Key Learnings of draft policy papers on water conservation/efficiency and energy efficiency in urban water management

National seminar(s) on Mainstreaming Sustainable Urban Water Management

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Structure of the Presentation

- **Current issues related to water conservation /efficiency and energy efficiency in urban water management**
- **Understanding the subject**
- **Proposal for the policy papers**

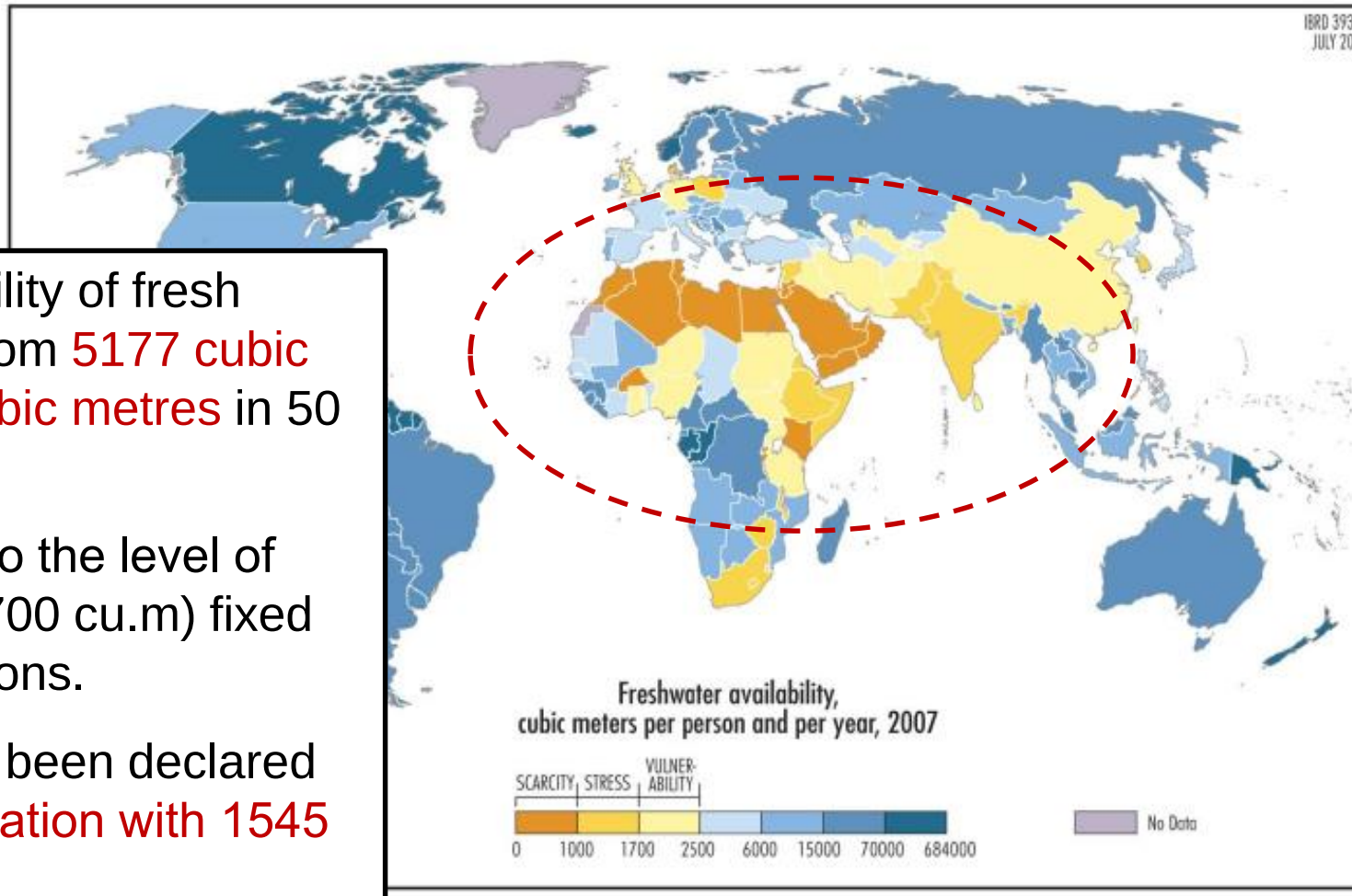
Why urban water conservation and water efficiency?

Global Freshwater Availability

Per capita availability of fresh water has fallen from 5177 cubic metres to 1869 cubic metres in 50 years (2001).

That's very close to the level of stress mark (i.e.1700 cu.m) fixed by the United Nations.

