

# Moving towards water secure and climate resilient cities

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**Global South Academic Conclave on WASH and Climate 2026**  
6th – 7th February 2026, Ahmedabad

**CWAS** CENTER  
FOR WATER  
AND SANITATION  
**CRDF** CEPT  
UNIVERSITY

**CEPT**  
UNIVERSITY  
FACULTY  
OF PLANNING

**Gates Foundation**

**viega** foundation

# Vulnerability in India has increased due to climate change . .

- Climate change impacts seen more on developing countries - **90 %** human losses reported from developing countries
- India is **7<sup>th</sup>** most vulnerable country to the climate hazard
- **27** out of **36** states are highly vulnerable to climate change impact
- The two focus states of Gujarat and Maharashtra flood, drought and heat wave induced by climate change



Delhi Floods, 2023 – Water Treatment plants are dysfunctional; sewage mixing with flood water

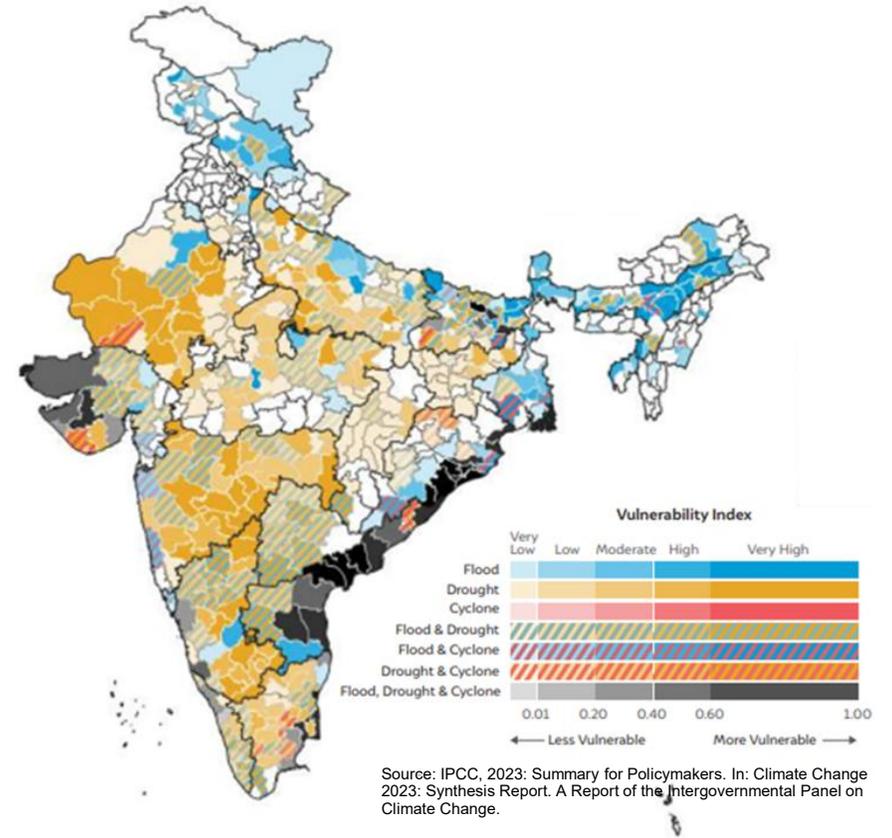
Uttarakhand, 2023 - Cloud burst destroys city infrastructure and services

Chennai floods, 2021 and drought, 2019



Kerala floods, 2018 – Access to sanitation facilities

Latur, 2016 - Water delivered through trains during drought



# Cities in Gujarat and Maharashtra: No Different in Facing Climate Change Impacts...

## Kachchh Region in Gujarat

Chronically drought prone region with a frequency of once in every 2.5 years



## Rains pound Gandhidham, Anjar towns in Kutch

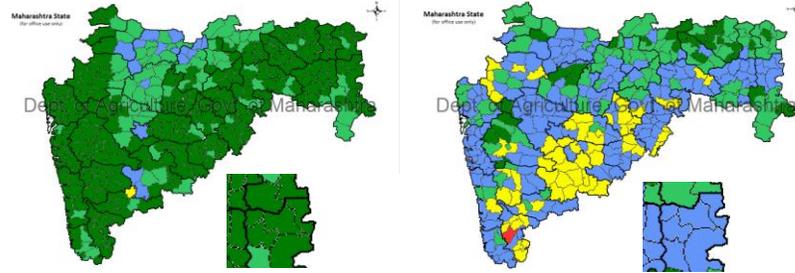
Rajkot: Heavy rain lashed Kutch's commercial city Gandhidham and Anjar on Saturday evening causing severe water-logging in many areas. However, the people welcomed the rain that gave them some respite from the



