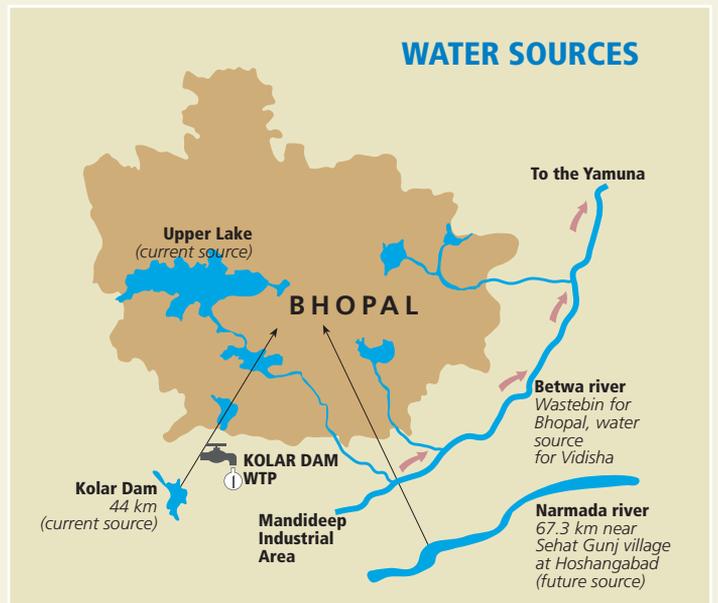
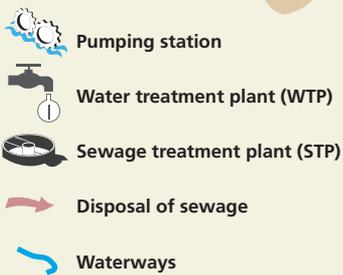


## BHOPAL

### THE WATER-WASTE PORTRAIT

*Ironically, this city of lakes is also gaining notoriety for its water crisis. Instead of managing its own water sources, Bhopal is eyeing distant sources like the Narmada*



# Bhopal

Bhopal, the capital of Madhya Pradesh, is witnessing rapid urban development and industrialisation. Over the decade of 1991-2001, its population had grown at about 3.5 per cent per year, higher than the national average of 2 per cent.<sup>1</sup> This surge has put the city's available water resources under immense pressure.

Bhopal's water supply and sanitation responsibilities are ostensibly vested with the state government's Public Health and Engineering Department (PHED). However, the real picture is not that simple: since 1995, the PHED has been given charge of planning, design and construction of water supply, sewerage and drainage projects. Under this arrangement, the financial and administrative sanction for a project comes from the PHED. The assets, however, have to be transferred to the Bhopal Municipal Corporation (BMC) on completion for all operations and maintenance – which the BMC does with the help of engineering staff deputed from the PHED. Thus, while the PHED's staff work under the functional control of the BMC, their administrative control remains with the PHED. As a result, the system suffers from dualities and blurred accountabilities.<sup>2</sup>

## WATER

### DEMAND, SUPPLY AND SOURCES

As in most large cities, demand and supply estimations for Bhopal vary widely between agencies. According to the BMC's calculations done in 2005-06, the city gets a supply of 266 million litre a day (MLD). But leakage losses of 35 per cent leave it with a shortfall of 108 MLD (see Table: *The water*).<sup>3</sup>

The majority of Bhopal's drinking water supply is met by two surface water sources: the Upper Lake and the Kolar reservoir. Besides, there are tubewells, handpumps and a few large diameter dugwells. Bhopal also has an unaccounted number of privately owned dugwells and borewells (see Box: *Groundwater in Bhopal*). Out of its total supply, the city gets about 135 MLD from Kolar, 99 MLD from the Upper Lake and 33 MLD from groundwater. Surface water accounts for 88 per cent of the total supply.<sup>4</sup>

In the past, the city had depended on the Upper Lake for all its drinking water. One of the oldest human-made lakes in India, this mammoth waterbody was built by King Bhoj in the 11<sup>th</sup> century.<sup>5</sup> A piped water supply system was first developed in the 1940s for the old city area; this was augmented and expanded as per demand. It is said that the lake's water quality was so good till 1947 that its water could be consumed directly without any treatment. In 1989, the potential yield of the lake was raised from 86 MLD to 135 MLD with the building of the Kolar Dam near Birur

### THE CITY

Municipal area	285 sq km
Total area	601 sq km
Population (2005)	1.6 million
Population (2011), as projected in 2005-06	2 million