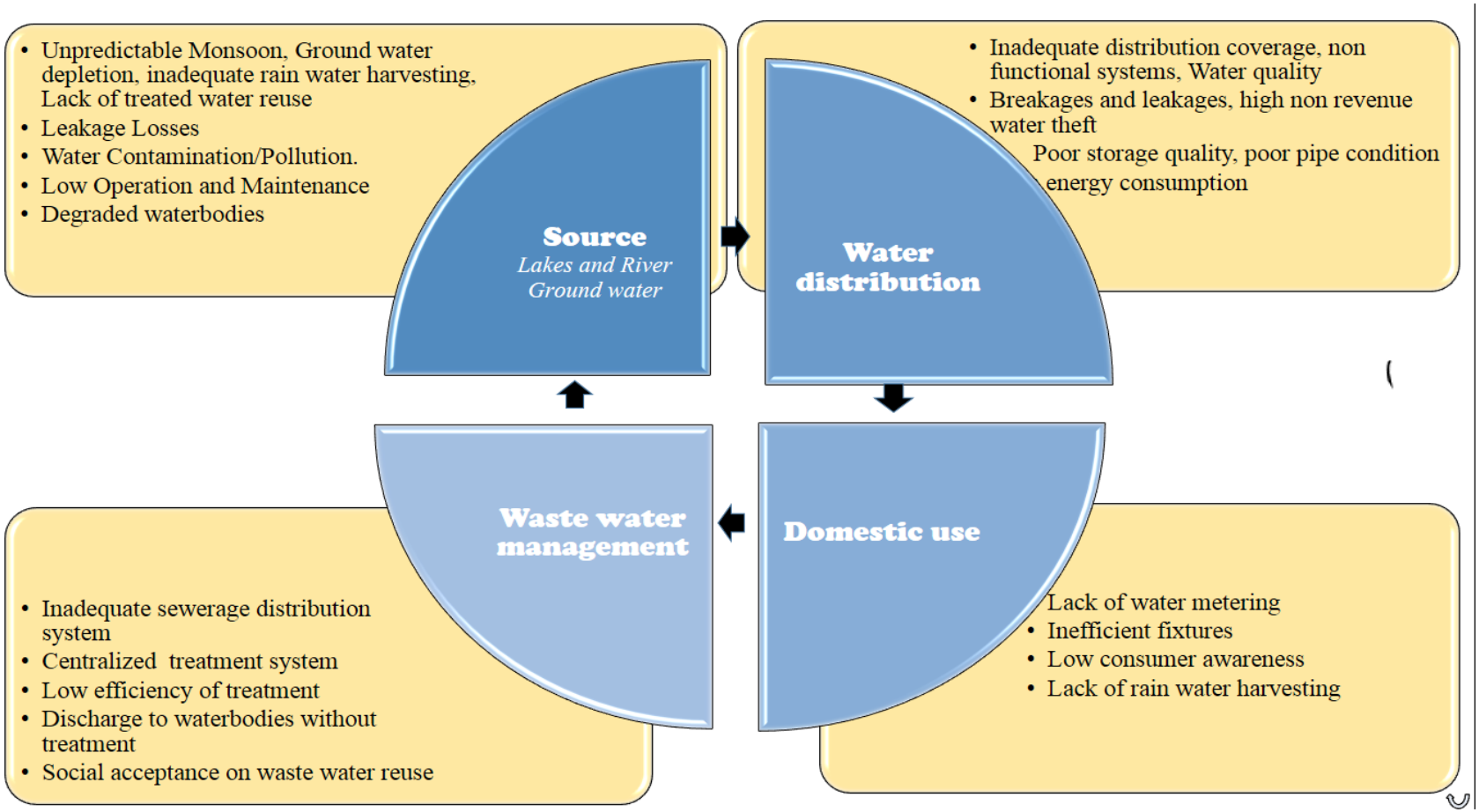
India in 2011* has been declared "water-stressed" nation with 1545 cubic metres



Source: based on (Rekacewicz, 2006).

* Based on provisional population result of Census of India 2011

Existing water management model



Lost water = Less water

71-CITY SURVEY: HOW LEAKAGE LOSSES CREATE THE REAL SHORTFALL IN WATER ACTUALLY SUPPLIED

	Demand 2005 MLD	Supply 2005 MLD	Gap in 2005 MLD	Shortfall in supply, 2005 (%)	Leakage loss MLD	Supply after loss, 2005 (MLD)	Demand-actual supply gap, 2005 (MLD)	Shortfall in actual supply, 2005 (%)
Metro	17,987	16,591	1,396	8	6,150	10,441	7,546	42
Class I	2,879	2,775	104	4	706	2,069	811	28
Class II & III	129	123	7	6	21	101	28	22
Total	**20,996**	**19,489**	**1,507**	8	**6,877**	**12,611**	**8,385**	40

MLD: Million litres daily
Source: Anon 2011, *71-City Water-Excreta Survey, 2005-06*, Centre for Science and Environment, New Delhi

Most large cities report losses in distribution of 40 per cent and more. The loss-list is an impressive one, full of prestigious cities such as Delhi, Hyderabad, Bengaluru, Agra, Vadodara, Bhubaneswar and Udaipur.

Access ≠ Reach

- The pipeline may be a long one, but does not translate to water reaching more people.
- If the length of the pipeline increases, chances of **water losses during distribution** also increase, because pipelines need **repair and maintenance as well as investment in both**.
- The end result, usually, is **even lesser water to distribute**: thus, fewer households are reached.

City	Traditional source	Distance from city	Subsequent source	Distance from city	Current/Future source	Distance from city
Agra	River Yamuna	Within the city	River Yamuna	Within the city	Mathura-Vrindavan water supply scheme	400 km
Rajkot	Barrages on river Aji	11 km	Bhadar dam (River Bhadar)	65 km	River Narmada water from Malia canal	400 km
Delhi	Stepwells	Within the city	Tehri dam (River Ganga)	Over 300 km	Renuka dam	325 km
Chennai	Redhills and Poondi lakes	50-70 km	Veeranam lake	235 km		
Jodhpur	Stepwells and lakes	Within the city	Indira Gandhi Canal	205 km		
Aurangabad	Shallow wells	Within the city	Nath Sagar dam	42 km	Nandur Madhmeshwar dam (River Godavari)	185 km
Dewas	Stepwells	Within the city	River Shipra	12 km	River Narmada	168 km
Bhilwara	Meja dam	11 km	Groundwater from bed of river Banas	9 km	Bisalpur dam (River Chambal)	138 km
Tumkur	Maidala tank	Within the city	Bugudanahalli reservoir	8 km	Hebbaka tank Hemavati dam	 133 km
Mathura	Groundwater (shallow wells)	Within the city	Groundwater and River Yamuna	Nearby	Upper Ganga Canal	130 km
Mumbai	Prior to 1870, shallow wells	Within the city	Bhatsa, Tansa, Upper Vaitarna, Tulsi, Vihar lakes	100-110 km	Middle Vaitarna	120 km
Hyderabad	River Musi and Hussain Sagar lake	Within the city	Osman Sagar lake Himayat Sagar lake	15 km 9.6 km	Manjira, Singur IV & Nagarjuna Sagar dams	59-80 km 116 km

Source: Anon 2011, 71-City Water-Excreta Survey, Period 2005-06, Centre for Science and Environment, New Delhi

According to the constitution of India, It shall be the **Fundamental duty** of every citizen of India **To protect** and **improve the natural environment** including forests, **lakes, rivers and wild life**, and to have compassion for living creatures

National Water Mission

The main objective of the NWM is "**conservation of water, minimizing wastage and ensuring its more equitable distribution both across and within States through integrated water resources development and management**".

