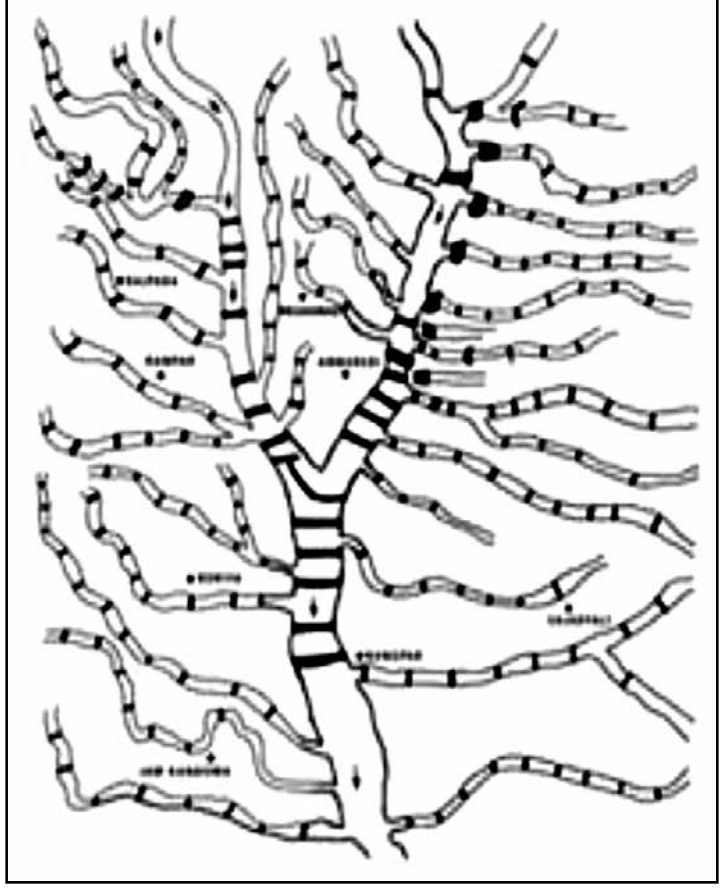
Traditional knowledge- Water for life -I

- Alwar district became completely degraded at the time of independence. The Aravalli range denuded.
- According to remote sensing data, Aravallis were shown as brown areas.
- If a farmer spent ₹10000 on cultivation he only got back ₹500 as return.
- Acute distress migration; some blocks were all-women villages.
- Women had to walk long distances to collect water.
- Less than 3% of cultivable land was irrigated
- Thanagazi, a 'dark zone' in the 1980s, was recently declared a 'white zone' by the irrigation department
- Official documents say that the forest cover is 40 per cent now, a rise of 33 per cent in the past 15 years for the Aravalli.
- In 1987 Vruksh Prem Seva Sanstha Trust encouraged farmers to build check dams in Rajkot district. In 1998, the VPSST constructed check dams to harvest and recharge groundwater in 9 villages
- By the year 2000, farmers began to see the effect of the check dams – water table had increased and there was water available in the wells.
- River Fofal in the region was revived
- Between 2001 and 2007, the Trust helped to construct a series of 1605 check dams in 27 villages of Gondal and Jamkondarna talukas
- In 1995, the five rivers became perennial
- Milk production has gone up by ten times
- In many villages, people have started cultivating sugarcane and wheat, which are water-intensive
- Johads – earthern dams to capture rainwater to percolate down and moisten the soil
- Tarun Bharat Sangh began work in 1985. First work was of repairing a damaged johad
- Impact of first dam was water in dry wells. Decided to focus on water harvesting

Three principles:

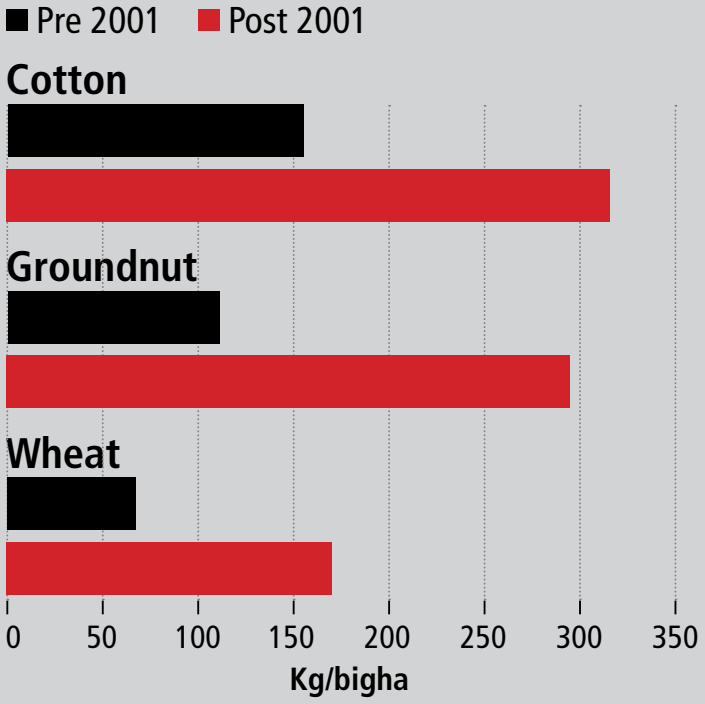
1. Johads should be built to catch water;
2. As the catchment areas are totally degraded, the forest has to be protected and regenerated to halt soil erosion;
3. There should be consensus within the community on the works to be taken up

