

# CHAPTER 3

## Water Pollution

Water pollution denotes the contamination of water or such alteration of the physical, chemical or biological properties of water which is harmful or injurious to public health and to the life and health of animals or plants or of aquatic organisms. Domestic sewage, poor sanitation, industrial effluents and surface runoff are the primary sources, that result in severe water and sanitation related problems, sometimes disasters. Lack of adequate collection, treatment and disposal facilities for sewage contribute to enhanced level of biological pollution of lakes, streams and rivers.

Water pollution is a threat to biodiversity itself, thereby adversely impacting sustainable development. Polluted water transmits bacteria and parasites which cause various diseases including diarrhoea and typhoid.

### 3.1 Regulatory Framework, Policies and Strategies

The Water (Prevention and Control of Pollution) Act, 1974 (Water Act) and Rules made thereunder provide for prevention and control of water pollution in the country and for maintenance and restoration of the wholesomeness of water. Under the Water Act, UPPCB is the nodal agency responsible for planning a comprehensive programme and advising the State Government on matters relating to water pollution including prescribing standards for sewage/trade/industrial effluents and for the quality of water, its analysis and classification. UPPCB is also required to evolve economical and reliable methods of disposal, treatment and utilisation of sewage and trade/industrial effluents. The agency is to advise the State Government regarding the location of any industry, the existence of which is likely to pollute surface or ground water. It is to establish or recognize laboratories to enable the board to test the quality of water. It is also to exercise punitive powers for violation of the Water Act.

In addition, according to Section 114 of the UP Municipal Act, 1959 the LNN is responsible for planning and management of the sewage system and drinking water system, as also the prevention and control of water pollution in City through LJS which was constituted in 1975 with the objective of providing safe drinking water, prevention of contamination, maintenance of sewerage system, creating awareness amongst the citizens, preparation and implementation of water storage systems and maintenance of hand pumps.

## 3.2 Operational Management

### 3.2.1 Drinking water

According to the assessment evaluation conducted (July 2010) by LJS, the total requirement of drinking water for the projected population of City in 2010 was 552 million litres per day (mld). Of 552, 282 mld (51 *per cent*) is met from ground water through 631 tube wells, 8751 public and private hand pumps. The balance 270 mld (49 *per cent*) is met from river through Aishbagh Waterworks and Bala Ganj Waterworks.

The Indian Institute of Toxicology Research (IITR), Lucknow had analysed (June 2007) 100 samples (50 each for piped and ground water supply) from different localities of the City during *pre-monsoon* of 2007 and conducted bacteriological tests in the three different categories of residential, commercial and industrial water. No further analysis of samples was done by IITR as of April 2011. The results of tests of the drinking water are given in *Appendix-III*.

Audit observed that:

- Water samples of residential, industrial and commercial areas were contaminated to the extent of 33, 27 and 43 *per cent* respectively;
- Drinking water supplied through pipes was contaminated to the extent of 42 *per cent*;
- Underground water was bacteriologically unsafe in 26 *per cent* of water samples;
- Bacterial contamination in drinking water was relatively higher in samples from commercial and residential areas than from those in industrial areas; and
- In samples of industrial areas, bacterial contamination in ground water was higher than in piped water.

Scrutiny of the records of LJS revealed (July 2010):

- Despite having a laboratory, it had conducted only chlorination test at the water works on daily basis;

- Test for Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD) and status of coliform in the water supplied from the water works was not conducted by the LJS; and
- LJS sent samples to State Health Institute (SHI) for chemical and bacteriological test of drinking water but the test reports of SHI revealed that it carried out chemical tests only.

On this being pointed out in audit, LJS in its reply (July 2010) stated that it was facing shortage of technical/non-technical staff and that the laboratory had obsolete testing equipment which had not been upgraded for 60 years.