The five identified goals of the Mission are: (a) comprehensive water data base in public domain and assessment of impact of climate change on water resource; (b) **promotion of citizen and state action for water conservation, augmentation and preservation**; (c) **focused attention to over-exploited areas; (d) increasing water use efficiency by 20% by 2017**, and (e) promotion of basin level integrated water resources management.

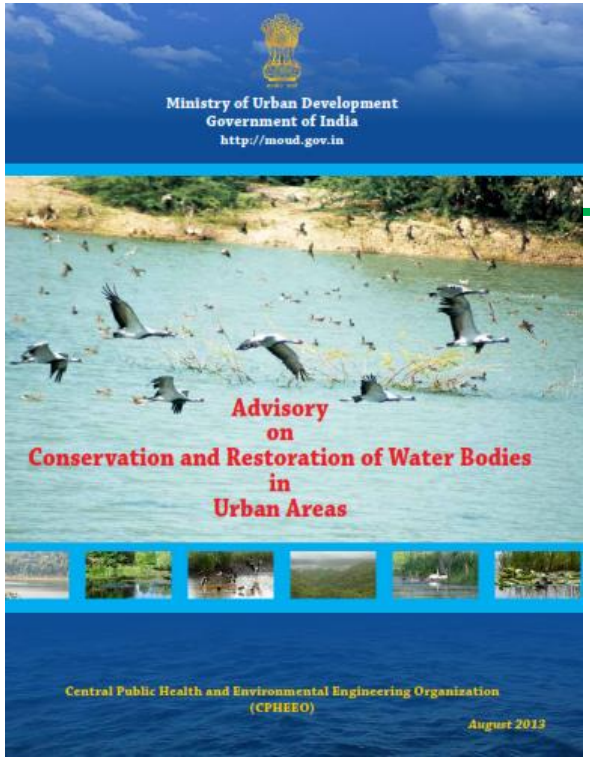
The **National Mission on Sustainable Habitat** has been established with the following objectives-

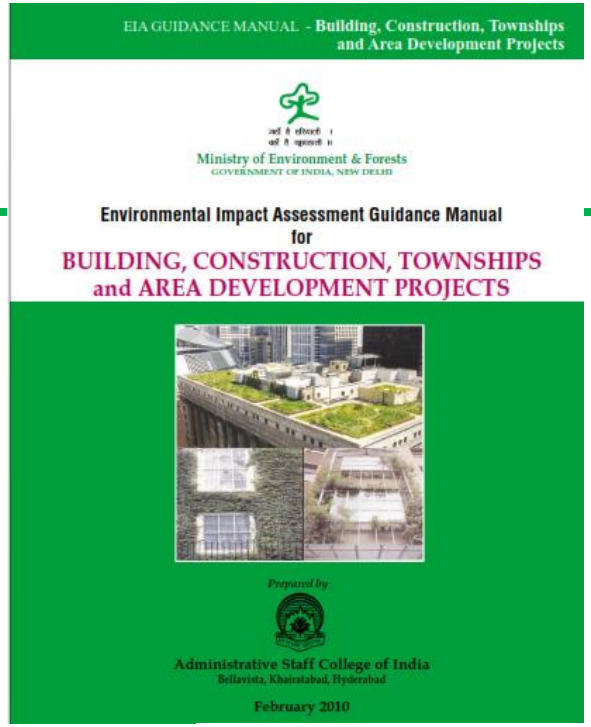
- **To reduce energy demand by promoting alternative technologies and energy conservation practices in both residential and commercial areas.**
- **Better Urban Planning** with a view to enable better disaster management; promoting patterns of urban planning that enable lesser use of private and more usage of public transport. Promoting and encouraging use of lesser polluting vehicles.
- **Encourage community involvement and dialogue for more sustainable pattern of development; participation of stakeholders**.
- **Conservation of natural resources such as clean air, water, flora and fauna that are the keystones of sustainable human habitats.**

Missed out: Water being a state subject, no execution on ground, no Action plan and no specification of urban water

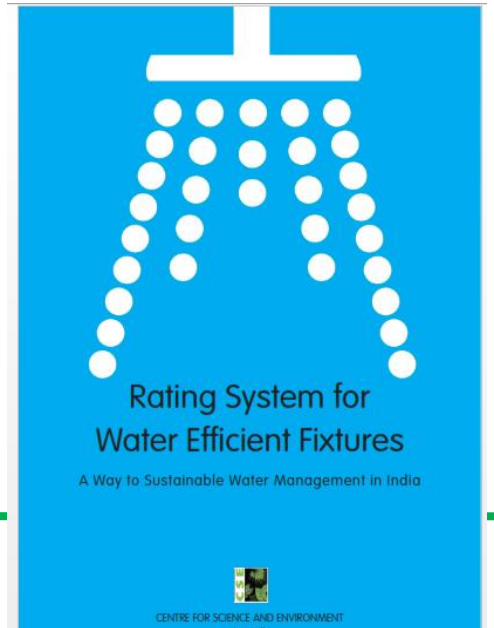
Review of policies, plans and guidelines related to water in India

Focused On	Missed Out
Water got converted into commodity with passage of time especially after colonial period	Participation of public/communities, their role in water management has been reduced over time or became extinct. This has seriously affected the water management in country
Most of the present legal provisions are influenced by historic and colonial rules and remained rigid without considering the modern day requirements	Being an essential element, Water is covered under various institutions (ministries) with different aim and objectives (e.g. Forest, Urban Development, Water Resources and Rural Development). The targets or milestones for each institution/ministry are different. This remains major hurdle in resolving the daily water related issues and challenges in real world. There is an urgent need to bring water under one umbrella (as already suggested in national framework of law)
Demand supply gap: the focus of various initiatives has been in seeking supply side solution and ignoring the demand side solutions.	
Long distance: Infrastructure based planning	There are no provisions in current legal framework which take actions against the officials who are not providing sufficient water and not supplying water in time
	Prudent use of water resources - Use of local water resource is missing in most of the legal provisions, i.e. storm water, wastewater and rainwater harvesting.
	Ground water extraction: there is no policy which focus on ground water as a resource.


