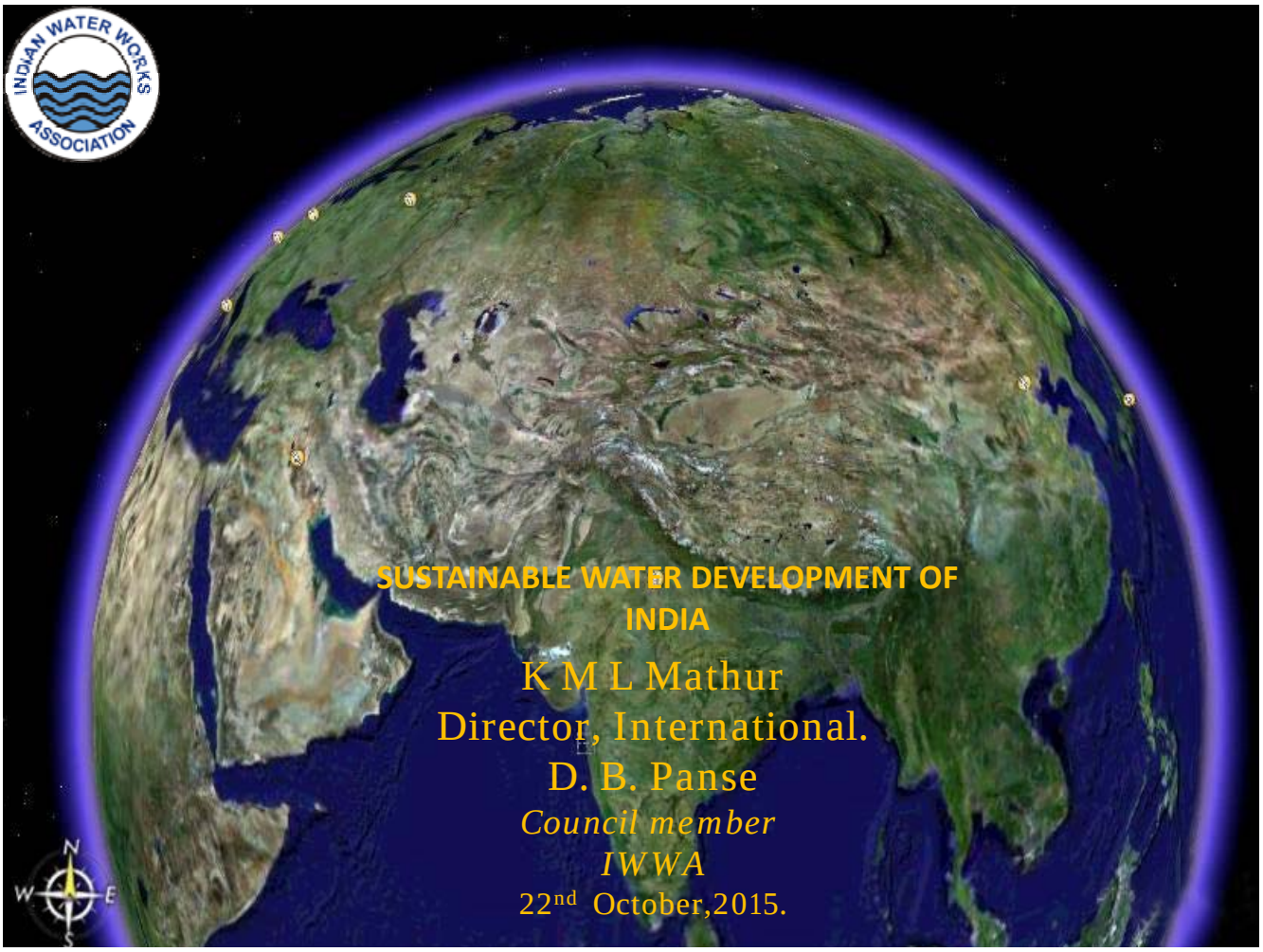


India

India is the 7th largest country by geographical area

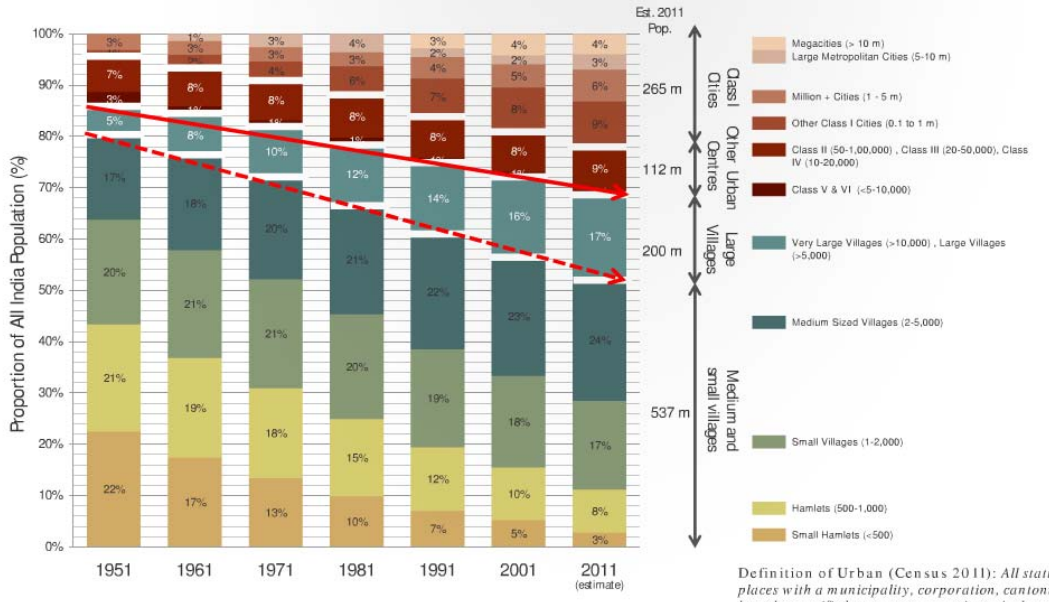
2nd-most populous country with 1.18 billion people

Most populous liberal democracy in the world

50% population will live in urban areas by 2050

Urbanization

Depending on the definition of urban, more settlements shift from the rural into the urban category.