Scrutiny of the records of the UPPCB revealed (July 2010) that:

- Despite its mandate, during 2005-10 the UPPCB confined itself only to testing drinking water of tube-wells in the industrial areas of Chinhat, Aishbagh and Dewa Road. It did not test drinking water in residential and commercial areas;
- UPPCB, which was responsible for inspecting the water treatment plants and reviewing data relating to the purification of water, had failed to do so; and
- UPPCB had at no stage checked the samples of drinking water intended to be supplied. This fact was confirmed by LJS in June 2010.

On this being pointed out in audit, UPPCB in their reply (July 2010) stated that it had tested drinking water from tube-wells in the industrial areas of Chinhat, Aishbagh and Dewa Road only.

The Government replied (August 2011) that Orthotolidine method (OT) (free chlorine test) was done every day by a joint team consisting of representatives of CMO, Engineers of *Jal Kal Vibhag*, Health Officer of *Nagar Nigam* and also by the Departmental Laboratory to ensure supply of contamination free, chlorinated drinking water. Result of 3272 samples taken from various locations during 2010-11 has been found 100 *per cent* positive in departmental laboratory. Bacteriological tests done by SHI on 1754 samples, collected during 2010-11 from various parts of the city especially from communicable disease prone areas, revealed that only two samples of water of private supply were found unsatisfactory.

It is evident from the Governments' reply that though the requisite tests were conducted during 2010-11, it was silent about tests conducted during 2006-10, shortage of technical and non-technical staff and equipment at LJS laboratory.

### 3.2.2 Contamination of River Gomti

The source of pollution of the river Gomti is disposal of sewage and industrial effluents through 26 drains flowing directly into the river. Besides, unscientific disposal of MSW into the open areas in and around the city and on the embankment of the river, contaminates the surface water and groundwater due to leachate carried by the runoff of water. The waste water discharged from these sources continues to flow into the river Gomti posing great danger to water quality, which needs to be especially viewed against the backdrop of the fact that the river Gomti is an important source of drinking water to a large number of people living in City.

#### 3.2.2.1 Failure in achievement of the standard norms of surface water quality

The standard norms of surface water quality fixed by CPCB were as below:

**Table 3.1: Standard norm of Water quality**

Parameter	Unit	A	B	C	D	Category Definition
Dissolved Oxygen (DO)	Mg/ltr	6	5	4	4	A- Without treatment but after filtration water is drinkable
Biochemical Oxygen Demand (BOD)	Mg/ltr	2	3	3	--	B- Bathing purpose C- Drinkable after traditional treatment
Total Coliform	MPN <sup>8</sup> /100ml	50	500	5000		D- Fisheries purpose only

(Source: UPPCB)

Scrutiny of the test reports (2006-2010) of the water samples, carried out by UPPCB, taken from different locations of the river (upstream to downstream) revealed that the pollution level of the river Gomti remained static during 2005-10. The water was not fit for drinking without treatment as total coliform level was far above the standard norm as given in *Appendix-IV*.

Thus, the levels of pollution at upstream locations were of "A" category and at downstream locations it was below "D" category in comparison to the standard norms of surface water quality (**Table 3.1**). The water was fit for drinking at upstream (water

<sup>8</sup> Most Probable Number

intake point) but the BOD level and the total coliform level in the downstream was alarmingly above the norms.

On this being pointed (July 2010) UPPCB replied (August 2010) that the major source of water pollution of the river Gomti was the discharge of untreated domestic waste water and the industrial effluents and that the samples were collected from the river every month for detailed analysis. It also stated (August 2010) that lack of manpower was the main constraint for identification of polluters and initiating punitive action against them.

The reply is self explanatory. UPPCB, although established for specified purposes as enunciated in the Water Act of 1974, had failed to fulfill the mandate for which it was constituted.

### **3.2.2.2 Untreated sewage disposal in River Gomti**

Under the UP Municipal Act, 1959 LNN is responsible for planning and management of sewerage system and as per Section 17(f) of the Water Act 1974, UPPCB is responsible for inspecting the same.