Estimation of crop production post



Estimation of crop production post groundwater recharge movement

Increase in crop production in Ambaredi village, Jamkondarna taluka



RWH-city bye laws

Chennai :

Building plans will not be approved if RWH is not incorporated. If RWH found missing during inspection, the municipal authority will construct the system and recur cost from the owner. No water and sewage connection without incorporation of RWH.

Mumbai

RWH is compulsory in all new buildings of plot size 300 sq m. No approval will be granted without incorporation of RWH. ₹1000 will be levied for every 100 sq m plot where RWH has not undertaken

Hyderabad

RWH is compulsory in all new buildings. No approval will be granted without it. 10% of additional property tax every year will be imposed as penalty till the regulatory conditions is fulfilled. If RWH is not constructed the municipal authority will construct the system and recover costs from the owner. 10% rebate on property taxes for those who undertake both RWH and wastewater recycling.

Delhi

RWH structures are compulsory in all new buildings of plot size 100 sq m and above. No approval will be granted without incorporation of RWH. Water and Sewage connections will not be given if RWH are not constructed.

My Delhi I care provide financial assistance to the citizens for constructing RWH structures

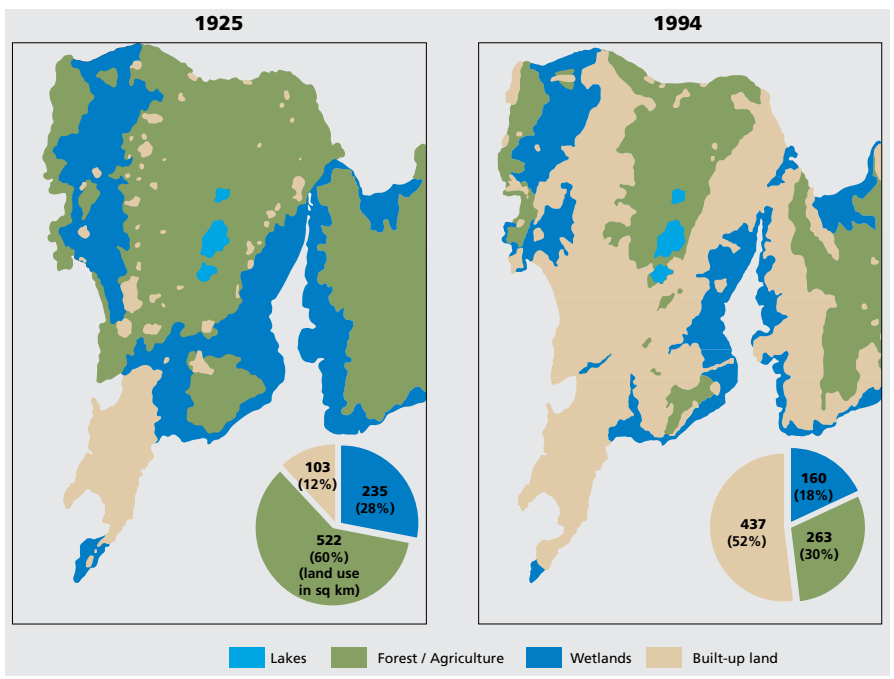
Bengaluru

Bangalore Water Services and Sewerage Board is the key authority.

The major by-laws include: RWH is compulsory with plinth area 100 sq m. Unavailability results in penalty of ₹1000 per annum.

❶ Dry Badkhal due to mining of catchment;
❷ Mumbai 2006; ❸ Uppal lake, Hyderabad;
❹ Encroached and polluted Dal lake

HOW MUMBAI HAS DEVELOPED, AND ITS LAND-USE



*Land use in square kilometres

Lakes: need to be protected

Problems

- Groundwater is not considered as critical for water supply, recharge is neglected, Land is valued, water is not
- No legal protection for city lakes, catchment and drainage systems
- Sponges of our cities then get destroyed
- Domestic as well as industrial wastes into the waterbodies, lack of proper sewage system, encroachments by the government departments, builder lobbies and also unclear laws.
- The process of restoration gets delayed because of the lack of understanding the ecology of the waterbodies, conflict of interests between the land owning agencies and the stakeholders.