Ministry of Urban Development
Government of India
http://moud.gov.in
Advisory
on
Conservation and Restoration of Water Bodies
in
Urban Areas
Central Public Health and Environmental Engineering Organization
(CPHEEO)
August 2013


EIA GUIDANCE MANUAL - Building, Construction, Townships and Area Development Projects
Ministry of Environment & Forests
GOVERNMENT OF INDIA, NEW DELHI
Environmental Impact Assessment Guidance Manual
for
BUILDING, CONSTRUCTION, TOWNSHIPS
and AREA DEVELOPMENT PROJECTS
Prepared by
Administrative Staff College of India
Bellavista, Khairatabad, Hyderabad
February 2010


ielo
Model National Institutional Framework on Water Use Efficiency (Industry, Commercial, Domestic Urban Sector)
By
ielo
Indian Environment Law Offices
H-383, Palam Vihar


Rating System for
Water Efficient Fixtures
A Way to Sustainable Water Management in India
CENTRE FOR SCIENCE AND ENVIRONMENT


SWM STORM WATER MANAGEMENT
retrofitting our urban streets for sustainable drainage
Draft copy . July 2012
Prepared by:
OASIS DESIGNS INC.
For :
UTTIPEC
DELHI DEVELOPMENT AUTHORITY

Definition of Water conservation and efficiency

- Water conservation is defined in terms of **benefit-cost approach** by Baumann, et al. (1980) as the "***socially beneficial reduction of water use or water loss***", where net social benefit is one of the key concepts of water conservation.

- On the other hand water efficiency as defined by the **United States environmental protection agency**, is "***Use of improved technologies and practices that deliver equal or better water service with less water.***"

- According to **The Potential for Urban Water Conservation in California** report (2003): conservation, describes any **action or technology that increases the productivity of water use**. Collectively, they refer to these actions and technologies as conservation measures, demand management, or improving water productivity

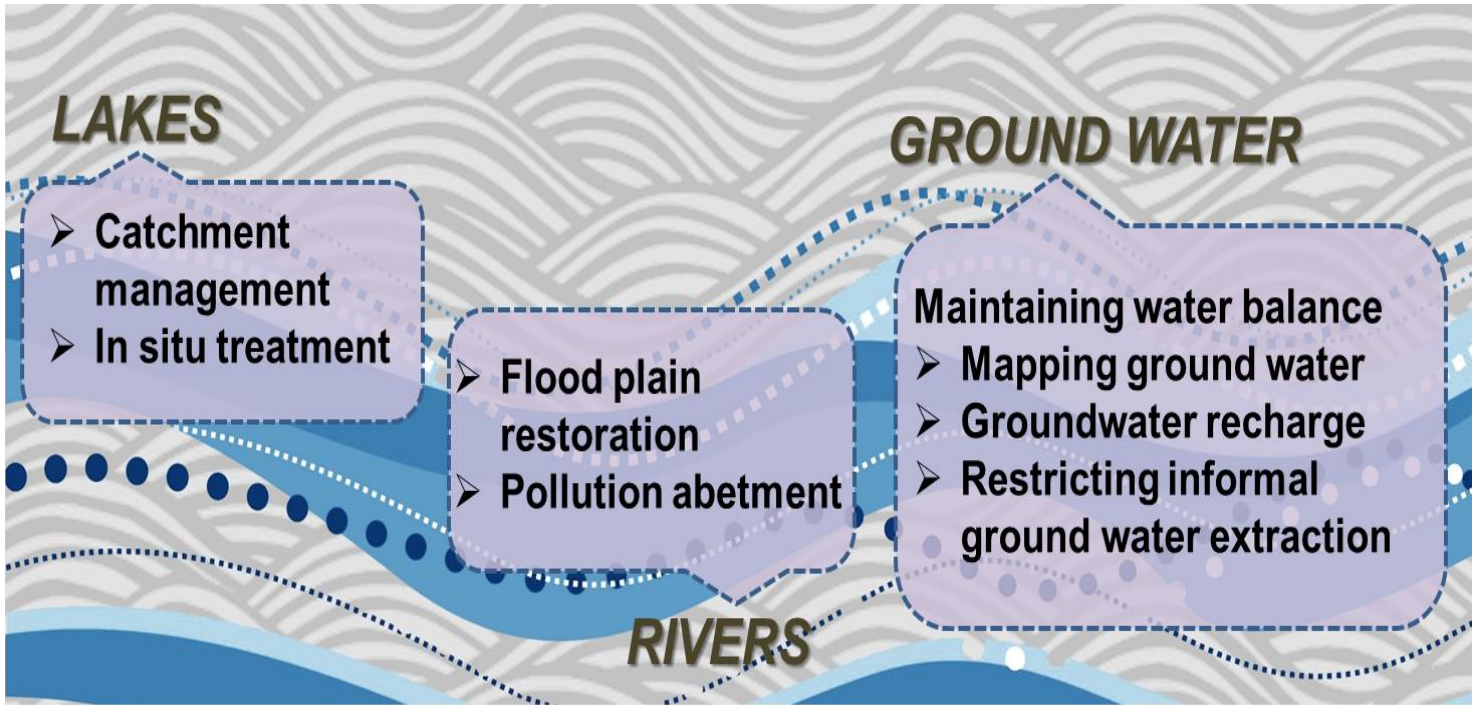
New South Wales (NSW), Australia Conservation Strategy

- As per the NSW Conservation strategy (2000), **water conservation** is defined as ***"using water efficiently and equitably so that the needs of ecosystems, human settlements and production are all met sustainably on a permanent basis"*.**