All India: Number of Settlements (1971-2011)

	1991	2001	2011
Urban	3,351	5,161	7,935
Rural	6,34,321	6,38,588	6,40,867

Definition of Urban (Census 2011): *All statutory places with a municipality, corporation, cantonment board or notified town area committee. A place satisfying the following three criteria simultaneously: a minimum population of 5,000; at least 75 per cent of male working population engaged in non-agricultural pursuits; and a density of population of at least 400 per sq. km.*

Source: Census, 2011

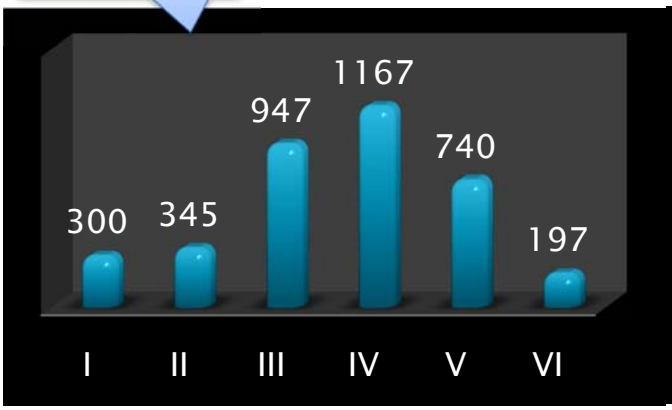
*The break-up of smaller cities + for 2011 is an estimate

Source: IIHS Analysis based on Census 1951 to 2011

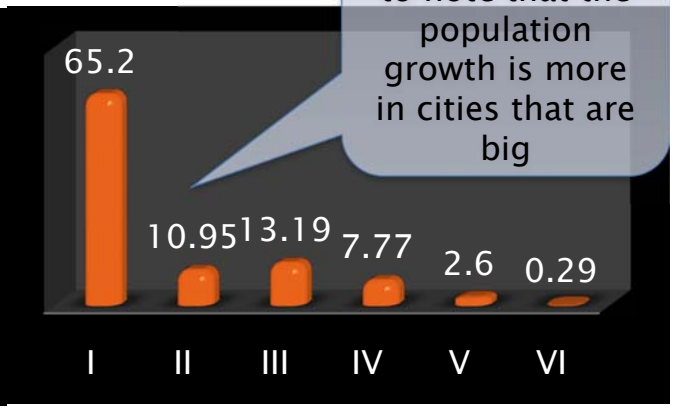
Source: http://2.bp.blogspot.com/-NToesic_IM0/T4B[illegible]AAAAAAAAGA8/S24COZDYjXo/s1600/Urbanization+10.png

Urban Morphology

Total Towns = 3,696



Number of Towns



It is interesting to note that the population growth is more in cities that are big

Share of Urban Population (%)

Class	Population
I	**1,00,000 & above**
II	50,000 to 99,999
III	20,000 to 49,999
IV	10,000 to 19,999
V	5,000 to 9,999
VI	less than 5,000

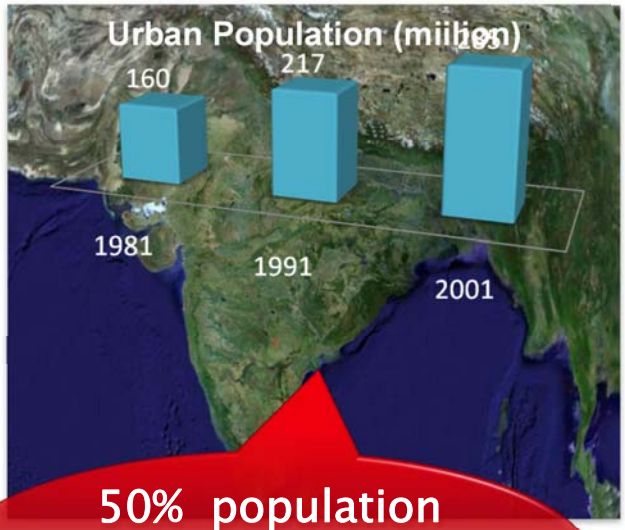
As per 1991 census, 2/3 of the country's urban population lived in Class-I cities with > 1,00,000 population

The Background

Urban Scenario

21st Century- Set to become India's urban century

City	Year
140 million will move to cities	2020
700 million will urbanize(more that US population today)	2050
No. of cities (Population. > 1 million) will double(68cities)	2020

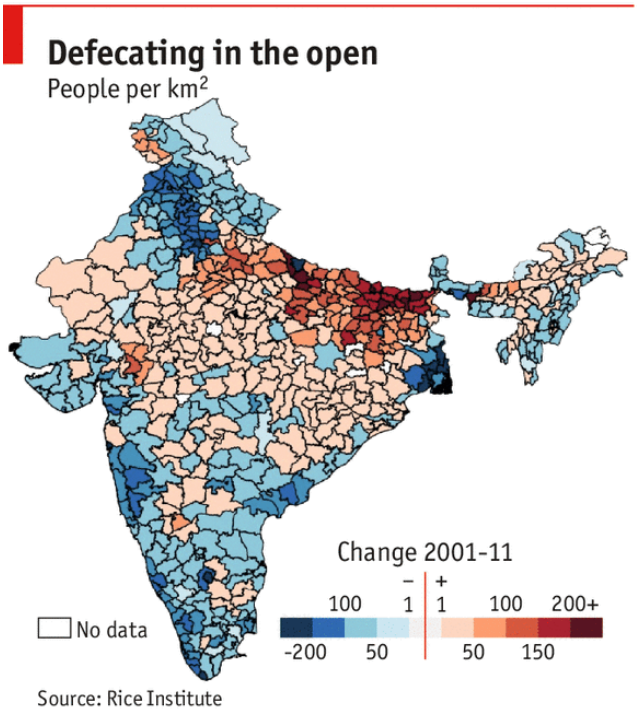


50% population will live in urban areas by 2050.