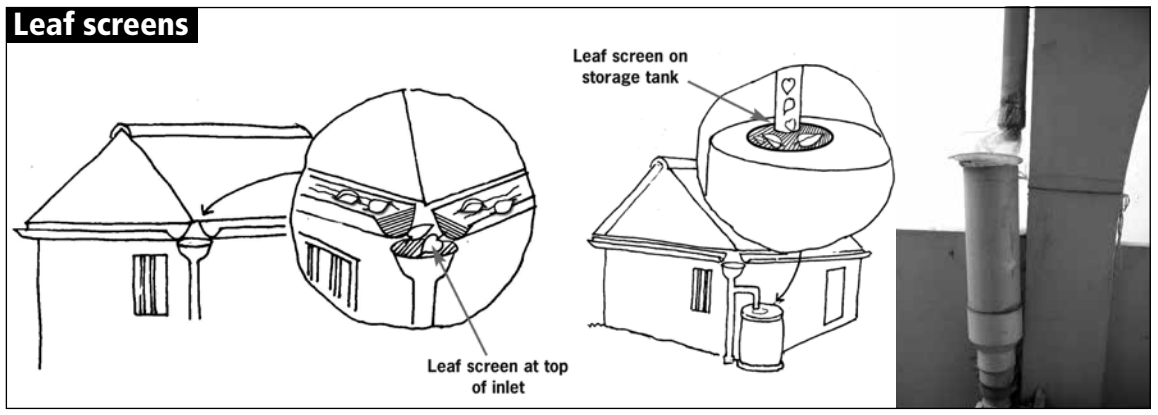
What we need to do?

- With climate change extreme rainfall events will grow
- More rain, fewer rainy days
- Cities need sponges to capture rain, recharge for scarcity
- Need to consider in future planning

The protection of water bodies and their catchment is only half the story. The real challenge lies in ensuring that these bodies are supplied unpolluted rainwater, that is, they are recharged

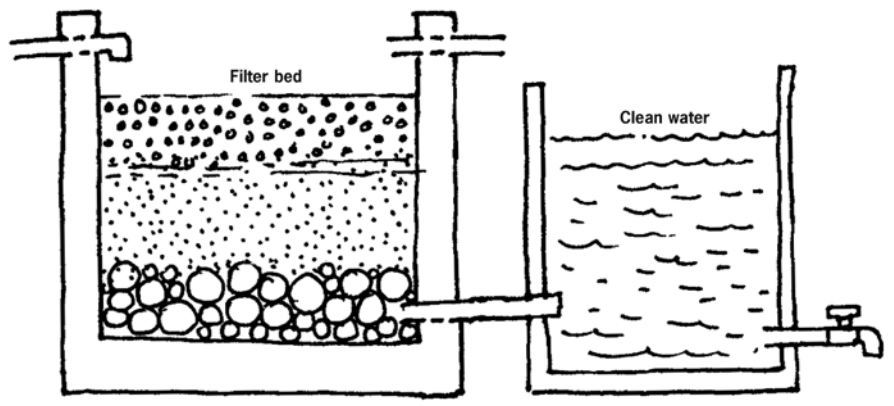
Filter systems

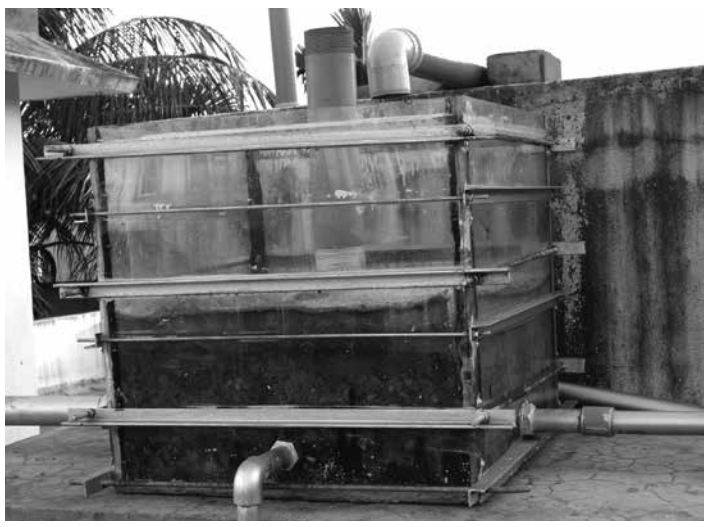
Leaf screens



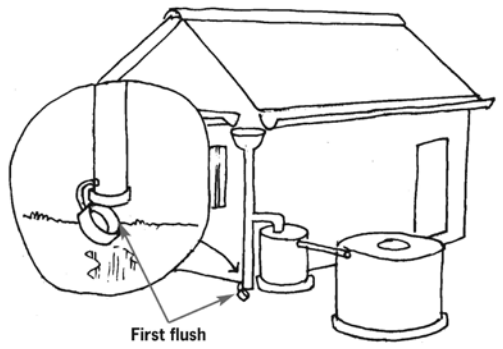
A type of simple sand fiter designed by V N Shroff. It has a combination of sand, pebbles and charcoal within a PVC pipe. A nylon wire mesh covers the inlet

