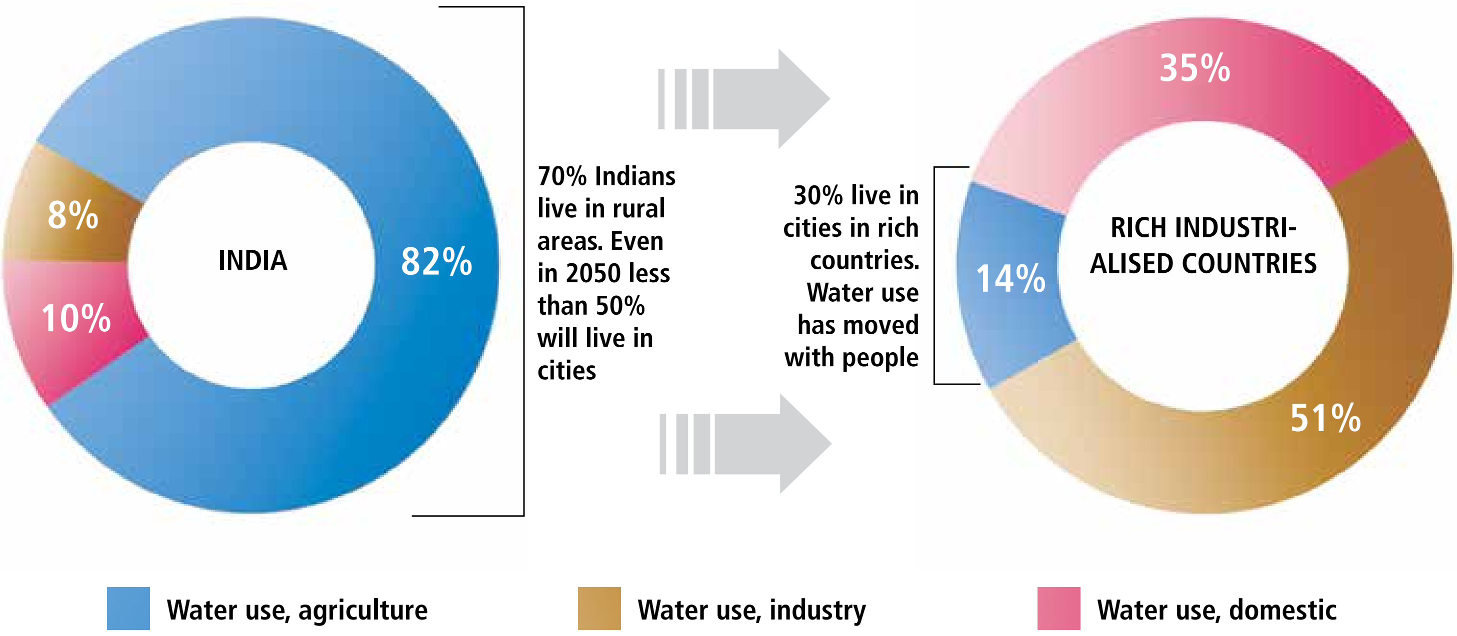
# Why do we need to worry water and waste

- Monsoon is India's finance minister
- Water insecurity already high and crippling
- In this situation, what do farmers do?
- How will they manage scarcity; unseasonal and variable rain events; and extreme rain, which leads to flooding?

Agriculture will remain critical for livelihoods – 60% dependence. But cities-industries will grow. Will need water for growth Unless we manage competing needs; violence will grow. Already cases of protest and police firing over water allocation to industry or city

## WATER TRANSITION THAT WILL NOT HAPPEN

Urban-industrial growth needs water but in India, even as this sector will grow, people will continue to live in rural areas and depend on agriculture



