

Bhopal disaster:

The **Bhopal disaster**, also referred to as the **Bhopal gas tragedy**, was a [gas leak](#) incident on the night of 2–3 December 1984 at the [Union Carbide India Limited \(UCIL\) pesticide plant](#) in [Bhopal](#), Madhya Pradesh, India. It is considered to be [the world's worst industrial disaster](#).^{[1][2]} Over 500,000 people were exposed to [methyl isocyanate \(MIC\)](#) gas. The highly toxic substance made its way into and around the small towns located near the plant.^[3]

Estimates vary on the death toll. The official immediate death toll was 2,259. In 2008, the [Government of Madhya Pradesh](#) had paid compensation to the family members of 3,787 victims killed in the gas release, and to 574,366 injured victims.^[4] A government affidavit in 2006 stated that the leak caused 558,125 injuries, including 38,478 temporary partial injuries and approximately 3,900 severely and permanently disabling injuries.^[5] Others estimate that 8,000 died within two weeks, and another 8,000 or more have since died from gas-related diseases.^[6] The cause of the disaster remains under debate. The Indian government and local activists argue that slack management and deferred maintenance created a situation where routine pipe maintenance caused a backflow of water into a MIC tank, triggering the disaster. [Union Carbide Corporation \(UCC\)](#) argues water entered the tank through an act of sabotage.

The owner of the factory, UCIL, was majority owned by UCC, with Indian Government-controlled banks and the Indian public holding a 49.1 percent stake. In 1989, UCC paid \$470 million (equivalent to \$845 million in 2018) to settle litigation stemming from the disaster. In 1994, UCC sold its stake in UCIL to [Eveready Industries India Limited \(EIIL\)](#), which subsequently merged with [McLeod Russel \(India\) Ltd.](#) Eveready ended clean-up on the site in 1998, when it terminated its 99-year lease and turned over control of the site to the state government of Madhya Pradesh. [Dow Chemical Company](#) purchased UCC in 2001, seventeen years after the disaster.

Civil and criminal cases filed in the United States against UCC and [Warren Anderson](#), UCC CEO at the time of the disaster, were dismissed and redirected to Indian courts on multiple occasions between 1986 and 2012, as the US courts focused on UCIL being a standalone entity of India. Civil and criminal cases were also filed in the [District Court](#) of Bhopal, India, involving UCC, UCIL and UCC CEO Anderson.^{[7][8]} In June 2010, seven Indian nationals who were UCIL employees in 1984, including the former UCIL chairman, were convicted in Bhopal of causing death by negligence and sentenced to two years imprisonment and a fine of about \$2,000 each, the maximum punishment allowed by [Indian law](#). All were released on bail shortly after the verdict. An eighth former employee was also convicted, but died before the judgement was passed.

Long-term health effects

Some data about the health effects are still not available. The [Indian Council of Medical Research \(ICMR\)](#) was forbidden to publish health effect data until 1994.^[6]

A total of 36 wards were marked by the authorities as being "gas affected," affecting a population of 520,000. Of these, 200,000 were below 15 years of age, and 3,000 were pregnant women. The official immediate death toll was 2,259, and in 1991, 3,928 deaths had been officially certified. Ingrid Eckerman estimated 8,000 died within two weeks.^{[6][39]}

The [government of Madhya Pradesh](#) confirmed a total of 3,787 deaths related to the gas release.^[4]

Later, the affected area was expanded to include 700,000 citizens. A government affidavit in 2006 stated the leak caused 558,125 injuries including 38,478 temporary partial injuries and approximately 3,900 severely and permanently disabling injuries.^[5]

A [cohort](#) of 80,021 exposed people was registered, along with a control group, a cohort of 15,931 people from areas not exposed to MIC. Nearly every year since 1986, they have answered the same questionnaire. It shows [overmortality](#) and [overmorbidity](#) in the exposed group. [Bias](#) and [confounding factors](#) cannot be excluded from the study. Because of migration and other factors, 75% of the cohort is lost, as the ones who moved out are not followed.^{[6][40]}

A number of clinical studies are performed. The quality varies, but the different reports support each other.^[6] Studied and reported long-term health effects are:

- Eyes: Chronic conjunctivitis, scars on cornea, corneal opacities, early cataracts

- Respiratory tracts: Obstructive and/or restrictive disease, pulmonary fibrosis, aggravation of TB and chronic bronchitis
- Neurological system: Impairment of memory, finer motor skills, numbness etc.
- Psychological problems: Post traumatic stress disorder (PTSD)
- Children's health: Peri- and neonatal death rates increased. Failure to grow, intellectual impairment, etc.

