

Bhopal Water

The chemical industry disaster at Bhopal on 3rd December 1984 killed and injured thousands of people. Yet the gas leak was just the beginning of an ongoing tragedy. 17 years later, residents of Bhopal are still suffering injury, not just from the accident but the legacy of contamination left by the chemical industry. Virtually nothing has been done to clean up the site and water used by people for everyday needs is still contaminated.

The Union Carbide factory, Bhopal, India began manufacturing pesticides in 1969. Following the gas disaster of December 3rd 1984, the plant ceased normal operations. Four years later the site was abandoned by the company. Hazardous waste is strewn around the site and there are large areas of contamination both above and below the ground. Today, more than 20,000 people live in close proximity to the factory site.

The fight for clean water

Community demands to clean up the site and to provide clean drinking water date as far back as 1990. In 1991 and 1996, tests on local groundwater taken from 11 tubewells were carried out by the Madhya Pradesh Public Health Engineering Department's State Research Laboratory. Both studies reported heavy contamination, though the tests did not attempt to identify specific contaminants. In 1999, the memo from the November 1996 report, which was filed under The Official Secrets Act, was leaked.

Written by the Chief Chemist, State Research Laboratory, Bhopal, the memo indicates that 10 samples were collected from around the plant and confirms that Bhopal's groundwater was contaminated: "... it is established that this pollution is due to chemicals used in the Union Carbide factory that have proven to be extremely harmful for health. Therefore the use of this water for drinking must be stopped immediately."

Another 1996 study by the Bhopal Municipal Corporation also declared over 100 wells in the vicinity of the plant to be 'unfit for drinking' though the wells were not capped and no alternative supply was provided. That year, the regional government's Department of Gas Relief and Rehabilitation clearly mentioned that an alternative supply of drinking water was required for communities adjacent to the factory because the groundwater was contaminated (*Action Plan – II, 1996-2001*).

Greenpeace report : Bhopal Toxic Legacy

In 1999, Greenpeace International collected samples of soil/waste from seven locations and samples of groundwater from twelve sites in and around the factory. The findings led Greenpeace to declare the site a "global toxic hotspot". Twelve volatile organic compounds, most greatly exceeding US Environmental Protection Agency standard limits, were found to have seeped into the water supplies of an estimated 20,000 people in the local area. Three water wells in the Atul Ayub Nagar community northeast of the plant, were found to have the most severe contamination. Other wells to the south of the plant, though not as severely contaminated, also showed elevated levels of toxic chemicals.

Greenpeace analysis found:

- Water samples from five locations contained a range of volatile and semi-volatile organochlorines.
- Volatile organochlorine compounds (VOCs), including chloroform (ranging from 0.1 to 2.59 mg/l respectively), carbon tetrachloride (range: 0.2 to 3.4 mg/l) and tetrachlorethene were found in groundwater collected from three wells close to the northern boundary of the former Union Carbide plant. Chloroform and carbon tetrachloride were both used as solvents in the Sevin manufacturing process. Despite warning signs not to drink the water, these wells remain accessible and in continued use by the local residents.
- Chlorobenzenes were also detectable in the groundwater. One sample adjacent to the northern plant boundary contained over 2.8 mg/l of 1,2-dichlorobenzene.
- Trichlorobenzenes, rarely reported in drinking water at levels in excess of 1 ug/l were found in four samples, the highest concentrations being 0.145 mg/l.

Further water tests conducted by Greenpeace in 2001 reaffirm the presence of chlorinated benzenes (1,2-dichlorobenzene, 1,3, dichlorobenzene and 1,4-dichlorobenzene), chloroform, trichloroethene and carbon tetrachloride (tetrachloromethane) in the water well being used by the communities. While no trichlorobenzenes were found in 2001, this is probably due to the monsoon diluting contaminates.

On September 9th 2000, after continued pressure on the civic authorities to provide further alternative drinking water supplies by the people of Bhopal, six tanks of 10,000 litres capacity were provided by the Municipal Corporation to some communities. Since then, six to eight tankers have delivered relatively clean drinking water to some areas of Bhopal every day. However, the wells are still often used by everyone for cooking, washing and drinking when government supplies run out. In addition, about 20 % of the population still do not have access to tanker water. Six localities are yet to receive clean drinking water and as many as 5,000 families depend on contaminated water for drinking, washing and cooking.

Summary of highest contaminate levels found in Bhopal well water in 1999 & potential effects on health

| <i>Chemical compound</i> | <i>No. of times greater than US EPA limits (1)</i> | <i>Potential effects on health</i> |
|--------------------------|--|---|
| 1, 2-Dichlorobenzene | 5 | Reported effects include leukemia, liver and kidney damage and chromosomal aberrations |
| 1, 4-Dichlorobenzene | 11 | |
| Tetrachloroethene | 9 | Exposure to very high concentrations can cause dizziness, headaches, sleepiness, confusion, nausea, difficulty in speaking and walking, and unconsciousness This compound is classified as reasonably anticipated to be a human carcinogen" by the US Department of Health and Human services (US DHHS). Exposure to tetrachloroethene-contaminated drinking water has been reported to be associated with an increased risk of leukemia and bladder cancer |
| Trichloroethene | 50 | Drinking large amounts of trichloroethylene may cause nausea, liver and kidney damage, convulsions, impaired heart function, coma, or death. Drinking small amounts of trichloroethylene for long periods may cause liver and kidney damage, nervous system effects, impaired immune system function and impaired foetal development in pregnant women, although the extent of some of these effects is not yet clear. |
| Chloroform (2) | 26 -32 | Chloroform is classified as reasonably anticipated to be a human carcinogen" by the US Department of Health and Human services (US DHHS). The US EPA lists liver, kidney or central nervous system problems and an increased risk of cancer for trihalomethanes, as a group of chemicals of which chloroform is part. |
| Carbon tetrachloride | 682 | Reasonably anticipated to be a human carcinogen" by the US Department of Health and Human services (US DHHS). High exposure can cause liver, kidney and central nervous system damage, including the brain. Causes headaches, dizziness, nausea and vomiting. In severe cases coma and even death can occur. |

(1) EPA National Primary Drinking Water Regulations (NPDWRs or primary standards), legally enforceable standards that apply to public water systems.

(2) The value for chloroform is actually for a group of compounds called trihalomethanes, of which chloroform is one. There are four contaminants included in this group: chloroform, bromodichloromethane, dibromochloromethane and bromoform. No other trihalomethanes were detected in any of the samples analyzed in 1999, nor in the sample analysed in 2001. From 1st January 2002, the EPA level for trihalomethanes will change from 100 ug/l to 80 ug/l.

More information is available at:

<http://www.greenpeace.org/~toxics/>

The Greenpeace report is available here:

<http://www.greenpeace.org/~toxics/toxfreeasia/bhopal.pdf>

and the executive summary at

<http://www.bhopal.net/gpexecsummary.html>