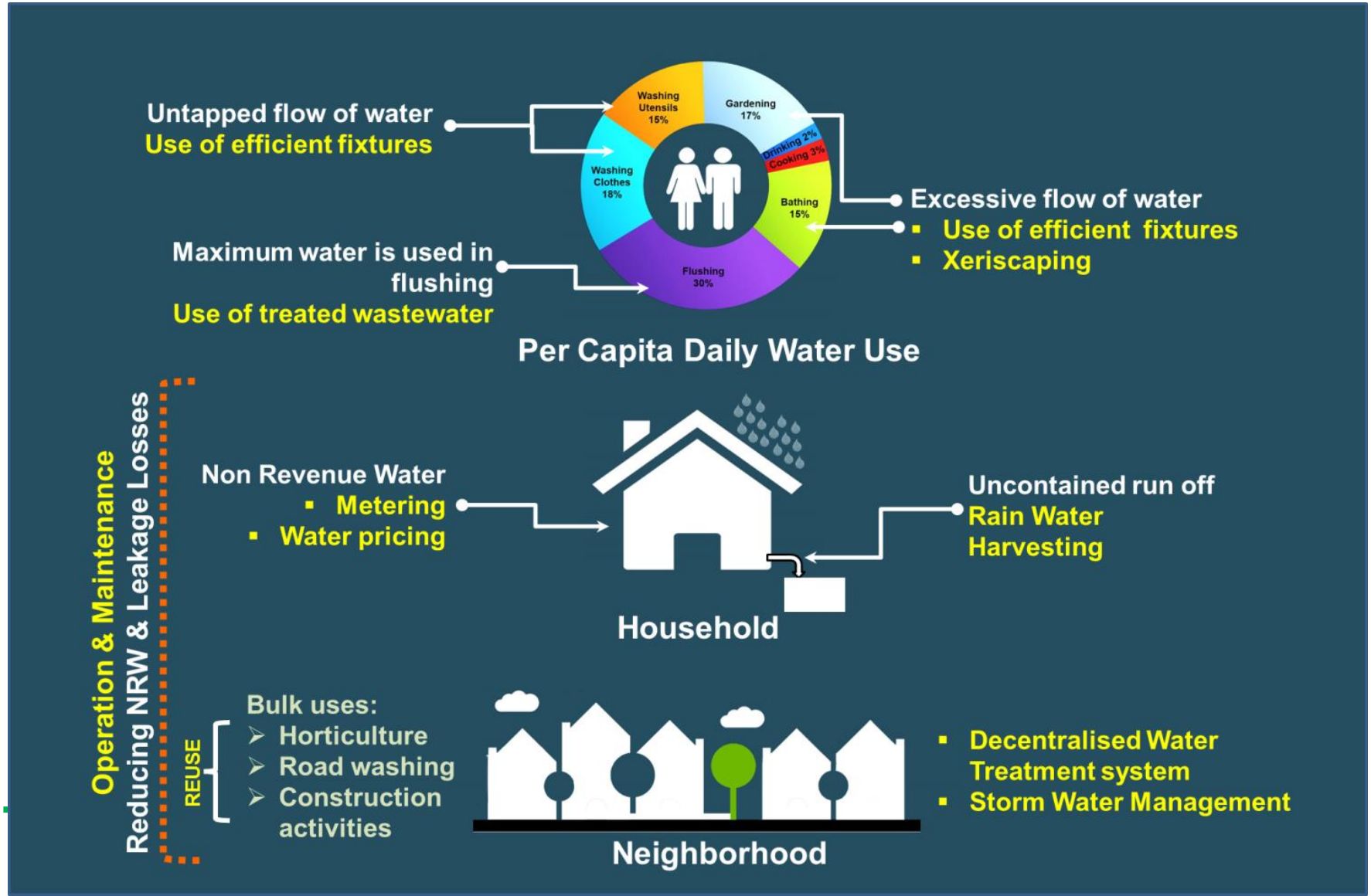
- The Water Conservation Strategy takes **a holistic approach** to **water use efficiency and conservation and builds on existing programs and projects, and addresses both urban** and regional environments.

The review of the current situation in New South Wales demonstrates that the most important principles in **water conservation and water use efficiency** improvement is **that individual small savings adding up to a large total saving. Thus contributing to the overall goal of reducing water use**.