Missing or insufficient fields for research are female reproduction, chromosomal aberrations, cancer, immune deficiency, neurological sequelae, post traumatic stress disorder (PTSD) and children born after the disaster. Late cases that might never be highlighted are respiratory insufficiency, cardiac insufficiency (cor pulmonale), cancer and tuberculosis. Bhopal now has high rates of birth defects and records a [miscarriage](#) rate 7x higher than the national average.^[16]

A 2014 report in *Mother Jones* quotes a "spokesperson for the Bhopal Medical Appeal, which runs free health clinics for survivors" as saying "An estimated 120,000 to 150,000 survivors still struggle with serious medical conditions including nerve damage, growth problems, gynecological disorders, respiratory issues, birth defects, and elevated rates of cancer and tuberculosis."^[41]

Health care

The Government of India had focused primarily on increasing the hospital-based services for gas victims thus hospitals had been built after the disaster. When UCC wanted to sell its shares in UCIL, it was directed by the Supreme Court to finance a 500-bed hospital for the medical care of the survivors. Thus, Bhopal Memorial Hospital and Research Centre (BMHRC) was inaugurated in 1998 and was obliged to give free care for survivors for eight years. BMHRC was a 350-bedded super speciality hospital where heart surgery and hemodialysis were done. There was a dearth of gynaecology, obstetrics and paediatrics. Eight mini-units (outreach health centres) were started and free health care for gas victims were to be offered until 2006.^[6] The management had also faced problems with strikes, and the quality of the health care being disputed.^{[42][43]} [Sambhavna Trust](#) is a charitable trust, registered in 1995, that gives [modern](#) as well as [ayurvedic](#) treatments to gas victims, free of charge.^{[6][44]}

Environmental rehabilitation

When the factory was closed in 1986, pipes, drums and tanks were sold. The MIC and the Sevin plants are still there, as are storages of different residues. Isolation material is falling down and spreading.^[6] The area around the plant was used as a dumping area for hazardous chemicals. In 1982 [tubewells](#) in the vicinity of the UCIL factory had to be abandoned and tests in 1989 performed by UCC's laboratory revealed that soil and water samples collected from near the factory and inside the plant were toxic to fish.^[45] Several other studies had also shown polluted soil and groundwater in the area. Reported polluting compounds include 1-[naphthol](#), [naphthalene](#), [Sevin](#), [tarry residue](#), [mercury](#), toxic [organochlorines](#), volatile organochlorine compounds, [chromium](#), copper, nickel, lead, [hexachloroethane](#), [hexachlorobutadiene](#), and the pesticide [HCH](#).^[6]

In order to provide safe drinking water to the population around the UCIL factory, Government of Madhya Pradesh presented a scheme for improvement of water supply.^[46] In December 2008, the Madhya Pradesh High Court decided that the toxic waste should be incinerated at [Ankleshwar](#) in Gujarat, which was met by protests from activists all over India.^[47] On 8 June 2012, the Centre for incineration of toxic Bhopal waste agreed to pay ₹250 million (US\$3.5 million) to dispose of UCIL chemical plants waste in Germany.^[48] On 9 August 2012, Supreme court directed the Union and Madhya Pradesh Governments to take immediate steps for disposal of toxic waste lying around and inside the factory within six months.^[49]

A U.S. court rejected the lawsuit blaming UCC for causing soil and water pollution around the site of the plant and ruled that responsibility for remedial measures or related claims rested with the State Government and not with UCC.^[50] In 2005, the state government invited various Indian architects to enter their "concept for development of a memorial complex for Bhopal gas tragedy victims at the site of Union Carbide". In 2011, a conference was held on the site, with participants from European universities which was aimed for the same.^{[51][52]}

Occupational and habitation rehabilitation

33 of the 50 planned work-sheds for gas victims started. All except one was closed down by 1992. 1986, the MP government invested in the Special Industrial Area Bhopal. 152 of the planned 200 work sheds were built and in 2000, 16 were partially functioning. It was estimated that 50,000 persons need alternative jobs, and that

less than 100 gas victims had found regular employment under the government's scheme. The government also planned 2,486 flats in two- and four-story buildings in what is called the "widow's colony" outside Bhopal. The water did not reach the upper floors and it was not possible to keep cattle which were their primary occupation. Infrastructure like buses, schools, etc. were missing for at least a decade.^[6]

Economic rehabilitation

Immediate relieves were decided two days after the tragedy. Relief measures commenced in 1985 when food was distributed for a short period along with ration cards.^[6] [Madhya Pradesh](#) government's finance department allocated ₹874 million (US\$12 million) for victim relief in July 1985.^{[53][54]} Widow pension of ₹200 (US\$2.80)/per month (later ₹750 (US\$11)) were provided. The government also decided to pay ₹1,500 (US\$21) to families with monthly income ₹500 (US\$7.00) or less. As a result of the interim relief, more children were able to attend school, more money was spent on treatment and food, and housing also eventually improved. From 1990 interim relief of ₹200 (US\$2.80) was paid to everyone in the family who was born before the disaster.^[6]

The final compensation, including interim relief for personal injury was for the majority ₹25,000 (US\$350). For death claim, the average sum paid out was ₹62,000 (US\$870). Each claimant were to be categorised by a doctor. In court, the claimants were expected to prove "beyond reasonable doubt" that death or injury in each case was attributable to exposure. In 1992, 44 percent of the claimants still had to be medically examined.^[6]

By the end of October 2003, according to the Bhopal Gas Tragedy Relief and Rehabilitation Department, compensation had been awarded to 554,895 people for injuries received and 15,310 survivors of those killed. The average amount to families of the dead was \$2,200.^[55]

In 2007, 1,029,517 cases were registered and decided. Number of awarded cases were 574,304 and number of rejected cases 455,213. Total compensation awarded was ₹15,465 million (US\$220 million).^[46] On 24 June 2010, the [Union Cabinet](#) of the [Government of India](#) approved a ₹12,650 million (US\$180 million) aid package which would be funded by Indian taxpayers through the government.