Innovations for Efficient Water Management and Public Utility Approach

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What are the key challenges faced for water service delivery?

What is Water Efficiency?

Water Efficiency

- Water Efficiency means promoting the sustainable use of water with adopting solutions that enables the comprehensive reduction in the waste of domestic, industrial and agricultural water usage.
- Implementing water efficient measures to make it possible for sustainably saving on water energy and cost.

Water Conservation

- Water conservation refers to **the preservation, control and development of water resources, both surface and groundwater, and prevention of pollution**.
- Water conservation is the practice of using water efficiently to reduce unnecessary water usage.
- Water conservation is important because fresh clean water is a limited resource, as well as a costly one.
- **Niti Aayog has warned that if methods of water conservation are not adopted, 20 cities including Delhi, Bengaluru, Hyderabad will out of water in next 20 years.**

Government's Initiatives

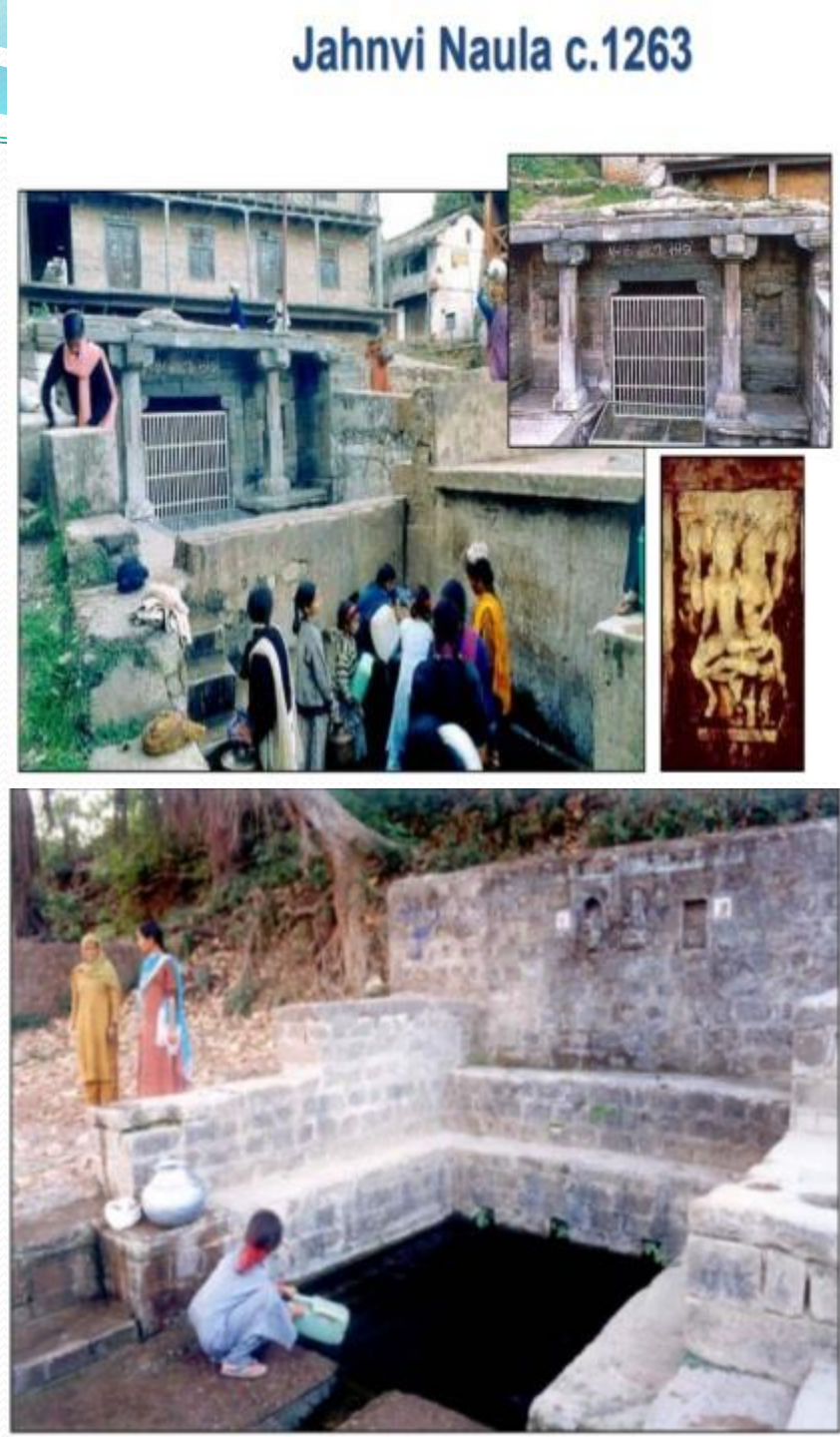
- Hon. Prime Minister has stressed the need for adopting water conservation practices and efficient use of water by every citizen of the country.
- Catch the Rain Campaign – Catch the rain where it falls and when it falls with focus on renovation of traditional and other water bodies, tanks, ponds and reuse & recharge of borewell with watershed development.
- Atal Bhujal Yojana being implemented in 6 States on above lines.

Historical facts about water

- The history of water resource development in India dates back to Indus valley civilization (3200 BC to 2750 BC).
- The importance of conserving water in advance to meet the natural calamities, draught and floods has been emphasized in Vedas and other ancient scriptures.
- Kautilyas *Arthasastra*, (321-297 BC) fix the responsibility of the King to construct dams, reservoirs, wells and ponds from some perennial source or rain fed for the benefit of society
- Bylaws for orientation & construction of ponds for storing and conserving water efficiently and protecting them from possible pollutents & damages have been specified in *Vrahat Sanhita* during 550 A.D.
- Kautilya had also described the role of community in water management- "*Community should assist the king in constructing irrigation system by providing land, labor, equipment and other resources. If somebody is not able to do the labor then they should bear the expenses against it otherwise no benefit to be provided to them*".
- Thus water conservation through public participation has been an ancient practice of our society.

Traditional Water Wisdom in UK & HP

- Uttarakhand traditionally depended upon its *naulas* and *dharas* (seepages and natural springs).
- Over the centuries Uttarakhand has developed its own geo-hydrological techniques for conversing, using & abstracting subsurface natural flow , is quite unique in its construction & usefulness.
- The ancient people evolved these techniques, taking into consideration all the necessary factors which suit the local environment .
- The people are well aware of the importance of water, so they protected their water sources as sacred place and many rituals are performed around the water sources.