### THE WATER

<b>Demand</b>	
Total water demand as per city agency (PHED)	281 MLD
Per capita water demand as per PHED	176 LPCD
Total water demand as per CPHEEO @ 175 LPCD	280 MLD
<b>Sources and supply</b>	
Water sources	Upper Lake, Kolar Dam
Water sourced from surface sources	88%
Water sourced from ground sources	12%
Total water supplied	266 MLD
Per capita supply	166 LPCD
Leakage loss	35%
Actual supply (after deducting leakage losses)	173 MLD
Per capita supply (after deducting leakage losses)	108 LPCD
Population served by water supply system	67%
Per capita supply in the served area	NA
Demand-supply gap (after leakage losses)	108 MLD
<b>Treatment</b>	
Number of WTPs	10
Total treatment capacity	308 MLD
Actual treatment	260 MLD
<b>Future demand and supply</b>	
Demand (2011), as projected in 2005-06	344 MLD
Augmentation needed to meet 2011 water demand	78 MLD
Required increase in supply	29%

### THE SEWAGE

<b>Generation</b>	
Sewage generated as per CPCB	285 MLD
Sewage generated as per city agency	193 MLD
<b>Collection</b>	
Length of sewerage network	210 km
Population covered by sewerage network	28-30%
Area covered by closed sewerage network	40%
<b>Treatment</b>	
Number of STPs	8
Total treatment capacity	76 MLD
Actual sewage treated	39 MLD
<b>Disposal</b>	
	Upper and Lower lakes*

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

**Note:** \*And through them, into the Patra, Halali and Betwa rivers

## GROUNDWATER IN BHOPAL

*About 40 per cent of citizens own and use borewells*

Bhopal's supplementary source, groundwater, mainly comes from 42 dugwells, 541 tubewells and 1,295 handpumps. The majority of the 33 million litre a day (MLD) supply is from dugwells, as the region's rocky strata does not support deep tubewells.<sup>1</sup>

It is estimated that about 35 to 40 per cent of the population of Bhopal uses its own borewells to meet its daily water needs. There are 35,000 private borewells within municipal limits; the number can go up to 50,000 if the fringe area is included. If we go by the numbers of borewells inside the city, and assuming they are pumped for five hours every day with an average yield of 3,000 litre per hour, the groundwater extraction in the city works out to be 525 MLD, twice the quantity supplied by the government.<sup>2</sup>

Assuming a low per capita consumption of 100 LPCD and given that 35-40 per cent of the population is dependent on private sources, the groundwater supply in the city works out to be about 595 MLD. Thus, based on this groundwater usage, sewage generation in Bhopal could amount to 476 MLD.<sup>3</sup>

A Central Ground Water Board (CGWB) study indicates that

groundwater levels in the city are declining at an average annual rate of 0.4-0.6 metre (m). The water table has gone down by 4-6 m between 1993 and 2003. Quality is also an issue, as nitrate concentrations are high; the northern and central parts of the city also suffer from salinity of groundwater due to high chloride concentration. The high nitrate concentration is due to disposal of untreated sewage through open and unlined drains/*nullahs* and indiscriminate dumping of solid wastes.<sup>4</sup>

In 2004, a study by the Central Pollution Control Board (CPCB) had examined 25 groundwater samples from various sources around the city. More than 75 per cent of the samples had total dissolved solids (TDS) and alkalinity levels above the desirable limit, while about 50 per cent had higher hardness values than prescribed. The study also indicated bacterial contamination at many places.

The decline in groundwater levels continues. According to a recent report in June 2011 in the financial daily *Business Standard*, groundwater has reached an "alarming low" of some 244 m in some areas like east and west Bhopal.<sup>5</sup>

There is an immediate need to adopt suitable measures for proper disposal and treatment of sewage at identified sites. For drinking water wells, it is important to ensure that their intake points are not in direct contact with pollution from ground surface.

**TABLE: TREATED WATER FROM VARIOUS SOURCES**

*Most of Bhopal's water sources are located – and their waters treated – within city limits*

Source	Distance from city (km)	Abstraction of raw water (MLD)	Remarks
Upper Lake	Within city limits	99	Rain-dependent; generally sustainable
Kolar Dam	32	135	Rain-fed; sustainable
Local groundwater	Within city limits	33	Over-extraction; unsustainable

Source: Anon 2005, *Bhopal Development Plan*, Town and Country Planning Organisation, Bhopal, mimeo

village, about 32 km from Bhopal.<sup>6</sup>

The 2,850 hectare (ha) Kolar is also being exploited for recreation, fishing and irrigation. Bhopal's other dams – the Kalia Sote (113 ha), the Hatai Kheda (126 ha) and the Kerva (524 ha) – are mainly used for irrigation (see Table: *Treated water from various sources*).<sup>7</sup>

### TREATMENT

Most of Bhopal's water sources are located within two to five km (approximately) of the treatment plants; the city has 10 of these, with a total treatment capacity of 308 MLD. According to inputs from the BMC in 2005-06, these 10 plants ran at an 84 per cent utilisation capacity, and could treat only 260 MLD.<sup>8</sup>

