# Excreta Matters

## CSE's 7th State of India's Environment Report

## An introduction


# THE FLUSH, THE CITY AND

India's cities are on a deadly spiral. On one hand, water scarcity is growing; on the other, water is getting more and more polluted, escalating the cost of treatment or leading, increasingly, to more illnesses and deaths. Diarrhoea and other water-borne diseases remain some of the most common causes of death among children under age five.

Our cities must re-invent and re-work the methods and technologies of conveying water and disposing waste. The current method has problems -- it is capital-intensive, creates and maintains a divide between the rich and the poor (evident from the fact that much of urban India does not have access to water or sewage facilities) and is natural-resource intensive (uses water first to flush, then to convey the waste). This system of water-waste management, first invented in the water-and-money rich industrialised world and imitated mindlessly here, can work well only for some. It is not built to work for all.

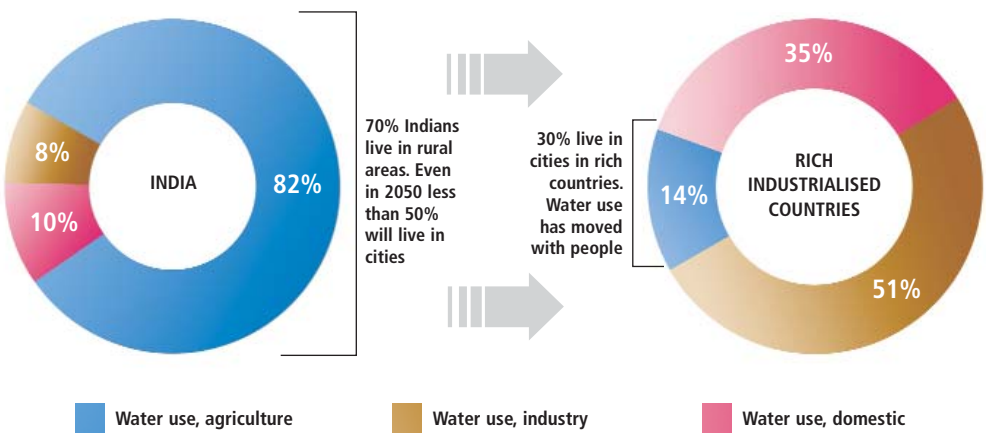
We know India is urbanising fast, literally exploding at the seams. Currently, some 340 million live in cities; by 2030, as estimated, this number will double. Such growth – of cities and, concomitantly, of industries – directly impinges on water use and waste discharge. At the same time, even by 2030, as much as 60 per cent of Indians will continue to live in rural areas. They will continue to depend on agriculture. How, then, will the water be shared?

Forcible 're-allocation' of water between areas becoming urban and those remaining rural is already causing serious conflict. This tension will grow if we cannot manage water use in cities better.

The scenario is bleak because planning today is done without any real data on the use of water. The last estimation of the country's future water needs was done in 1999. It predicted that by 2025, cities and industries would use some 15 per cent of all available water. It did not factor in growth as it is happening today.

**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

# THE RIVER FLASH POINTS

**TONK / RAJASTHAN 2005**
Villagers against diverting water of Bisalpur dam to Jaipur

**NALGONDA / ANDHRA PRADESH 1993**
Villagers against diversion of Krishna water to Hyderabad

**JAMNAGAR / GUJARAT 1999**
Villagers against Kankavati dam water for Jamnagar

**VEERANAM LAKE / TAMIL NADU 2004**
Villagers against water for Chennai

**DEWAS / MADHYA PRADESH 2009**
Farmers damage pipeline carrying water to city

**VISHAKHAPATNAM / ANDHRA PRADESH 2007**
Villagers against further diversion of water for Jindal refinery, as city had already drawn out water meant for irrigation

**SAMBALPUR / ORISSA 2007 (ONGOING)**
30,000 farmers fight to stop industry from sourcing water from Hirakud dam

**VIDARBHA / MAHARASHTRA 2010 (ONGOING)**
Villagers against irrigation water diverted for Sophia power plant

**BHAVNAGAR / GUJARAT 2010 (ONGOING)**
Farmers protest takeover of waterbody by Nirma plant

**SOMPETA / SRIKAKULAM 2010 (ONGOING)**
Two killed fighting takeover of irrigation source by Nagarjuna thermal power plant

**CHHATTISGARH 2010 (ONGOING)**
Scores of protest against diversion to cater to the increase in capacity of thermal and iron and steel plants along the river Mahanadi.