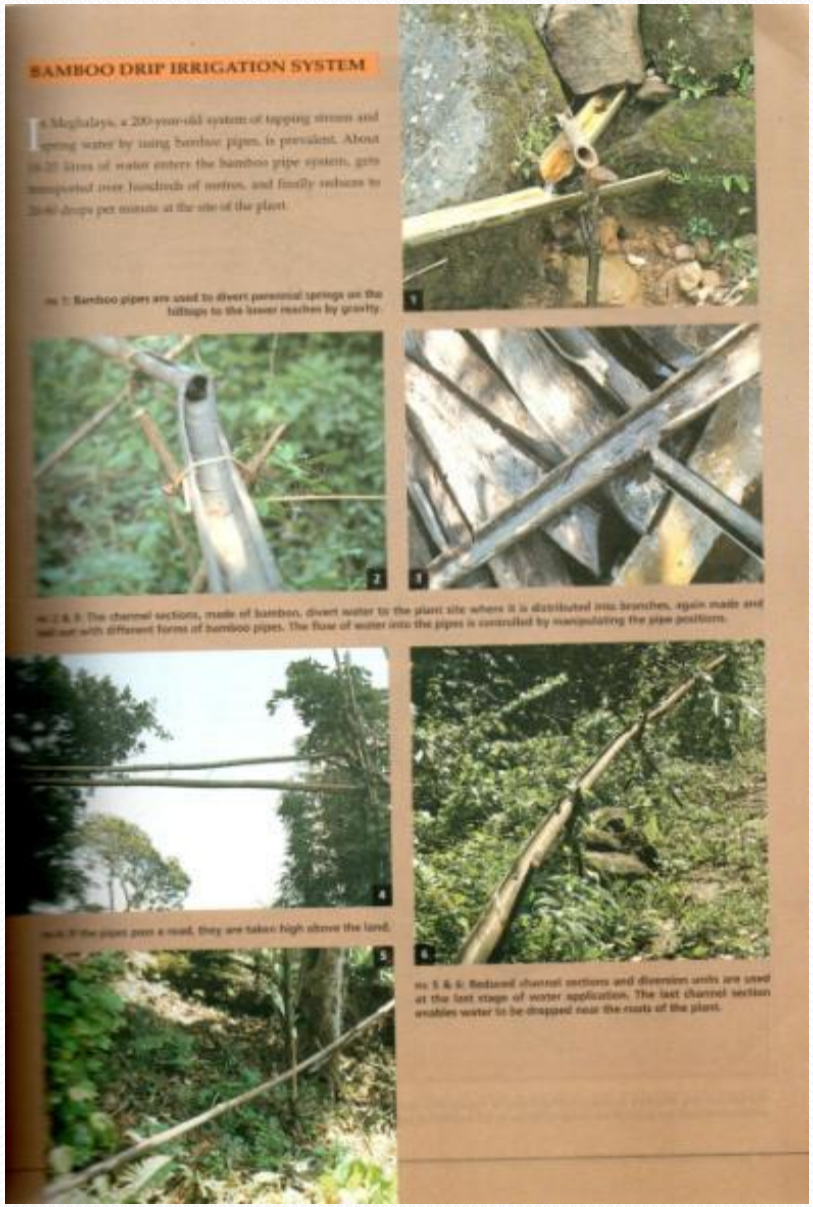
Water Conservation techniques Ladakh

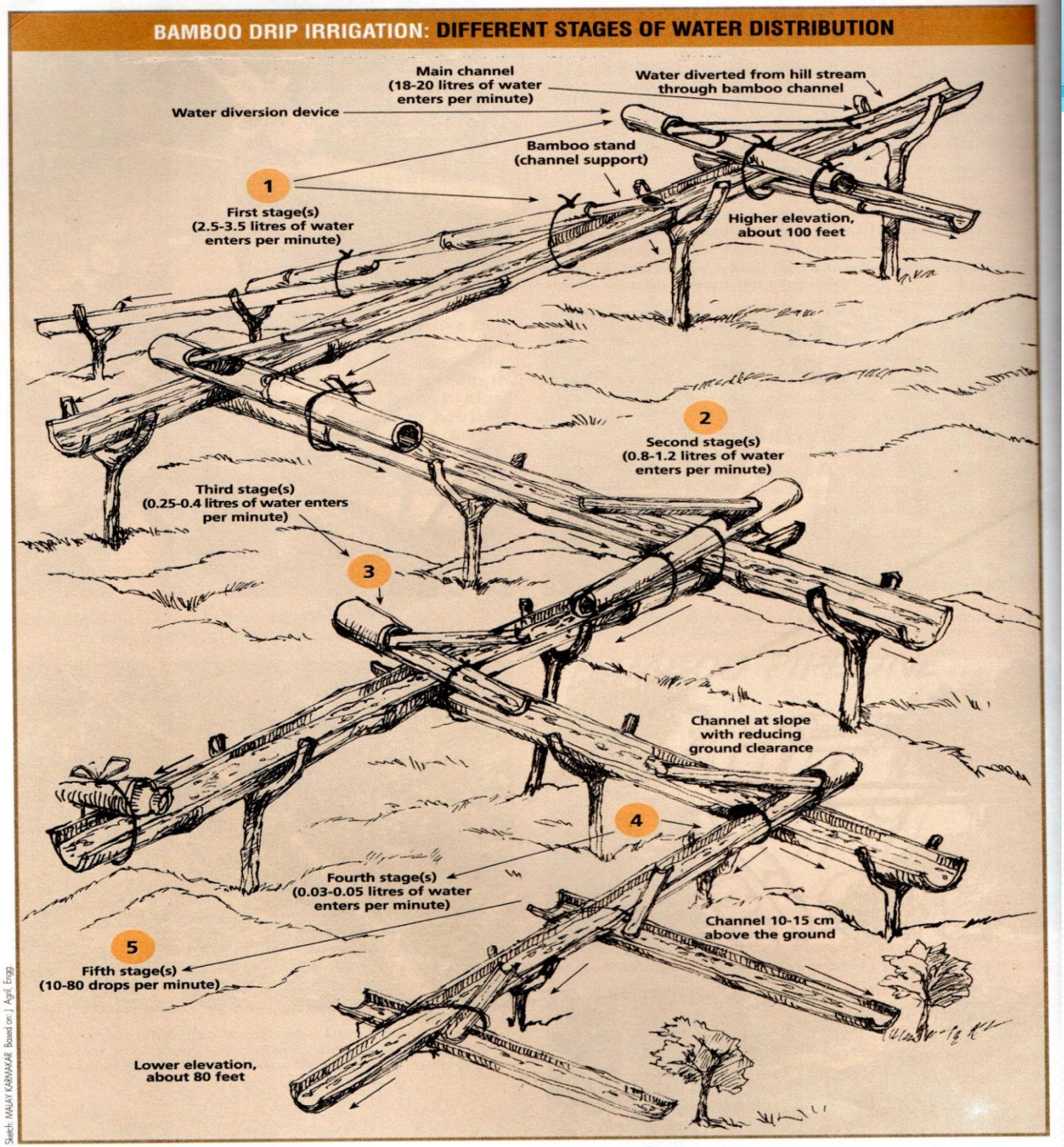
System of Zings and Churpun in Ladakh

- Snow and glaciers melt slowly throughout the day, which is carried to the village through bamboo pipes. water reaches in the village late evening. This water is stored in a community made reservoir – tanks, locally called Zings to meet their water needs during the day.
- A water official known as Churpun is elected by the inhabitants of village every year. The churpun's primary task is to ensure equitable distribution of water.

Water Conservation techniques in Meghalaya

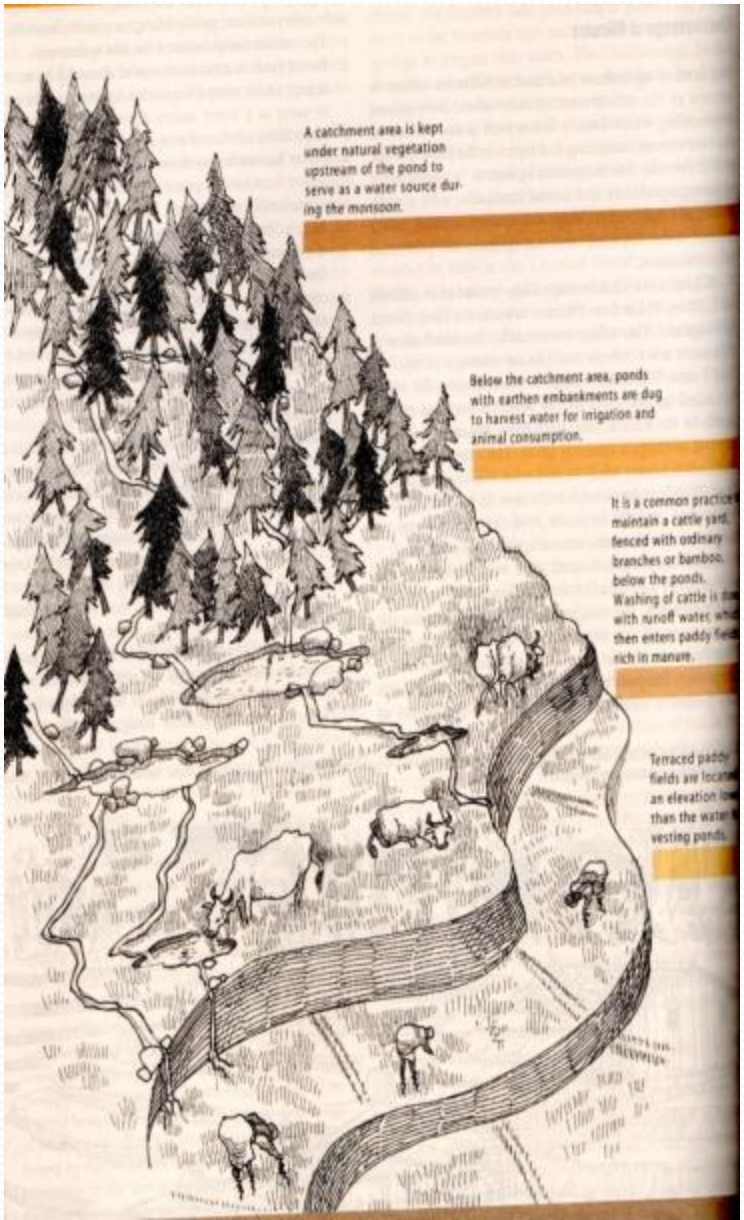
- In Meghalaya, Diversion of melting Glaciers, Spring and Streams using Bamboo to carry water to village.





The bamboo drip irrigation system is normally used to irrigate betel leaf or black pepper crops. About four to five stages of water distribution are involved from the point of the water diversion to the application point at the plant site.

Water Conservation techniques in Nagaland



- **Zabo system** is practiced in Nagaland. The term Zabo means impounding of water. The system comprises of protected forest land on hill top, well planned water harvesting tank at the middle of hill slope, cattle yard and paddy fields towards foot hills.

Water harvesting technique in Sikkim - Dhara Vikas initiative of Sikkim under MGNREGA

Patterns of Climate Change

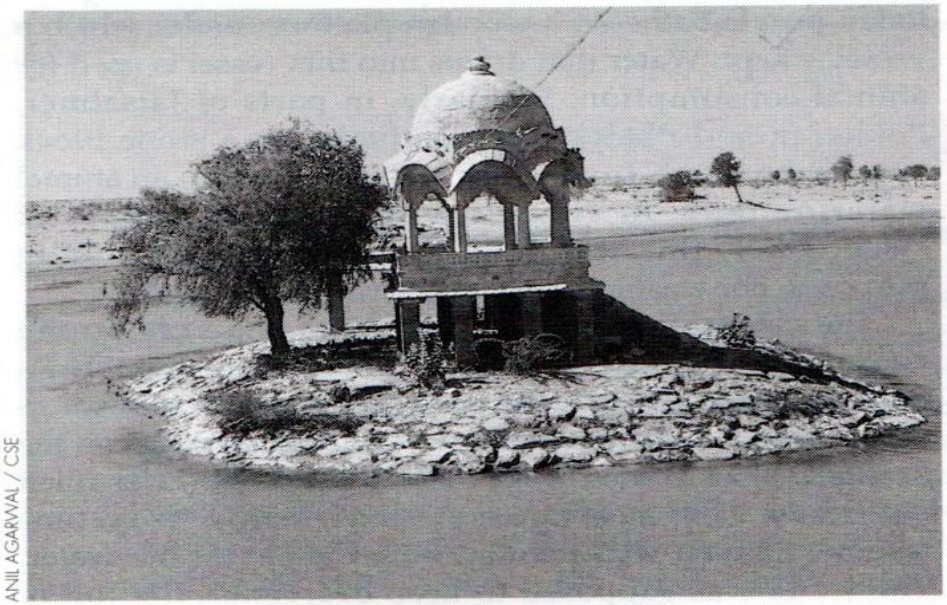
Like in other developing countries, there is a lack of spatially disaggregated meteorological records. Long term, reliable data is available only for one station - Gangtok.

Climate change related studies based on the analysis of the data for this station month-wise, season wise and annually from 1957 to 2005 indicates a trend towards warmer nights and cooler days, with increased rainfall except in winter. The maximum temperature in Gangtok has been rising at the rate of 0.2 ^{0}C per decade and the annual rainfall is increasing at the rate of nearly 50 mm per decade

Comparison of long term meteorological data available for Gangtok station (1957 to 2005) with the trend over the last few years (2006-09), shows an acceleration of these patterns, with winters becoming increasingly warmer and drier now

Recharge structures Location of Ponds & Trenches and Artificially recharging the aquifer

Water conservation in Rajasthan

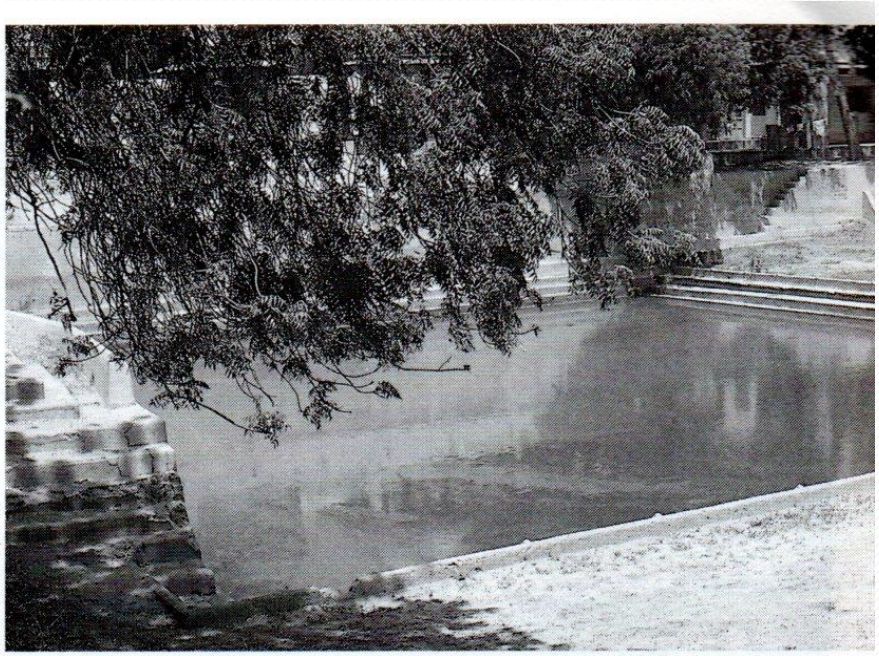


ANIL AGARVVAL / CSE

Gadisar tank, built by Gharsi Rawal in 1367 AD, was the chief source of water supply to Jaisalmer town until 1965. Its water lasted throughout the year. Today, with its catchment area destroyed, the lake has almost dried up.