Water conservation at source



Water conservation and efficiency at use

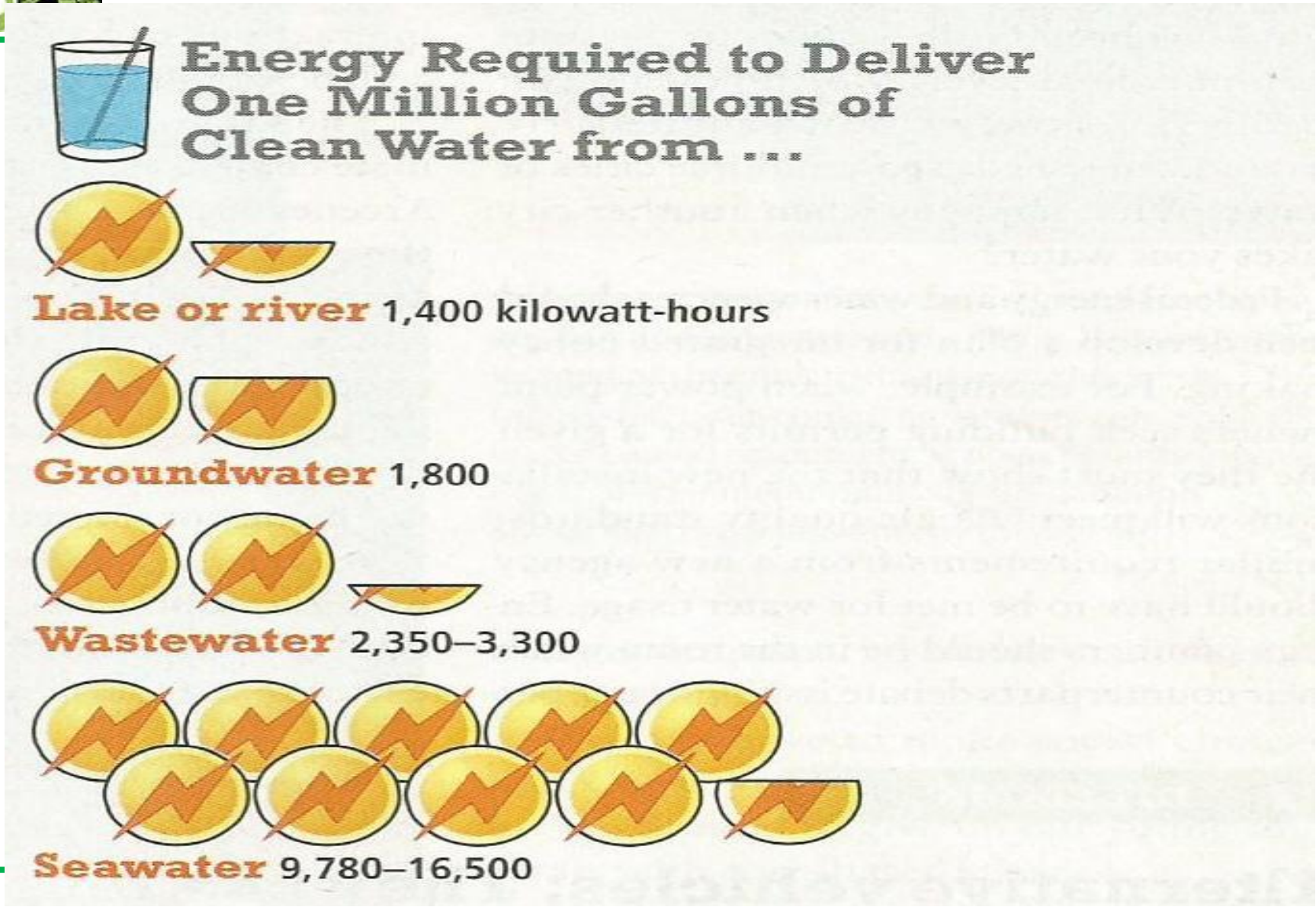


The Country needs Policy that ……

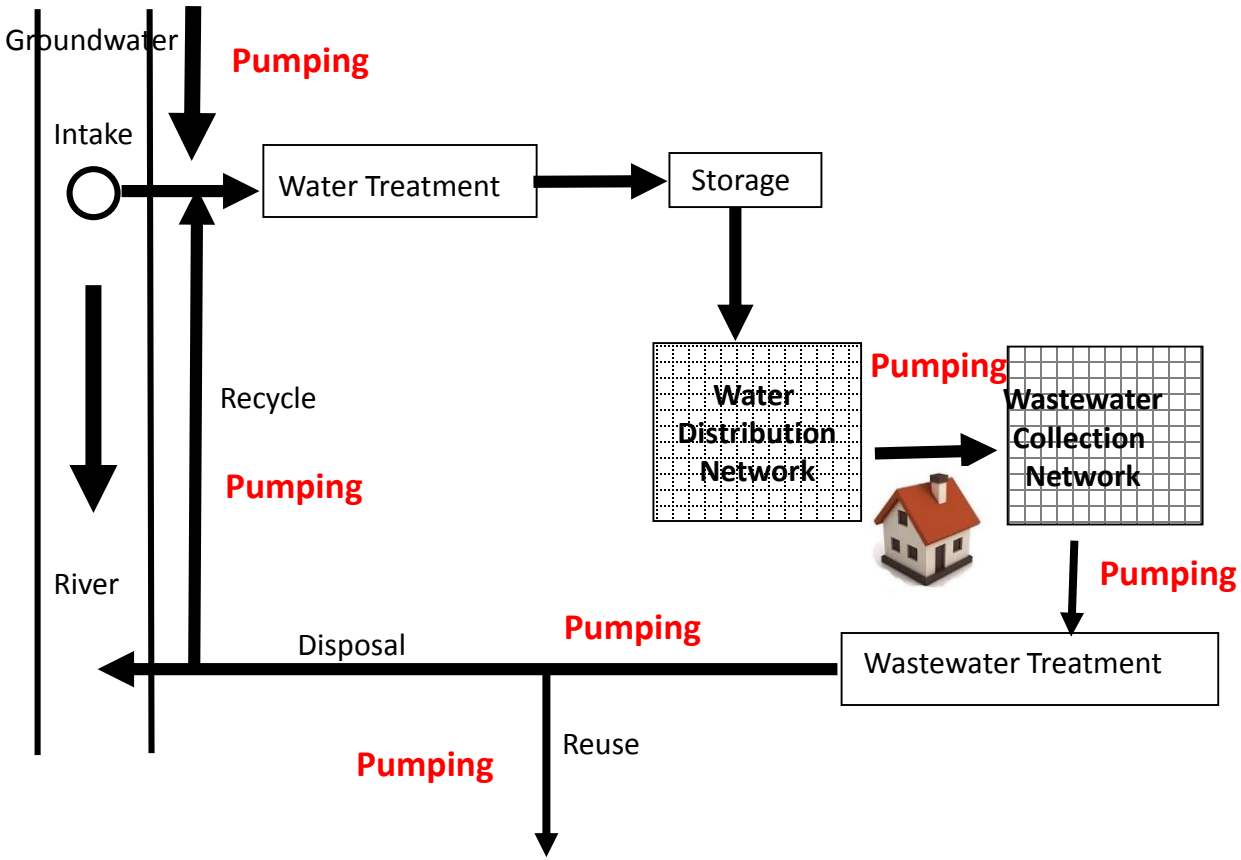
Defines urban water conservation and efficiency as an "Approach" that needs to be executed and not an "option" or "choice"

Why Energy Efficiency in Urban Water/ Wastewater Management

Water Production & Energy Use



Conventional wastewater treatment and reuse



71-CITY SURVEY: WATER SUPPLY REQUIRES EXHAUSTIVE SPENDING ON ENERGY (TOP 22 CITIES)

City	Energy expense[1]		
	Rs crore	%[2]	Rs lakh/MLD
Jodhpur	54	77	24.40
Vadodara	41	74	15.30
Pune	22.5	73	2.8
Aurangabad	20	67	9.8
Nagpur	20	63	4.3
Bhopal	21	60	7.9
Indore	49	60	24
Mussoorie	3	60	37
Bengaluru	251	60	28
Baramati	0.22	57	1.8
Ranchi	12	57	10.3
Bhubaneswar	14	56	6.9
Dehradun	6	54	5.2
Jaipur	42	54	12
Alwar	5	47	15.8
Bhilwara	0.91	45	4.8
Faridabad	8.55	44	3.7
Aizawl	9	44	86
Jammu	13.79	40	6.3
Jabalpur	5.5	38	3.5
Hyderabad	80	37	8.6

Water-energy nexus

WATER

- Abstraction and conveyance
- Treatment
- Distribution
- End use
- Wastewater collection and treatment
- Constructing, O&M water supply facilities