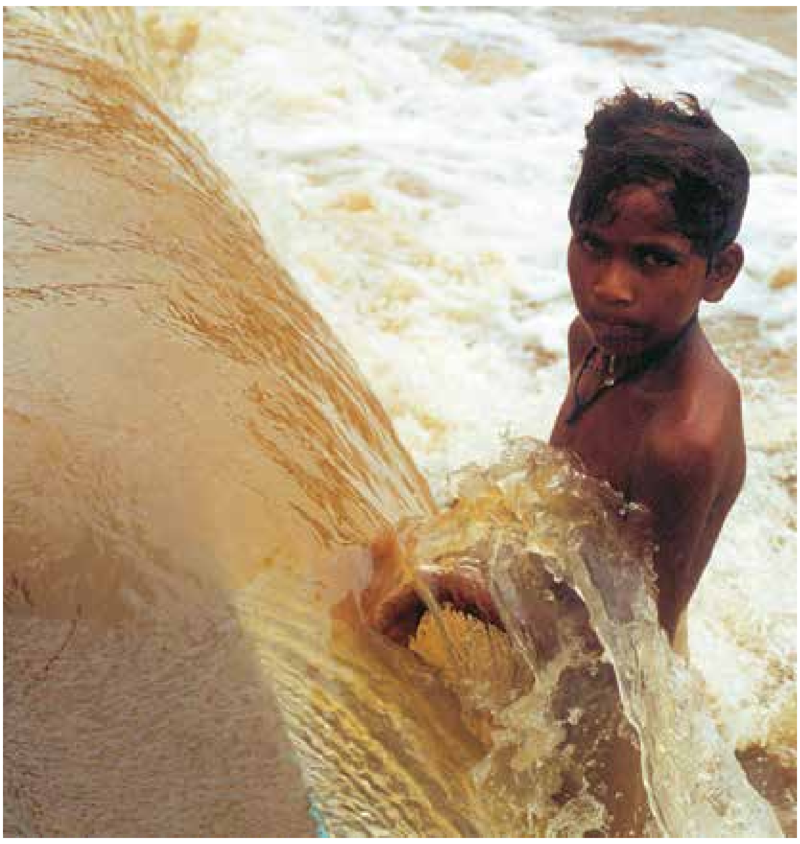

Source: Anon 2009, *Water in a Changing World*, Third UN World Water Development Report, UNESCO, Paris

# Why do we need to worry water

As India enters the new millenium, rainwater harvesting is being revived all over the country. At Ralegan Siddhi, Maharashtra. In Alwar district, Rajasthan. In Jhabua district, Madhya Pradesh. In drought-stricken Gujarat and Andhra Pradesh, rainwater harvesting has drought-proofed villages.

And now, rainwater harvesting is being taken up in cities. In Aizawl, Mizoram. In Bangalore, Karnataka. In New Delhi, India's capital city. In Chennai.

In India, the monsoon is brief. We get about 100 hours of rain in a year. It is this 100-hour bounty that can be caught, stored, and used over the other 8,660 hours in a year



**THE RATIONALE:**
Extend the fruits of the monsoon.

**THE BASIS:**
Catch water where it falls.

**THE METHOD:**
Build systems to recharge aquifers and to store the water for use, domestic and industrial.

Not mega-systems. But systems that suit local needs, whether in a village or in a city.

Make old wisdom new.


# Technologies for decentralised waste management

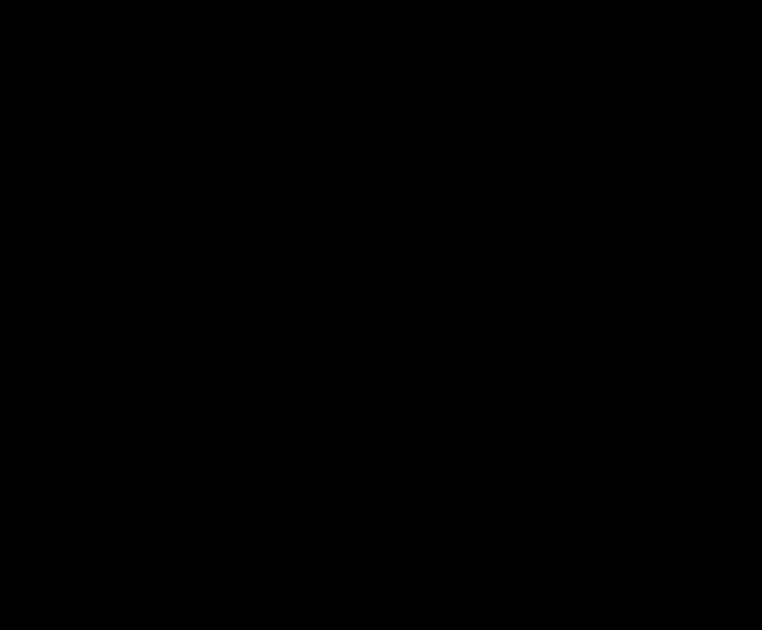
Location: **Centre for Science and Environment, New Delhi**
Design Capacity: **8 KLD (Operational since 2005)**
**Capital cost : ₹2,25,000O&M: ₹25,000- 30,000 per year (approx.)**