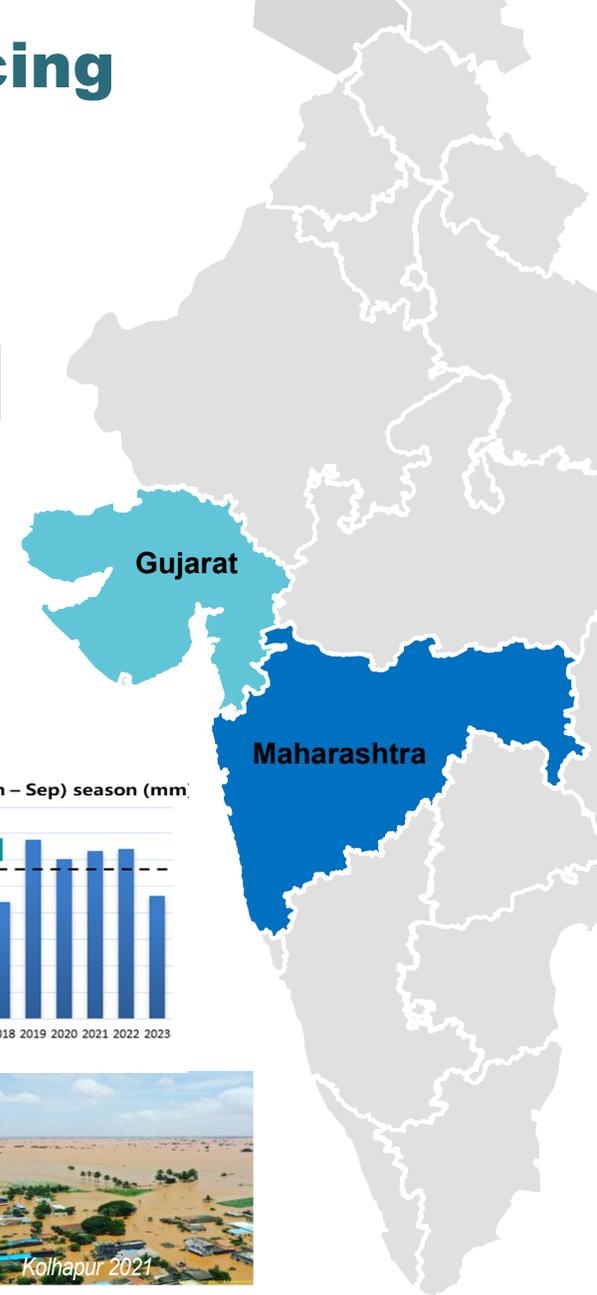
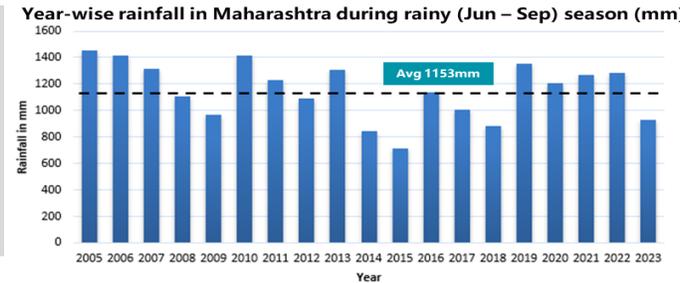
Frequent **Urban flooding** scenario in major parts of the cities

- **Over exploitation of ground water**, which is further aggravated by **salt water intrusion**
- **Dependent on distant water source**

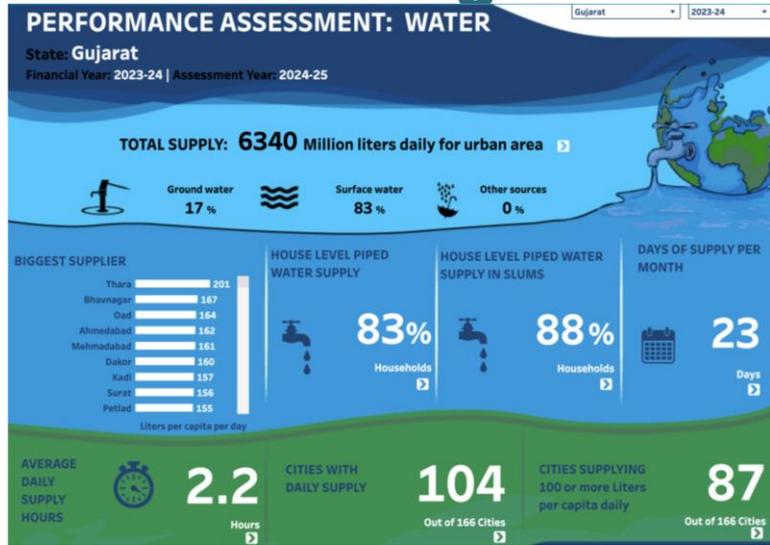
## Maharashtra Fluctuations in rainfalls



intensify both droughts and floods



# Understanding water security through the lens of service level benchmarking...



## Intermittent water supply – Invisible and Hidden Burden



Economical and public health risks of non-daily supply

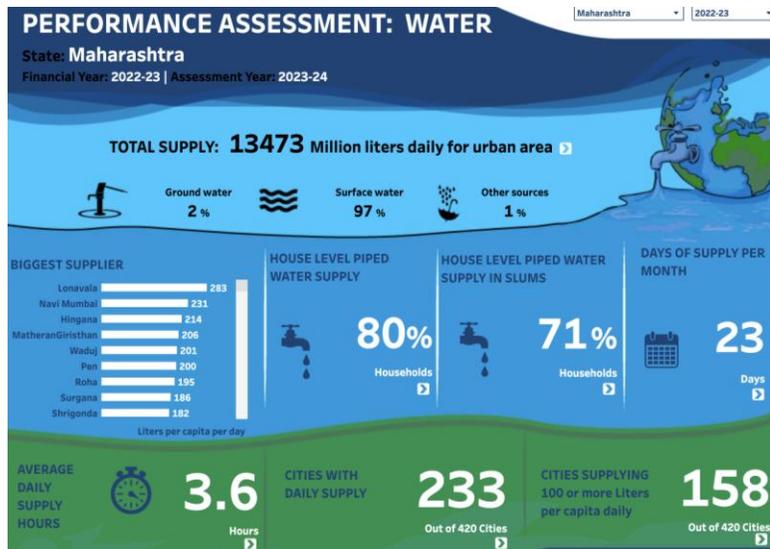


Operational inefficiency and dependent on alternative Sources



Additional burden on poor: Coping costs of non-daily water supply

## Urban Water Service Performance in Gujarat and Maharashtra



High dependence on **surface water sources**

Surface water sources are **vulnerable to climate variability** (Erratic rainfall - reduced inflows in catchment areas, seasonal shortages)