Jaisalmer

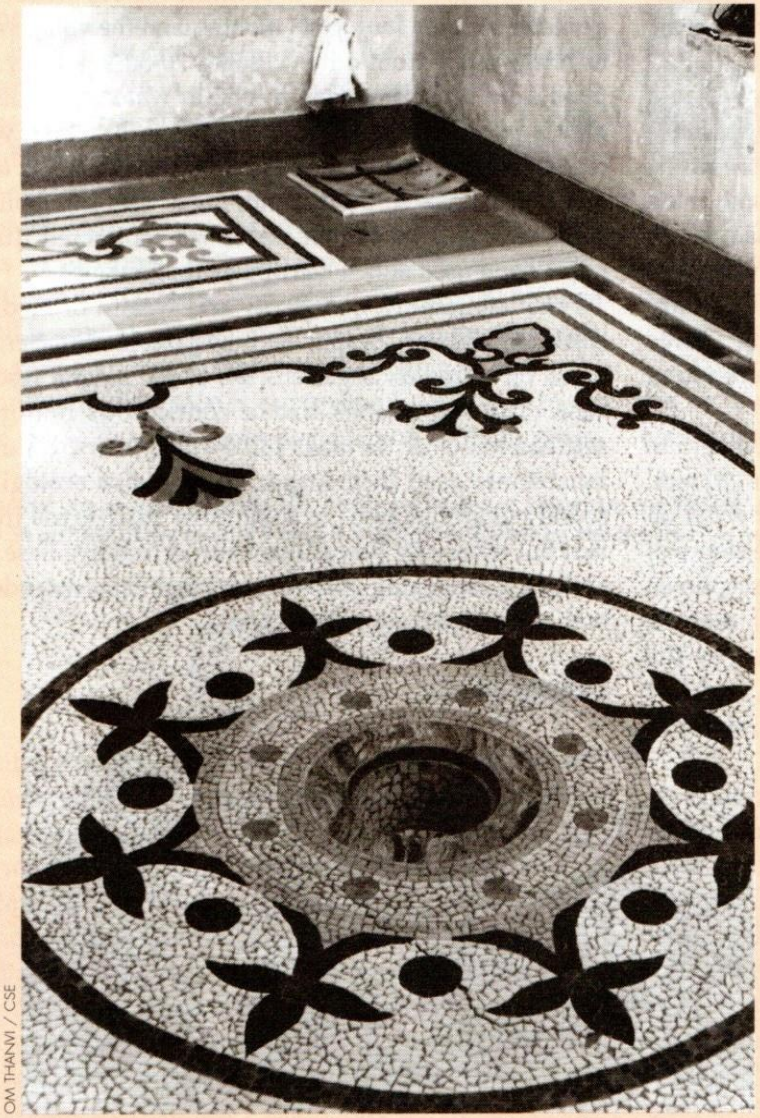
Bikaner



ANIL AGARVVAL / CSE

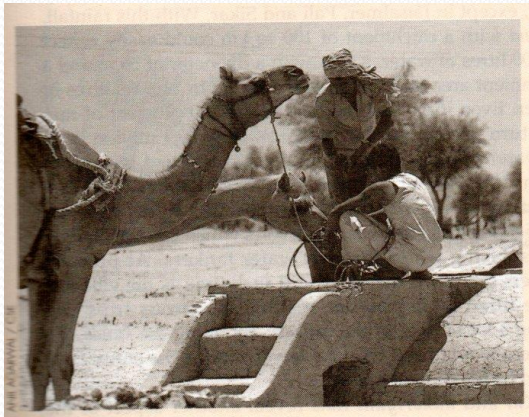
The innumerable tanks in and around Bikaner met the water needs of the town. The catchment areas of the tanks were once treated as sacred places. But today, catchment areas of almost all the tanks have been destroyed and some old tanks have been wiped off the map of Bikaner.

Water conservation in Rajesthan

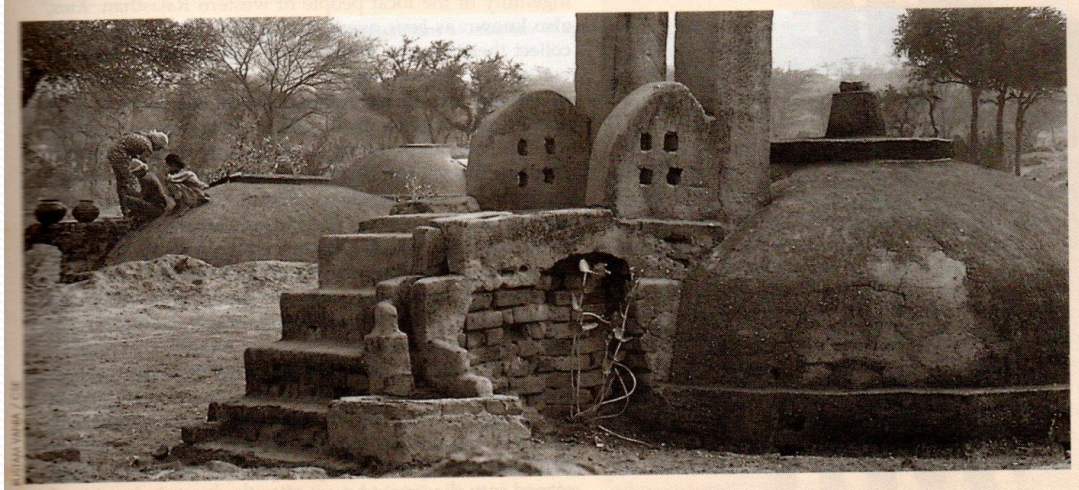


OM THANVI / CSE

Tankas, underground tanks for drinking water, were found in most traditional Bikaner houses. They were circular holes made in the ground, lined with fine polished lime, in which water was collected during rainfall and used only when other supplies failed. These were often beautifully decorated and the tiled covering shown below helped to keep the water cool.



RUSTAM VANIA / CSE



Many of Nyangali's *kunds* lie in disrepair. Yet, because of the erratic water supply from the Rajasthan Canal, villagers have not given up the *kunds* altogether.

INDIAN WATER SENARIO

- **Our country receives an average of 1100 mm of rainfall every year**
- **If we assume 100 liter per capita per day as drinking water requirement than this whole requirement can be met by collecting rain water in just 2% area of the country.**

➢ **Total Water Resource Availability in the country**

- **Year 1951 was -5170 Cum meter per person per year.**
- **Year 2001 -1869 Cum meter per person per year.**
- **Year 2050 (estimated) -1140 Cum meter per person per year.**

➢By 2050, India's population is expected to touch 1,500 million.

➢Demand for water is expected to double and will touch 1,180 billion cubic meters.

➢Required food production will be 400 million tons with respect to current 250 million tons.

➢ **Out of annual precipitation (as snow and rainfall) of around 4,000 billion cubic meters. barely 690 billion cubic meters is used, rest drains out into the sea.**

➢ **Per-capita water storage in India stands at a merely 190 cubic meters compared to 5,961 in the US, 4,717 in Australia and 2,486 in China.**

Average Flow and Utilisable Surface Water- Basinwise

S.N.	River Basin	Total Water Resource	Utilisable Surface Water
1	2	3	4
1	Indus	73.31	46
2	Ganga-Brahmaputra-Meghna		
2a	Ganga	525.02	250
2b	Brahmaputra	629.05	24
2c	Barak	48.36	
3	Subarnarekha	12.37	6.81
4	Brahmani-Baitarani	28.48	18.3
5	Mahanadi	66.88	49.99
6	Godavari	110.54	76.3
7	Krishna	69.81	58
8	Pennar	6.32	6.86
9	Cauvery	21.36	19
10	Tapi	14.88	14.5
11	Narmada	45.64	34.5
12	Mahi	11.02	3.1
13	Sabarmati	3.81	1.93
14	West Flowing Rivers of Kachchh, Saurashtra and Luni	15.1	14.98
15	West Flowing Rivers South of Tapi	200.94	36.21

Cont.

S.N.	River Basin	Total Water Resource	Utilisable Surface Water
1	2	3	4
16	East Flowing Rivers Between Maganadi and Godavari	17.08	13.11
17	East Flowing Rivers Between Godavari and Krishna	1.81	
18	East Flowing Rivers Between Krishna and Pennar	3.63	
19	East Flowing Rivers Between Pennar and Cauvery	9.98	16.73
20	East Flowing Rivers South of Cauvery	6.48	
21	Area of North Ladakh not draining into Indus	0	NA
22	Rivers draining into Baagladesh	8.57	NA
23	Rivers draining into Myanmar.	22.43	NA
24	Drainage areas of Andaman, Nicobar and Lakshadweep Islands.	0	NA
	Total	**1952.87**	**690.32**

UTTARAKHAND AT A GLANCE

Total Land Area of Uttarakhand	-	53483 Sq.km.
Population of Uttarakhand	-	11.42 million (Approx)
Floating Population	-	3.8 million
Total Population	-	15.22 million
Annual average Rainfall	-	1495 mm
Rainfall (volume) received per year	-	79957 Billion Litre

Water being used for Different purposes

Drinking water (1682 mld) - 613.9 Billion litre/Year

Irrigation (8000 mld) - 2920 Billion litre/Year

Total - 3533.9 Billion litre/Year

Percentage of water requirement in relation to total rainfall

Drinking - 0.75 %

Irrigation - 3.65 %

Industries - 0.03 %

Total - 4.43 %

Area required to collect 3534 billion litre water - 2523.8 sq. km.