**Forcible 're-allocation' of water between areas becoming urban and those remaining rural is already causing serious conflict. This tension will grow if we cannot manage water use in cities better.**

# WATER'S GREAT MARCH
## HAS GREAT LOSSES AND GREATER COSTS

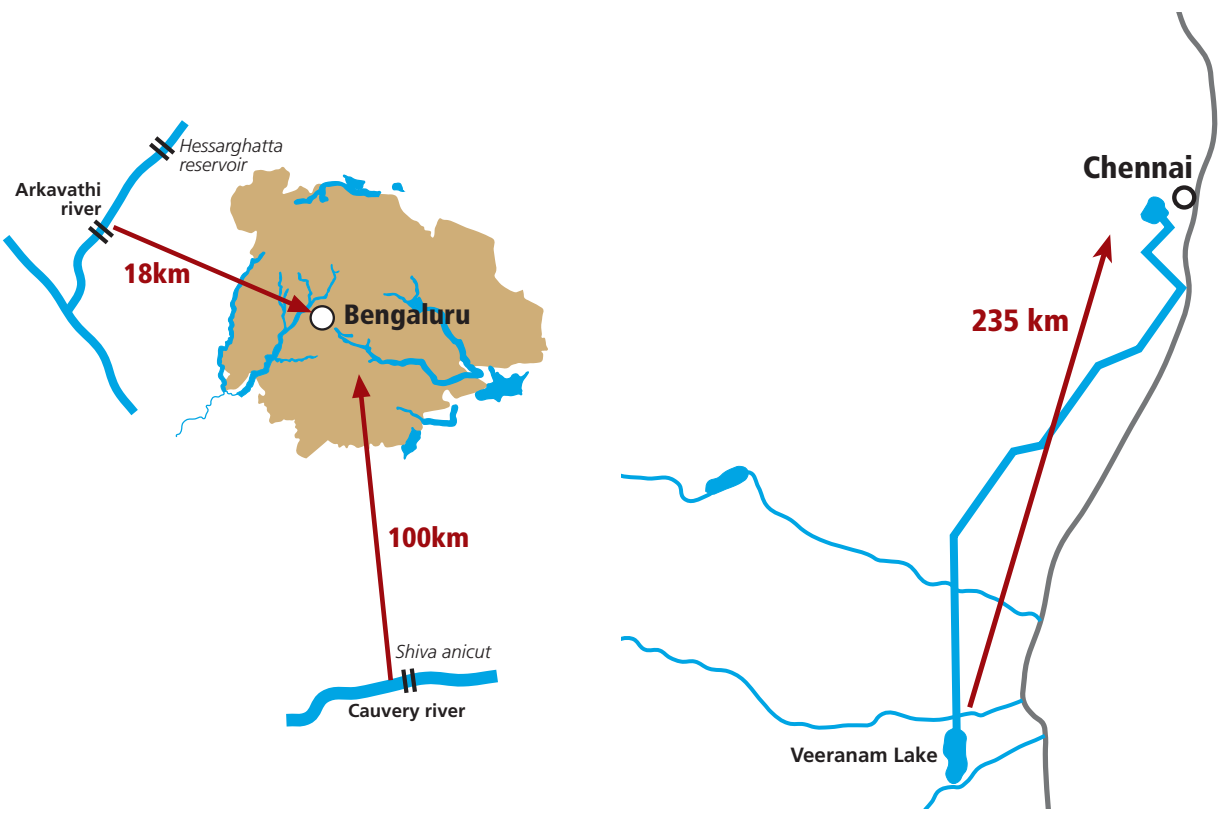
The current obsession is to bring more and more water to cities. But this has a cost. All cities ape the same practice – they bring water from far and distribute it far and wide, losing most of it along the way. The cost of supply goes up, but actual supply goes down.