Household-level piped water coverage

Improved access **reduces dependence on public stand-posts** and improves **service equity**: enable **transition to daily supply**

Cities with **Daily Water Supply**

Despite strong **infrastructure**, cities are supplying water on **non-daily basis**

# Government initiatives in urban Gujarat and Maharashtra to scale up source augmentation through RWH/ GWR measures...

## Central government's programs and initiatives

Schemes and Programs	Implementing dept at State	Urban RWH / GWR Relevance
AMRUT 2.0	Urban Development Department	Rejuvenation of water bodies, urban aquifer mapping and management, promote recycle & reuse and rainwater harvesting to augment freshwater resources.
Jal Shakti Abhiyan: Catch the Rain	Urban Development Department	Harvest rainfall through creation of artificial recharge structures, watershed management, recharge and reuse structures, intensive afforestation and awareness generation.

## State government's programs and initiatives

Maharashtra				Gujarat			
	Schemes and Programs	Implementing department	Urban RWH / GWR Relevance		Schemes and Programs	Implementing department	Urban RWH / GWR Relevance
1	Maharashtra State Water Policy, 2019	Water Resource Department	Makes RWH mandatory in urban areas	1	Subsidy scheme by GWSSB	GWSSB	Subsidies for installing RWH systems in urban areas
2	DCPR-2034 (BMC) and UDCPR	UDD	Detailed provision of RWH and GWR. Ensures open spaces allows natural percolation	2	Gujarat State Water Policy	GWSSB, GWIL, WASMO, GWRDC	Integrated water resources management
3	Urban RWH By-laws and Incentives (Municipal Initiatives)	UDD and ULBs at local level	ULBs mandate RWH in new constructions on plots of a certain size and offer property tax rebates for adoption	3	Comprehensive General Development Control Regulations - CGDCR 2017	UDD and ULBs at local level	ULBs mandate RWH in new constructions on plots of a certain size .

**Engagement with the State departments shall be fostered to scale up the initiatives through different schemes and programs**

# CWAS's Water security initiatives in Maharashtra and Gujarat...

## Gujarat: Integrated Approach for Climate-Resilient Water Management



Assessment of Existing water Situation



Development of Water Security Plan



Implementation of Pilot Demonstrations



Scale-up and Dissemination



Anjar



Gandhidham



Ichalkaranji

## Maharashtra: Community-Led Nature based Solutions to become water secure and climate resilient



Rain water harvesting



Ground water recharge



Mini-piped water supply scheme



Sponge park concept



Ichalkaranji

# Integrated Approach for Climate-Resilient Water Management in Kachchh, Gujarat

## Action Plan developed for Anjar and Gandhidham



An assessment framework was developed, and based on the findings, an action plan was prepared. Various initiatives were undertaken in line with the action plan.