The plants have been using the conventional water treatment system with rapid sand filter-type technology for primary, secondary and tertiary treatment. However, the problem of pollution in waterbodies has persisted during peak summers and monsoons.<sup>9</sup>

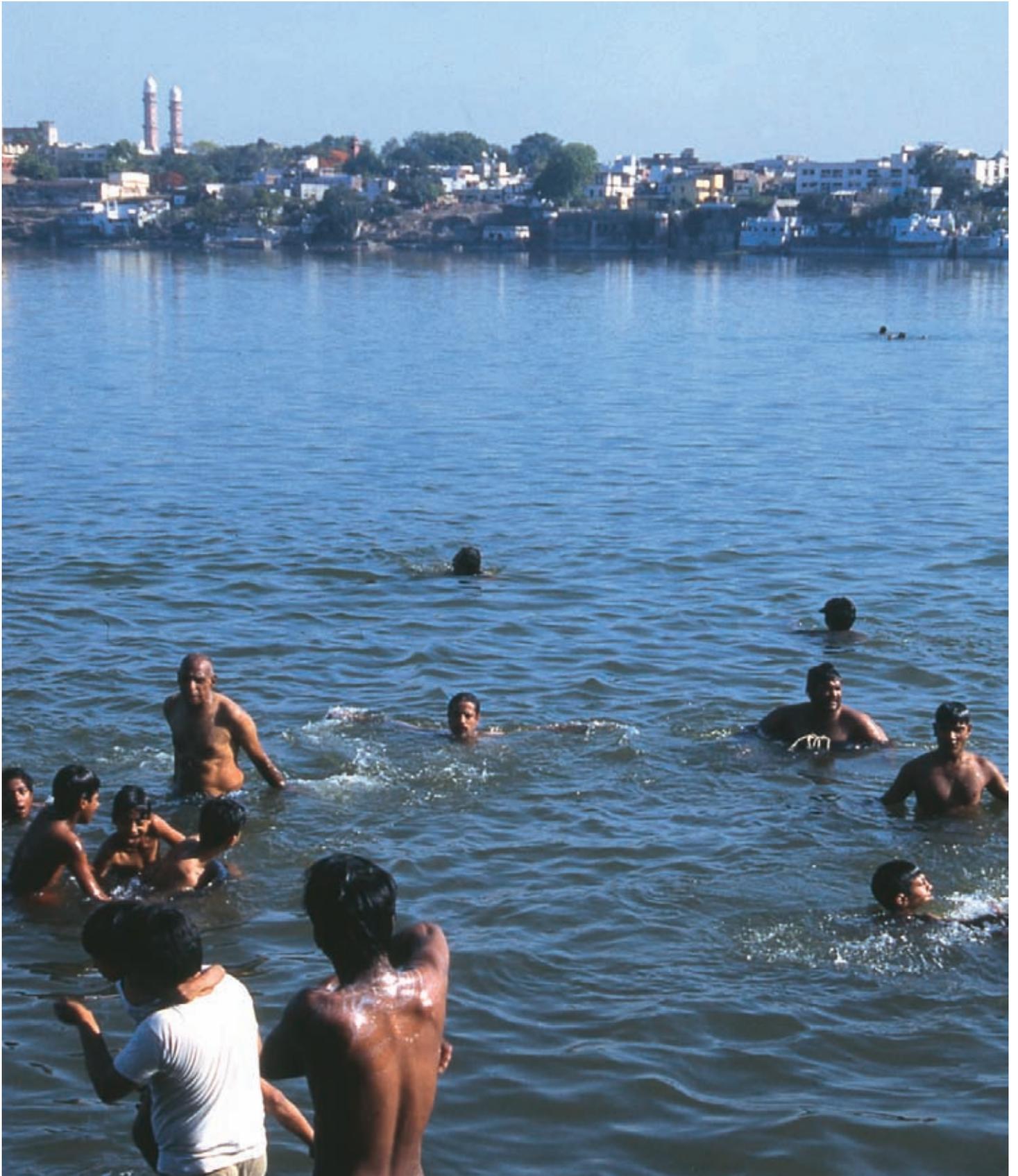
Raw water from the Upper Lake is abstracted for municipal supply at seven different points around the lake and pumped to an equal number of independent water treatment plants (WTPs).