Today, most cities spend anywhere between 30-50 per cent of their money on electricity to pump water. The cost of building and maintaining water pipelines and distribution networks, too, increases.

This is because the longer the pipeline, ironically the less water there is for supply. Today, municipalities officially report 30-50 per cent of the water they procure for supply as 'lost' in leakages. So there is less to supply and more to pay. The end result: cost of water increases, the city is not able to subsidise the supply of water to all and – ironically – the government ends up subsidising the rich and not the poor. Also, as the city municipal water system collapses under the weight of under-recoveries, the rich move to private water sources like bottled water. It is left to the poor to also suffer the cost of poor health.

Intra-city inequity is simply lost on planners, as water accounts are never maintained to track who is getting water and how much. In this way, two basic requirements of this service – equity in supply and quality of supply – have become insurmountable problems.

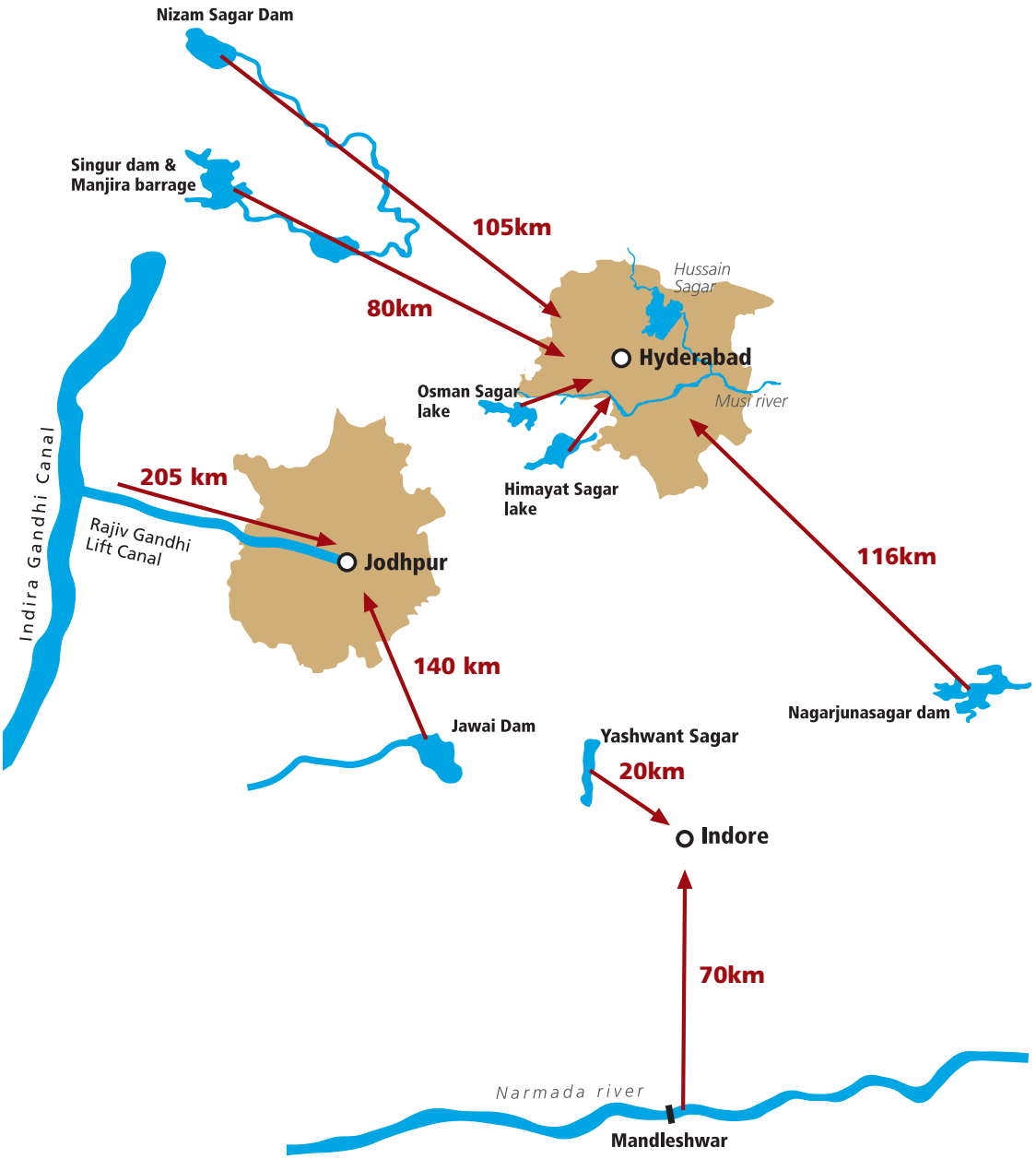
The real gap, therefore, is not between demand and supply of water. The real gap is between supply and supply.