Percentage of the total area of State - 4.71 %

WATER AVAILABILITY & PRESENT SCENARIO

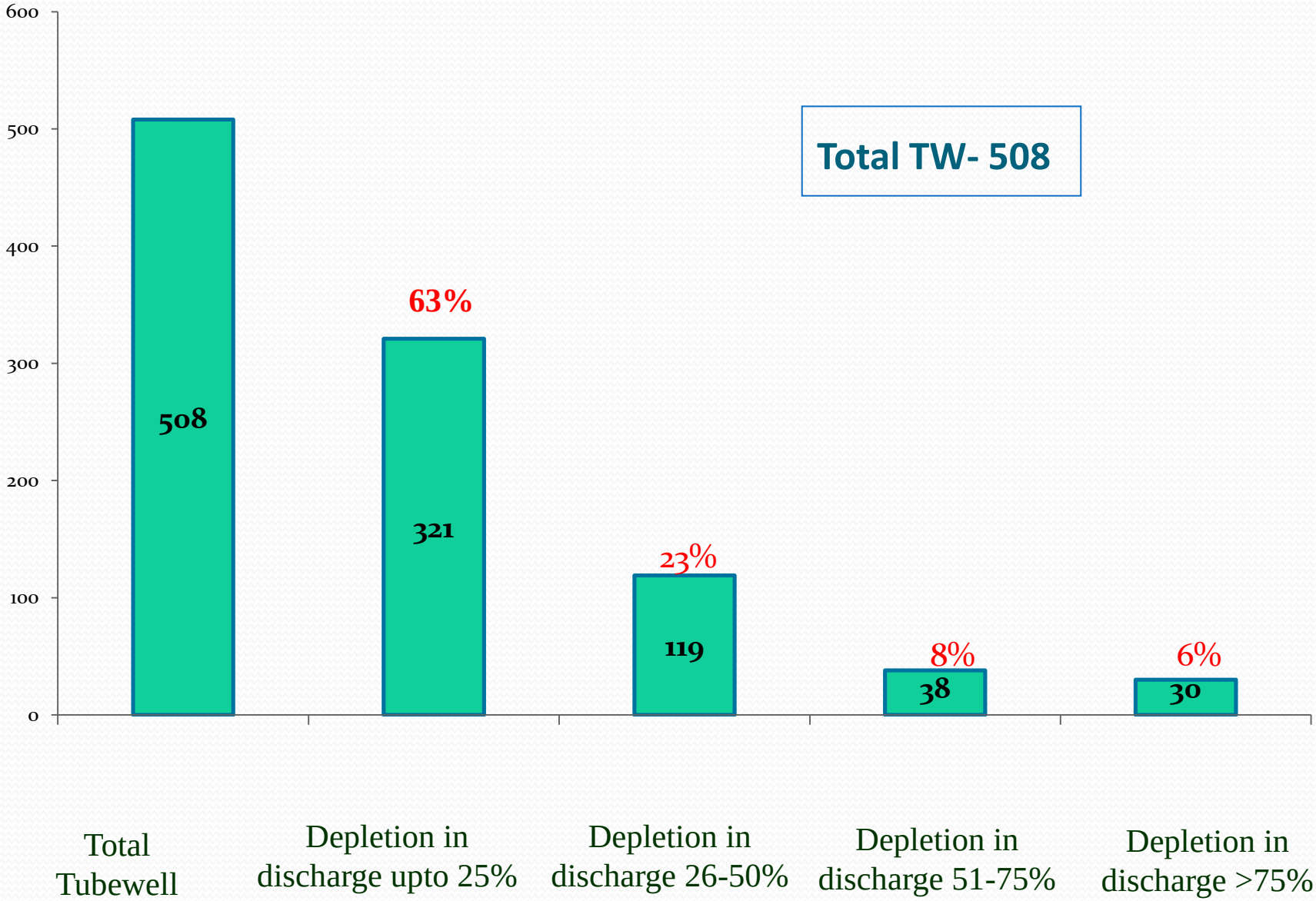
Forest Cover	24295 sq.km. (45.43%)
Glacier cover	3550 Sq.Km
Average annual precipitation in the form of rain	1495 mm
Estimated annual rain water volume	79957 Million litre
Annual replenish-able ground water resources	2.27 BCM
Annual ground water draft for irrigation, domestic & industries	1.34 BCM
Vast scope to recharge ground water by water harvesting structures	
Cultivable land	1.55 mha
Total cropped area	1.13 mha
Area under irrigation (out of total cropped area)	0.56 mha
Un-irrigated area (out of total cropped area)	0.57 mha about 12% in the plains & 88% in the hills
Assessed hydro power potential of state	27039 MW
Hydro power potential harnessed	3972 MW

STATUS OF URBAN WATER SUPPLY in Uttarakhand

STATUS OF WATER SUPPLY IN URBAN AREAS

	Total Urban Population of Uttarakhand 2011 **2021** **Floating population**	**35,53, 336** **42, 64, 003 (+19.99%)**
	Total Urban Bodies in Uttarakhand	100
	Urban bodies getting water more than 135 lpcd	23
	Urban bodies getting water in between 70 to 134 lpcd	32
	Urban bodies getting water less than 70 lpcd	45
	Total household in Urban local bodies	10,67,032
	Total connection provided to household	6,78, 457 (63.58% coverage)
	Total Water Demand (in MLD) Water available Water shortage	833.77 649.86 22%

Depletion in tube wells in urban area



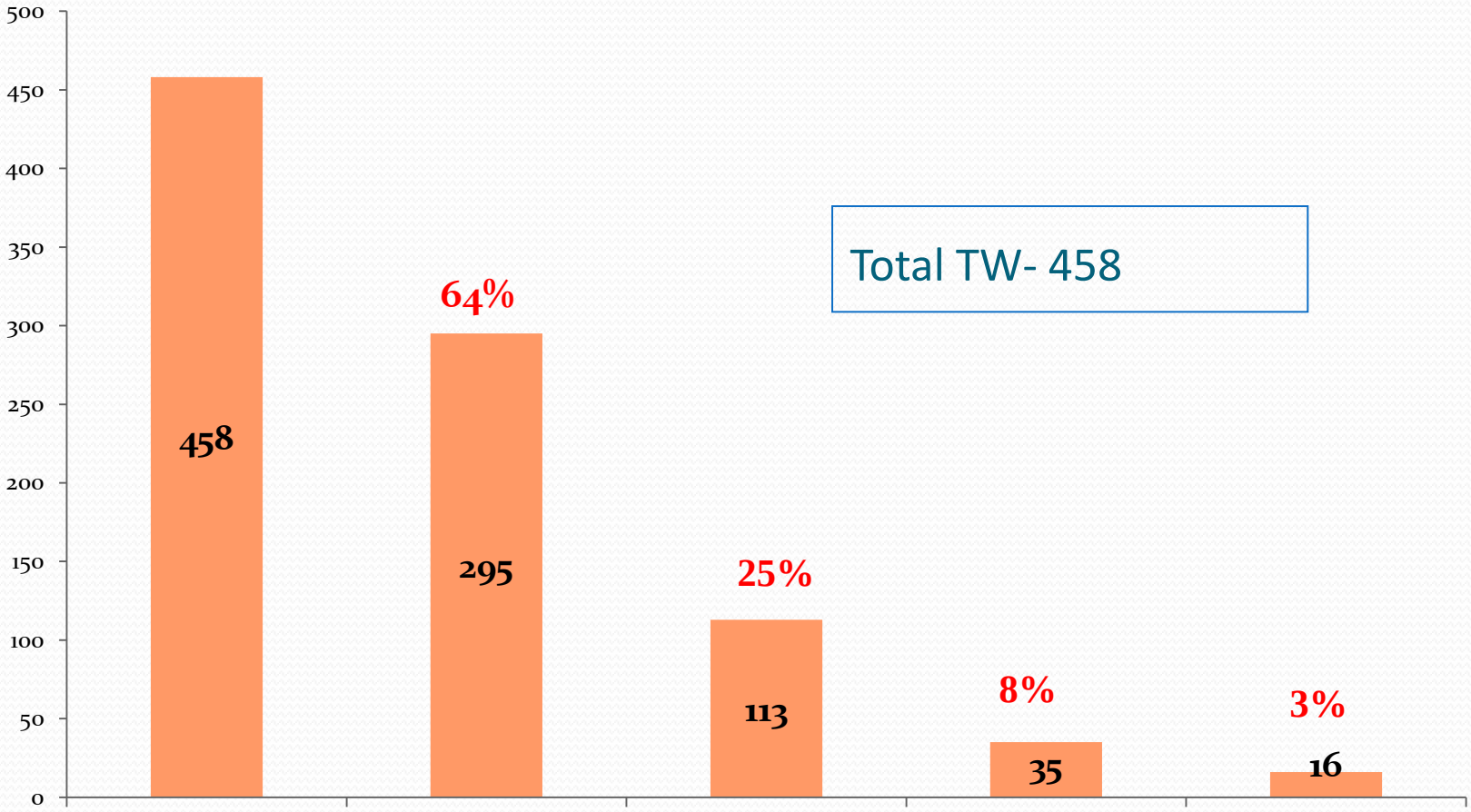
STATUS OF RURAL WATER SUPPLY in Uttarakhand

Biggest Challenge-

Depleting surface water sources in rural area

S.N.	District	No. of sources	% depletion			
			More than 76%	51 to 75%	26-50%	0 to 25%
1	Dehradun	139	36	38	33	32
2	Pauri	644	**98**	95	**413**	38
3	Chamoli	436	51	165	81	139
4	Rudraprayag	333	2	53	179	99
5	Tehri	627	36	**181**	255	**155**
6	Uttarkashi	415	**69**	**243**	88	15
7	Nainital	459	32	138	183	106
8	Almora	569	56	135	**293**	85
9	Pithoragarh	542	21	114	136	**271**
10	Champawat	277	1	49	211	16
11	Bageshwar	204	1	42	130	31
	Total	**4645**	**403 (9%)**	**1253 (27%)**	**2002 (43%)**	**987 (21%)**

