

## PATNA

### THE WATER-WASTE PORTRAIT

*The city is water-sufficient – it supplies more than it needs. But it is all groundwater. The Ganga flows by, untouched and heavily polluted*



# Patna

Flanked by three large rivers – the Ganga, Son and Punpun – and situated at the confluence of the Ganga and its three tributaries (the Son, Ghaghra and Gandak), Patna, the capital of Bihar enjoys the unique advantage of being one of the richest banks of surface water in the country. Despite this, it is haunted by the twin ills of floods and water scarcity, fallouts of the glaring inefficiencies in its public water supply system and the pollution of these very same surface waterbodies.

## WATER

### DEMAND, SUPPLY AND DISTRIBUTION

Officially, Patna gets more water than it needs, says the Patna Municipal Corporation (PMC), the city agency responsible for waterworks. As per 2005-06 estimates of the PMC, by 2011, the city's water demand would have been expected to increase by 14 per cent. This could be met by the level of supply existing in 2005-06, but only if the city authorities managed to curb Patna's high leakage losses (see Table: *The water*).<sup>1</sup>

The water is currently distributed through a pipeline system that is approximately 700 km in length. Of this, nearly 300 km requires an immediate replacement to stop the large amount lost as leakages.<sup>2</sup> The city water supply is not metered; therefore, it is hard to gauge precisely how much water is being actually supplied or lost.

The piped water supply system was established in 1919 only for government quarters. Other residents of the city relied almost exclusively on the Ganga and on open wells. In 1934, a powerful earthquake destroyed most of the wells. The government then extended the piped water supply system to the rest of the city.

In 2005-06, when the CSE survey was conducted, Patna had 89 fully functional pumping stations which covered about 60 per cent of the city's area. Water was supplied at 1,500 standposts, each with a capacity of a little over 18 million litre a day (MLD). The total estimated requirement of handpumps in the city was 285; it had only 55. The number since then has gone up to 175.

Supply of water by tankers is not common in the city. At the time of the CSE survey, the Patna Water Board (PWB) owned six tankers which were used to supply water during community or social functions.<sup>3</sup>

### THE SOURCE

The Ganga flows by Patna. The city is embanked on all sides by a four-feet high wall (with gaps in between to act as passageways) to prevent it from being inundated by floods in the river. Even with such a generous source of surface water, the PWB does not

### THE CITY

|  |             |
|--|-------------|
| Municipal area                             | 105 sq km   |
| Total area                                 | 235 sq km   |
| Population (2005)                          | 1.6 million |
| Population (2011), as projected in 2005-06 | 1.7 million |

### THE WATER

|  |             |
|--|-------------|
| <b>Demand</b>                                  |             |
| Total water demand as per city agency          | 215 MLD     |
| Per capita water demand as per city agency     | 135 LPCD    |
| Total water demand as per CPHEEO @ 175 LPCD    | 280 MLD     |
| <b>Sources and supply</b>                      |             |
| Water source                                   | Groundwater |
| Water sourced from surface sources             | Nil         |
| Water sourced from ground sources              | 100%        |
| Total water supplied                           | 325 MLD     |
| Per capita supply                              | 203 LPCD    |
| Leakage loss                                   | 38%         |
| Actual supply (after deducting leakage losses) | 202 MLD     |
| Per capita supply (after leakage losses)       | 126 LPCD    |
| Population served by water supply system       | 60%         |
| Per capita supply to the served area           | 210 LPCD    |
| Demand-supply gap (after leakage losses)       | 13 MLD      |
| <b>Treatment</b>                               |             |
| Number of WTPs                                 | Nil         |
| Total treatment capacity                       | Nil         |
| Actual treatment                               | Nil         |
| <b>Future demand and supply</b>                |             |
| Demand (2011), as projected in 2005-06         | 231 MLD     |
| Augmentation needed to meet the demand         | Nil         |
| Required increase in supply                    | Nil         |

### THE SEWAGE

|  |             |
|--|-------------|
| <b>Generation</b>                      |             |
| Sewage generated as per CPCB           | 290 MLD     |
| Sewage generated as per city agency    | 210 MLD     |
| <b>Collection</b>                      |             |
| Length of sewerage network             | NA          |
| Population covered by sewerage network | 9%          |
| Area covered by sewerage network       | 20%         |
| <b>Treatment</b>                       |             |
| Number of STPs                         | 3*          |
| Total treatment capacity               | 105 MLD     |
| Actual sewage treated                  | 52 MLD      |
| <b>Disposal</b>                        | Ganga river |

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

**Note:** \*A fourth STP is under construction at Karmalichak

rely on the Ganga for supplying water to the city. This can be attributed to the fact that Patna is located in a high-yielding groundwater zone, which has remained the primary source of water supply here.