To bring the pollution levels under control, the Gomti Action Plan (GAP) Phase-1<sup>9</sup> was introduced in 1993 in Lucknow, under which, 108 mld discharge of five out of total 26 drains, was diverted to the Sewerage Treatment Plant (STP-42 mld) constructed in 2003. The GoI approved a scheme (June 2003) under GAP Phase-II for treatment of sewage of 21 drains increasing the capacity of STP to match the capacity of sewage generated (400 mld) for its treatment. This envisaged increase of the capacity of old STP from 42 mld to 56 mld and construction of two additional STPs with a total treatment capacity of 370 mld (345 mld + 25 mld).

Scrutiny revealed that the physical progress<sup>10</sup> (June 2010) of the STP-345 mld was 88 *per cent* with the stipulated date of completion being 31 December 2010, while that of the second STP-25 mld was only three *per cent* with no target date having been fixed for completion.

No significant investment for sewage treatment had been done since 1948, the year of inception of the Sewage Master Plan (SMP). Resultantly, over the years only 30-35

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<sup>9</sup> Financed by GoI through National River Conservation, Directorate, Ministry of Environment and Forest.

<sup>10</sup> Status Report of *UP Jal Nigam*, the implementing agency.

*per cent* of area was covered (July 2010) by the sewerage system. A new SMP was taken up (August 2007) under Jawaharlal Nehru National Urban Renewal Mission (JNNURM), in which Lucknow City was divided into four sewerage districts comprising 110 wards for utilizing the existing and ongoing works.

Of the above, the Detailed Project Report (DPR) February 2007 of Sewerage District-I & III covering 40 wards (36 *per cent*) was sanctioned (August 2007) and progress of its implementation upto July 2011 is given in *Appendix-V*.

The preparation of DPR (February 2007) for schemes of Districts II & IV comprising as many as 70 wards was yet to be finalized (August 2010). Further only 55 *per cent* of the sanctioned amount (₹ 7.12 crore) was released (₹ 3.95 crore), of which, only 84 *per cent* (₹ 3.31 crore) was expended (July 2011) and 70 wards remained to be covered under the sewerage system.

Delayed construction of sewerage system and STPs and non-preparation of DPRs for Sewerage Districts II and IV resulted in discharge (July 2011) of untreated 344 mld of sewerage, 86 *per cent* of total generated sewage of 400 mld in the river Gomti.

The Government stated (August 2011) that the works related to interception and diversion of all the drains discharging in the river Gomti had been commissioned in June 2011. The sewage from these drains was being taken to the two commissioned STPs at Daulat Ganj and Bharwara. It was further stated that the construction of 25 mld STP had been dropped from the Sewerage Master Plan.

In respect of disposal of Municipal Solid Waste (MSW) into the open areas in and around the City and on the embankment of the river, the Government stated (August 2011) that for the treatment of solid waste generated in the city, a Solid Waste Management Project (SWMP) had been prepared which included door-to-door collection, transportation and processing of the solid waste.

As regards disposal of untreated sewage in the river Gomti, the Government replied (August 2011) that the DPRs for the schemes of District II and IV were under preparation. The sanctioned work for District-I was proposed to be commissioned in December 2011 and the remaining two sewerage projects related to District-III were

proposed to be completed by the end of March 2012. The Government accepted that the total coverage of city area with sewerage was incomplete.

### **3.2.3 Non-identification of industries due to lack of co-ordination, monitoring and inspection**

Provision 17(f) of the Water Act, 1974 provides for inspection by UPPCB of sewage or trade effluents, works and plants set up for treatment of water and works for treatment/purification thereof. In order to conduct inspection, prior identification of existing industries and continuous monitoring is an essential pre-requisite for effective enforcement. This necessitates effective co-ordination between UPPCB and the Industries Department of GoUP.