## IEC and Capacity Building Exercise

**Jal Sanrakshan Mela – 1200+ attendees**

**Engineers**  
50+ Engineers  
35+ Plumbers  
30+ School Teachers

**Ramnavami Rally in Anjar- 30,000+ visitors**

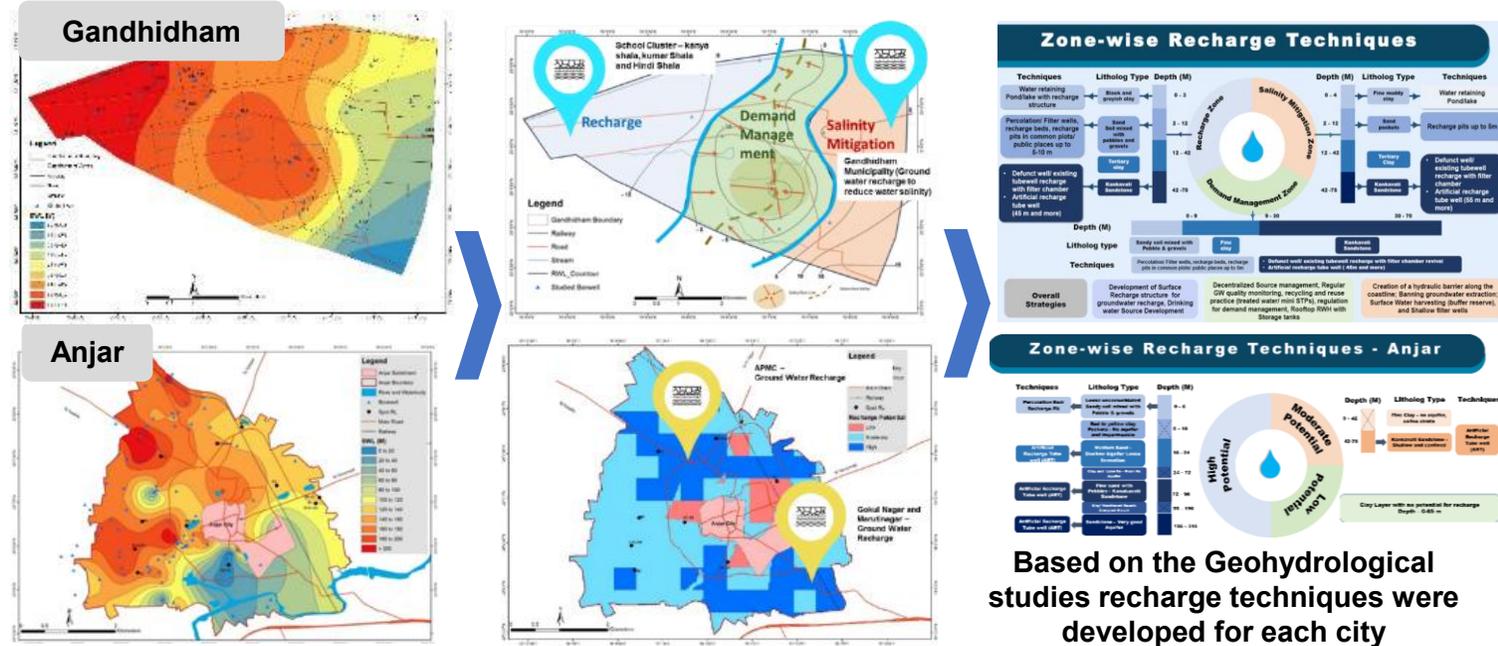
**Plumbers**

**Vikshit Bharat Yatra & Seva Setu**

**School Students**

**Teachers**

## Geohydrological Study for 2 cities- Zone Wise Recharge Techniques



Based on the Geohydrological studies recharge techniques were developed for each city

## Pilot Demonstration

Anganwadi no-85

RWH - Group School

GMC Building

**40,000+ Litres fresh water available for 3000+ students, through Rainwater Harvesting in Gandhidham**

Vivekanand School

Urban Flood Mitigation

Anganwadi

**56+ million litres groundwater recharging annually through GWR equivalent to drinking water for 10,000+ HHs**

# Gujarat's First RWH Theme Park, serving as educational and awareness platform...

## Rainwater Harvesting Theme Park @ Adisar Park, Gandhidhaam



School students at RWH theme park

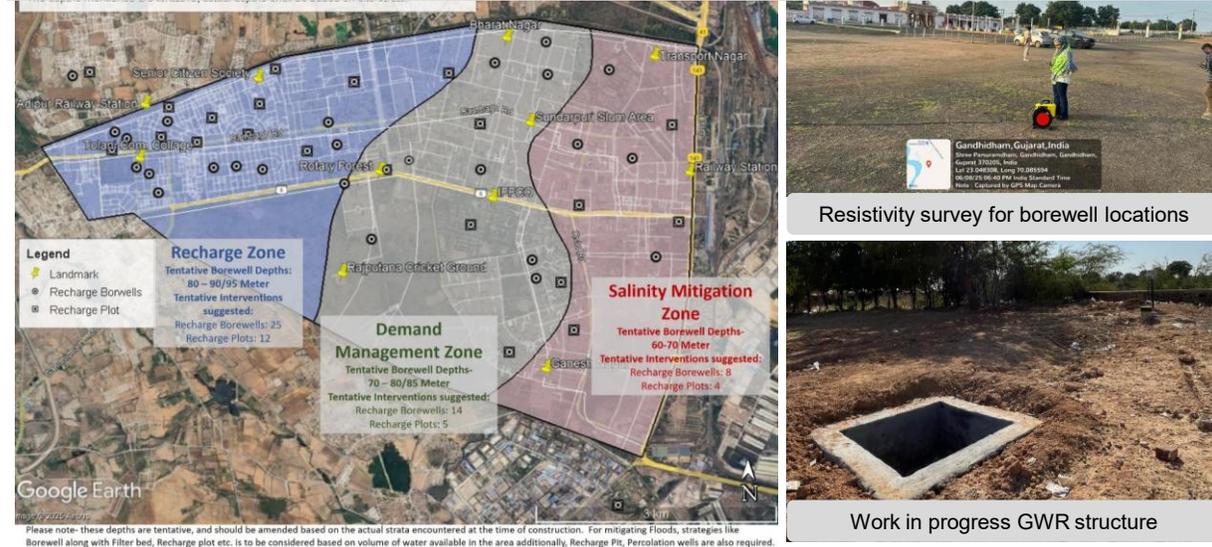
Household RWH, Bio swales and GWR structure

Traditional method

RWH systems

- Gujarat's first-of-its-kind demonstration park dedicated to rainwater harvesting and groundwater recharge
- Serves as educational and awareness platform promoting sustainable water conservation practices

## City level scale up plan for Ground water recharging



Resistivity survey for borewell locations

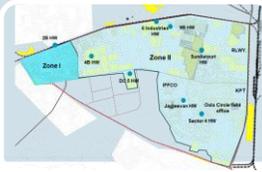
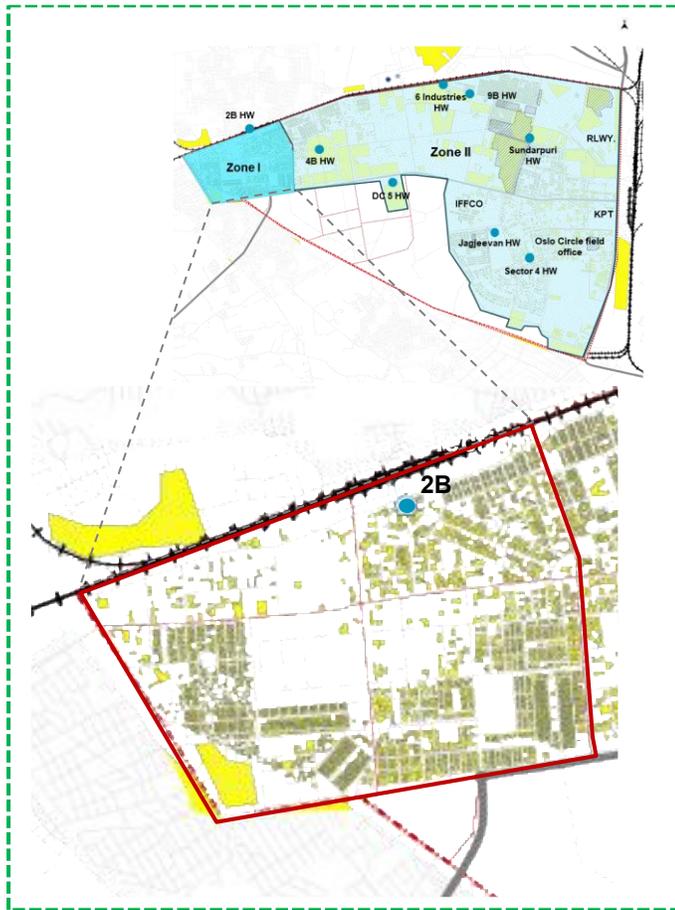
Work in progress GWR structure