Depletion in tube wells in rural area



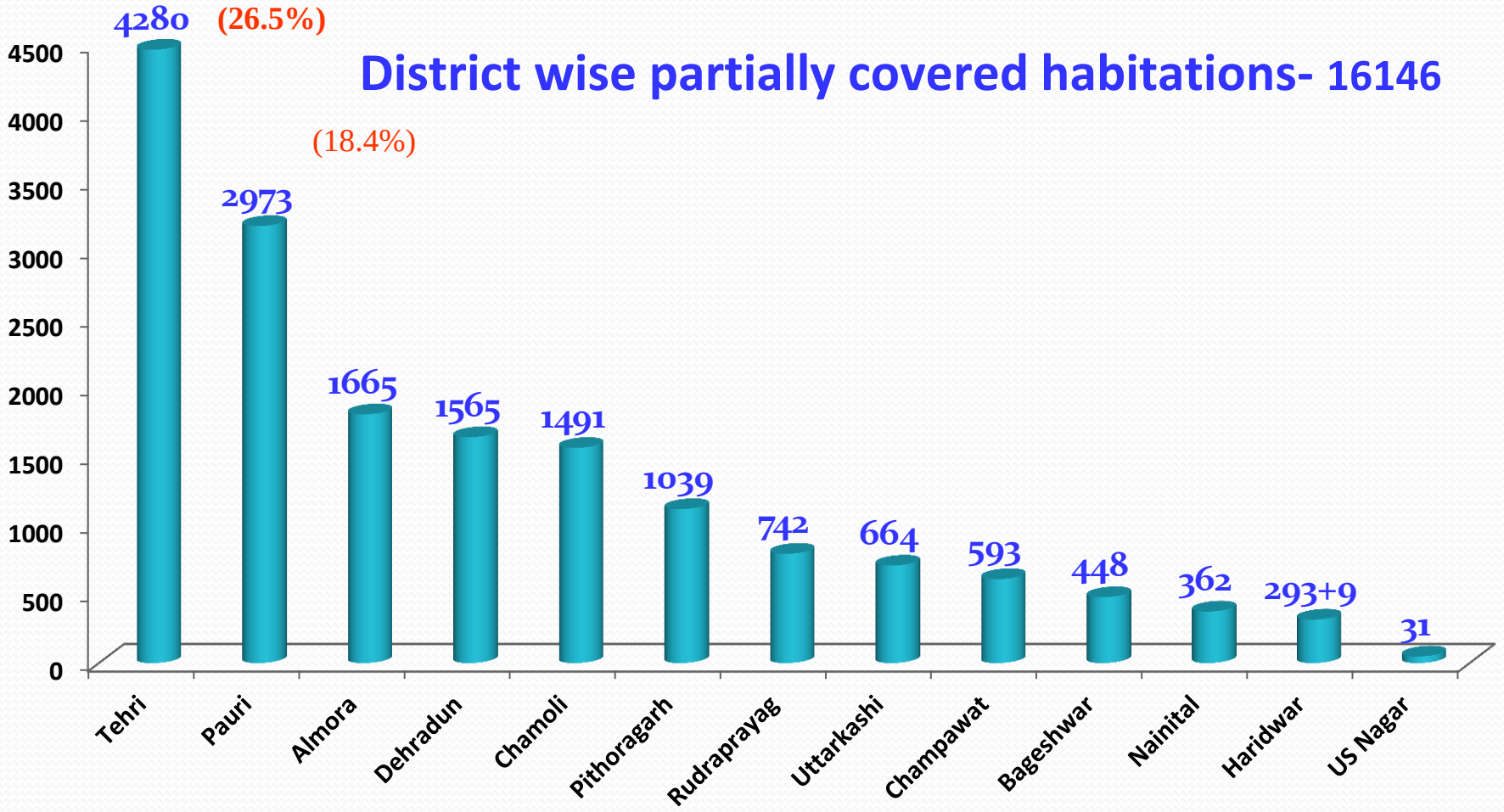
Coverage of water supply as on April 2019 before Jal Jeevan Mission

Total Habitations: 39311,

Fully covered: 23156 (59%) (@ 40 LPCD)

Partially covered: 16146 (41%),

Quality affected: 09



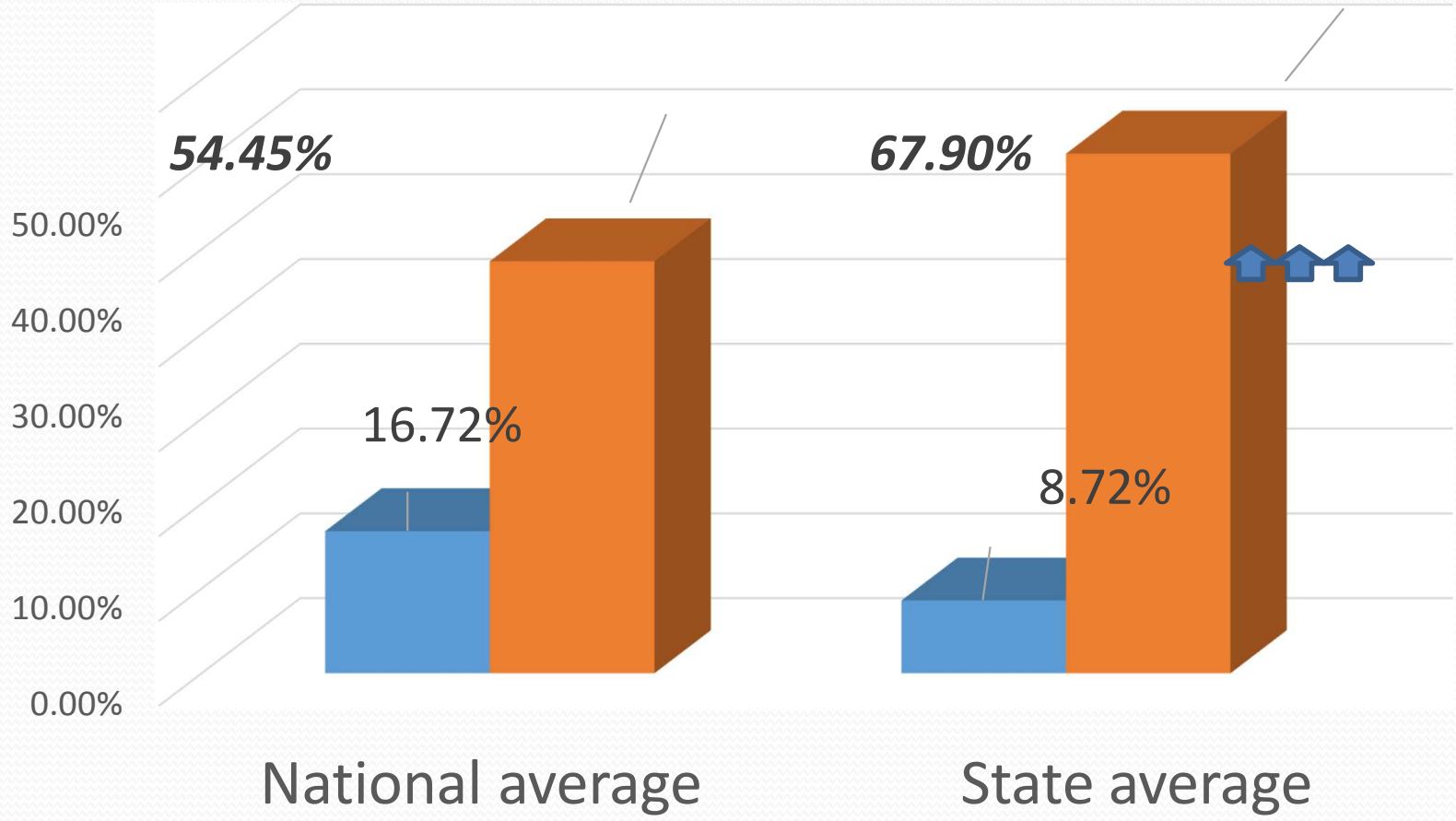
Achievement during 15th Aug. 2019 to 17th Nov. 2022 under Jal Jeevan Mission (JJM, IMIS Data)

S.N.	Description	Status
1.	Total Villages	15041
2.	Total Habitations	38756
3.	Total Rural Households	14,94,397
4.	Rural HHs with Tap Water Connection (15thAug. 2019)	130325 (8.72%)
5.	Rural HHs with Tap Water Connection (17 Nov. 2022)	1014625 (67.90%)
6.	100% FHTC Villages	2526 (16.79%)
7.	Rural WS Schemes under maintenance by UJS & UJN	4193
8.	Rural WS Schemes under maintenance by Gram Panchayats	5002
9.	Rural Pumping Schemes	330
10.	No. of Hand Pumps	9915

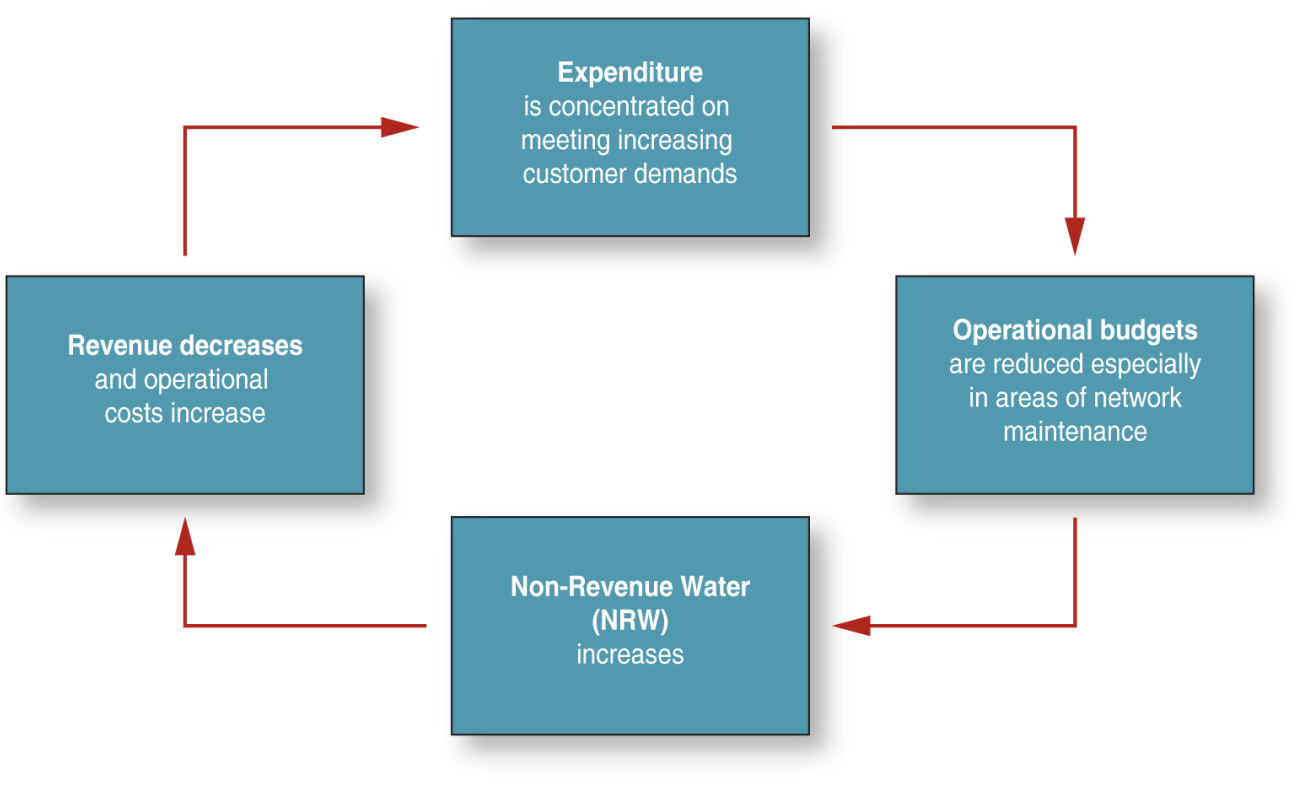
Journey So Far in JJM (Rural)