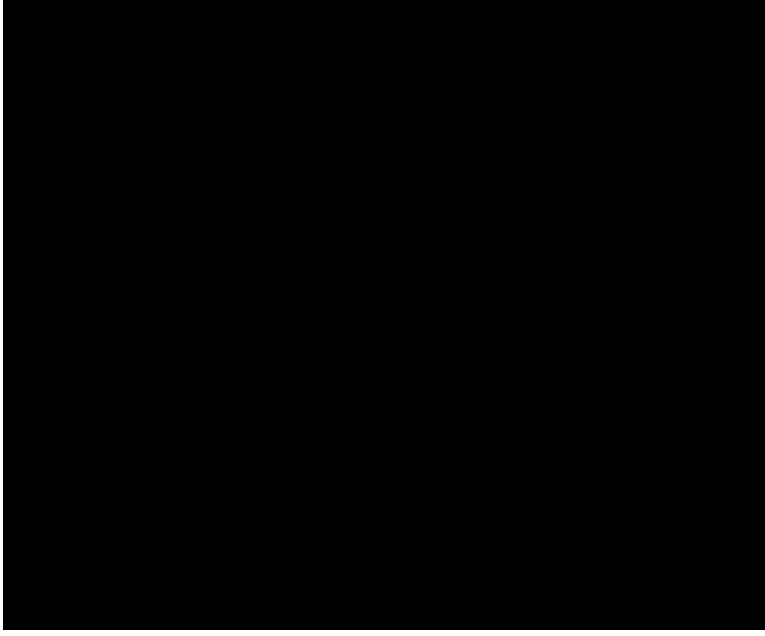
**Project background:** The wastewater system at CSE, implemented in 2005, has been designed to treat 8000 litres per day based on the assumption that at any given moment at least 100 persons would be occupying the premises. The treatment modules include a settler, an anaerobic baffled reactor a planted filter bed and a vortex system. The treated wastewater is stored in an underground sump. This water is used for gardening and landscaping CSE's premises.

**Technology:** The grey water from canteen is put through an oil and grease trap and allows to settler of 2m X 2m X 2m dimension for primary treatment. The settler controls the inflow rate and separate sludge and scum. The black water from toilets is taken into the chambered anaerobic baffled reactor (ABR - 10m X 2m X 1,5m) for secondary treatment. The activated sludge gets retained at the bottom of ABR. The water is then mixed with the outlet of the grey water settler. The combined grey and black water go into the horizontal planted filter bed (22m X 2m X 0.6m) for tertiary treatment. The filter bed is planted with Canna indica. The treated water is stored in 8000 L capacity sump. As no air is injected the water is allowed to swirl in the tube for 2 to 3 hours, so that it gets saturated and oxygen level is increased. As a consequence of increased oxygen content in COD and BOD drop drastically. Inside the vortex tube, a natural occurring self-purification effect from the effluent takes place during the continuous swirling movement. The overall pollution reduction is 95%.

**Decentralised wastewater treatment:** Horizontal planted filter is a hybrid system utilizing different plants (Typha, Canna, Pragmites etc) and filter material (such as gravel, sand etc) for reducing the nutrient load in the wastewater.

| **Performance** | **Inlet (Grey water + Black Water)** | **Outlet Water** |
|---|---|---|
| Biochemical Oxygen Demand (BOD) | 289 mg/L | 14 mg/L |
| Chemical Oxygen Demand (COD) | 565.5 mg/L | 60 mg/L |
| Total Kjeldal Nitrogen (TKN) | 17.6 mg/L | Not Detected |
| Total Phosphate | 4.06 mg/L | 2.3 mg/L |
| Total Coliform | 13 MPN/100ml | 4 MPN/100ml |





# Technologies for decentralised waste management

Location: **Ahar river, Udaipur Rajasthan**
Design Capacity: **100 MLD (Operational since 2010)**
Capital cost : **₹33 lakhs O&M:  ₹2-3 Lakhs per year**

**Project background:** Ahar River receives 100-150 MLD of wastewater (domestic and industrial) and ultimately meets Udaisagar Lake which is the final recipient. The untreated wastewater into the water bodies has  caused decrease in dissolved oxygen, foul odour, presence of faecal coliforms and Eutrophication in the water bodies.

**Technology:** The treatment involves six green bridges at a stretch of 1.6 km at Ahar river. The bridges are of varying length depending upon the width of the river at selected site. Two metal screens are installed at upstream of the bridges to prevent the solid waste entering into the system.  Plantation of local grasses, lemon grass, Typha etc was done to aid the treatment process. The wastewater passes through the green bridge filter which is a combination of coconut coir mats, sand, gravel and boulders. The floatable and suspended solids are trapped which reduces the turbidity of flowing water substantially.

