and outside the premises.
3. In cases where 100% recycling of treated wastewater is not possible within the premises, excess treated wastewater shall be traded for non-potable uses as per the norms given by the competent authority.

Monitoring

Monitoring shall span across the lifespan of the OWTS and can be divided into three categories:

- 1. Pre-establishment**
- 2. During the establishment**
- 3. Post-establishment**

Monitoring

DESIGN REQUIREMENTS:

1. **OWTSs shall be designed using the Best Available Technologies and Transformative Technologies approved by the competent authority.**
2. **OWTSs shall be located in such a way that all units of the OWTS are freely accessible for maintenance and inspection activities.**
3. **All buildings with installed OWTSs are required to have a separate electric sub-meter for the OWTS unit.**
4. **All installed OWTSs are required to install sensor-based inflow and outflow meters for real-time monitoring**
5. **All installed OWTSs are required to install sensors at the outlet of the OWTS to monitor the following parameters: pH, DO, TDS and Residual Chlorine.**
6. **All buildings with installed OWTSs and a connection to a sewer line shall install a flowmeter on the pipe that lets Wastewater from the building into the main sewers at the sewer connection.**

Monitoring

ENFORCEMENT BEFORE CONSENT FOR ESTABLISHMENT

- a) Competent authority shall empanel third-party agencies (TPA) for design validation and implementation.
- b) Competent authority shall charge a licensing fee to third-party agencies. Licenses shall be renewed every year.
- c) Incorporating submission of plan detailing the location and design of OWTS and certificate of approval from competent authority into the building license approval and certificate of establishment granting process.

ENFORCEMENT BEFORE CONSENT FOR OPERATION

- a) Competent Authority shall physically inspect the DSTP or on-site treatment system for all buildings to ensure all requirements detailed in section 6 are met before issuing an occupancy certificate or certificate for operation.

Monitoring

ENFORCEMENT AFTER OPERATION

- a) Competent authority shall empanel operation and maintenance agencies with credible competencies for undertaking O&M operations.
- b) O&M agencies shall engage a reputed laboratory with appropriate accreditation, such as NABL/ISO/DSIR.
- c) Competent authority shall charge a licensing fee to the O&M agencies. Licenses shall be renewed every year.
- d) Self-Monitoring
 - a) O&M agency/personnel shall keep a log of daily monitoring data.
 - b) O&M agency/personnel shall get a detailed analysis of influent and effluent parameters according to CPHEEO guidelines done through the engaged laboratory.
 - c) O&M agency/personnel shall upload laboratory analysis and daily log to the online monitoring platform (OMP) every 3 months.
- e) Statutory monitoring: Competent authorities shall monitor the performance of all OWTSS through onsite inspection every year.

Monitoring

STANDARDS

a) Standards for release into the sewerage network, a surface water body or land.

NO.	Parameter	Limits
1.	pH	6.5-8.5
2.	Total Suspended Solids (TSS)	< 20 mg/l
3.	COD	< 50 mg/l
4.	BOD (5 day)	< 10 mg/l
5.	Total Nitrogen	< 10 mg/l
6.	Ammoniacal Nitrogen	< 5 mg/l
7.	Faecal Coliform	<100 MPN/100 ml

Source: NGT order 2019 (M.A. No. 1792/2018, M.A. No. 1793/2018, I.A. No. 150/2019 & I.A. No. 151/2019)

Monitoring

b) Standard for Recycling

NO.	Parameter	Limits for Landscaping	Limits for other uses
1.	pH	6.5-8.5	6-9
2.	Total Suspended Solids (TSS)	< 20 mg/l	< 10 mg/l
3.	COD	< 50 mg/l	< 20 mg/l
4.	BOD (3 day)	< 10 mg/l	< 10 mg/l
5.	Total Nitrogen	< 10 mg/l	< 10 mg/l
6.	Ammoniacal Nitrogen	< 5 mg/l	<5 mg/l
7.	Dissolved Phosphorus as P	< 1 mg/l	< 1 mg/l
8.	Faecal Coliform	< 100 MPN/100 ml	<10 MPN/100 ml
9.	Residual Chlorine	1 ppm	1 ppm

Source: NGT order 2019 (M.A. No. 1792/2018, M.A. No. 1793/2018, I.A. No. 150/2019 & I.A. No. 151/2019); Jordanian Standards (JS1767:2008), CPHEEO manual Part A: Engineering Chapter 7: Recycling and Reuse of Sewage; WHO : Overview of greywater management Health considerations (2006)

Monitoring

STANDARDS

c) Standards for Biosolids: Standards for USEPA Biosolids Class A

Parameter	Limits
Arsenic (As)	20 mg/kg dry weight
Cadmium (Cd)	1 mg/kg dry weight
Chromium (Cr)	100 mg/kg dry weight
Copper (Cu)	100 mg/kg dry weight
Lead (Pb)	150 mg/kg dry weight
Mercury (Hg)	1 mg/kg dry weight
Nickel (Ni)	60 mg/kg dry weight
Selenium (Se)	5 mg/kg dry weight
Zinc (Zn)	200 mg/kg dry weight

Parameter	Limits
<i>Escherichia coli</i>	<100 CFU/gm
<i>Salmonella</i> Sp.	Not Detected (CFU/4gm)
Total Coliforms	<100 MPN/gm
Faecal Coliforms	<1,000 MPN/gm
Helminth ova (<i>Ascaris</i> sp. and <i>Taenia</i> sp.)	< 1 cell per 4 grams of total dry solids
Enteric Viruses	< 1 PFU per 4 grams of total dry solids

Source: USEPA part 503 Biosolids Rule

Incentives and penalties

Incentives:

- a) Reducing the water footprint and recycling used water is a key incentive for the builder.
- b) Further recycling treated wastewater will reduce freshwater usage, bringing savings to the owner as they would move to a lower tariff slab
- c) Competent authority shall issue a recognition system similar to the Energy Efficiency Star Rating System.