ENERGY

- Extraction and Mining
- Fuel processing
- Thermoelectric cooling
- Transportation
- Waste disposal and emission control
- Constructing, O&M energy-generation facilities

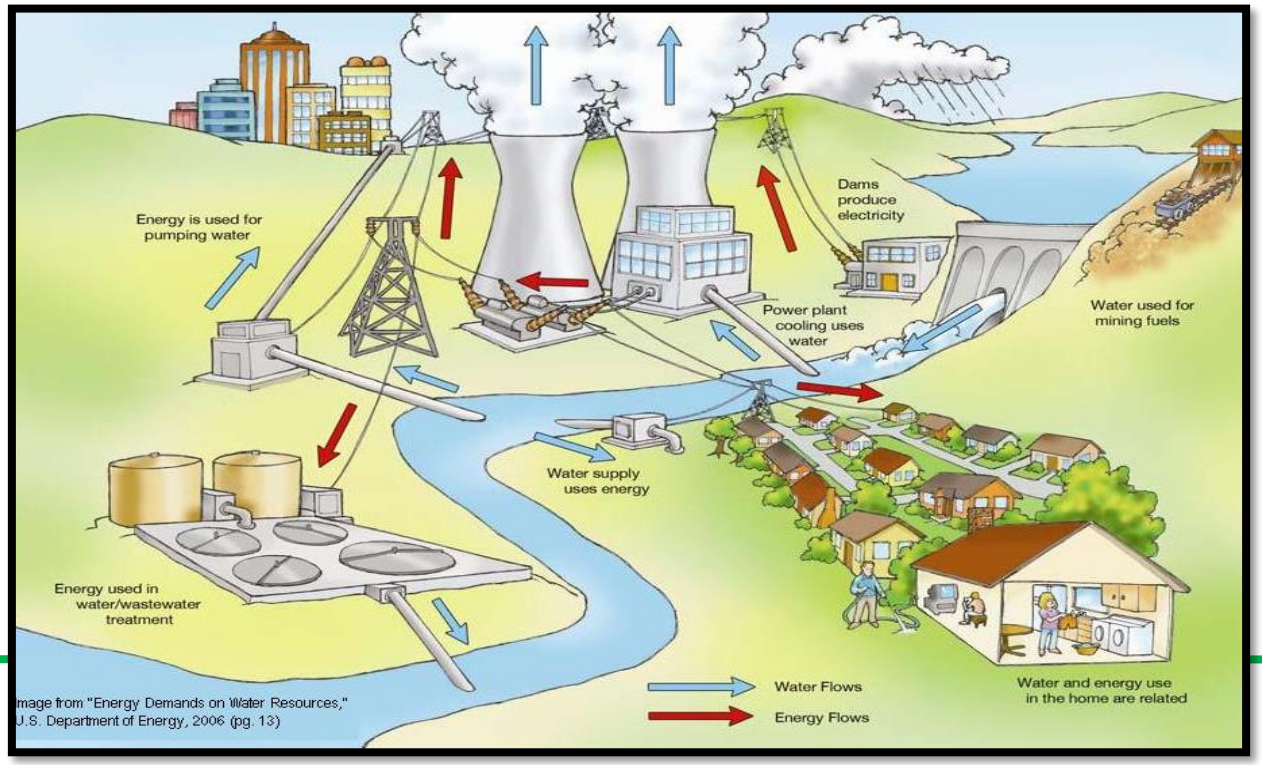
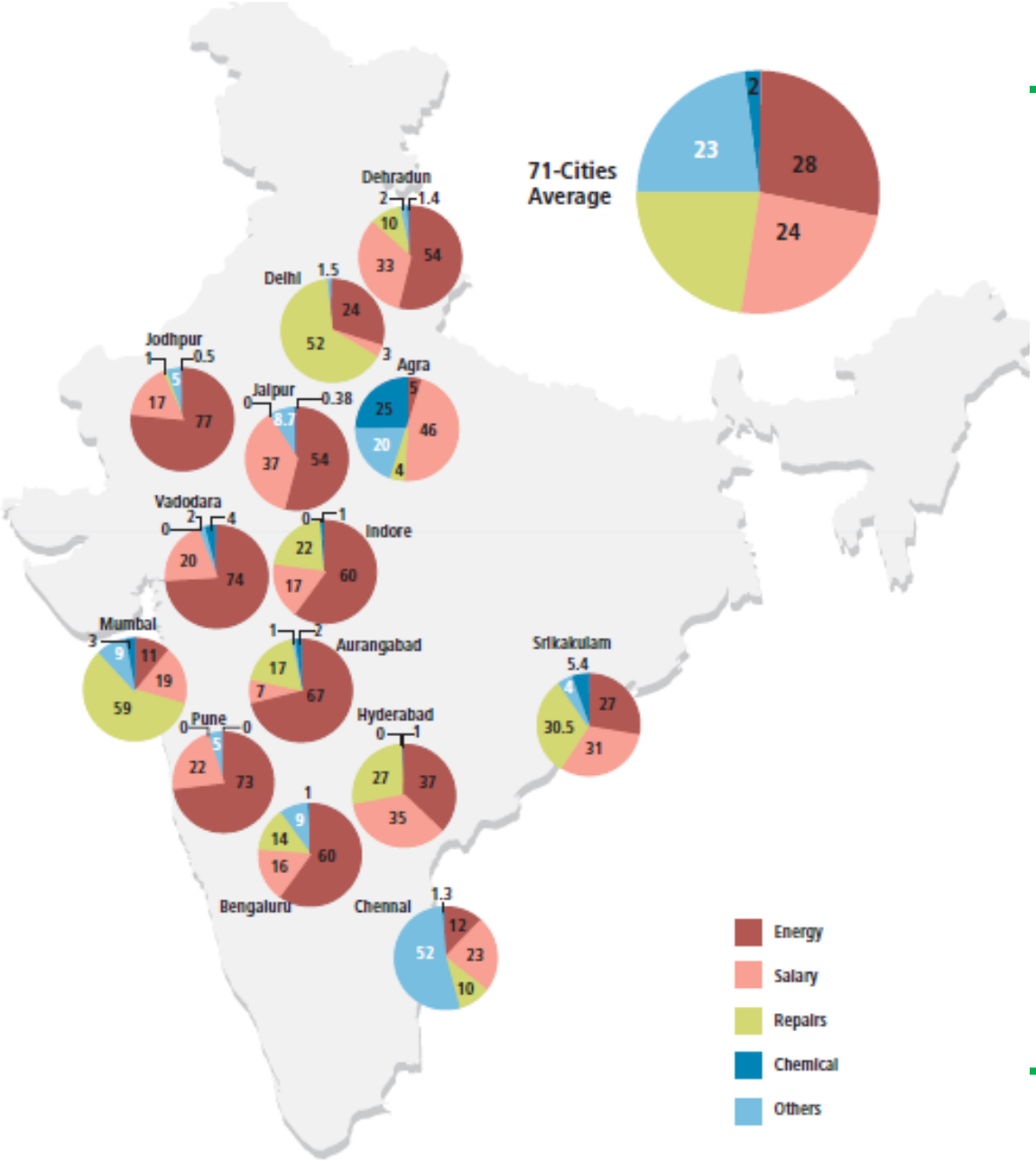