Simple sand filter





Type of simple sand filter being used in the Association of Engineers building, Kolkata. It has gravel and pebbles

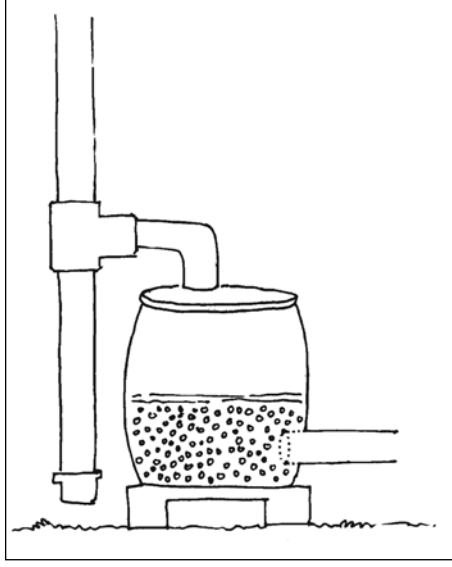


First flush device

First flush diverter manually operated by end cap

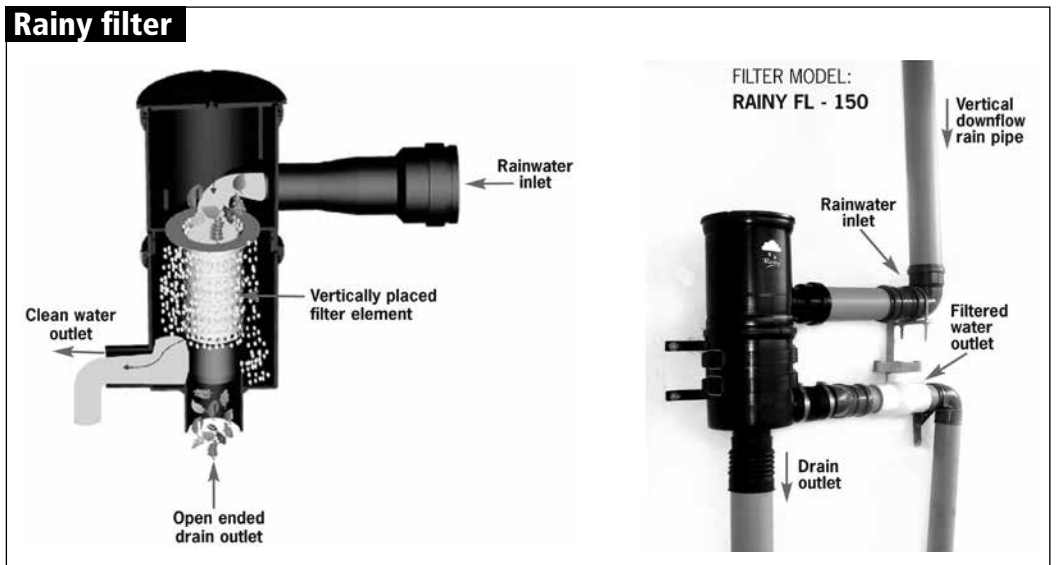
First flush diverter manually operated by a valve - this system is being used in Dewas, Madhya Pradesh