All the seven plants have been commissioned between 1945 and 1965, and their efficiencies had reduced considerably over the years – the capacity as of 2005-06 being only 81 MLD. A thorough upgradation and improvement of equipment and structures of these WTPs is a must.<sup>10</sup>

Raw water from Kolar is pumped to a 154-MLD treatment plant by two long pipes, 36 km long. After treatment, the water is pumped to the service reservoirs. The treatment plant was commissioned in 1990; owing to a reduction in efficiency, at the time of the CSE survey in 2005-06, it was producing only about 135 MLD of treated water.<sup>11</sup>

### DISTRIBUTION

Piped water supply in the city covers about 67 per cent of the population; the rest have to depend on handpumps and private borewells. If we presume that of the total population in 2005, 100 people depended on each community tap and handpump in the city, about 35 per cent of Bhopal's population could be said to be getting its daily supply from community taps and handpumps; of this, 27 per cent might have community taps as their exclusive source.<sup>12</sup>



ARVIND YADAV / CSE

*Bhopal's Upper Lake: it is said that the lake's water quality was so good till 1947 that its water could be consumed directly without any treatment. Not any more – the lake has now become a waste receptacle*

## A POISONED LEGACY

*Groundwater near the Union Carbide factory turns toxic, while regulators look the other way*

The 1984 gas leak disaster has been revisiting Bhopal in many ways, and one of the casualties has been the groundwater in and around the area of the abandoned Union Carbide facility. In 2007, organisations fighting for the cause of the disaster victims alleged that the Madhya Pradesh Pollution Control Board (MPPCB) had been suppressing information about the presence of highly toxic chemicals and heavy metals in the groundwater. This water was being used by over 25,000 people.

Quarterly monitoring reports on groundwater quality between October 1996 and July 2007 clearly indicated the presence of toxins and chemicals such as trichlorobenzene, lindane, benzene hexachloride, heptachlor, mercury, nickel and cadmium. These are known to damage the liver, kidneys, brain and reproductive, immune and other systems, as well as cause cancers and birth defects. The information was obtained through the Right to Information Act.

Reportedly, the MPPCB had not only suppressed this vital information for as long as five years, it had also deliberately stopped testing samples for certain chemicals once the problem had been identified. Thus, in November 2005, after finding trichlorobenzene to be eight times higher in concentration than the limits prescribed by the World Health Organization, none of the samples collected in the

eight quarters in 2006 and 2007 was tested for this chemical.<sup>1</sup>

In 2009, Centre for Science and Environment's (CSE's) Pollution Monitoring Laboratory tested water and soil samples from in and around the Union Carbide factory for the presence of toxic chemicals. Four groups of chemicals were selected for testing: chlorinated benzene compounds, organochlorine pesticides, heavy metals, and the two main products which the company used to make (Carbaryl and Aldicarb). The laboratory collected one surface water sample from inside the factory and 11 samples from handpumps, borewells and dugwells in the areas around the site.

All the samples were found to be highly contaminated. The surface water sample collected from inside the factory had a pesticide concentration of 0.2805 ppm – which is 561 times more than the Indian standard. The tests showed that groundwater in areas even three km away from the site contained almost 40 times more pesticides than Indian standards.

According to the CSE research team, the profile of the chemicals found within the factory matched the chemicals found in the samples taken from the colonies outside it. The study established the fact conclusively that the Union Carbide factory is the genesis of the contamination.

CSE researchers have found that people living around the accident site continue to suffer from diseases ranging from chronic ailments to abnormalities. The question that now arises is, who will take charge of and pay for cleaning up the place?<sup>2</sup>



SURYA SEN / CSE

*The agony endures: contamination of water around the factory site might be claiming new victims*

Till 2005, out of Bhopal's 97,092 water connections, 95,808 were domestic. The operations and maintenance of the treatment plants and distribution system was undertaken by the BMC, with assistance from engineering staff deputed from the PHED, with a total staff strength of about 1,500, including 75 of the engineering cadre. This worked out to be a little over 15 employees per 1,000 connections (much higher than the Asian average of 12 per 1,000).<sup>13</sup>

Apart from domestic connections, the city also had 147 industrial connections and 331 connections for supplying water to religious sites. This water was supplied through 5,000 community taps. Tankers of 10 kl capacity were also used for supplying water, especially during summers. In the period 2005-06, Bhopal had about 70 tankers for this purpose, which made a total of 200 trips per day and supplied about 140 MLD.<sup>14</sup>

Although sufficient water is being produced in the treatment plants of Bhopal to satisfy the prescribed per capita supply rate, actual supply is limited to barely two-three hours daily at low pressure. The gas leak-affected areas have been the worst hit with no water supply network and contaminated groundwater (see Box: *A poisoned legacy*). The existing water distribution system in the old city areas is not supported by adequate storage facilities, resulting in low-pressure supply at the consumer's end. Increasing population and growing municipal limits are also taxing the distribution system.