Source: Mint, The Wall Street Journal, Mumbai, Dt [illegible] August 2007

Urbanization

- Lack of drainage, especially in slum areas in cities
- Lack of access to sanitation due to physical absence of toilets and also ill-maintained services
- Open Defecation present even in urban areas



Source: Rice Institute

Source: http://www.economist.com/news/asia/21607837-fixing-dreadful-sanitation-india-requires-not-just-building-lavatories-also-changing

History of Water in India

- Prime importance on water since ancient times
  - Ancient civilizations developed near rivers
  - Rivers considered as deities in Indian culture
- Evidences of water and wastewater management practices since 3000BC in Indus Valley Civilizations
  - Drainage channels with covers for maintenance
  - Retention structures for sludge collection
  - Rain water harvesting measures in the form of reservoirs

Source: http://www.shunya.net/Pictures/WesternIndia/Gujarat/Dholavira/Dholavira03.jpg

Source: http://www.sewerhistory.org/images/w/wam/loth_wam10.jpg

History of Water in India

- Community approach also evident in many areas for conservation of water
  - Structures like Paar, Johads, Kund, Ahar and Bhandaras from Himalayas to arid deserts of Rajasthan
- Water supply infrastructure
  - Example: Katraj Lake near Pune which still functional after 250 years

Source: http://socks-studio.com/2014/03/13/inhabiting-infrastructures-indian-stepwells/

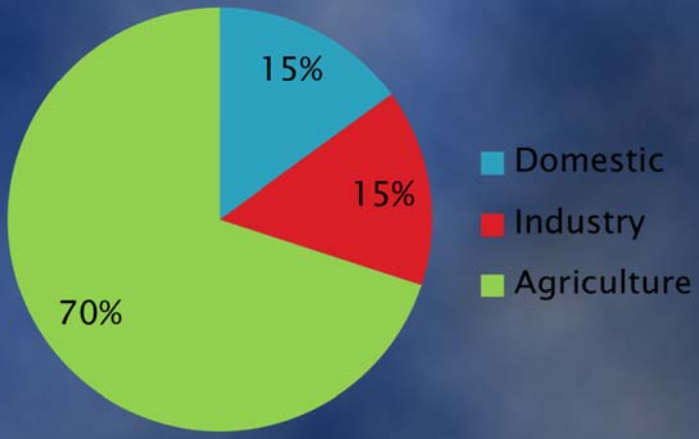
Source: http://www.thebetterindia.com/17159/jethu-singh-reviving-traditional-methods-rain-water-harvesting/

Top fifteen river basins in India: Average water flow and utilizable water				
River basins	Average annual water flow (in Km3/year)	Utilizable flow (in Km3/year)	% of total average annual water flow in India	% of total utilizable wa flow in Ind
Ganga–Brahmaputra–Meghna Basin	1202	274	61.6	40
West flowing rivers south of Tapi	201	36	10.3	5.2
Godavari	111	76	5.7	11
Indus	73	46	3.8	6.7
Krishna	70	58	3.6	8.4
Mahanadi	67	50	3.4	7.2
Narmada	46	35	2.3	5.0
Brahmni–Baitarani	28	18	1.5	2.7
East-flowing rivers between Mahanadi and Godavari	17	Un-assessed	0.9	Un-assesse
West-flowing rivers of Kachchh and Saurashtra including Luni	15	15	0.8	2.2
Tapi	15	15	0.8	2.1
Subarnarekha	12	6.8	0.6	1.0
Mahi	11	3.1	0.6	0.4
East-flowing rivers between Pennar and Cauvery	10	17	0.5	2.4
Rivers draining into Bangladesh	8.6	NA	0.4	NA
Total	**1887**	**649.42**	**96.62**	**94.12**
Total average annual water flow in all river basins (in Km3/year):				**1953**
Total utilizable water flow in all river basins (in Km3/year):				**690**

Water Statistics

- 16% of world population and 4% of water resources

Usage of water in India

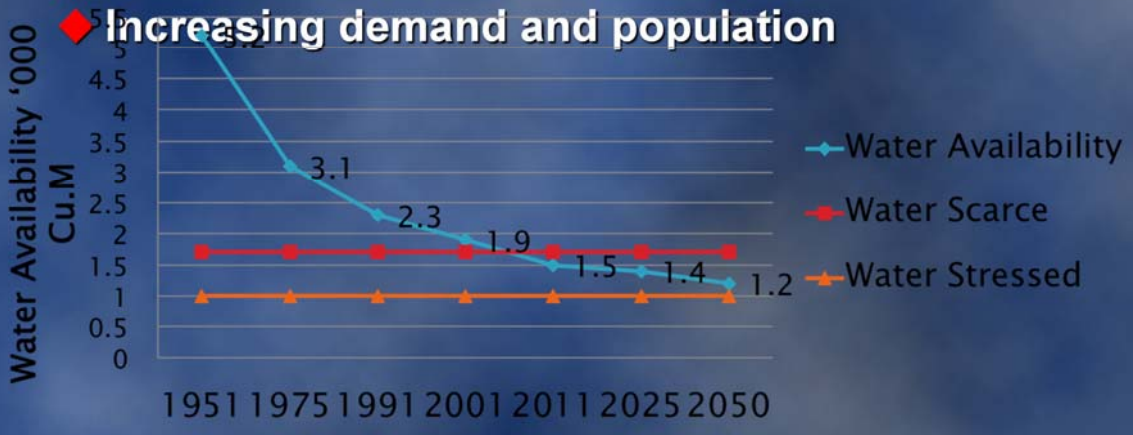


CRISIL, 2012

Water Statistics

- Per capita water availability in India has dropped and is expected to further reduce in the future
- Increasing demand and population

Per Capita Water Availability in India



Sources:
- CWC, Water Data Book 2005
- http://www.india-wris.nrsc.gov.in/wrpinfo/index.php?title=India%27s_Water_Wealth

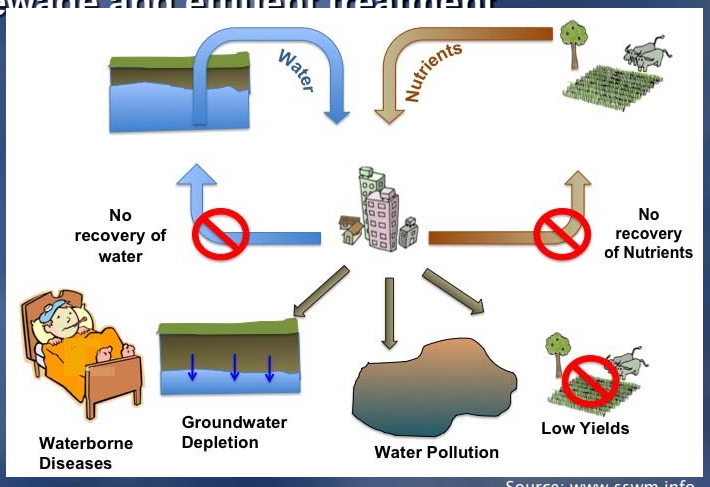
Key Issues

- India is fast urbanizing with about 31% urban population by 2011, likely to reach 50% in next 20 yrs
- Access to Water Supply and Sanitation Infrastructure in urban areas is increasing …
  - More than 90% of India's urban pop has access to improved source
- However, there is still a large gap on sanitation access.
  - Only about 60% of India's urban pop has access to improved sanitation facilities