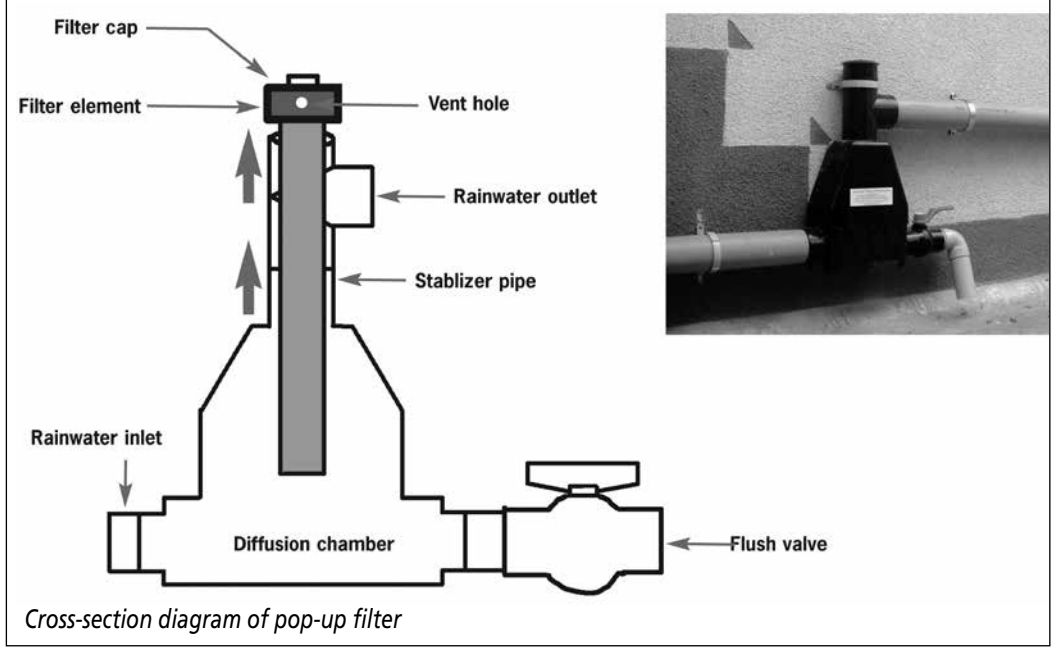
Varun filter



Avariation of Dewas filter used by Ulhas Paranjpe in Mumbai

Rainy filter

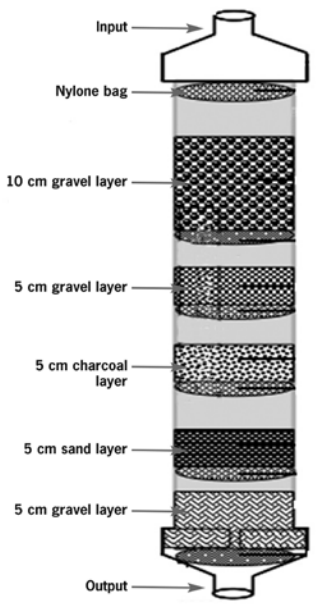




Cross-section diagram of pop-up filter

Vinayak filter

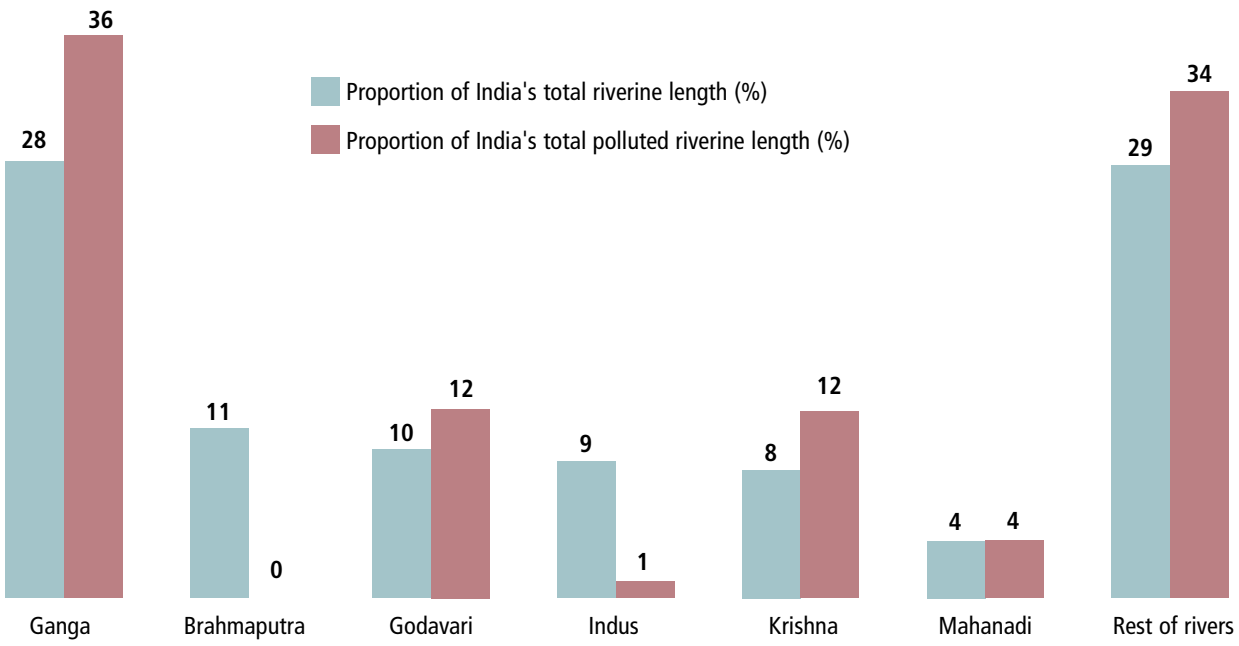
Cross-section diagram of Vinayak filter