Penalties:

- a) Penalty for failing to establish OWTSs:
 - a) If a residential establishment fails to install OWTS within the stipulated time, the competent authority shall withdraw the establishment's free water ration, double the water tariff and charge a fine of Rs 1,00,000/month till the OWTS is installed.
 - b) If establishments of other categories fail to install OWTS within the stipulated time, the competent authority shall double their water tariff and charge a fine of Rs 2,00,000/month till the OWTS is installed.
- b) Penalty for failing to submit self-monitoring data or to meet effluent standards:
 - a) If a residential establishment fails to submit self-monitoring data for three consecutive cycles or fails to meet notified effluent standards during monitoring, the competent authority shall withdraw the establishment's free water ration, double their water tariff and charge a fine of Rs 10,000/month till the compliance is achieved.
 - b) If establishments of other categories fail to submit self-monitoring data for three consecutive cycles or fail to meet notified effluent standards during monitoring, the competent authority shall double their water tariff and charge a fine of Rs 20000/month till the compliance is achieved.

Safety

- Provision of a 'DANGER' sign board near the OWTS.
- Provision of “not fit for drinking” sign in both Telegu and English at the taps where treated wastewater flows.
- Maintaining a minimum of two sets of protective gear in working conditions at all times.
- Displaying the “Caution – Danger” sign whenever there is a maintenance activity.
- Ensuring maintenance personnel wear all protective equipment, including a portable oxygen cylinder with a mask, during maintenance activities.
- Ensuring at least two additional individuals are supervising the maintenance activity from the outside at a distance from which they can immediately evacuate the person inside if such a situation arises.
- All desludging and maintenance operations shall strictly follow the Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013

Data Management

- Development of **Online-Monitoring Platform (OMP)**, including a dashboard for periodic monitoring and reporting
- Continuous data exchange amongst different competent authorities

Regulators: Roles and Responsibilities

Competent Authority	Responsibilities
GHMC	<ul style="list-style-type: none"> • Shall ensure all requirements detailed in the regulation are met before issuing a building licence for buildings within the ORR area • Shall communicate all relevant data with HMWSSB
ULB	<ul style="list-style-type: none"> • Shall ensure all requirements detailed in the regulation are met before issuing a building licence within their jurisdiction • Shall communicate all relevant data with HMWSSB
HMWSSB	<ul style="list-style-type: none"> • Shall empanel third-party agencies for design validation and implementation • Shall empanel third-party operation and maintenance agencies • Shall curate a list of the Best Available Technologies and approved Transformative Technologies for the design of OWTs • Shall ensure all requirements detailed in the regulation are met before issuing a CFE and CFO for OWTs in buildings with a built-up area of less than 20,000 sq. m within the ORR area • Shall perform a yearly physical statutory inspection of OWTs for building with a built-up area of less than 20,000 sq.m within the ORR area • Shall engage a third-party knowledge partner to perform an audit of all OWTs within the ORR area as and when needed • Shall develop a centralised Online Monitoring Platform (OMP) • Shall establish a separate cell at the HMWSSB office to monitor this activity • Shall ensure all operators of OWTs are uploading self-monitoring data in a timely manner • Shall develop a virtual water trade framework • Shall enforce penalties and incentives on OWTs for buildings with built-up areas less than 20,000 sq.m within the ORR area
TSPCB	<ul style="list-style-type: none"> • Shall ensure all requirements detailed in the regulation are met before issuing a CFE and CFO for OWTs for buildings with a built-up area of more than 20,000 sq. m as per EIA • Shall perform a yearly physical statutory inspection of OWTs for building with a built-up of more than 20,000 sq.m • Shall enforce penalties and incentives on OWTs for buildings with built-up of more than 20,000 sq.m • Shall communicate all relevant data with HMWSSB

HMWSSB: Responsibilities

- Shall empanel third-party agencies for design validation and implementation
- Shall empanel third-party operation and maintenance agencies
- Shall curate a list of the Best Available Technologies and approved Transformative Technologies for the design of OWTs
- Shall ensure all requirements detailed in the regulation are met before issuing a CFE and CFO for OWTs in buildings with a built-up area of less than 20,000 sq. m within the ORR area
- Shall perform a yearly physical statutory inspection of OWTs for building with a built-up area of less than 20,000 sq.m within the ORR area
- Shall engage a third-party knowledge partner to perform an audit of all OWTs within the ORR area as and when needed
- Shall develop a centralised Online Monitoring Platform (OMP)
- Shall establish a separate cell at the HMWSSB office to monitor this activity
- Shall ensure all operators of OWTs are uploading self-monitoring data in a timely manner
- Shall develop a virtual water trade framework.
- Shall enforce penalties and incentives on OWTs for buildings with built-up areas less than 20,000 sq.m within the ORR area

Monitoring flowchart: HMWSSB responsibility