**Green bridge technology:** The technique is based on filtration, biodegradation and biosorption mechanisms by microbes and plants. The system is suitable for in situ treatment in rivers, flowing streams. No skilled labour is required for its operation and maintenance

## Performance

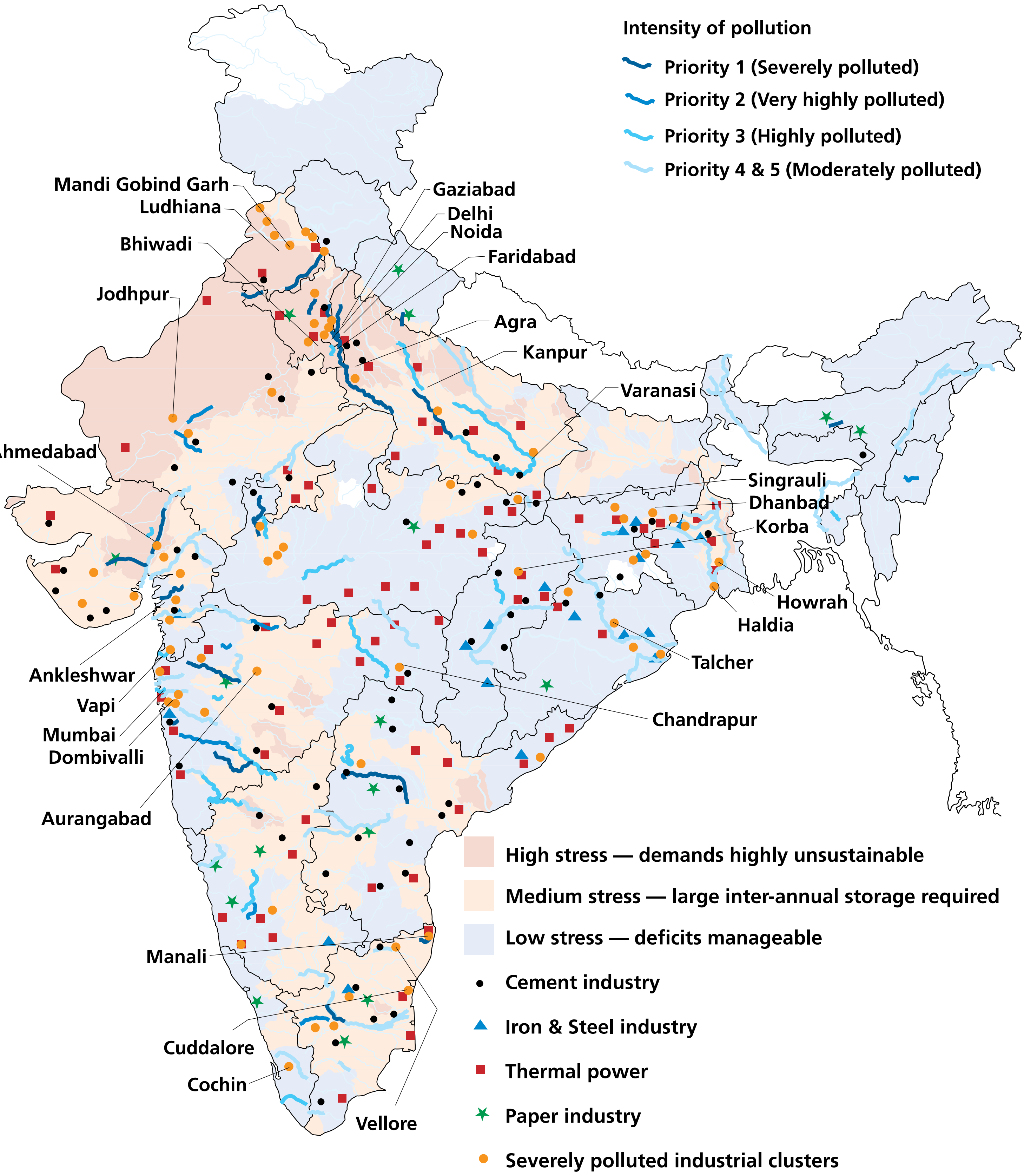
| Parameters | Inlet | Outlet |
|---|---|---|
| pH | 7.8 | 6.8 |
| TDS (mg/L) | 1680 | 1600 |
| DO (mg/L) | 0.7 | 6.9 |
| BOD (mg/L) | 78 | 37 |
| COD (mg/L) | 296 | 165 |

Source: Jheel Sanrakshan Samiti, Udaipur

# Industrial water footprints

## Industry concentration in India

Pollution and water stress around industrial clusters




### Table 1.3: Water demand (in BCM)

Industrial demand continues to grow

| Sector | 2000 | 2025 | 2050 |
|---|---|---|---|
| Irrigation | 605 | 675 | 637 |
| Domestic | 34 | 66 | 101 |
| Industrial | 42 | 92 | 161 |
| Total | 680 | 833 | 900 |