8.84 Lacs Households provided with tap water connection since launch of the Mission (In 3 years)

15th Aug 2019 ***upto 17.11.2022***



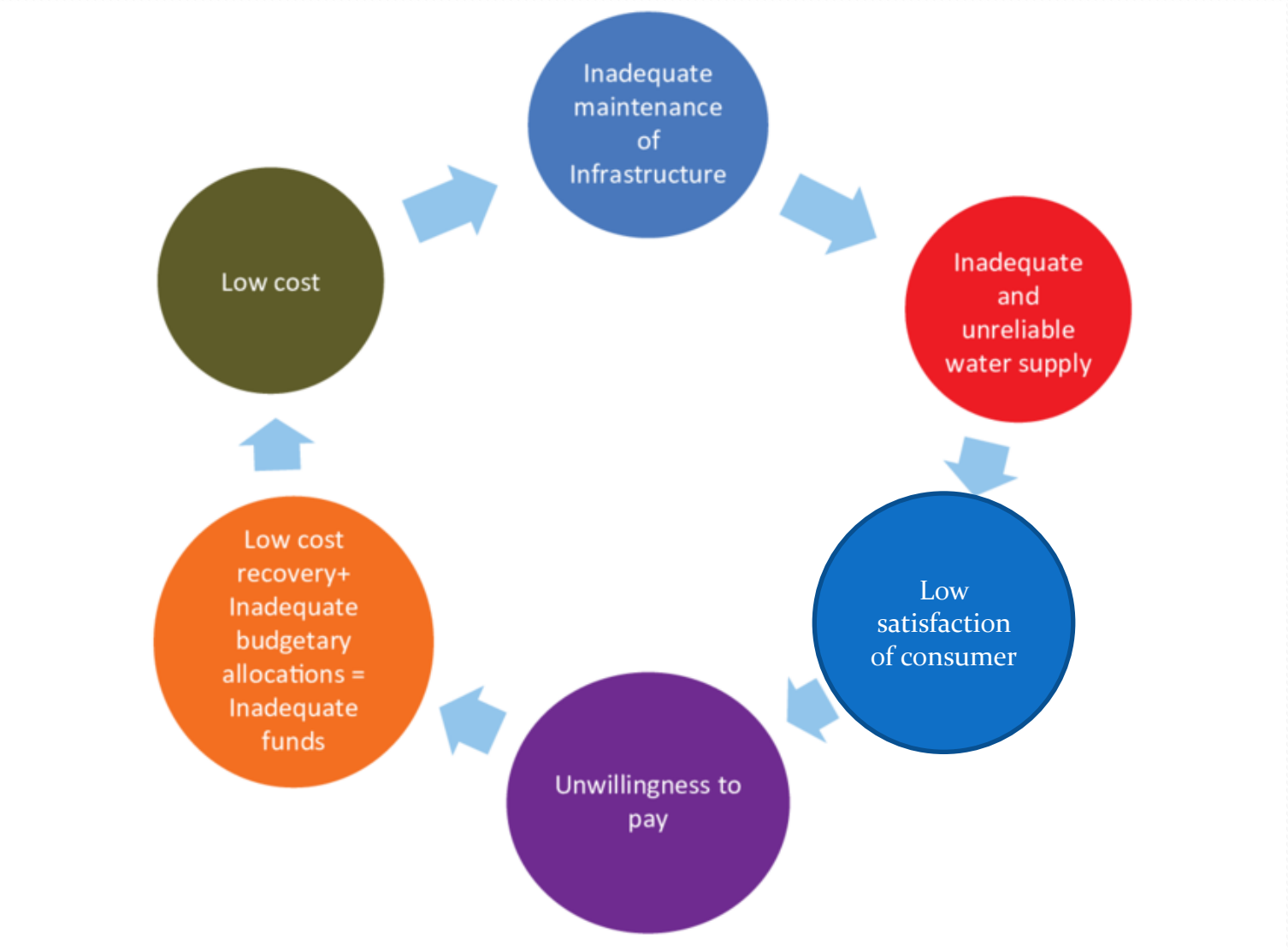
Present Water Scenario



Need to break this cycle in service providers

25-50% of all distributed water globally is lost (Leakages, Deteriorating infrastructure, Incorrect water pressure, Inaccurate metering & billing systems, illegal connections)

Vicious Circle of Low Service Level



Change in water flows with increasing paved surface

	Runoff	Deep infiltration	Shallow infiltration	Evapo-transpiration
Natural ground cover	10	25	25	40
10%-20% paved surface	20	20	20	40
35%-50% paved surface	30	20	20	35
75%-100% paved surface	55	10	10	30

The decrease in infiltration (green bar) and the increase of surface runoff (blue bar) is evident as paved area increases.

Innovations and Solutions

How much water does a person use?

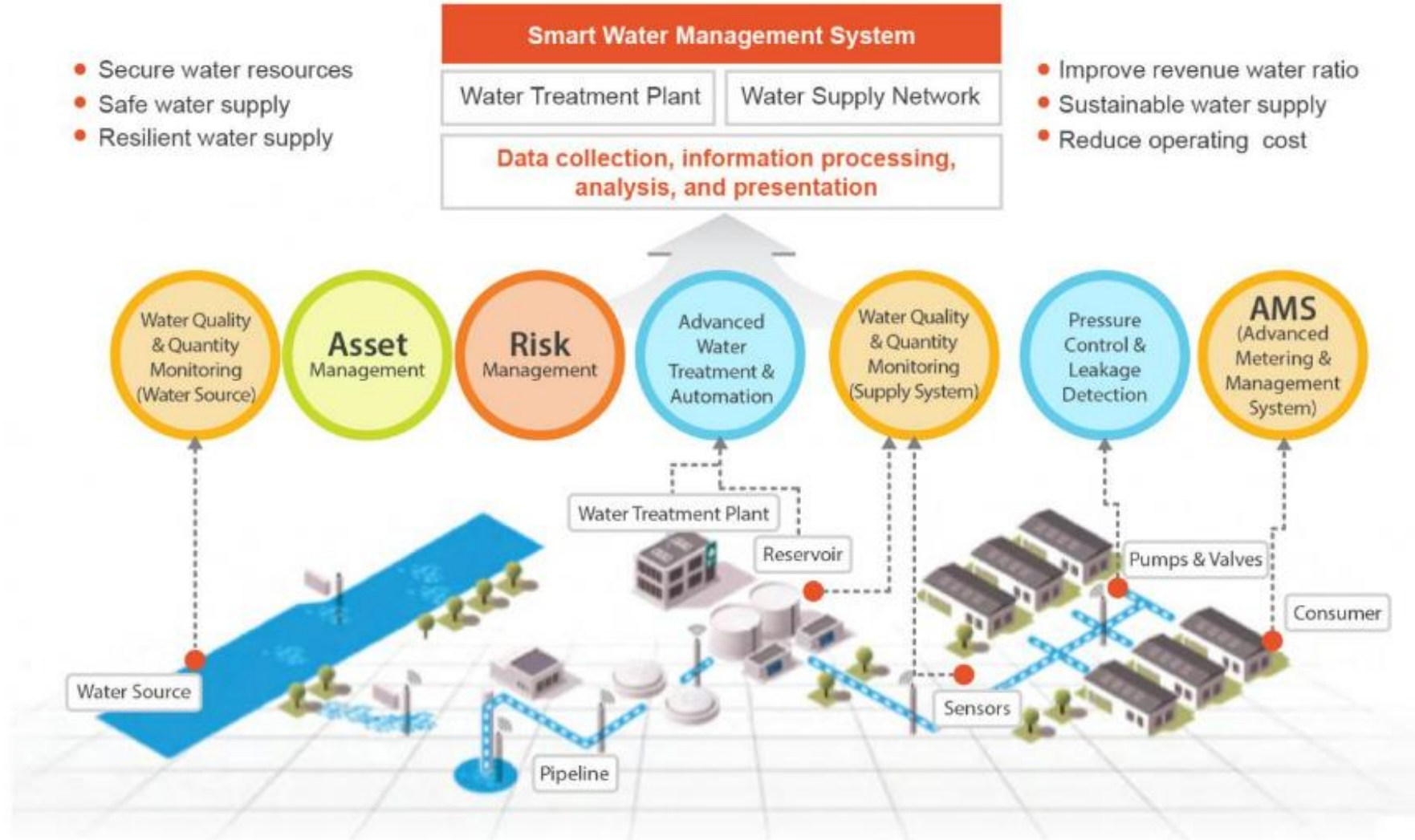
Type of Use	Urban Area (Liters per person per day)	Rural Area (Liters per person per day)
Drinking	3	3
Cooking	4	4
Bathing	20	15
Flushing	40	15
Washing clothes	25	18
Washing utensils	20	
Gardening	23	
Total	135	55

A person uses 108 out of 135 (80%) liters of water every day for flushing, washing and gardening in urban area and 33 liters out of 55 liters in rural areas.

Our challenge is to reduce or replicate this 80% of non-potable water usages.

Why Smart Technology?

- Smart technology can change conventional water and wastewater systems into instrumented, interconnected, and intelligent systems.
- Instrumented: the ability to detect, sense, measure, and record data.
- Interconnected: the ability to communicate and interact with system operators and managers.
- Intelligent: the ability to analyze the situation, enable quick responses, and optimize troubleshooting solutions.


Smart Water Management System
Water Treatment Plant
Water Supply Network
Data collection, information processing, analysis, and presentation
Secure water resources
Safe water supply
Resilient water supply
Improve revenue water ratio
Sustainable water supply
Reduce operating cost
Water Quality & Quantity Monitoring (Water Source)
Asset Management
Risk Management
Advanced Water Treatment & Automation
Water Quality & Quantity Monitoring (Supply System)
Pressure Control & Leakage Detection
AMS (Advanced Metering & Management System)
Water Treatment Plant
Reservoir
Pumps & Valves
Consumer
Water Source
Sensors
Pipeline

Benefits of Smart Water Management Systems

- Reducing wastage of water
- Monitoring water quality
- Improving the efficiency of water systems
- Creating awareness of household water use

Control of Leakage & Wastage in the system (accounts for the limit of 30-40%)

- Piped Water supply system was introduced from 1960s and in these 62 years urban & rural water supply has been reorganized many times in the name of improvement of schemes but neither old damaged nor leaking of system was considered and it has been found that every time we are putting more water in leaking bucket.
- That is the reason that in 2019, 41% habitations are still partial covered or not covered.
- Prime need is to first assess the leakage and wastage in existing system and a provision for repair, renovation and retrofitting of the existing system should be provided separately in the estimate.