**USD 3,50,000 budgeted by state government in 50+ ground water recharge structures**

- **City-Level Groundwater Recharge Plan** is developed to address challenges, such as depleting water levels, deteriorating quality and flooding during rainy season
- Considering the **Geohydrological characteristics of each management**, specific locations for appropriate recharge techniques have been identified

# Gandhidham – on a pathway to move to daily water supply at pilot location

## Strategic plan to transition from Non-daily to daily water supply



Understanding Existing System



Strategy Development for Trial Run



Conducting Trial Run



Quick Action based on trial run



Development of detailed plan

2B ESR Command Area Details

No.	Priority Zone	Area/Block	Population	Household	Population
1	Day 1 Supply Zone	102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000	Population		

- 2B Command area serves – 4500 HHs
- Approximately 22540 population
- Some areas – 4A Block – SVF, 4AF and 4A, IFFCO – 4A are connected to both sources – 2B ESR + HSR (direct connection)



2B ESR Command Area Details

No.	Priority Zone	Area/Block	Population	Household	Population
1	Day 1 Supply Zone	102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000	Population		

Non-daily to Daily Supply

Your Cooperation Today Ensures Daily Water Tomorrow

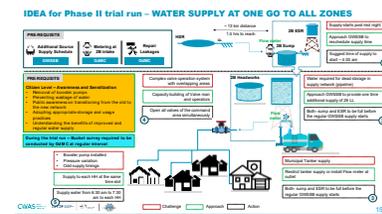
- Be water-wise
- Cooperate with municipal staff
- Do NOT use booster pumps
- Do NOT throw excess water on trial run day



- Water Source
- Storage Capacity
- Service at HH Level
- Operations and Distribution Network

Actions required by various agencies before Phase II Trial Run (by 09<sup>th</sup> February 2026)

No.	Agency	Required Action	Responsibility
1	Water Source	Water Source	Water Source
2	Storage Capacity	Storage Capacity	Storage Capacity
3	Service at HH Level	Service at HH Level	Service at HH Level
4	Operations and Distribution Network	Operations and Distribution Network	Operations and Distribution Network



Dependence on a Single Water Source for the 2B Command Area

# Ichalkaranji (Maharashtra) adopting Community based, Climate-Resilient Solutions to become water secure...

## ! Problem Statement

- Frequent floods & water logging during peak monsoons
- Summer water scarcity and intermittent supply
- There is presence of vulnerable low-lying areas in the city.
- High dependency on private and government borewells.
- Due to rising urbanization, limited permeable green areas



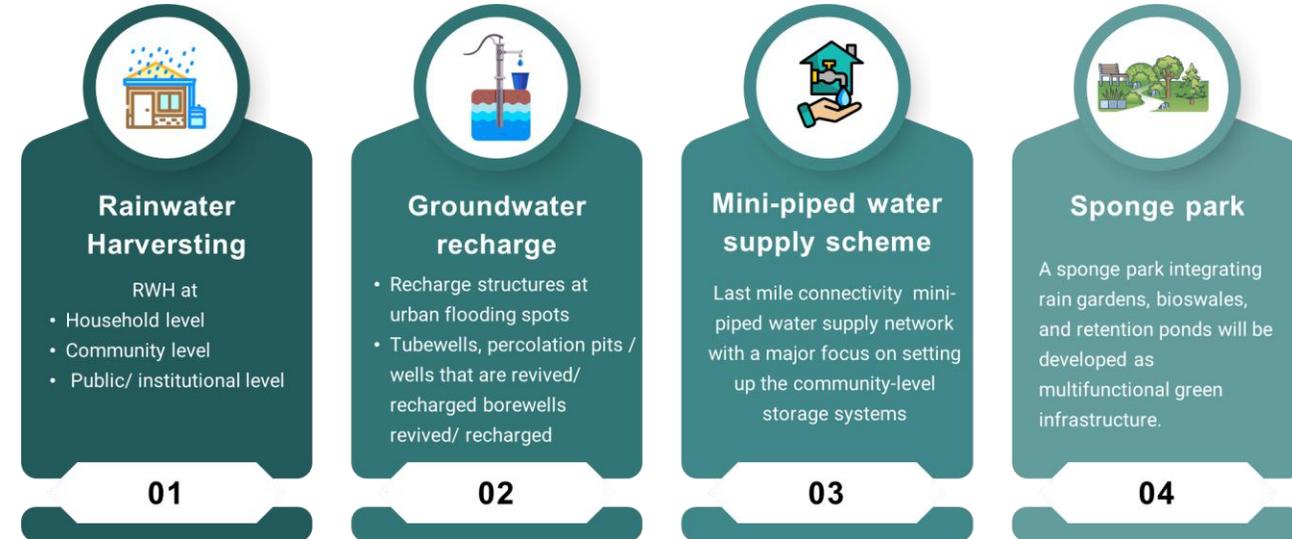
## 🌿 Project Approach

- **Nature-Based Solutions (NbS)**
  - Rainwater harvesting & groundwater recharge systems
  - Sponge parks with rain gardens & bioswales
  - Mini-piped water networks with community level storage
  - Recharge borewell revival in flood-prone areas
- **Community-Led Implementation**
  - SHG-led operations with training & financial inclusion
  - Capacity-strengthening for local organizations
  - Awareness campaigns (e.g., Jal Sanrakshan Melas)