## THE FURTHER A CITY GOES, THE MORE MONEY IT TAKES TO SUPPLY WATER

| City | Source | Distance | Per kl cost to supply (Rs/kl) |
|---|---|---|---|
| Aizawl | River Tlwang | 1,000 metres down the valley, 18 km away | 53.90 |
| Bengaluru | River Cauvery | 100 km from the city | 12.70 |
| Chennai | Lakes, groundwater and Veeranam lake | 60-235 km | 11.60 |
| Delhi | River Yamuna and groundwater | Across the city | 8.70 |
| Indore | River Narmada | 70 km | 11.00 |
| Jodhpur | Indira Gandhi Canal | 205 km | 8.70 |
| Mussoorie | Springwater: Bhilaru, Jinsi, Khandighat, Murray, Mount Rose and Dhobighat | 6-7 km down the valley | 16.80 |
| Mumbai | Bhatsa, Vihar, Tulsi, Tansa, Upper Vaitarna | 100-110 km | 10.70 |
| Hyderabad | River Krishna | 116 km | 6.40-18 |

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




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

# THE X-FACTOR IS GROUNDWATER AND RECHARGE

Today, every city extracts more and more groundwater. Households do it privately, especially when the official pipeline fails to reach water to them. When supply pipeline fails to reach, the water tanker mafia and bottled water rules. If water tariff is increased, households and industries move to groundwater.

But as groundwater use is not factored into city water accounts, nobody knows how much is used or extracted from the aquifers. In this way, no city plans to recharge groundwater. No city values its local water bodies as a key element of its water supply strategy. Instead, these are seen as a lucrative land option – a hole in the ground to be first filled with garbage and then taken over as real estate. The catchment is encroached on – by the poor, thrown out of the city; then by the rich, who need it for their houses. The many functions of water bodies as sources of local water supply, sponges for groundwater recharge or even potential spaces for sewage treatment are forgotten.

Climate change is the next big threat. Already, every intense downpour has become an urban nightmare, as roads waterlog and dirty water floods homes, adding to filth and disease. Scientists predict climate change threats will manifest in more extreme and variable rainfall – it will rain, but within a shorter number of rainy days. Cities, which cry today because of shortages, will weep tomorrow because of torrential downpours.

Clearly, the way to cope with this new threat is to do one better on the water ways of the past, which created water storage as locally as possible. The dictum 'rain is decentralised' should be applied more strenuously in cities today.

# THE WATER-WASTE CONNECTION

All we worry about is water. It is as blinding as an oversight can get, for where there is water there will be waste: roughly 80 per cent of the water that reaches households leaves as sewage. And sewage, once generated, has to go somewhere. It invariably does go – into the streams, ponds, lakes and rivers of the city, polluting the waterworks. Or it goes into the ground, contaminating the same water people use for drinking.

Surveys of groundwater quality today are finding higher levels of nitrate contamination – a sure sign that untreated sewage has found its way into the aquifer. So it is that India's cities find they are in a spiral, costly and deadly. When surface water or groundwater gets contaminated, a city has no option but to hunt for newer sources. Its search becomes more extensive; as the distance increases, so do the cost of pumping and supply.

We know where there will be humans there will be excreta. But there are no national accounts for the excreta we generate, or what we treat or do not. Sewage in cities is measured in the most rudimentary of ways: we simply assume 70-80 per cent of the water municipalities officially supply is returned as sewage.