Amber filter

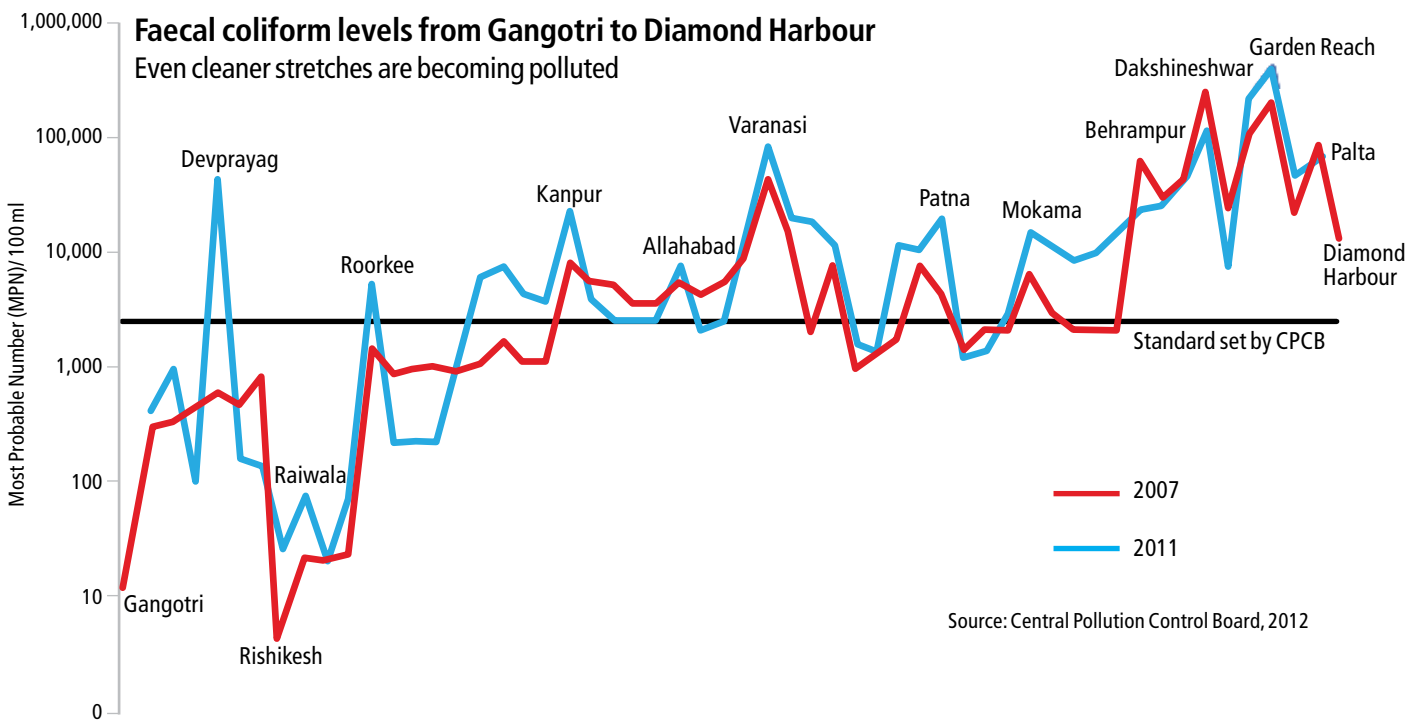
Crisis of our river: Ganga

THE STATE OF INDIA'S RIVERS: THE EXTENT RIVER STRETCHES ARE POLLUTED



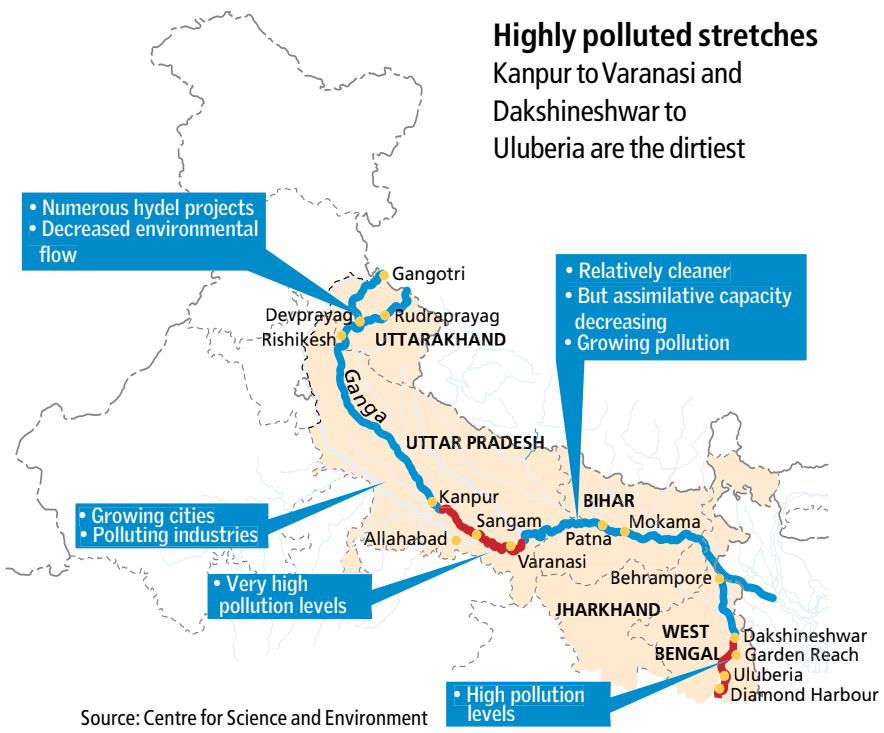
Source: R C Trivedi 2007, *Pollution in our rivers: the CPCB perspective,* presentation, New Delhi, June, *mimeo*