Source: World Bank's Open Data Initiative – data.worldbank.org

Current Water Issues

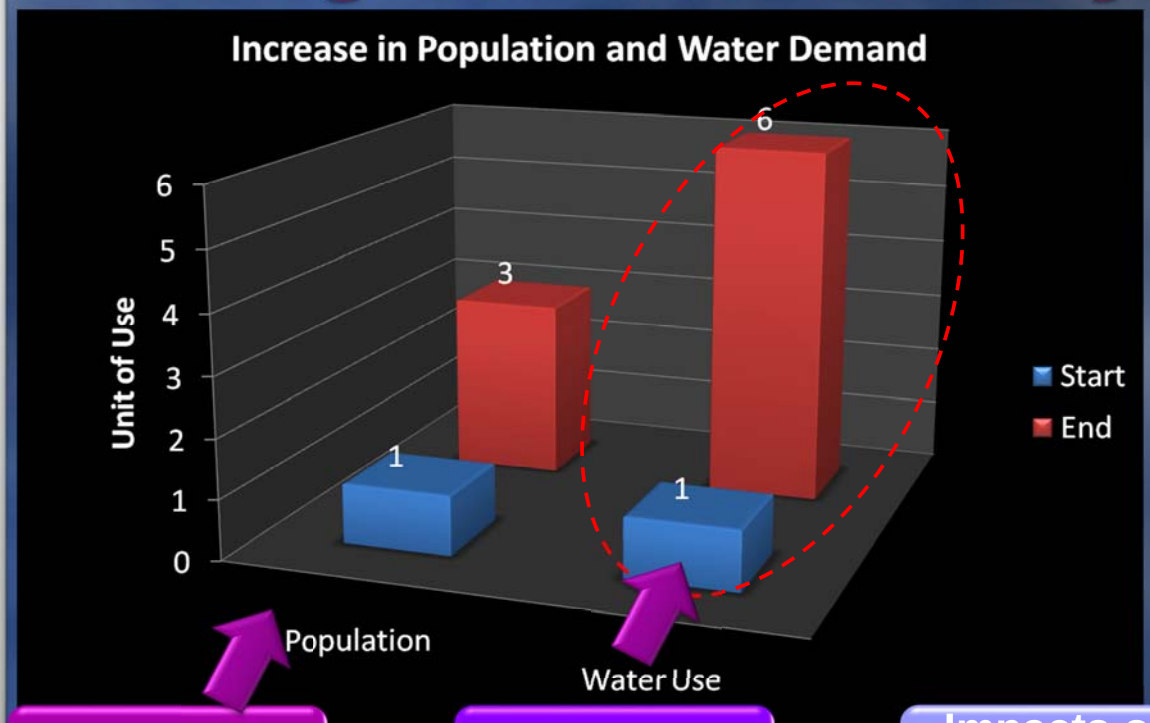
- Over exploitation of ground water resources
- End of the Pipe solutions
- Lack of sewage and effluent treatment



Source: www.sswm.info

The Use of Water Today

During the 20th century



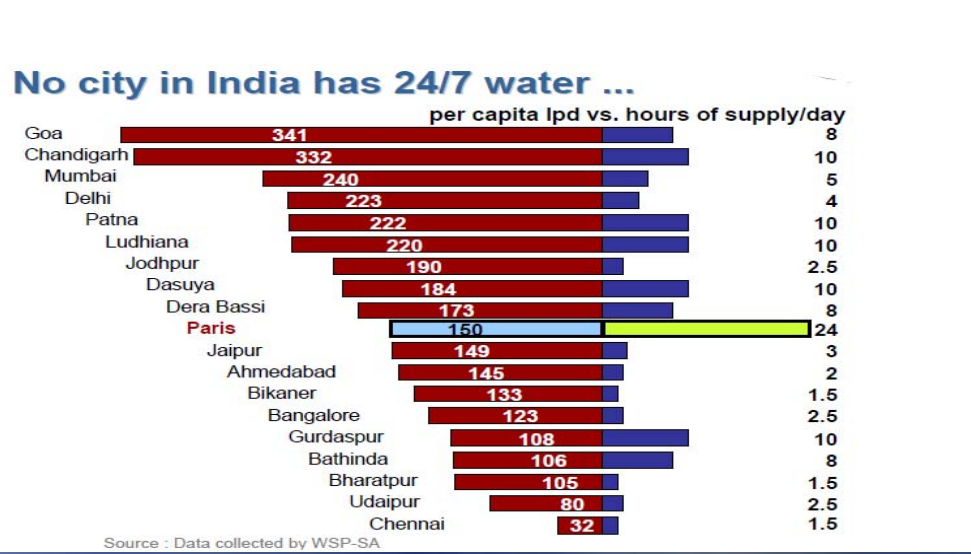
100 Years Ago → Now → Impacts on people and the environment

Current Water Issues

- Inefficient operation and maintenance of wastewater treatment facilities by Municipal Bodies and SMEs at many places
- Water use productivity in India is very low (UNESCO, WWAP)
- Many SMEs can't afford ETPs. CETPs employed in few cases
- Distribution losses due to lack of maintenance and repair
- Service Level benchmark for NRW is fixed at 20%
- "In a study by Andey and Kelkar (2007), in four cities across India, to evaluate the influence of intermittent and continuous water service on NRW, it was showed that NRW increased from 19.5% to 35.8% under IWS, whereas it increased from 31 to 47.8% under continuous supply system" (Jayaramu and Kumar