This is not accurate. There is the water that is supplied but lost. There is the water that households draw from the ground or buy from private tankers. And all this water gets discharged as sewage.

# EXCRETA'S JOURNEY TO POLLUTION

Our planners want a sewage system, which will connect toilets – the flush variety, the WC – to laid-out, concrete underground sewers. This system, it is believed, will magically connect the waste to the treatment plant, which will then treat the sewage and dispose it in the river or the neighbouring water body.

But we are not learning lessons from cases where sewage systems are failing to keep up with the excreta challenge. The problem is the current sewage collection and conveyance paradigm is based on centralised systems. These rely on using a large quantity of clean surface water to transport a small amount of human excreta through expensive sewer lines to an expensive sewage treatment facility, which cannot cope with the amount of waste generated and releases it untreated into the environment. In this way, this system has become part of the environmental problem and not the solution.

The capital intensity of the waste system results in an arrangement whereby cities can only provide for a few and not for all. Most cities cannot afford a sewage drainage system, let alone a sewage treatment system.

The waste system needs capital investment in infrastructure; more importantly, it needs funds for operation, particularly to pay for energy costs of pumping and treatment. The costs of capital investment or the costs of operation and maintenance are not paid for by even the richer users, who use water maximally and thus generate most of the waste.

Moreover, large parts of our modern cities remain unconnected to the sewage system, for people live in unauthorised areas or slums where municipal services do not reach. This is the situation that gives rise to the political economy of defecation, the condition where the rich (who are also the sewage-connected) are subsidised, not the poor.

Currently, India has an installed capacity to treat roughly 30 per cent of the 'official' excreta generated. (The sewage generated in unauthorised slums or settlements is called 'illegal sewage'; city municipalities refuse to consider it in their scheme of things.) But some of these plants do not function because of high recurring costs – electricity and chemicals.

Those that do function cannot because they have no sewage to treat. This bizarre situation arises because, like water pipelines, sewage pipelines have to be built and then maintained. But most of our cities, old and new, do not have underground sewerage systems. Even if they do, the pipes are old and defunct.

Which means, actually only 20 per cent of the human excreta cities generate is treated.

The final blow comes when sewage, 'cleaned' through expensive treatment, is let back out into drains, which carry untreated sewage of the majority. In a situation where municipalities are already not recovering the cost of supplying water, forget sewage treatment, such a blow is indeed cruel.

The end result is pollution. The end result is India, drowning in its excreta.

**EXCRETA MATHS OF INDIA**

Sewage from class I and II cities
**38,255 MLD**

Capacity to treat
**11,788 MLD**
(30 per cent of sewage)

Sewage actually treated, assuming 70 per cent of capacity
**8,251 MLD**

Gap
**30,004 MLD**
22 per cent of sewage generated is treated and 78 per cent goes untreated

# WE ALL LIVE DOWNSTREAM

Cities, industries take water and return waste. This is a fact. It is also a fact that cities and most industries – other than those that use water as raw material – return the bulk of what they withdraw as sewage or effluent.

A city or industry does not "consume" water. The question is whether the wastewater discharged by a city or industry into waterways has been treated to complete the water-to-water cycle. Therein lies the opportunity.

The fact is that each one of us lives downstream. We flush but cannot forget. Each city that discharges its waste into the river does so thinking that the problem of wastewater will go away. But we forget the city upstream will do the same. And as settlements grow, the discharge increases, and if not treated it overloads the waterbody. The river turns into a sewage canal. In a situation, where cities, industries and farmers are all competing to take water from the river, the river has less to dilute the waste. This then means that our rivers do not have the assimilative capacity – their ability to clean the muck discharged in the water between two settlements.

Rivers are not rivers, but modern sewers. This is what needs to be changed.

People downstream drink the sewage of those upstream. Water-borne diseases remain the biggest killers of modern times.

**The flush and the river**

Why is pollution control strategy not working in the country? Simple: not a single city or river treatment system has been designed to clean.

First, there is the pollution-drainage disconnect. Unless the city is able to collect and then convey its sewage, pollution control does not work.