जल अमूल्य है इसका अपव्यय न करें

जल संचय जीवन संचय

जल की छोटी सी लीकेज का परिणाम

	पेय जल की क्षति			
 एक बूंद प्रति सैकेंड	1 मिनट	=	0.0024	लीटर
	1 घण्टा	=	0.14205	लीटर
	1 दिन	=	3.4092	लीटर
	1 सप्ताह	=	23.8644	लीटर
	1 माह	=	715.932	लीटर
 दो बूंद प्रति सैकेंड	1 मिनट	=	0.0947	लीटर
	1 घण्टा	=	0.5682	लीटर
	1 दिन	=	13.6368	लीटर
	1 सप्ताह	=	95.4576	लीटर
	1 माह	=	2863.728	लीटर
 बूंद-बूंद बनती धार	1 मिनट	=	0.05682	लीटर
	1 घण्टा	=	3.4092	लीटर
	1 दिन	=	81.8208	लीटर
	1 सप्ताह	=	572.7456	लीटर
	1 माह	=	17182.37	लीटर
 1/16" धार	1 मिनट	=	0.213075	लीटर
	1 घण्टा	=	12.7845	लीटर
	1 दिन	=	306.828	लीटर
	1 सप्ताह	=	2147.796	लीटर
	1 माह	=	6443.88	लीटर
 1/8" धार	1 मिनट	=	0.65343	लीटर
	1 घण्टा	=	39.2058	लीटर
	1 दिन	=	940.9392	लीटर
	1 सप्ताह	=	6586.5744	लीटर
	1 माह	=	197597.232	लीटर
 3/16" धार	1 मिनट	=	1.10799	लीटर
	1 घण्टा	=	66.4794	लीटर
	1 दिन	=	1595.5066	लीटर
	1 सप्ताह	=	11168.5392	लीटर
	1 माह	=	335056.176	लीटर
 1/4" धार	1 मिनट	=	2.35803	लीटर
	1 घण्टा	=	141.4818	लीटर
	1 दिन	=	3395.5632	लीटर
	1 सप्ताह	=	23768.9424	लीटर
	1 माह	=	713068.272	लीटर

Rooftop Rain Water Harvesting

its storage and re-use for non domestic purposes

Case Study – Khali Estate Almora

Details and Capacity of ground and underground tanks

No.	Detail of Tank	Size in meter			Capacity (Liters)	Remark
		Length	Width	Depth		
1.	Underground tank in back side court yard	15.5	9.5	3.0	4,41,750	It is constructed in 8 compartment
2.	Underground tank near cottage	7.5	6.0	2.2	99,000	Pumped to OHT
3.	Underground tank near cottage	4.5	3.0	2.2	30,000	Pumped to OHT
4.	Tennis court tank	14.0	7.0	2.2	2,15,600	The surface run of tennis court is used to fill the tank
5.	Staff quarter tank	4.5	4.5	2.2	44,550	For staff use
6.	Kitchen tank	7.3	5.5	2.2	88,300	For washing utensils
7.	Front side court yard tank (2 nos.)	4.5	1.5	2.2	30,000	Pumped to OHT
8.	Garden tank (2 nos.)	4.5	4.5	2.2	89,100	For washing and irrigation only
9.	Corner tank	3.0	1.5	2.2	10,000	Pumped to OHT
	Total Capacity				**10,48300**	

Source: Mr. M.D Pandey Owner Khali Estate

Storage of rain water from roof top for daily use

Almora Town

Sl. No.	Month	Rooftop area - 100 Sqm. Storage Tank capacity - 20 KL, Per day consumption - 170 Liters			
		Storage of water in the beginning of month (KL)	Water stored in the month (KL)	Water Consumed in the month (KL)	Water remained in the end of month (KL)
1	September	20	14.95	5.10	29.85
2	October	20	1.21	5.27	15.94
3	November	15.94	0.23	5.10	11.07
4	December	11.07	1.34	5.27	7.14
5	January	7.14	3.77	5.27	5.64
6	February	5.64	5.27	4.76	6.15
7	March	6.15	2.97	5.27	3.85
8	April	3.85	2.23	5.10	0.98
9	May	0.98	2.37	5.27	-1.92
10	June	0	7.65	5.10	2.55
11	July	2.55	22.74	5.27	20.02
12	August	20	18.70	5.27	33.43

RAIN FALL DATA OF DISTRICTS & STORAGE TECHNIQUES

Detail of rain fall in mm distt. Dehradun
From 1994 to 2015 (19 Years)

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total
1994	57.20	56.90	1.90	78.20	9.40	217.70	724.20	776.90	65.00	0.00	0.00	2.20	**1989.60**
1995	53.30	73.90	39.20	14.60	0.80	83.50	494.50	630.10	310.30	2.20	0.50	9.30	**1712.20**
1996	40.30	106.20	45.50	13.40	10.00	355.80	604.00	962.10	282.30	57.70	0.00	0.00	**2477.30**
1997	34.00	21.90	65.60	111.10	130.00	397.40	785.60	558.50	385.80	94.50	44.80	90.80	**2720.00**
1998	5.40	72.50	117.70	78.60	86.30	110.40	855.80	1114.20	270.20	248.00	0.90	0.00	**2960.00**
1999	57.30	4.20	4.90	0.00	6.90	398.40	795.30	536.30	671.00	75.80	0.00	9.90	**2560.00**
2000	71.50	110.90	44.40	12.40	141.10	308.60	767.30	724.70	381.20	0.20	0.00	0.00	**2562.30**
2001	42.00	2.20	31.80	51.10	131.50	505.40	803.40	613.20	134.20	2.90	1.40	9.40	**2328.50**
2002	47.10	139.10	65.70	62.60	24.10	126.40	164.80	643.70	273.50	17.90	0.00	0.20	**1565.10**
2003	38.60	98.90	49.60	13.80	31.20	138.50	424.70	601.30	436.10	0.00	6.60	21.80	**1861.10**
2004	94.60	21.80	0.00	21.40	99.80	359.30	694.80	517.30	147.40	62.70	0.00	77.70	**2096.80**
2006	18.30	2.40	138.50	14.80	165.20	139.30	640.20	482.60	196.40	16.80	1.70	25.20	**1841.40**
2007	0.40	112.00	98.00	15.90	22.90	78.00	0.00	0.00	0.00	0.00	0.00	0.00	**327.20**
2010	-	-	-	-	49.10	126.50	777.40	894.00	799.50	11.70	17.80	27.10	**2703.10**
2011	30.50	73.80	15.90	24.80	97.70	342.50	748.40	802.50	240.80	18.70	0.00	6.70	**2402.30**
2012	44.50	13.40	27.30	44.30	0.80	64.50	557.50	822.80	385.90	18.10	5.40	17.50	**2002.00**
2013	107.10	175.80	13.70	7.10	15.00	846.30	699.60	599.40	190.10	49.60	8.90	5.00	**2717.60**
2014	58.20	152.90	76.50	33.40	27.00	78.10	484.30	583.90	125.50	56.90	-	29.00	**1705.70**
2015	27.20	24.00	159.50	57.60	12.60	173.70	495.00	-	-	-	-	-	**949.60**
Total	**827.50**	**1262.80**	**995.70**	**655.10**	**1061.40**	**4850.30**	**11516.80**	**11863.50**	**5295.20**	**733.70**	**88.00**	**331.80**	**39481.80**
Average	**45.97**	**70.16**	**55.32**	**36.39**	**55.86**	**255.28**	**606.15**	**659.08**	**294.18**	**40.76**	**5.18**	**18.43**	**2077.99**

Source Meteorological Deptt. Dehradun

Storage of rain water from roof top for future use

Dehradun Town

Sl.No.	Month	Monthly average rainfall of last 19 years (MM)	Rain water can be Collected (Run off coefficient)	Total rainfall received from rooftop (KL)							
				100 Sq. mtr.	200 Sq. mtr.	250 Sq. mtr.	300 Sq. mtr.	350 Sq. mtr.	400 Sq. mtr.	450 Sq. mtr.	500 Sq. mtr.
				1076 Sq. ft.	2152 Sq. ft.	2690 Sq. ft.	3228 Sq. ft.	3766 Sq. ft.	4304 Sq. ft.	4842 Sq. ft.	5380 Sq. ft.
1	September	294.18	90%	26.48	52.95	66.19	79.43	92.67	105.9	119.14	132.38
2	October	40.76	80%	3.26	6.52	8.15	9.78	11.41	13.04	14.67	16.30
3	November	5.18	80%	0.41	0.83	1.04	1.24	1.45	1.66	1.86	2.07
4	December	18.43	80%	1.47	2.95	3.69	4.42	5.16	5.90	6.63	7.37
5	January	45.97	80%	3.68	7.36	9.19	11.03	12.87	14.71	16.55	18.39
6	February	70.16	80%	5.61	11.23	14.03	16.84	19.64	22.45	25.26	28.06
7	March	55.32	80%	4.43	8.85	11.06	13.28	15.49	17.70	19.92	22.13
8	April	36.39	80%	2.91	5.82	7.28	8.73	10.19	11.64	13.10	14.56
9	May	55.86	70%	3.91	7.82	9.78	11.73	13.69	15.64	17.60	19.55
10	June	255.28	70%	17.87	35.74	44.67	53.61	62.54	71.48	80.41	89.35
11	July	606.15	90%	54.55	109.11	136.38	163.66	190.94	218.21	245.49	272.77
12	August	659.08	90%	59.32	118.63	148.29	177.95	207.61	237.27	266.93	296.59
	Total	**2142.76**		**183.90**	**367.81**	**459.75**	**551.70**	**643.66**	**735.60**	**827.56**	**919.52**