Key Issues ..3

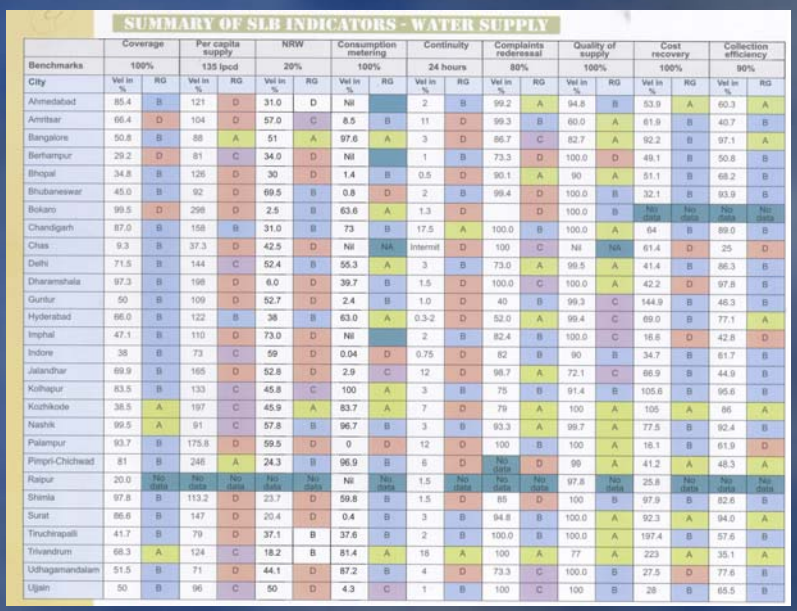
- **No city in India has 24/7 water service as of now…**
  - **It is just catching up, after successful demonstration of feasibility, through a Bank supported project in Karnataka.**



Key Issues ..4

- **Non-Revenue water of more than 50% is not a surprise, and**

Cost recovery for water service can sometimes go down to just 16%


SUMMARY OF SLB INDICATORS - WATER SUPPLY

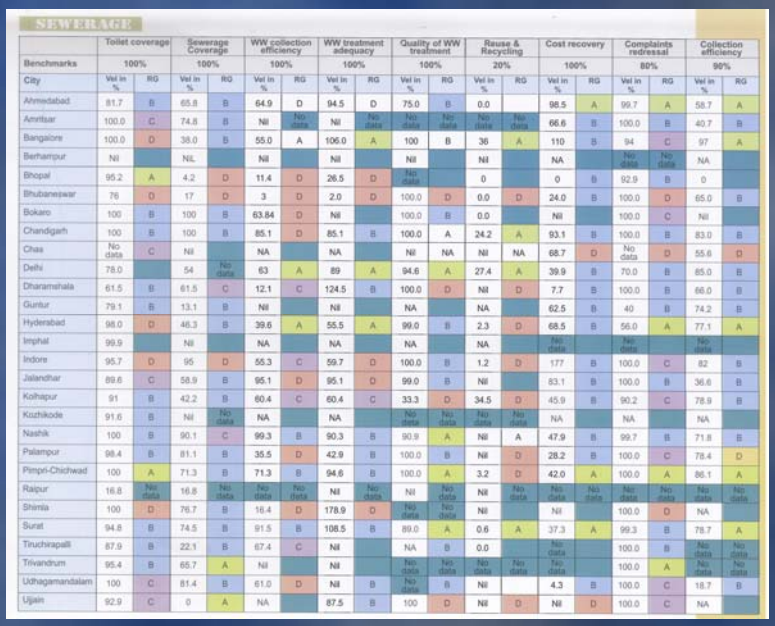
	Coverage		Per capita supply		NRW		Consumption metering		Continuity		Complaints redressal		Quality of supply		Cost recovery		Collection efficiency	
Benchmarks	100%		135 lpcd		20%		100%		24 hours		80%		100%		100%		90%	
City	Val in %	RG	Val in %	RG	Val in %	RG	Val in %	RG	Val in %	RG	Val in %	RG	Val in %	RG	Val in %	RG	Val in %	RG
Ahmedabad	85.4	B	121	D	31.0	D	Nil		2	B	99.2	A	94.8	B	53.9	A	60.3	A
Amritsar	66.4	D	104	D	57.0	C	8.5	B	11	D	99.3	B	60.0	A	61.9	B	40.7	B
Bangalore	50.8	B	88	A	51	A	97.6	A	3	D	86.7	C	82.7	A	92.2	B	97.1	A
Berhampur	29.2	D	81	C	34.0	D	Nil		1	B	73.3	D	100.0	D	49.1	B	50.8	B
Bhopal	34.8	B	126	D	30	D	1.4	B	0.5	D	90.1	A	90	A	51.1	B	68.2	B
Bhubaneswar	45.0	B	92	D	69.5	B	0.8	D	2	B	99.4	D	100.0	B	32.1	B	93.9	B
Bokaro	99.5	D	298	D	2.5	B	63.6	A	1.3	D		D	100.0	B	No data	No data	No data	No data
Chandigarh	87.0	B	158	B	31.0	B	73	B	17.5	A	100.0	B	100.0	A	64	B	89.0	B
Chas	9.3	B	37.3	D	42.5	D	Nil	NA	Intermit	D	100	C	Nil	NA	61.4	D	25	D
Delhi	71.5	B	144	C	52.4	B	55.3	A	3	B	73.0	A	99.5	A	41.4	B	86.3	B
Dharamshala	97.3	B	198	D	6.0	D	39.7	B	1.5	D	100.0	C	100.0	A	42.2	D	97.8	B
Guntur	50	B	109	D	52.7	D	2.4	B	1.0	D	40	B	99.3	C	144.9	B	46.3	B
Hyderabad	66.0	B	122	B	38	B	63.0	A	0.3-2	D	52.0	A	99.4	C	69.0	B	77.1	A
Imphal	47.1	B	110	D	73.0	D	Nil		2	B	82.4	B	100.0	C	16.8	D	42.8	D
Indore	38	B	73	C	59	D	0.04	D	0.75	D	82	B	90	B	34.7	B	61.7	B
Jalandhar	69.9	B	165	D	52.8	D	2.9	C	12	D	98.7	A	72.1	C	86.9	B	44.9	B
Kolhapur	83.5	B	133	C	45.8	C	100	A	3	B	75	B	91.4	B	105.6	B	95.6	B
Kozhikode	38.5	A	197	C	45.9	A	83.7	A	7	D	79	A	100	A	105	A	86	A
Nashik	99.5	A	91	C	57.8	B	96.7	B	3	B	93.3	A	99.7	A	77.5	B	92.4	B
Palampur	93.7	B	175.8	D	59.5	D	0	D	12	D	100	B	100	A	16.1	B	61.9	D
Pimpri-Chichwad	81	B	246	A	24.3	B	96.9	B	6	D	No data	D	99	A	41.2	A	48.3	A
Raipur	20.0	No data	No data	No data	No data	No data	Nil	No data	1.5	No data	No data	No data	97.8	No data	25.8	No data	No data	No data
Shimla	97.8	B	113.2	D	23.7	D	59.8	B	1.5	D	85	D	100	B	97.9	B	82.6	B
Surat	86.6	B	147	D	20.4	D	0.4	B	3	B	94.8	B	100.0	A	92.3	A	94.0	A
Tiruchirapalli	41.7	B	79	D	37.1	B	37.6	B	2	B	100.0	B	100.0	A	197.4	B	57.6	B
Trivandrum	68.3	A	124	C	18.2	B	81.4	A	16	A	100	A	77	A	223	A	35.1	A
Udhagamandalam	51.5	B	71	D	44.1	D	87.2	B	4	D	73.3	C	100.0	B	27.5	D	77.6	B
Ujjain	50	B	96	C	50	D	4.3	C	1	B	100	C	100	B	28	B	65.5	B