Scrutiny of records (July 2010) of the DIC, Lucknow revealed that 4476 industrial units were established in Lucknow District during 2005-10. DIC also informed Audit (July 2010) that according of consent and issuance of No Objection Certificate for water and air pollution was required to be given by UPPCB, being the concerned authority for pollution related matters.

Audit observed that the UPPCB had failed to identify all the industries located in Lucknow District and furnished (July 2010) a statement of only 234 industrial units.

On this being pointed out in audit, UPPCB stated (July 2010) that non-identification of all the industrial units, operating within the City, was attributable to the shortage of manpower.

The Government replied (August 2011) that necessary action was being taken to cover all polluting industrial units under the provisions of Air and Water Acts.

### **3.2.4 Water bodies**

As per the City Development Plan, Lucknow (August 2006), City had 846 tanks and ponds, the majority of which are unidentifiable now due to reclamation. The exact number of existing water bodies was not available either with the UPPCB or with the LDA.

The National Botanical Research Institute (NBRI), Lucknow conducted (2003-05) a survey of water quality of 11 water bodies of Lucknow. No further survey has been conducted after 2005 till December 2011. As per this report the pond water was found



contaminated with heavy metals including Lead, Chromium, Cadmium, Arsenic, Zinc, Copper and Nickel thereby posing severe environmental and health problems including the leaching of harmful metals into the groundwater.

Out of the aforesaid 11 water bodies, audit conducted (July 2010) joint physical inspection of Butler Palace Lake and *Motijheel* to assess the present physical status with a representative of UPPCB. Results of the joint physical inspection are summarised below:

#### **3.2.4.1 Dumping of garbage and municipal waste**

##### **Butler Palace Lake**

The lake which was primarily used to rear fish is infested with garbage and municipal waste received from the Butler Palace Colony. Water of the lake has become green due to algal growth and is covered with aquatic grass. Further scrutiny of the records (July 2010) of UPPCB revealed that after a news item published regarding the death of fish in this lake, an inquiry was conducted (June 2009) to check the level of pollution of the lake. The team of UPPCB found that;

- the sewage generated by the nearby population was disposed of through three drains into the lake;
- the overflow of septic tanks of LNN operated *Sulabh Shauchalay* was also disposed of into this lake; and
- the DO level of lake water ranged between 2.5 and 3.5 mg per litre as against 4 mg per litre essential for survival of fish.

The Government replied (August 2011) that the sewer lines of the colony and the surrounding population had been connected to the main sewer line of the area and the treated over flow of the septic tank of *Sulabh Shauchalay* house was only flowing into the Butler Palace lake.

The reply was not tenable as the Government had not provided any periodical testing report about the water quality of the lake and treatment facility available at *Sulabh Shauchalay*. UPPCB had also not conducted further (after June 2009) periodical testing of water of the lake.



## Motijheel

Joint physical inspection of *Motijheel* (July 2010), situated in Aishbagh, Lucknow City, by audit with a representative of UPPCB, revealed that it had become a dumping site of MSW. The outflow of sewage and drains of the surrounding locality, including the outflow of the drain of LNN run Abattoir carrying inedible oil, blood and wash imparts, were discharged into the lake as would be evident from the photographs below:



**MSW dump in the Motijheel, Aishbagh, Lucknow**



**Drain of LNN run Abattoir flowing into the Motijheel**

The Government stated (August 2011) that bid process for the construction, operation and management of a modern abattoir and Carcass Utilisation Plant under PPP mode is under progress.

It was also stated by the Government that action was being initiated for regular monitoring of prominent lakes and ponds in and around Lucknow.

### 3.3 Recommendations

- *The bacteriological and chemical testing of drinking water, supplied by the LJS through its system, should be done on a regular basis at a prescribed periodicity;*
- *Database of all water bodies should be maintained and a detailed Action Plan prepared to improve water quality; and*
- *LNN should provide requisite infrastructure for disposal of sewage.*