Storage of rain water from roof top for daily use

Dehradun Town

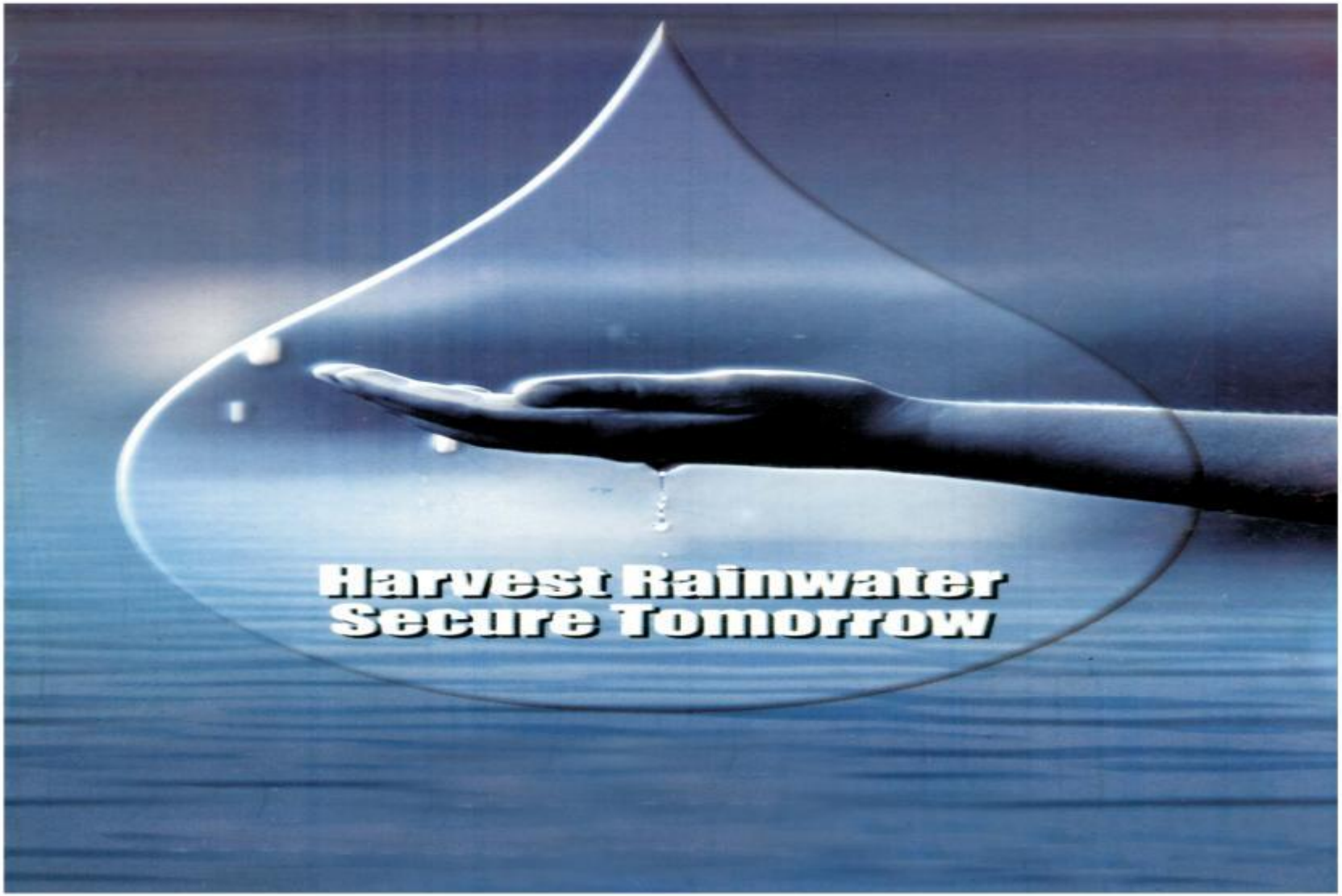
Sl. No.	Month	Rooftop area - 100 Sqm. Storage Tank capacity - 20 KL, Per day consumption - 185 Liters			
		Storage of water in the beginning of month (KL)	Water stored in the month (KL)	Water Consumed in the month (KL)	Water remained in the end of month (KL)
1	September	20	26.48	5.55	40.93
2	October	20	3.26	5.74	17.52
3	November	17.52	0.41	5.55	12.38
4	December	12.38	1.47	5.74	8.11
5	January	8.11	3.68	5.74	6.05
6	February	6.05	5.61	5.18	6.48
7	March	6.48	4.43	5.74	5.17
8	April	5.17	2.91	5.55	2.53
9	May	2.53	3.91	5.74	0.70
10	June	0.70	17.87	5.55	13.02
11	July	13.02	54.55	5.74	61.83
12	August	20	59.32	5.74	73.58

Storage of rain water from roof top for daily use

Tehri Town

Sl. No.	Month	Rooftop area - 100 Sqm. Storage Tank capacity - 20 KL, Per day consumption - 160 Liters			
		Storage of water in the beginning of month (KL)	Water stored in the month (KL)	Water Consumed in the month (KL)	Water remained in the end of month (KL)
1	September	20	12.32	4.8	27.52
2	October	20	1.04	4.96	16.08
3	November	16.08	0.32	4.80	11.60
4	December	11.60	1.01	4.96	7.65
5	January	7.65	3.01	4.96	5.70
6	February	5.70	6.13	4.48	7.35
7	March	7.35	3.98	4.96	6.37
8	April	6.37	2.30	4.80	3.87
9	May	3.87	3.21	4.96	2.12
10	June	2.12	10.26	4.80	7.58
11	July	7.58	23.43	4.96	26.05
12	August	20	26.65	4.96	41.69


"HARVEST RAINWATER INDIVIDUALLY
ENJOY GROUND WATER COLLECTIVELY"
CARE FOR WATER
BEFORE IT BECOMES RARE
जल संरक्षण एवं संवर्धन
के इस कार्य में अपना
सहयोग प्रदान करें।
Pratiba Printers, Dehra: 0135-2670051, 9027300535



Foe more info, please contact www.

Use of Water efficient plumbing and accessories in our water supply system

- It has been found that 15-20% water can be saved by using water efficient accessories.

Use of Grey-Water for flushing and gardening purposes

जल जीवन है जीवन जल है

54,750,000

लीटर पानी की

बचत

सम्भव

बोतल से पानी की बचत ! कैसे ?

आपको करना है–

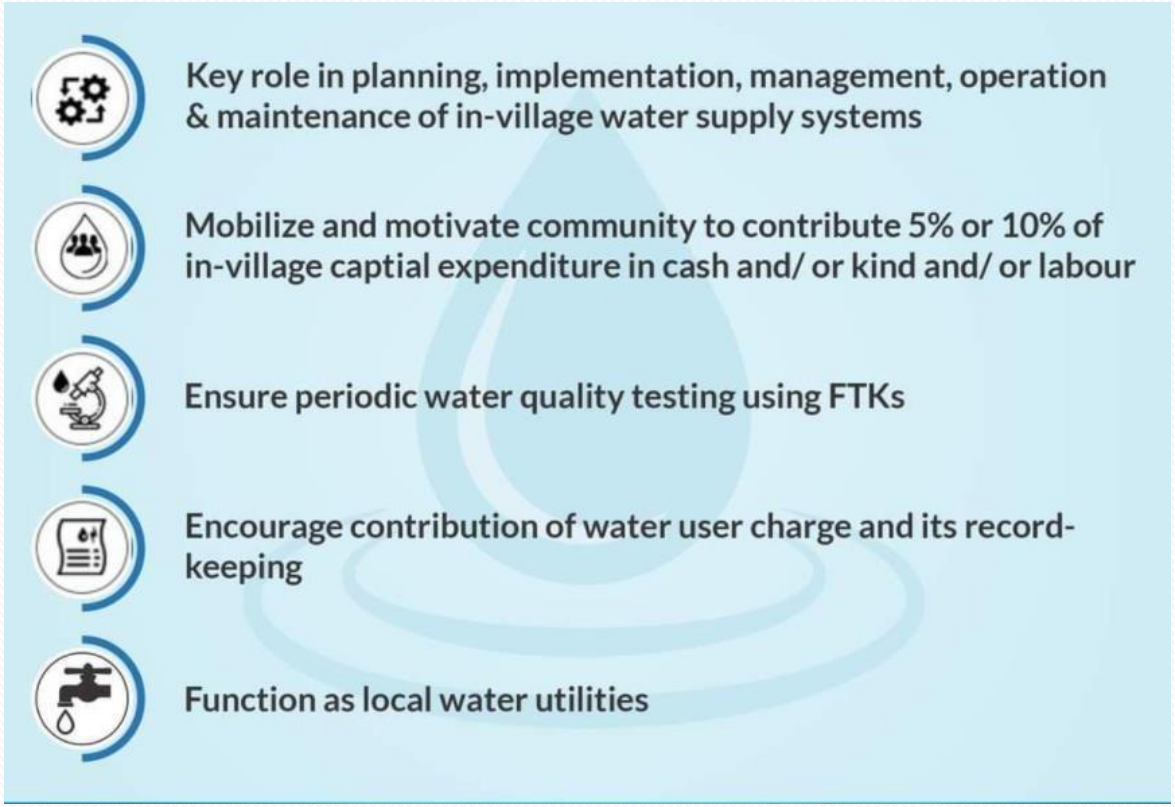
प्लास्टिक की एक लीटर वाली खाली बोतल लें।
बोतल को आधा रेत या मिट्टी से भर दें फिर पूरा पानी से भरकर ढक्कन बन्द करें।
अब अपने टायलेट की सिस्टर्न (फ्लश टंकी) का ढक्कन उठाकर उसके अंदर बोतल रखें और ढक्कन पुनः बंद कर दें।
इससे आपके सिस्टर्न में बोतल के आकार (एक लीटर) के बराबर पानी कम भरेगा अर्थात जब भी आप फ्लश चलायेंगे तो एक लीटर पानी की बचत होगी। इससे सिस्टर्न की कार्यकुशलता पर कोई प्रभाव नहीं पड़ेगा।

कितने पानी की बचत?

एक परिवार में प्रतिदिन 15 बार फ्लश चलाई जाती है
तो इस प्रकार प्रतिदिन 15 लीटर पानी की बचत होगी।
नगर देहरादून में लगभग 1 लाख सिस्टर्न हैं। इस प्रकार
प्रतिदिन 15 लाख लीटर पानी
की बचत होगी।
वर्ष में यह बचत 54.75 करोड़
लीटर की होगी और आपकी
दिनचर्या पर कोई असर नहीं पड़ेगा।

क्या आप
जानते हैं कि प्रकृति में कुल
उपलब्ध जल का मात्र एक प्रतिशत से
भी कम जल हमारे प्रयोग हेतु स्रोतों, नदियों,
झीलों, भूगर्भीय जल स्रोत आदि के रूप में उपलब्ध
है। क्या बढ़ती आबादी एवं घटती प्रति व्यक्ति
उपलब्ध में इसका किफायती उपयोग
समय की आवश्यकता नहीं है?

Plans are great!
But how to make Community empowered and make water systems sustainable?



Institutional and framework

73rd Amendment to the Constitution of India placed drinking water management to Panchayats

Finance Commissions recommended recovery of user charges for provision of water supply services

15th Finance Commission assured allocation of Rs. 1.42 lakh crore as tied grants for WASH for next 5 years.

Recognising need of minimising and replicating the use for non potable purposes with above explained solutions

Thanks.....