Source: Data being collected for Service level

Key Issues ..5

- Many cities do not even have sewage treatment facilities, and

cost recovery for sewerage operations can even go down to just 4%



SEWERAGE

	Toilet coverage		Sewerage Coverage		WW collection efficiency		WW treatment adequacy		Quality of WW treatment		Reuse & Recycling		Cost recovery		Complaints redressal		Collection efficiency	
Benchmarks	100%		100%		100%		100%		100%		20%		100%		80%		90%	
City	Val in %	RG	Val in %	RG	Val in %	RG	Val in %	RG	Val in %	RG	Val in %	RG	Val in %	RG	Val in %	RG	Val in %	RG
Ahmedabad	81.7	B	65.8	B	64.9	D	94.5	D	75.0	B	0.0		98.5	A	99.7	A	58.7	A
Amritsar	100.0	C	74.8	B	Nil	No data	Nil	No data	No data	No data	No data	No data	66.6	B	100.0	B	40.7	B
Bangalore	100.0	D	38.0	B	55.0	A	106.0	A	100	B	36	A	110	B	94	C	97	A
Berhampur	Nil		NIL		Nil		Nil		Nil		Nil		NA		No data	No data	NA	
Bhopal	95.2	A	4.2	D	11.4	D	26.5	D	No data		0		0	B	92.9	B	0	
Bhubaneswar	76	D	17	D	3	D	2.0	D	100.0	D	0.0	D	24.0	B	100.0	D	65.0	B
Bokaro	100	B	100	B	63.84	D	Nil		100.0	B	0.0		Nil		100.0	C	Nil	
Chandigarh	100	B	100	B	85.1	D	85.1	B	100.0	A	24.2	A	93.1	B	100.0	B	83.0	B
Chas	No data	C	Nil		NA		NA		Nil	NA	Nil	NA	68.7	D	No data	D	55.6	D
Delhi	78.0		54	No data	63	A	89	A	94.6	A	27.4	A	39.9	B	70.0	B	85.0	B
Dharamshala	61.5	B	61.5	C	12.1	C	124.5	B	100.0	D	Nil	D	7.7	B	100.0	B	66.0	B
Guntur	79.1	B	13.1	B	Nil		Nil		NA		NA		62.5	B	40	B	74.2	B
Hyderabad	98.0	D	46.3	B	39.6	A	55.5	A	99.0	B	2.3	D	68.5	B	56.0	A	77.1	A
Imphal	99.9		Nil		NA		NA		NA		NA		No data		No data		No data	
Indore	95.7	D	95	D	55.3	C	59.7	D	100.0	B	1.2	D	177	B	100.0	C	82	B
Jalandhar	89.6	C	58.9	B	95.1	D	95.1	D	99.0	B	Nil		83.1	B	100.0	B	36.6	B
Kolhapur	91	B	42.2	B	60.4	C	60.4	C	33.3	D	34.5	D	45.9	B	90.2	C	78.9	B
Kozhikode	91.6	B	Nil	No data	NA		NA		No data	No data	No data	No data	NA		NA		NA	
Nashik	100	B	90.1	C	99.3	B	90.3	B	90.9	A	Nil	A	47.9	B	99.7	B	71.8	B
Palampur	98.4	B	81.1	B	35.5	D	42.9	B	100.0	B	Nil	D	28.2	B	100.0	C	78.4	D
Pimpri-Chichwad	100	A	71.3	B	71.3	B	94.6	B	100.0	A	3.2	D	42.0	A	100.0	A	86.1	A
Raipur	16.8	No data	16.8	No data	No data	No data	Nil	No data	Nil	No data	Nil	No data	No data	No data	No data	No data	No data	No data
Shimla	100	D	76.7	B	16.4	D	178.9	D	No data	No data	Nil		Nil		100.0	D	NA	
Surat	94.8	B	74.5	B	91.5	B	108.5	B	89.0	A	0.6	A	37.3	A	99.3	B	78.7	A
Tiruchirapalli	87.9	B	22.1	B	67.4	C	Nil		NA	B	0.0		No data		100.0	B	No data	No data
Trivandrum	95.4	B	65.7	A	Nil		Nil		No data	No data	No data	No data	No data		100.0	A	No data	No data
Udhagamandalam	100	C	81.4	B	61.0	D	Nil	B	No data	B	Nil		4.3	B	100.0	C	18.7	B
Ujjain	92.9	C	0	A	NA		87.5	B	100	D	Nil	D	Nil	D	100.0	C	NA	