The city's peripheral areas are served largely by dugwells; there is a lack of adequate distribution systems. These areas, including many new colonies on Airport road, Hoshangabad road, Raisen road, Berasia road, Kolar road and Vidisha road, face acute scarcity in dry summers.<sup>15</sup>

Bhopal's standposts are unmetered and a major source of wastage. In addition, there is significant leakage in pipelines, which suffer from a lack of repair. As of 2005-06, the BMC estimated that there were at least 25,000 illegal connections eating into the distribution system.<sup>16</sup>

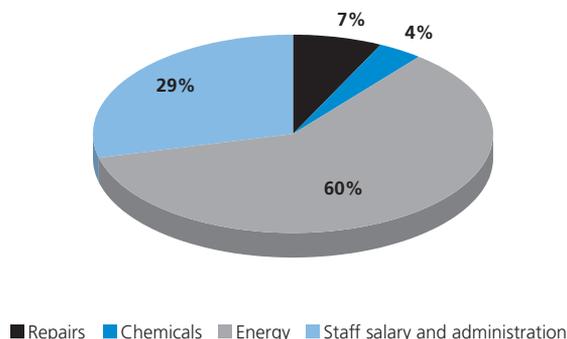
## THE ECONOMICS

The BMC has a water tariff system for metered and unmetered connections, divided into three broad categories: domestic, non-domestic and industrial (see Table: *Water tariffs*). Last revised in

TABLE: WATER TARIFFS			
<i>Meters exist, but billing is still done at a flat rate</i>			
Flat rate (Rs / month)			
Size of pipe	Domestic	Commercial	Industrial
½ inch	150	500	600
¾ inch	300	1,000	1,000
1 inch	600	1,500	1,500
1½ inch			1,500
2 inch			1,500

Source: <http://www.bhopalmunicipal.com/water.htm> as viewed in June 2011

**GRAPH: WHERE THE BMC SPENT ITS MONEY**  
It manages to recover a mere 36 per cent of expenses



Source: Based on data received from Bhopal Municipal Corporation, 2005-06

April 2002, a flat rate water tariff is applicable either based on volumetric consumption and/or a fixed monthly charge. Even though few metered connections do exist, the billing is done at a flat rate. The income from water tax had showed an increasing trend – Rs 1,262 lakh in 2004-05 from Rs 1,067 lakh in 2000-01.<sup>17</sup>

In 2005-06, the total annual cost of supplying 266 MLD of water was about Rs 35 crore (see Graph: *Where the BMC spent its money*). Hence, the production cost per kl was Rs 4. In 2003-04, the BMC managed to collect a revenue of just Rs 0.88 per kl: this means the corporation could recover only 36 per cent of the production expenses.<sup>18</sup>

## SEWAGE

### GENERATION AND COLLECTION

Bhopal probably generates far more sewage than what is claimed by the BMC – since it consumes a lot more water than estimated: a large section of its population has to meet its daily needs from private borewells and tankers vending water from ground sources (see Graph: *Estimates of sewage generation*).<sup>19</sup>

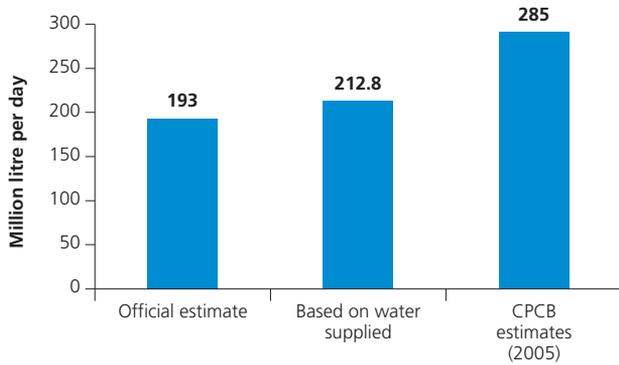
About 40 per cent of Bhopal has a sewerage network, which covers about 28-30 per cent of the population. Of the 66 wards within municipal limits, 10 are fully sewered and 18 partially sewered (see Table: *Sewerage network in Bhopal*). Nearly 50 per cent of the city's old and dilapidated sewerage lines were marked for urgent repair. Most of the city's raw sewage flows into the Upper Lake and then empties into the Patra, Halali and Betwa rivers.<sup>20</sup>

### TREATMENT AND DISPOSAL

At the time of the CSE survey, Bhopal was treating only about 20 per cent of its sewage. Of the 193 MLD officially generated, only 39 MLD was carried through the sewerage network for treatment in the city's eight sewage treatment plants (STPs). The remaining sewage was disposed off into water sources like the Upper Lake. The treated waste was disposed off downstream of Bhopal's lakes and into the drains, from where it flowed into the rivers.<sup>21</sup>

**GRAPH: ESTIMATES OF SEWAGE GENERATION**

*Bhopal probably generates far more sewage than what is claimed by its municipal corporation*