- The inadequate flow of water in the river needed to dilute and assimilate waste
- Growing quantum of untreated sewage discharged from cities along the river
- The lack of enforcement against point-source pollution from industries discharging waste into the river



Source: Central Pollution Control Board, 2012

Ganga is India's largest river basin: it covers 26 per cent of the country's landmass and supports 43 per cent of its population. Despite programmes, funds and some attention, the Ganga still runs polluted



Source: Centre for Science and Environment

State of pollution

How much wastewater states dump into the Ganga

States	Stretch (in km)	Number of drains	Waste water flow (in mld)
Uttarakhand	450	14	440
Uttar Pradesh	1,000	43	3,183
Bihar	405	25	580
West Bengal	520	34	1,179

Source: Central Pollution Control Board, 2013

Technologies for decentralised waste management

Location: **Amarnath, Jammu and Kashmir**
Design capacity: **150 KLD**
Operational since: **2007 and redesigned in 2011**

Project background: Amarnath is an important Hindu shrine – a cave in the highest Himalaya, where each year thousands of devotees reach to pay obeisance to a seasonal ice lingam. The Amarnath Shrine Board who is responsible for the management of the pilgrimage decided to work with bioremediation technologies to treat the sewage of its 0.3-0.5 million pilgrims, who visit within a duration of 45-60 days. In the camp at Nunwan, where the pilgrimage begins, a bioremediation system designed by Mumbai-based company Gurudev International has been put in place.

Technology: A concoction of micro-bacteria cultivated at the site is used. The system is dosed with 1,000 litres of microbes each day. The toilet waste is then collected in large plastic tanks (buried underground), which act as settlers. This settled and treated waste is then taken to a reed bed and oxidation pond where it is mixed, using pumps, with a non-chemical flocculent.

Bioremediation: Bioremediation is a natural process which utilizes the biological entities (microbes, algae, plants etc) to decompose organic waste or contaminants present in the sewage.

Performance: The discharge from this system, tested and monitored, meets all parameters – Biochemical Oxygen Demand is less than 15.

Location: **Lovegrove Pumping Statation, Worli, Mubai, Maharashtra**
Design capacity: **3 MLD (Operational since 2006)**
Capital cost: **₹3 crores**
O&M: **40-45 lakhs/year**

Project Background: The station receives 600 MLD of wastewater. After preliminary treatment through screening, 3 MLD of wastewater is treated through SBT.

Technology: The treatment system has two units of 1250 sq m each called as bioreactor. The perforated pipes are laid on the surface and the wastewater is distributed over the media through these pipes. Bioreactor has different layers consisting of stone or rubble, soil media (weathered rock) containing culture. The wastewater trickles down the bed and undergoes treatment. The treated wastewater is collected in separate collection tanks and then goes to a common polishing pond. The treated wastewater then undergoes chlorination and sand filtration before it is reused.

Soil Biotechnology (SBT): Soil biotechnology, also known as Constructed Soil filter (CSF) is a terrestrial system based on trickling filter principle. The capital cost is ₹10,000-15,000 KLD which is ten times of operation and maintenance cost.

Performance

Parameters	Inlet	Outlet
pH	6.9	7.1
TSS (mg/L)	230	8.0
DO (mg/L)	BDL	3.0
BOD (mg/L)	144	1.2
COD (mg/L)	377	21

Source: Sugam Paryavaran Vikalp Pvt Ltd, Mumbai

Location: **Nichrome India Ltd, Shirwal, Satara, Maharashtra**
Design capacity:**10 KLD (Operational since 2008)**
Capital cost : **₹2.75 Lakhs**
O&M: **₹18000 per annum per year**

Project background: Soil scape filter technology was adopted to treat the domestic wastewater generated by 150 users in the packaging industry

Technology: Estimated wastewater generated is around 7-8 KLD. The waste water is first collected in the collection sump. With the help of the pump, it is transferred to the filtration unit. The waste water through the perforated pipe system is sprinkled over the soil scape filter. The system is planted with Canna indica. The wastewater trickles down vertically and the filtration process takes 10-30 min. The treated waste water is then stored in the storage sump which is reused for gardening.