Source: Data being collected for Service level

Water Sector in India

The Background

90% of Urban population

63 % Population

Range: 57 – 160 LPCD, Target: 140 LPCD

Slum: 27 LPCD
Infant Mortality =38

Access to water supply

Piped water

Provided water

Health Risk

Source: CMG, ASCI, Hydrabad

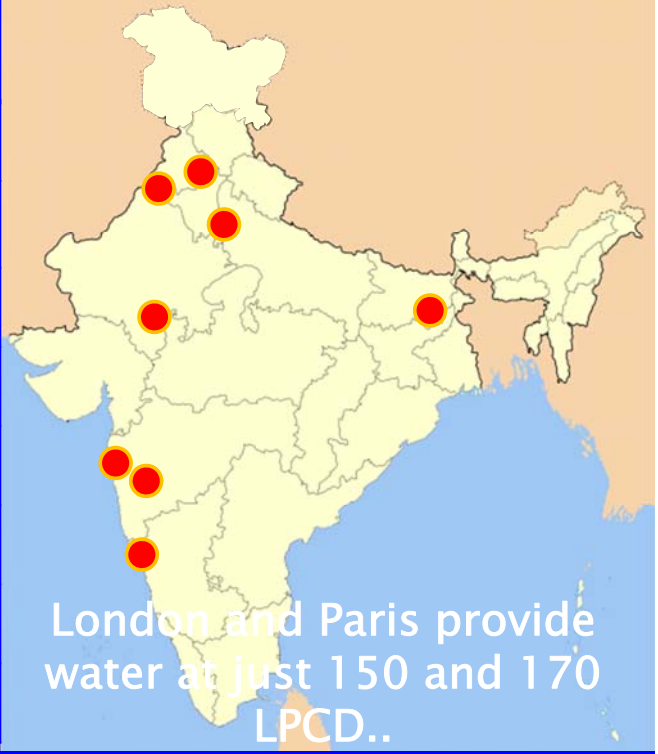
What are Challenges of Water Sector?

Challenges

Utility Life	House Connections	NRW	Cover-age	Stand Posts	Supply Hours	Sustain-ability
> 25 Years	25-40 %	30-55 %	70 %	High No.	2-6 hours	O&M cost > Revenue

India- No City has 24/7 Water

Goa	341	8
Chandigarh	332	10
Mumbai	240	5
Delhi	223	4
Patna	222	10
Ludhiyana	220	10
Jodhpur	190	2.5
Badlapur	171	3



London and Paris provide water at just 150 and 170 LPCD..

Source: World Bank, October 2005

Government Initiatives

- Fiscal incentives by central and state governments
  - Tax deductions
  - Custom duty exemption
  - Depreciation allowance at higher rate

Equitable Distribution

- National Water Policy recognizes the need for equitable distribution
- It also recommends judicious use of water including recycle and reuse
- Focus on subsidizing basic services for urban poor with schemes like JNNURM
- Issues like high NRW, lack of metering

Laws and Legislations

- Environment Protection Act (1986)
- Water recognized as a basic need and a part of right to life
- Water Act (1974)
  - Prevention, Control and Abatement of Pollution
  - Ensure safe supply of water to people
  - Responsibility on State and ULBs to enact and enforce
- Rules and regulations at local level, written and unwritten
- Most control of water utilization with states rather than centre
- Pollution Control Boards at State and Central level
- National Water Policy, National Sanitation Policy, Municipality Act etc. all recognise the need of access, treatment and regulation of water sources

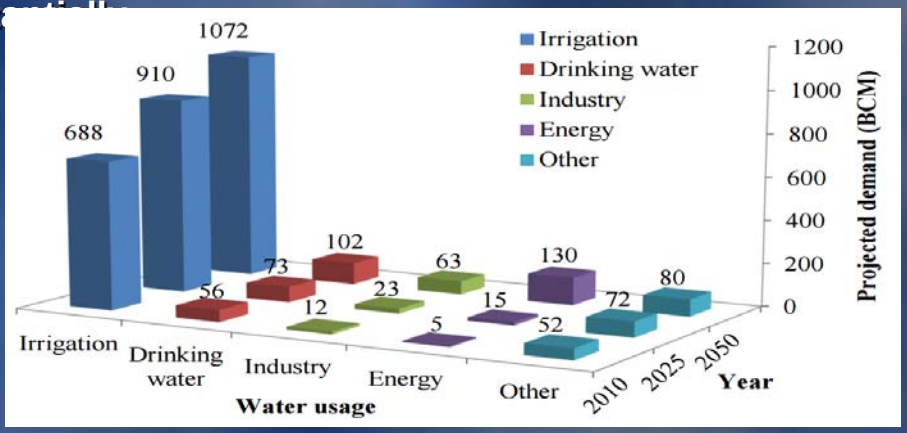
Wastewater Treatment in India

- Only 30% of domestic wastewater and 60% of industrial wastewater is treated
- Only 13% of wastewater is recycled (India Water Portal)
- Mostly conventional methods are used which consume energy and resources
- Inadequate O&M, improper design, lack of technical manpower and unavailability of electricity results in improper functioning of plants
- Decentralized and unconventional methods are limited

Future of Water in India

- Domestic and Industry will account for 85% of increased demand by 2050 (IWMI, 2007)
- Demand for water in Energy sector will also increase substantially

Sector Wise Projected Water Demand

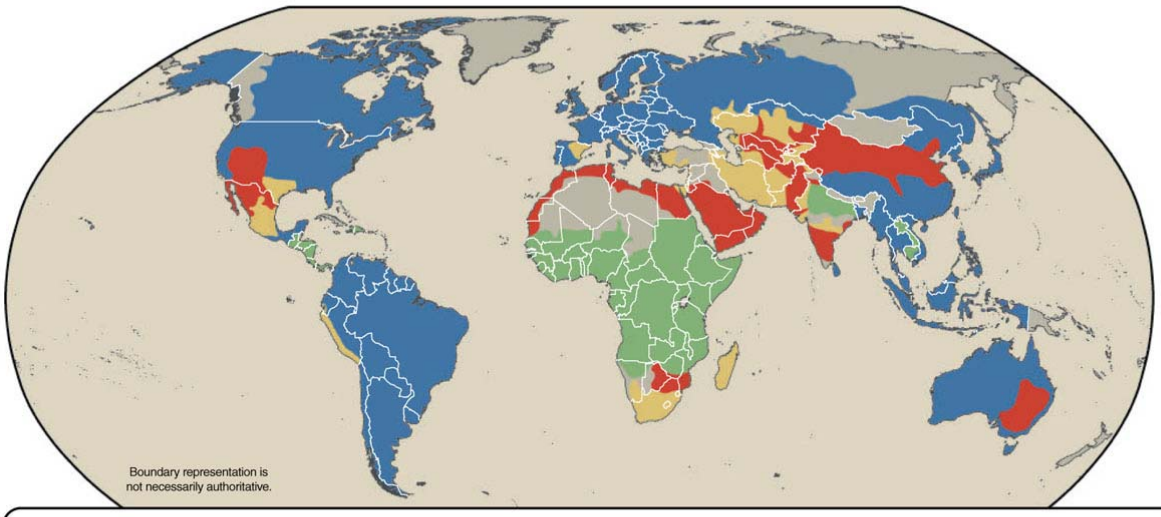


Source: India Country Report, UN Water, AIS

Future of Water in India

- Risk of being a water scarce country owing to increasing demand and population
- Contamination of water resources and climate change can further aggravate the problem
- 55% of all water is sourced from groundwater sources which are fast depleting

Projected Global Water Scarcity, 2025



Physical water scarcity: More than 75% of river flows are allocated to agriculture, industries, or domestic purposes. This definition of scarcity — relating water availability to water demand — implies that dry areas are not necessarily water-scarce.