Image from "Energy Demands on Water Resources," U.S. Department of Energy, 2006 (pg. 13)

Cost Components of Water Supply - India



Water / Sewage Management - Costs

25 %

IT TAKES A LOT OF MONEY TO SUPPLY WATER AND TAKE CARE OF SEWAGE

Sector	Per capita cost (Rs)	Per capita O&M (Rs)	Total capital expenditure needed (Rs crore)[1]	Relative share of sector (%)
Water supply	5,099	501	3,20,908	10.4
Sewage	4,704	286	2,42,688	7.8
Solid waste management	391	155	48,582	1.6
Urban roads	22,974	397	17,28,941	55.8
Stormwater drains	3,526	53	1,91,031	6.2
Transport	5,380	371	4,49,426	14.5
Traffic support infrastructure	945	34	97,985	3.2
Street lighting	366	8	18,580	0.6
Total	**43,386**	**1,806**	**30,98,141**	

[1]At 2009-2010 prices; O&M: Operation and maintenance

Source: Anon 2011, *Report on Indian Urban Infrastructure and Services, the high powered expert committee for estimating the investment requirements for urban infrastructure services, JNNURM*, Ministry of Urban Development, GOI, Delhi

Incorporating Energy Efficiency during Design Stage of New Water Supply and Wastewater System

Source and conveyance → Water Treatment → Water Distribution → Water Consumption → Wastewater Treatment

Conserve Water

Install water efficient showers and faucets. Use water carefully

Reduce annual CO_2 emissions by 75 - 189 kg

	Water conserved / household / day (l)*	Water conserved / household / year (l)	Emission Factor- borewell supply (kg/kl)	Emission Factor - municipal supply (kg/kl)	Annual CO_2 emissions reduction - borewell supply (kg)	Annual CO_2 emissions reduction - municipal supply (kg)
Better shower fittings and reduced time under shower	200	73000	0.67	1.69	48.91	123.37
Using aerator faucets and changing dish washing habits	106	38690	0.67	1.69	25.92	65.39
Total	306	111690			74.83	188.76

* Endnote 24

Annual CO_2 emission reduction of 75-189 kg is equivalent to 7-19 additional trees

Change flush tanks in the bathrooms

Reduce annual CO_2 emissions by 39 - 99 kg

	times flushed / capita / day	Daily water consumption per household (l)	Annual water consumption (kl)	Emission Factor- borewell supply (kg/kl)	Emission Factor - municipal supply (kg/kl)	Annual CO_2 emissions reduction - borewell supply (kg)	Annual CO_2 emissions reduction - municipal supply (kg)
Flush tank 10 lts	5	250	91.25	0.67	1.69	61.14	154.21
Dual flush tank of 3 and 6 lts	5	90	32.85	0.67	1.69	22.01	55.52
Savings						39.13	98.70

Annual CO_2 emission reduction of 39-99 kg is equivalent to 4-10 additional trees

Harvest Rainwater

Harvest 1000 litres per household per day over 40 days of rainfall

In half an hour, a rooftop of 100 m² can harvest 1000 litres in a downpour of 25 mm/hr

Reduce annual CO_2 emissions by 27 - 68 kg

	Water conserved/ household/ year (l)	Emission Factor - borewell supply (kg/kl)	Emission Factor - municipal supply (kg/kl)	Annual CO_2 emissions reduction - borewell supply (kg)	Annual CO_2 emissions reduction - municipal supply (kg)
1000 lts harvested per day for 40 days	40000	0.67	1.69	26.80	68

Annual CO_2 emission reduction of 27-68 kg is equivalent to 2-7 additional trees

17

- Energy Efficient Technology
- Energy Saving Devices
- System Flexibility

Way forward

- The **potential impacts of climate change on Water and Wastewater operations**
- How we should **design our water and sewage treatment systems to be more resilient**
- How we can **reduce energy usage and ultimately GHG emission**
- How we can **invest in solutions that have multiple benefits for multiple physical systems** (water, wastewater, stormwater, energy), the environment and the society as a whole

Improving water conservation/efficiency and energy efficiency

Net gain for 3 Missions

National Water Mission

To achieve the water energy efficiency target set by**, which is 20% energy efficiency improvement, would create cost saving of about INRs 12 billion per year in water utilities, and INRs 7 billion per year in pumping station operations**

National Mission on Sustainable Habitat

- **To reduce energy demand by promoting alternative technologies and energy conservation practices in both residential and commercial areas**
- **Conservation of natural resources** such as clean air, water, flora and fauna that are the keystones of sustainable human habitats.

National Mission for Enhanced Energy Efficiency (NMEEE)

- Aims to strengthen the market for energy efficiency by creating **conducive regulatory** and **policy regime** and has envisaged fostering innovative and sustainable business models to the energy efficiency sector
- Mission seeks to upscale the efforts to unlock the market for energy efficiency which is estimated to **achieve fuel savings of around 23 million tonnes per year** and **green house gas emissions reductions of 98.55 million tonnes** per year at its full implementation stage

Thank you