**Source:** Based on data received from Bhopal Municipal Corporation, 2005-06

Many of the city's septic tanks are in a dilapidated state. According to the 2005 *City Development Plan*, they had not been cleaned in several years, and many of them did not have soak pits. As a result, raw sewage finds its way to nearby stormwater drains. A large number of households in slum areas have to use dry latrines or resort to open defecation.<sup>22</sup>

**TABLE: SEWERAGE NETWORK IN BHOPAL**

*The city's closed drains reach only 28-30 per cent of its population*

Type	Per cent of city covered
Closed drainage	40
Open drainage	50
No drainage	10

**Source:** Based on data received from Bhopal Municipal Corporation, 2005-06

The BMC has some mobile vacuum suction and sewer-jetting machines for maintenance of septic tanks, manholes and sewers, but these are totally inadequate to cater to the needs of the entire city. In 2004-05, the corporation invested almost Rs 4 crore towards maintenance of the sewerage network.<sup>23</sup>

The BMC area has about 210 km of non-contiguous underground sewers in three different catchments. The sewage generated from Bairagarh is collected in a 16-km sewer line with two pumping stations and is treated in a 4.5-MLD oxidation pond. The sewage from Old Bhopal is collected in a 24-km sewer line with five pumping stations; it is then either discharged into the Patra *Nullah* or taken to the STP under the Bhoj Wetland Project. The project's sewage is collected in a 61.7-km sewer line with



ARVIND YADAV / CSE

*Nearly 50 per cent of the city's old and dilapidated sewerage lines need repair. The system, which covers just 40 per cent of Bhopal's area, can cater to only about 30 per cent of the population*

**TABLE: POLLUTION IN BHOPAL'S WATERWAYS***The waters of the lakes do not meet drinking water standards*

Disposal	Location	pH	DO (mg/l)	BOD (mg/l)	Total coliform (MPN/100 ml)
Upper Lake	At intake point	8.1	8.6	3	2040
Lower Lake	At outlet point	8.1	7.6	6.3	2400
CPCB standard*		Between 6 and 9	4 or more	3 or less	5000 or less

**Source:** Anon 2006, *Status of water quality in India-2004*, Central Pollution Control Board, New Delhi

**Note:** \*Drinking water source after conventional treatment and disinfection

11 pumping stations and treated in five STPs (total capacity of which stands at 58 MLD).<sup>24</sup>

The sewerage system in New Bhopal (the state capital) area is almost 40 years old. The system operates through a 108-km sewer line with six pumping stations and two STPs: a 13.5-MLD bio-filter plant at Mata Mandir and a 4.5-MLD oxidation pond at Bawadi Kallan. Of these, the bio-filter plant is not functioning properly. Treated sewage from the plant is discharged into a nearby drain which also carries sewage from other areas; this results in mixing of treated effluents and raw sewage. The drain opens into the Shahpura Lake, polluting it.<sup>25</sup>

The oxidation pond does not fare any better. Its embankments and sewage channels (inlet and outlet) as well as the pumping station at the entry to the plant are severely damaged. Silt and sludge deposits cover the ponds, and weeds are growing in them. The plant is non-functional at present.<sup>26</sup>

The pumping stations are also in a critical state. For instance, the Habibganj sewage pumping station, which pumps sewage to Old Shahpura Pumping Station, has been rendered ineffective as sewage does not reach it due to broken and choked lines.<sup>27</sup>

## IMPACTS

### POLLUTION OF WATERBODIES

Bhopal's Upper and Lower lakes together constitute what is known as the Bhoj wetland. Of these two, the Upper Lake is one of the major sources of water for the city, providing drinking water to 40 per cent of the population. The inflow of raw sewage into the two lakes has deteriorated their water quality (see Table: *Pollution in Bhopal's waterways* and Box: *Cleaned out!*).<sup>28</sup>

Most of the city's sewage ends up eventually in the Patra, Halali and Betwa rivers. These rivers are highly polluted; their waters meet bathing and irrigation standards, but not those for drinking.

### LAKE CLEANING PROGRAMME

A programme of conservation and management of the Upper and Lower lakes has been undertaken by the state government's housing and environment department, under a Japan Bank for International Cooperation (JBIC)-funded project called the 'Lake Bhopal Conservation and Management Project', or the Bhoj Wetland Project.<sup>29</sup>

The aim of the project is to intercept the *nullahs* carrying sewage and prevent their discharge into the lakes. The project covers 23 municipal wards – 18 per cent of the city's area – and about 20 per cent of the population.<sup>30</sup>

Three independent sewer networks – Gandhi Nagar, Maholi and Kotra – have been completed under the project. Each network has pumping stations, collection systems and STPs; about 62 km of gravity sewers, 24 km of force main, eight pumping stations and four STPs have been constructed. Renovation of some old sewage pumping stations has also been done under the project.<sup>31</sup>