Secondly, the location of the hardware – the sewage treatment plant – is not chosen to facilitate disposal of the treated effluent in such a manner that it can clean the water body. To understand pollution in cities, it is important to understand where the sewage goes. Most cities build a sewage treatment plant wherever land is available. If the plant is near a river then the treated effluent is disposed of in the river; if it is far from a river or lake then it is disposed of in the nearby drain. We don't plan what we should do with the treated water. We plan only for building hardware, not for pollution control.

As a result, pollution control is like chasing a tail, which keeps winding endlessly.

# PRIVATISATION = PANACEA?

No, it isn't. Firstly, huge investment is needed in building sewage infrastructure. For sewage generation of 40,000 million litre daily (MLD), building treatment plants and setting up the entire paraphernalia to manage the sewage will cost some Rs 1,80,000 crore. Compare this to the Rs 50,000 crore spent under the Jawaharlal Nehru National Urban Renewal Mission, and other river and lake pollution programmes.

To top it, cities are growing and adding more water and waste. The unfinished agenda, in short, remains a little more unfinished each day.

Secondly, this infrastructure is not bankable, because the risks of non-payment are high. Worse, the cost of building the system is unknown. It is sometimes said that cities will pay for the costs. People can afford to and they will spend more. All this is true. In fact, municipalities have found they can recover part of their costs through high tariffs on industrial users. They have also learnt (in many cases) to raise tariffs of water and sewage. But how will they recover their bills?

Meters do not exist; where they do, they often do not work. The cost of recovery adds to the costs of operations. Here, inventive solutions are needed. But it is also a fact that the higher the cost of operations, the less the municipality and water agency can and will balance their books. Even a profit-making entity like Chennai's MetroWater is finding that, with expensive projects of desalination, it is slipping into the red. In this supply-obsessed context, there will bound to be less to spend on sewage.

# CHANGING WAYS TO THE FUTURE
# WE WILL HAVE TO THINK DIFFERENTLY

The challenge is two-fold. Rich cities of the poor world will have to invest in efficiency so that they do not, first, become water-wasteful and then learn the science and art of efficiency. On the other hand, they will also have to invest in managing and treating wastewater. The objective is to re-invent the most modern waste management system that reuses every drop of water discharged, at costs that can be afforded by all.

- Firstly, we will have to spend less in bringing water to our houses. In other words, cut the length of the pipeline to reduce electricity and pumping costs and the ubiquitous 'leakage' loss. This means we will have to revive local water bodies and recharge groundwater, so that we can source water from as close as possible.
- Secondly, we must use less, not more water, in our homes, so that we have less to treat and less to dispose off.
- Thirdly, we must again cut the costs and transportation of sewage – use existing drain networks and a variety of technologies to treat sewage as locally as possible.
- Finally, we will have to reuse every drop of sewage – turn it into drinking water with expensive technology or re-use and recycle it in our gardens, industries or use it (after treatment) to recharge groundwater. Life is about re-inventing the cycle of water to water.

It would not be wrong to say the technology of toilets – an equipment to handle human excreta in a safe and hygienic manner – has been the least researched in the world. Toilets need to be re-engineered, so that they are affordable and can function to reuse and recycle the excreta generated. This is a technology challenge we have to work on, using the most advanced science and the most traditional knowledge. We know frontier technologies for toilets exist in space programmes. We also know traditional water systems were engineered in our villages for vulnerability and to optimise on scarce resources. We need the ingenuity and the humility of science to take us to the next generation of sanitation technologies.

But all this requires a major change in mindset so that the rich cities of poor India find innovative answers in their water and excreta management. Modern technologies for cleaning waste are out of the financial reach of the waste-accumulating societies of the poorer world. They are too expensive to install and even more expensive to run.

It is here the challenge lies: to reinvent the paradigm of waste treatment by reinventing the paradigm of waste generation itself.

The answer will lie in doing things differently. Cities must look at their waste economy and invest in reuse. For instance, Singapore uses expensive membrane technology that completely cleans up wastewater, making it potable new water. This is at the expensive end. The other alternative is our cities leapfrog to minimise on generating waste or ensure the waste is segregated – household waste from industrial waste – so that what is relatively less toxic can be cleaned up and then used to recharge groundwater or irrigate fields. This is the win-win for the future.