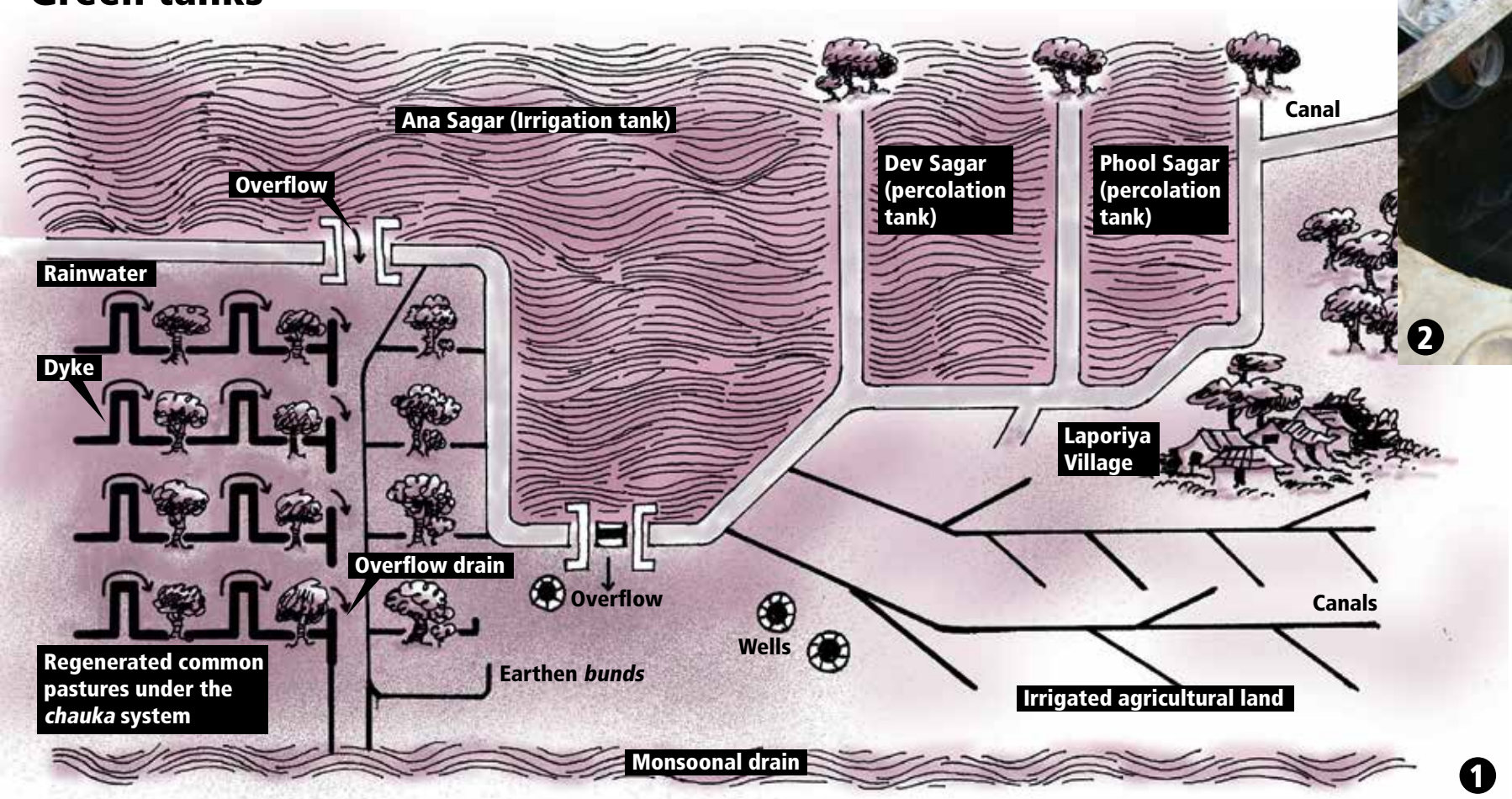
Soil Scrape Filter Technology: This is a vertical filtration process in which pollutant is absorbed over biologically activated medium. It is efficient in treating industrial effluents. The capital cost is ₹20,000-30,000 KLD and O&M cost around ₹1800-2000 KLD/year. No sludge production, no electricity requirement and no skilled man-power

Performance

Parameters	Inlet	Outlet	Reduction (%)
TSS (mg/L)	140	15	89
BOD (mg/L)	180	8	95.5
COD (mg/L)	450	38	91

Source: Shrishti Eco Research Institute, Pune

Green tanks



❶ ~~Dry Badkhal due to mining of catchment;~~ ❷ ~~Mumbai 2006;~~ ❸ ~~Uppal lake, Hyderabad;~~ ❹ ~~Encroached and polluted Dal lake umbai 2006;~~ ❺ ~~Uppal lake, Hyderabad;~~ ❻ ~~Encroached and polluted Dal lake~~

More crops per drop

~~Ganga is India's largest river basin: it covers 26 per cent of the country's landmass and supports 43 per cent of its population.~~