But the project's objectives have met with limited success at best. Some works under it, such as sewer and house service connections of the Bhoj wetland drainage zones, have been left out due to non-availability of funds, construction difficulties or expiry of the scheme. Also, the sewerage system commissioned under the project can cater only to dry weather flow – during monsoons, the Patra *Nullah*, for instance, discharges directly into the Upper Lake.<sup>32</sup>

## LOOKING AHEAD

Bhopal has, traditionally, developed along the Upper and Lower lakes, without any plans for protecting the two from sewage pollution. Faced with growing contamination and depletion, the city is now forced to look towards the Narmada river to solve its water crisis, and that at a huge cost (see Box: *Narmada ahoy!*).<sup>33</sup>

With the expansion of the city, its water demand was expected to go up to 344 MLD in 2011 for a projected population of 2 million.<sup>34</sup>

The city has been constantly aiming to improve its per capita availability. Coupled with this, there were plans to reduce transmission and distribution losses from the 35 per cent (in 2005-06) to around 20 per cent by 2010. The BMC also wanted to increase the piped water coverage from 67 per cent, as in 2005-06 to 100 per cent of the city's population by 2010. Additionally, the corporation planned to increase the supply hours from the dismal 45 minutes in 2005-06 to 24 hours by 2010. To achieve these goals, the BMC was to raise around Rs 550 crore under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM).<sup>35</sup>

## CLEANED OUT!

*City officials and citizens join hands to save a lake, but is it already too late?*

The Upper Lake or Badee Talab, a picturesque waterbody of Bhopal, is steadily disappearing. A report in the daily *Business Standard* says that the Upper Lake has almost been reduced to the size of a pool. The water level has reached an all-time low of 502 metre (m) against the minimum 504 m required. The main sources, the Ujhawan and Kolans rivers that feed this lake, have turned into polluted canals.<sup>1</sup>

The Upper Lake was built in the 11th century by King Bhoj by constructing an earthen dam across the Kolans river, a rain-fed tributary of the Betwa. It has a partial urban component in its catchment, 361 sq km in area, on the eastern end while the remainder is rural. The Lower Lake, locally known as Chhota Talab, was built in the 18th century by a local *nawab* and is situated at the east end of the Upper Lake; it is fully surrounded by built-up areas. Compared to the Upper Lake, it has a small catchment area of 9.60 sq km.<sup>2</sup>

These two lakes make up the biodiversity-rich Bhoj wetland, which supports a wide variety of flora and fauna. Over 20,000 birds have been observed here every year. The area has been recognised as a wetland of international importance under the Ramsar Convention of 1971.

Both the lakes have shrunk appreciably. By 2009, the Upper Lake had reduced from the initial 30 sq km to 8 sq km. The Lower Lake had come down to 2 sq m from 8 sq km. The various threats to the twin lakes include siltation due to soil erosion of the catchment area and

inflow of untreated sewage and wastewater from the surrounding human settlements. The lakes are also used daily by more than 2,000 people to bathe, wash clothes and clean vehicles; the immersion of idols and *tazias* is common in these waterbodies. The catchment areas have been encroached upon for slum development, agricultural activities and tourism. The use of motorboats by the tourism department has also increased the pollution level of the lakes' waters.<sup>3</sup>

In 2009, the district administration began rationing the water supply from the Upper Lake. The *Lake Princess*, a large cruise boat that ferried hundreds around the lake, was shifted to a reservoir because of the extremely low water level. Since the Lower Lake is located within an urban area, it has been subjected to many negative anthropogenic stresses, and its degradation has been much more than the Upper Lake.<sup>4</sup>

### Citizens to the rescue

In 1995, the state government initiated the Rs 250-crore Bhoj Wetland Project. In 2005, the Lake Conservation Committee sought help from the private sector. A master plan was launched to keep the 1,000-year-old water body free from city garbage.

A public interest litigation was filed in 2007 by the local citizens' forum (an informal pressure group of prominent citizens) with the Madhya Pradesh State Human Rights Commission, which brought all the issues relating to conservation of the wetland to the notice of the government.

At the end of 2008, the situation in the Upper Lake deteriorated due to poor quality of water as well as reduction of storage capacity.