## 🌱 Project Components

### • Nature-Based Solutions (NbS) through demonstration pilots



- **Assessments of WASH** in low-income areas including slums and **assess the geo-hydrological features** and Aquifers.
- Identify **suitable sites** for demonstration of pilots
- **Discussions with communities** and govt. stakeholders to identify and finalize locations
- **Community Handover** and Sustainability Plan for O&M

# Project Components : Community-Led Implementation and scale up

## Financial Access Entrepreneurship Development for SHGs



1. Assessments around **Stakeholder Engagement and SHG Mobilization**



2. A **landscape assessment to evaluate financial products** from banks, MFIs, NBFCs) for credit to SHGs for NbS-related activities



3. **Training SHGs on NbS orientation, Implementation** and on operations and maintenance

## Capacity building and Dissemination



1. **Tailored training of city government** officials, engineers and field staff on execution and maintenance of NbS



2. **Jal Sanraskhan Mela** ( Water Conservation Fair) to sensitize communities around NbS for Water conservation initiatives.



3. **Preparation of technical manuals**, standard operating procedures, and monitoring guidelines



4. **Dissemination of demonstration sites as live learning hubs**, showcasing good practices through case studies and video and facilitating peer learning.

## Impact & Scalability



### Expected Impact

- **Enhanced water security** & reduced urban flooding
- **Strengthened municipal & community capacity** and gender inclusivity
- **Improved health outcomes** for vulnerable communities

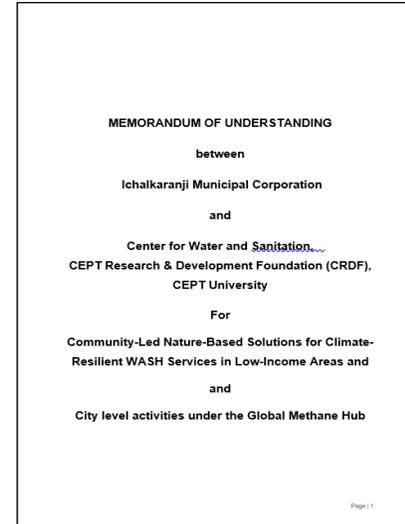


### Scalability & Replication

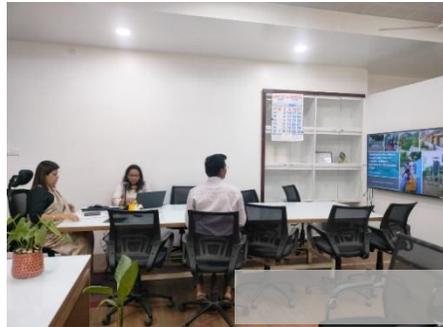
- **SOPs & technical manuals** for wider adoption
- **Convergence with government schemes** (SBM, AMRUT, NULM)
- **Model designed** for adaptation in other cities

# Milestones Achieved Under Ongoing Implementation...

- Inauguration meeting held on **16 Sept 2025** at IMC
- MoU signed between **IMC and CRDF, CEPT University**
- WASH assessments completed in **17 slums & 12 municipal schools**
- **11 of 17 municipal gardens** assessed for sponge park feasibility
- **5 sites finalized** for RWH & GWR; **1 site** for sponge park
- Resistivity tests completed at all pilot RWH/GWR locations
- RWH construction initiated at one IMC school
- Engagement initiated with **NULM & SHGs** for O&M and awareness



MoU and Inauguration meeting



Meetings with stakeholders



Slum assessment and FGDs



Site visits by the consultants



RWH work in progress



Assessment of IMC schools and gardens

# Exploring – innovative technologies to address the challenges across Urban Water Supply Value Chain...



## SOURCE

- High dependence on limited water sources
- Climate variability and drought risk
- Limited supply options in remote areas



## INTAKE



## WATER TREATMENT

- Aging and inefficient treatment systems
- High energy costs
- Limited real-time quality monitoring



## STORAGE/ TRANSMISSION

- High losses in bulk pipelines
- Poor monitoring of flows and pressure
- Energy-intensive pumping operations



## DISTRIBUTION

- High Non-Revenue Water (NRW)
- Frequent leakages & pipe bursts
- Lack of zone-wise network monitoring



## END USE

- No volumetric billing or accountability
- Low consumer awareness on water use
- Weak service & grievance systems

Key challenges

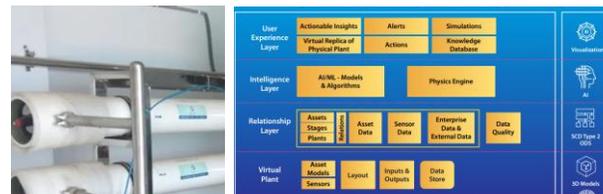
Solutions

- Air-to-Water (AWG),
- Aquifer recharge systems
- Solar powered Desal (community level)