According to the State Ground Water Board of Bihar, the area has quaternary alluvium soil, which is highly favourable for the development of water-rich aquifers. The average depth of the groundwater table in this region is 5.58 m in the pre-monsoon season and 3.12 m post-monsoon.<sup>4</sup> Since the city's public water supply agency is unable to meet the demand of the population, private borewells thrive. However, no study has been conducted to estimate the amount of water that is actually consumed from these private sources, and the number of operational private wells. One estimate puts the total amount extracted from groundwater in the city at 190 MLD.<sup>5</sup>

## TREATMENT

At the time when the CSE survey was conducted, Patna did not have an infrastructure to treat water. There were no water treatment plants; neither did the PWB have any facility for testing water quality. Drinking water was supplied by it and consumed by the residents on the assumption that all groundwater in the city is *Ganga Jal* and, therefore, eternally pure and unpolluted! The public water agency had not considered it worthwhile to investigate into any possible quality concerns of the water that was being supplied.

Since groundwater is supplied after pumping through a piped distribution network, a lot of it gets contaminated through leakage points in the pipelines that are already old and on the verge of a collapse. The water has also been found to have been high on iron and arsenic content. Also, the dumping of solid and liquid wastes has degraded the quality of the water. Tests done on water samples by the Public Health Institute, Patna found "more than 50 per cent" of the samples to be unfit for consumption due to serious bacterial contamination.<sup>6</sup> Water-borne diseases are common in the city.

## THE ECONOMICS

In Bihar, water charges and tax collection are the responsibility of municipal corporations and nagar parishads.

In 2005-06, the total number of connections in the Patna Urban Authority area was about 90,000, 80 per cent of which were domestic. The one-time domestic water connection charge was Rs 940. Water tax was collected as part of property tax at the rate of 2 per cent of the annual rental value or 10 per cent of the property tax. For houses without connections, water tax was collected at the rate of 6.25 per cent of the property tax.<sup>7</sup>

Water charges for non-domestic users was Rs 1,455; a user charge of Rs 3.5 per 1,000 gallon per month (or Rs 0.92 per kilolitre) was also levied.<sup>8</sup>

The PMC charged a water tax from the holdings, which was just about 24 per cent of the total holding tax. There was a proposal for imposing water tariff as per the assessed rate of cost of production, which was Rs 2.29 per kl. As per this proposal, the tariff would be set at Rs 4 and Rs 5, which would generate

Rs 22.5 crore every year.<sup>9</sup>

Revenues were low as no connection was metered. In the PMC area, the average income per connection per month was Rs 40, while the average expenditure amounted to a steep Rs 135 – thus, only 30 per cent of the cost was recovered. The annual revenue income in 2005 was Rs 4.32 crore and the expense, Rs 14.58 crore – per kl, the production cost was Rs 1.23 while the revenue was a mere Rs 0.36.<sup>10</sup>

With only 261 staffers, the PWB is stretched thin. Moreover, against the sanctioned posts of 448, only 232 were filled in 2005-06. For the 89 pumps in the city, only 25 pump operators had been employed; this affected the maintenance of unsupervised pumping stations. However, the Nagpur-based National Environmental Engineering Research Institute (NEERI) claims that Patna falls in the category of small cities, and for this category, it has one of the highest average organised hours of water supply – somewhere between 10 to 22 hours. As per the 2006 *City Development Plan*, the average annual water charges through this distribution system sums up to Rs 3.29 crore.<sup>11</sup>

## SEWAGE

### GENERATION AND COLLECTION

Patna's sewage generation for 2005, based on water supply, works out to be 289.6 MLD, almost the same as CPCB's estimation, but far higher than what the city agency claims. Most of the sewage lines are within the limits of the residential colonies; but these, in turn, are connected to open drains which constitute half of the drainage system of the city. The city has nine major drains, of which only 20 per cent are covered; approximately 280 drains are open. Most drains are in a bad shape, clogged with silt and solid wastes. Nearly 30 per cent of the city had no drainage system in 2005-06.<sup>12</sup>

Of the total sewage generated by the city, approximately two-third, or about 140 MLD, flows directly into the river Ganga. The rest seeps underground, polluting the ground sources. Under Phase I of the Ganga Action Plan (GAP), community toilets were constructed; most, however, have become non-operational, compelling people to return to open defecation.<sup>13</sup>

Naturally, the river water is not fit for any human consumptive uses (see Table: *Water quality of Ganga*), with

**TABLE: WATER QUALITY OF GANGA IN PATNA – 2004**  
*The pollution indicates lesser number of living organisms*

| Parameters                   | Minimum | Maximum | Mean   |
|------------------------------|---------|---------|--------|
| DO (mg/l)                    | 7.4     | 9.2     | 8.1    |
| BOD (mg/l)                   | 1.8     | 2.4     | 2.1    |
| Faecal coliform (MPN/100 ml) | 1,100   | 17,000  | 5,056  |
| Total coliform (MPN/100 ml)  | 2,200   | 50,000  | 13,533 |

**Source:** Anon 2006, *Status of Water Quality in India – 2004*, Central Pollution Control Board, New Delhi

pollution levels indicating a greatly reduced number of living organisms in the water.<sup>14</sup> According to a study done three decades ago and referred to by the PMC, the number of living organisms was found to be more than 3,000 – it came down to 250 in 2005-06. Coliform count was found to be more than 1,500 in 100 ml of Ganga water, as against the permissible norm of 500.<sup>15</sup>

### TREATMENT AND DISPOSAL

Even as it struggles with its inadequate drainage, Patna vaunts three treatment plants for treating its sewage (see Table: *Patna's STPs*). Most of them had come up under GAP. Wastewater is intercepted at the outfalls or, in some cases, in between and diverted to the STPs. Of the 18 sewage pumping stations, nine are exclusively allocated for stormwater transport.