Note: Domestic withdrawals include livestock water demand.
Industrial withdrawals include cooling needs for power generation
Source: Amarasinghe, U. A et al, 2007, India's water future to 2025-2050: Business-as-usual scenario and deviations,: International Water Management Institute,Colombo

### Table 1.4: Water withdrawal in BAU (in BCM)

Demand to rise for key industries

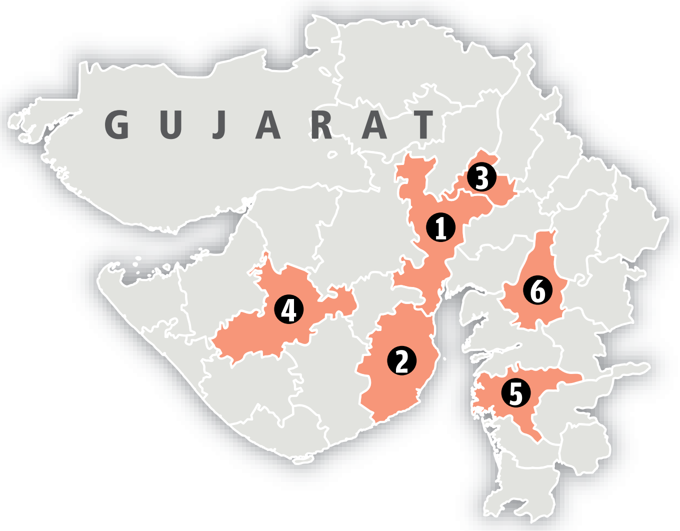
| Sector | 2012-13 | 2016-17 | 2021-22 |
|---|---|---|---|
| Power | 40.8 | 41 | 41.9 |
| Iron & steel | 0.9 | 1.4 | 2.0 |
| Cement | 0.13 | 0.15 | 0.18 |
| Pulp & paper | 0.6 | 0.7 | 0.8 |
| Total | 42.43 | 43.25 | 44.08 |

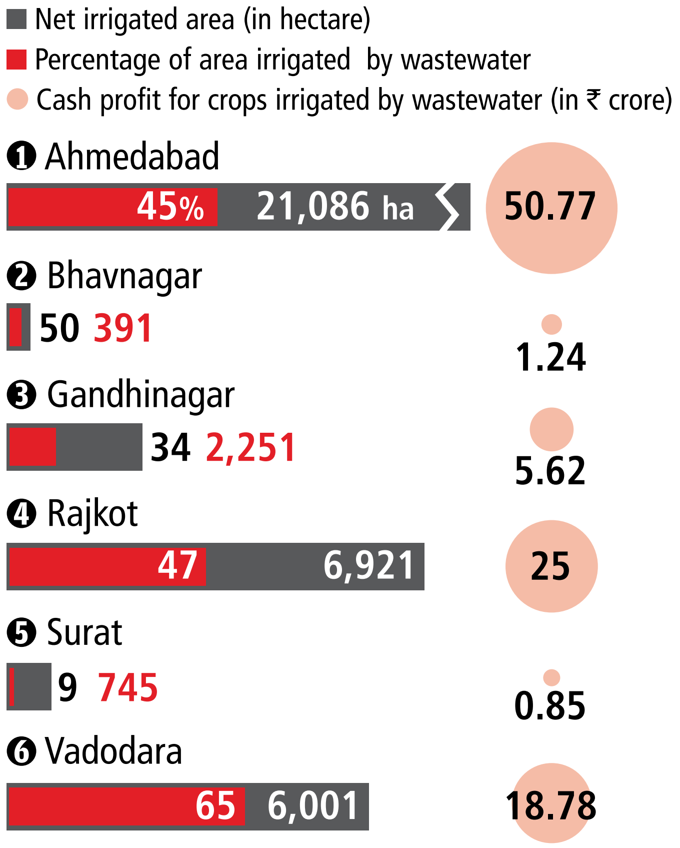
Source: 2014, CSE

# Reuse and recycling

## Smart option

Gujarat, where over 90 per cent of cities do not have sewage treatment plants, manages sewage by using it for farming




Source: People in Centre Consulting

Under the Jawaharlal Nehru National Urban Renewal Mission, 14 cities have included by-laws on reuse of recycled water – Hyderabad, Rajkot Vijayawada, Vishakapatnam, Chandigarh, Delhi, Bengaluru, Mysore, Pune, Coimbatore, Madurai, Chennai, Asansol and Kolkata.

Delhi and Chennai sell their treated sewage