AWG System and Aquifer recharge

- Advanced filtration (UF/RO), AI based optimization



RO and Digital Twin Technology

- SCADA, VFD and Energy efficient pumps



SCADA and VFD System

- DMA-based monitoring, AI-enabled leak detection, Smart water meters,



DMA. Leak detection and Water meters

*Situation- and ground-based technological innovations must be adopted—allowing any suitable technology to be deployed—across the entire water supply service chain*

# Thank You

**Global South Academic Conclave on WASH and Climate 2026**

**CWAS** CENTER  
FOR WATER  
AND SANITATION  
**CRDF** CEPT  
UNIVERSITY

**CEPT**  
UNIVERSITY  
FACULTY  
OF PLANNING

**Gates Foundation**

**viega** foundation

# Intermittent water supply – Invisible and Hidden Burden

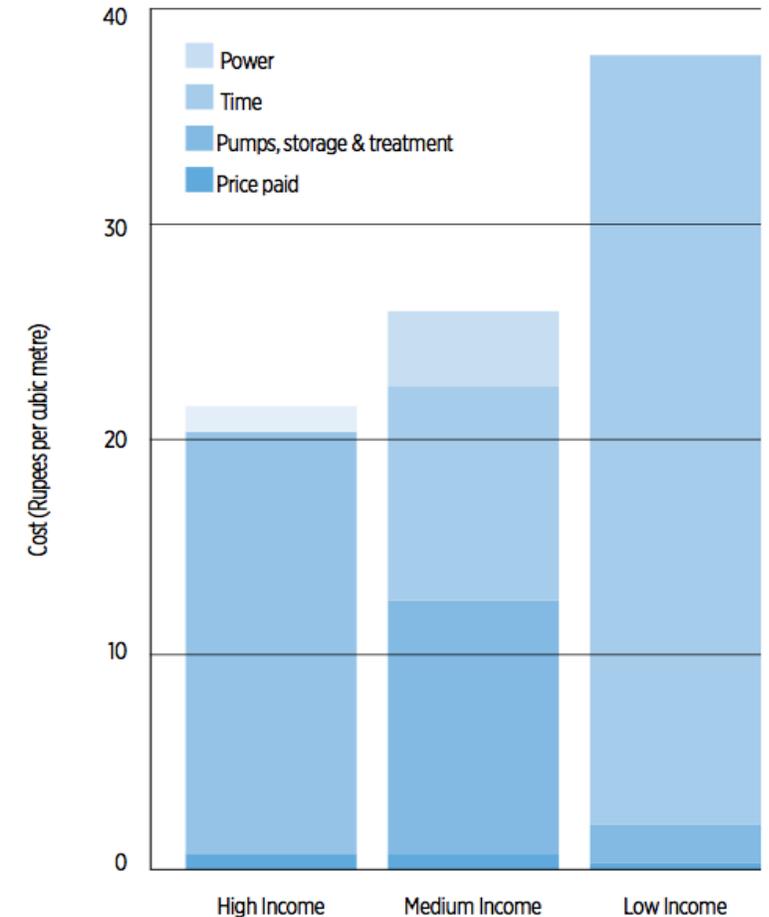
## Economical and public health risks

- **INR 13,600 Cr/Year:** Estimated annual losses from irregular urban water systems in India [1]
- **27% Electricity:** Average household electricity used for water access due to intermittency in Pune region [2]
- Poses severe public health risks, primarily through contamination entering pipes during low-pressure periods

## Operational inefficiency and dependent on alternative water markets

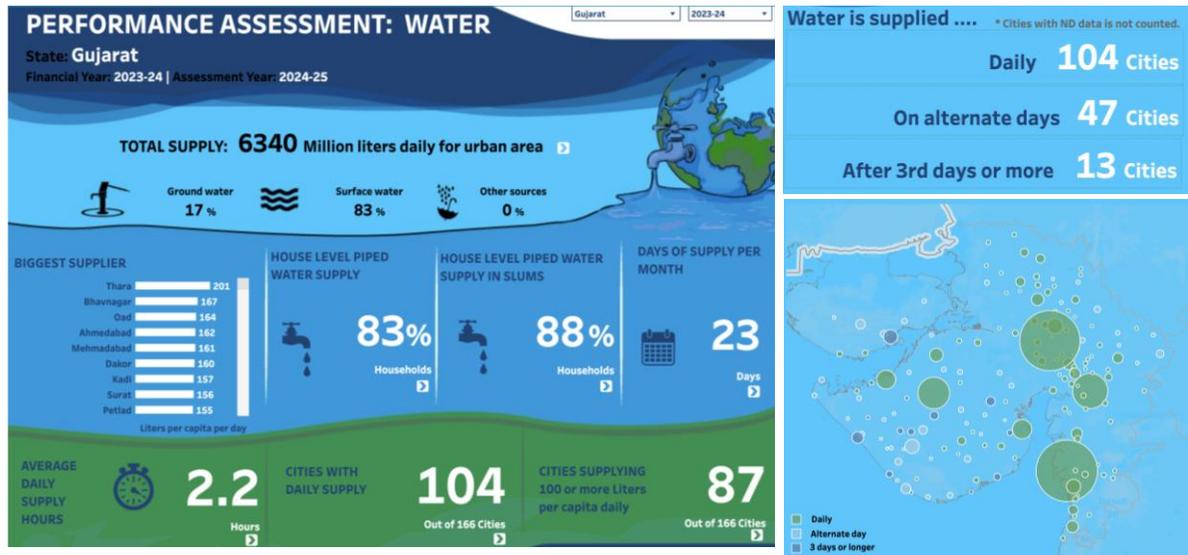
- High pressure variation leading to pipe deterioration resulting higher water losses.
- Unpredictable supply hours → Household coping mechanism
- Increased dependency on alternative water markets: Water tankers and Bottle water markets