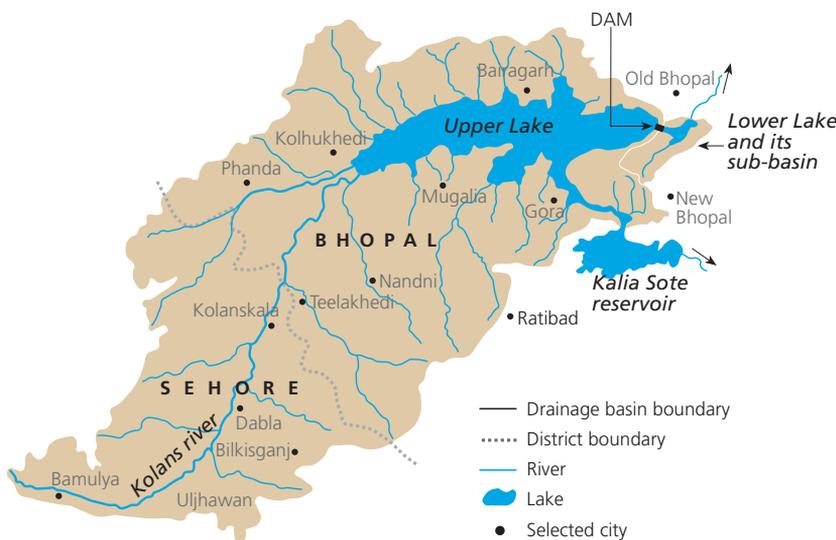
The problem was compounded with less rainfall, resulting in decrease in the supply of water. In November 2008, a joint drive was initiated by the district administration, district police and Bhopal Municipal Corporation, in which encroachments were removed from around 304 hectares of Upper Lake land.<sup>5</sup>

In 2009, the state government decided to act. It began a public campaign – *Apna sarovar apni dharohar Bada Taal sanrakshan abhiyan* – to increase the lake's capacity. Chief minister Shivraj Singh Chouhan, whose official bungalow overlooks the 11th century lake, led from the front by offering *shramdaan* (voluntary labour) for manual de-silting. The campaign involved voluntary organisations, students, professionals and industrialists. The state government issued appeals asking people, including bird watchers who frequent the lake, to contribute.

However, there were allegations of siphoning off of crores of rupees meant for the lake's conservation. The Bhopal Municipal Corporation reportedly made exaggerated claims like carting away silt in hundreds of trucks, when the actual number was much less.<sup>6</sup>

### MAP: BHOJ WETLAND BASIN

*The wetland, which spans two districts, is a Ramsar site. The Rs 250-crore project to clean and conserve the site has not had much results. There have been allegations of the money getting siphoned away*



**Source:** Aniruddhe Mukerjee and Mohan S Kodarkar 2006, 'Bhoj Wetland: Experience and lessons learned brief', [http://www.rainwaterharvesting.org/bhoj\\_lake/Bhoj\\_lake.htm](http://www.rainwaterharvesting.org/bhoj_lake/Bhoj_lake.htm) as viewed in June 2011

## **NARMADA AHOY!**

*Bhopal is looking towards the Narmada to relieve it of its water woes, but the move means tremendous costs – in terms of money as well as environment*

With a September 2009 deadline promised by the state chief minister, Bhopal has been waiting awhile to receive waters from the Narmada. The pipeline begins from Hirani village in Shahganj, on the banks of the river. The distance between Hirani and Bhopal is around 70 km.<sup>1</sup>

According to information from the Madhya Pradesh department of public relations and news reports, the work was expected to be completed by mid-2011.<sup>2</sup> About 96 per cent work of the approach bridge near Hiranighat has been completed. About 75 per cent work

To meet the projected water demand for 2021, a US \$22 million (Rs 2.2 crore) plan to augment water production by 198 MLD from the Kolar Dam is already under implementation. This will take Bhopal's total water production capacity to 438 MLD, enough to satisfy the demand of the city till 2027 at 135 LPCD with minimum losses of 15 per cent.<sup>36</sup>

Besides this, the city is planning to bring 185 MLD of water from the Narmada at Hoshangabad, more than 67 km away, at a

of a 185 million-litre water treatment plant at Khatpura is also over.<sup>3</sup>

The project was planned under Jawaharlal Nehru National Urban Renewal Mission (JNNURM). The Sadhikar Committee under the chairpersonship of its chief secretary, Rakesh Sahni approved the final estimate of Rs 339 crore for the project. The Union government agreed to meet 50 per cent of this estimated total cost of the project, while 30 per cent would be provided by the state government. The project cost went up by Rs 159 crore due to political manoeuvrings and unnecessary delays. The earlier estimate stood at Rs 240 crore.<sup>4</sup>

Besides its huge cost, the project will mean the destruction of hundreds of trees between Shahganj and Bhopal, which will be felled for laying the pipelines. The state forest department was given Rs 14 crore to plant saplings in lieu of the felled trees. But the department's record in similar cases in the past has not been very promising.<sup>5</sup>

cost of Rs 300 crore.<sup>37</sup>

Compared to the estimated water budget, the budget to manage sewage is only Rs 178 crore. The task, however, is colossal: from the present 30 per cent, the BMC aims to increase the percentage of population covered under the sewerage network to 70 per cent by 2010 and 90 per cent by 2020. The city's 20 per cent sewage treatment capacity will also be upgraded to 80 per cent by 2010 and 90 per cent by 2020.<sup>38</sup>