The treatment processes used in the three STPs vary. The plants at Saidpur and Beur use the sludge activated process, while the Pahari STP uses an aerated lagoon process. After treatment, the wastewater is disposed off into the drains and then transported to the Badshahi *Nullah*, which empties into the river Punpun. Most of the drain water that is not intercepted for treatment flows directly into the Ganga. Several functional shortcomings make the plants perform significantly below capacity. Problems like power failures, poor maintenance and non-functional tertiary stages of treatment cut down heavily on the quantity treated and lower the quality of the treated wastewater.

Patna's sewage treatment capability also faces financial bottlenecks. As of 2005-06, cost of operations stood at Rs 5.4 crore per annum, but the state government had earmarked only Rs 2.7 crore. Out of this, Rs 2.15 crore was for electricity; only Rs 0.55 crore was allocated for meeting operational expenses.<sup>16</sup>

In this period, the PMC was charging a nominal percentage of the annual rental value of holdings as a sewerage charge; there was a proposal to hike this charge to 2.5 per cent. This, it was believed, would help the PMC increase its investments in the city's sewage treatment system. The total investment made in at least two decades stood at approximately Rs 18 crore (spent on the building of three STPs and supporting drainage lines). This was subsequently brought under the investments made under GAP.<sup>17</sup>

| <b>TABLE: PATNA'S STPS</b><br><i>Working at just about 50 per cent of capacity</i> |                |                                 |
|--|----------------|---------------------------------|
| Name   | Capacity (MLD) | Sewage reaching the plant (MLD) |
| Saidpur  | 45             | 22-25                           |
| Beur   | 35             | 15                              |
| Pahari   | 25             | 12                              |
| <b>TOTAL</b>   | <b>105</b>     | <b>49-52</b>                    |

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

## LOOKING AHEAD

### WATER

The city had made plans worth Rs 175 crore to meet its future water demand. Patna aimed to draw water from the upstream side of Ganga, bring down the share of groundwater to 75 per cent and hike surface water utilisation to 25 per cent during the project implementation phase.<sup>18</sup>

In 2006, plans for water resource development included a project initiated in 2003 that called for the augmentation, modernisation and improvement of the water supply system. It included 43 high-yielding tubewells, 22 km of rising mains, 61 overhead reservoirs and 700 km of pipelines. The cost of the project was estimated to be over Rs 207 crore. In addition, the PWB also planned on laying down 500 km of pipelines to supply water to newly developed areas.<sup>19</sup>

In 2005-06, the National Bank for Agricultural and Rural Development (NABARD) reportedly sanctioned a loan of Rs 110.95 crore to the Bihar government to make piped drinking water available in 158 block headquarters across 34 districts.<sup>20</sup> The state Public Health and Engineering Department (PHED) has been given the responsibility of implementing the project, which is considering a design period of 15 years for pumping units and 30 years for the remaining components.

### SEWAGE

The city plans to invest Rs 443.90 crore in refurbishing its sewerage system.<sup>21</sup> Despite the poor performance of the existing STPs, three more treatment plants were planned under GAP IN 2005-06. Of these, an 8-MLD plant at Karmalichak (proposed under GAP-I) was under construction. No more new STPs were sanctioned by the National River Conservation Directorate under the second phase of GAP. However, city authorities decided to go ahead with their plans to build new STPs with the capacity to handle a sewage load of 252 MLD. One such plant was planned at Digha. Also on the anvil were 100 km of main and trunk sewers, 600 km of branch and lateral sewers with required number of manholes, seven intermediate lifting stations and more outfall channels.<sup>22</sup>

With almost half of the city's drainage lines in urgent need of repair, the Patna Drainage Modernisation Project was allocated Rs 697 lakh by the state government. Another Rs 2,184 lakh was approved for the Kankerbagh Drainage Project. This work was already underway at the time of the CSE survey in 2005-06.<sup>23</sup>

In 2011, the Union environment minister announced that Rs 3,000 crore will be spent for setting up STPs in 19 Bihar towns in the next five to six years under the National Ganga River Basin Authority (NGRBA). Patna will have the biggest plant for which about Rs 1,500 crore has been earmarked. The NGRBA had launched the Mission Clean Ganga in Uttar Pradesh, Uttarakhand, West Bengal and Bihar; the permission is expected to ensure development of areas on the riverbank and the setting up of STPs.<sup>24</sup>