## Additional burden on poor: Coping costs of intermittent water supply



Source: [1] - The value of 24/7 water - <https://thesourcemagazine.org/the-value-of-247-water/> [2] Impacts of intermittent water supply on household electricity demand: An econometric analysis for the Pune Metropolitan Region, India <https://www.sciencedirect.com/science/article/pii/S2212428424000148> [3] Chary (2009) and The value of 24/7 water - <https://thesourcemagazine.org/the-value-of-247-water/>

# Urban Water Service Performance in Gujarat and Maharashtra



- High dependence on **surface water sources**
  - Gujarat: 83% surface water
  - Maharashtra: 97% surface water

Surface water sources are vulnerable to climate variability (Erratic rainfall and reduced inflows in catchment areas); Increased risk of seasonal shortages during dry years

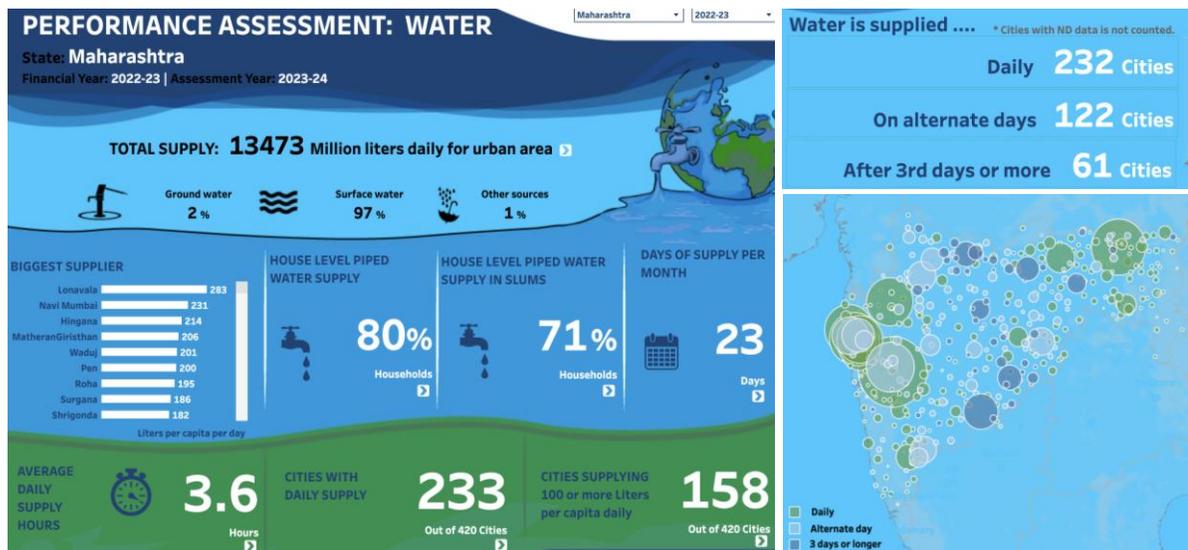
- Household-level piped water coverage
  - Gujarat: **83% households (88% in slums)**
  - Maharashtra: **80% households (71% in slums)**

Improved access **reduces dependence on public stand-posts** and improves **service equity**: enable transition to daily supply

- **Cities with Daily Water Supply**
  - Gujarat: 104 cities (28% of cities)
  - Maharashtra: 232 cities (55% of cities)

Despite strong infrastructure, cities are supplying water on intermittent basis;

Directives from state to **move towards daily water supply**



# Innovative technologies across the Urban Water Supply Service Chain

Service Chain Stage	Exact Technology Name	What it does	Indicative Cost Range (₹)	Implementation Level	Impact Area
<b>Water Source &amp; Augmentation</b>	Atmospheric Water Generator (AWG)	Produces drinking water from air moisture	₹5–25 lakh per unit	Low–Medium	Water security, climate resilience
	Managed Aquifer Recharge (MAR) Systems	Recharges groundwater using rainwater	₹50 lakh–5 crore	Medium–High	Groundwater recharge
<b>Water Treatment</b>	UF / RO / Hybrid Treatment Systems	Removes physical & chemical contaminants	₹1–5 crore per MLD	Medium	Water quality
	AI-based Process Control Systems	Optimises chemical and energy use	₹50 lakh–2 crore	Medium	Energy efficiency, cost reduction
<b>Transmission &amp; Bulk Supply</b>	SCADA Systems	Remote monitoring of pumps, flow & pressure	₹1–5 crore	Medium	Operational efficiency
	Electromagnetic Bulk Flow Meters	Accurate bulk water measurement	₹5–25 lakh per meter	Low	Loss identification
	Variable Frequency Drives (VFDs)	Controls pump speed based on demand	₹5–30 lakh per pump	Low	Energy efficiency
<b>Distribution Network</b>	District Metered Areas (DMA)	Divides city into monitoring zones	₹20–50 lakh per DMA	Medium	NRW reduction
	AI-based Acoustic Leak Detection	Detects hidden pipe leaks	₹50 lakh–3 crore	Medium	Leakage reduction
<b>Consumer end</b>	AMI / Smart Water Meters	Real-time household water measurement	₹2,000–6,000 per connection	Medium	Accountability, billing
	Water Demand Analytics Platforms	Analyses consumption patterns	₹25 lakh–1 crore	Low	Water conservation
<b>System-wide / Advanced</b>	Digital Twin of Water Networks	Virtual model of water system	₹2–10 crore	High	Planning & system optimisation
	AI & Machine Learning Platforms	Predict failures & optimise systems	₹1–5 crore	Medium–High	Proactive O&M