Approaching physical water scarcity: More than 60% of river flows are allocated. These basins will experience physical water scarcity in the near future.

Economic water scarcity: Water resources are abundant relative to water use, with less than 25% of water from rivers withdrawn for human purposes, but malnutrition exists.

Little or no water scarcity: Abundant water resources relative to use. Less than 25% of water from rivers is withdrawn for human purposes.

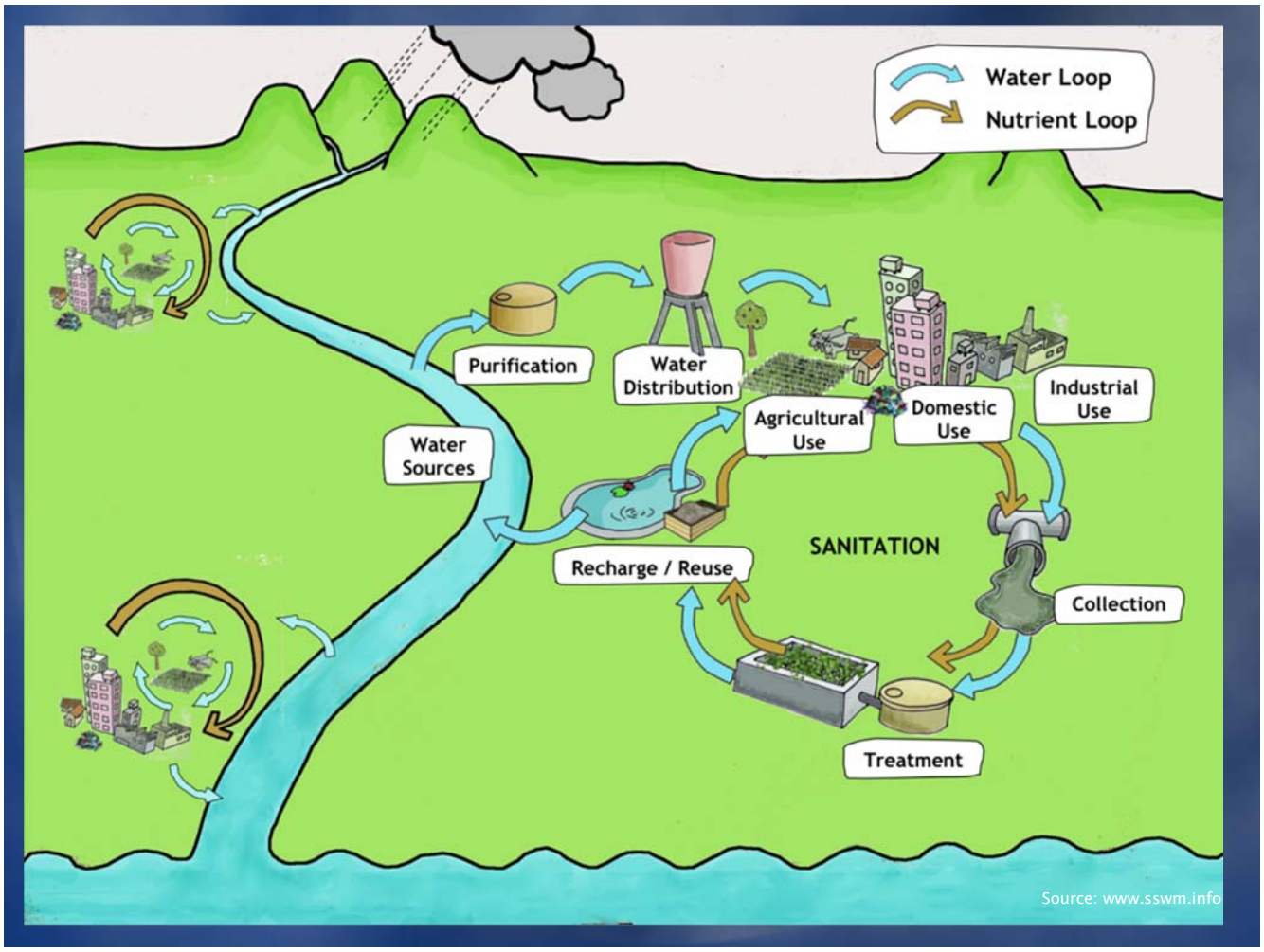
Not estimated

Source: International Water Management Institute.

Image Source: https://www.google.co.in/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0CAYQjB1qFQoTCLn3w7Pjk8cCFQ0Fjgod-y8GYg&url=http%3A%2F%2Fwww.global-warming-forecasts.com%2F2025-climate-change-global-warming-2025.php&ei=l_fCVfnPFI2KuAT735iQBg&bvm=bv.99556055,d.c2E&psig=AFQjCNHfFSwiqn2ozVprF7Vxns2KnkFC_Q&ust=1438927122104115

Securing India's Water Future

- Data Management and Dissemination for local adaptation and behavioral change
- Integrated watershed management to mitigate climate change
- Sustainable development
  - Adoption of unconventional and decentralized options along with centralized solutions
  - Maintaining environmental flow requirements
  - Encouraging water recycle and reuse



Securing India's Water Future

- More financing for water management with the help of private sector
- Incentive for treatment and reuse coupled with punishment for defaulters with strict implementation
- Efficient water use by using low flow equipments, increasing water productivity
- Technical skill development for better management of water resources
- Encouraging research and development in the water sector including research on traditional methods

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THANKS