# EXCRETA MATTERS 71 CITIES: A SURVEY

The second volume of the seventh State of India's Environment report – *Excreta Matters (71 cities: a survey)* – is really the first part. It puts together individual city profiles: each city is mapped to know more about its past, current and future water footprints. Each city is mapped to know more about how much waste is generated and where and how it is disposed off. Each city is mapped to know the state of its river, its lake and its groundwater – how polluted these are and what is the future.

What we have found is a frightening scenario: of policy that was mindless of reality or reality that was increasingly out of hand. Each city showed that sourcing new water was an obsession for planners but not its management. Each city showed that it was not even mindful of its growing problem of waste from its water.

As we went on with our research to put together each city profile, we also found there is just no information about these essential systems. Nothing is known. Worse, nobody is asking. It is almost as if the business of water supply is as opaque as the sewage that floats in it. The business of waste is nobody's business.

In this way, this report has put available information, desperately sourced and pieced together, to provide us the beginning of the new research that needs to be undertaken. We believe this research agenda is both essential and overdue. India is growing in its cities and this growth will have huge implications on the environment and development scenario of our future. But this growth is happening without scrutiny and without knowledge that should drive policy.

The State of India's Environment report and the 71-city Survey is not the last word on the matter of water or waste from our cities. It is the first. But we hope it will stimulate thought and more importantly, prod action for change.

It is in cities that this story began and where it will end. It is clear that unless each city learns to value its water past, it cannot build a water future. It is also clear that unless each city begins to worry obsessively about its sewage it generates it cannot save its rivers or itself. It has to start with changing itself.

We believe also that this can only happen if and when people – citizens of a city – understand their water-excreta story. They must know where they get their water from and where their flushed waste goes. The river or lake cannot be cleaned unless we know the story of our flush, our city and our river. It is a geography lesson of our lives. It is a lesson we better learn and fast.

*Sunita Narain*

# THE 71 CITIES

### THE HIMALAYA

Dehradun • Jammu • Mussoorie • Nainital • Srinagar • Uttarkashi

### INDO-GANGETIC PLAINS

Agra • Allahabad • Amritsar • Bathinda • Delhi • Faridabad • Gurgaon • Kanpur • Lucknow • Mathura • Meerut • Patna • Yamunanagar & Jagadhari • 12 cities of Punjab (Khanna, Malout, Mansa, Budhlada, Baretta, Bhucho, Goniana, Kot Fatta, Maur, Raman, Rampura and Sangat)

### EASTERN HIGHLANDS

Dhanbad • Hazaribagh • Ranchi

### THE NORTHEAST

Aizawl • Guwahati • Siliguri

### THE DESERT

Alwar • Bhilwara • Jaipur • Jodhpur • Udaipur

### CENTRAL HIGHLANDS

Bhopal • Dewas • Gwalior • Indore • Jabalpur • Jhansi • Nagpur • Rajkot • Ujjain • Vadodara

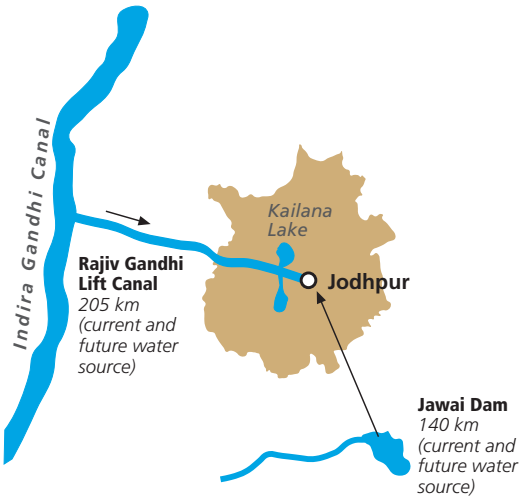
### THE DECCAN

Aurangabad • Bengaluru • Baramati • Hubli-Dharwad • Hyderabad • Pune • Solapur • Tumkur

### COASTAL CITIES

Bhubaneswar • Chennai • Cuttack • Kolkata • Kozhikode • Mumbai • Puducherry • Srikakulam • Surat • Thane • Thiruvananthapuram





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