

Bhopal disaster

Coordinates: 23°16′51″N 77°24′38″E﻿ / ﻿23.281°N 77.411°E﻿ / 23.281; 77.411

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The **Bhopal disaster** or **Bhopal Gas Tragedy** is the world's worst industrial catastrophe. It occurred on the night of December 2-3, 1984 at the Union Carbide India Limited (UCIL) pesticide plant in Bhopal, Madhya Pradesh, India. At that time, UCIL was the Indian subsidiary of the U.S. company Union Carbide Corporation (UCC), which is now a subsidiary of Dow Chemical Company. Around midnight on December 2–3, 1984, there was a leak of methyl isocyanate (MIC) gas and other toxins from the plant, resulting in the exposure of over 500,000 people. Estimates vary on the death toll. The official immediate death toll was 2,259 and the government of Madhya Pradesh has confirmed a total of 3,787 deaths related to the gas release.^[1] Other government agencies estimate 15,000 deaths.^[2] Others estimate that 8,000 died within the first weeks and that another 8,000 have since died from gas-related diseases.^{[3][4]} A government affidavit filed in the Supreme Court in 2006 stated that of the 558,125 cases of injury resulting from the disaster, 516,406 (92.5%) were minor, 38,478 (6.8%) were temporary partial disablement while 0.7% (~3,900) were severely and permanently disabled. The government's classification was criticized after the deaths of people who were classed as having minor injuries.^[5]

Some 26 years after the gas leak, 390 tons of toxic chemicals abandoned at the UCIL plant continue to leak and pollute the groundwater in the region and affect thousands of Bhopal residents who depend on it,^{[6][7][8]} though there is some dispute as to whether the chemicals still stored at the site pose any continuing health hazard.^[2]

Over two decades since the tragedy, certain civil and criminal cases remain pending in the United States District Court, Manhattan and the District Court of Bhopal, India, against Union Carbide with an Indian arrest warrant also pending against Warren Anderson, CEO of Union Carbide at the time of the disaster.^{[9][10]} Greenpeace asserts that as the Union Carbide CEO, Anderson knew about a 1982 safety audit of the Bhopal plant, which identified 30 major hazards and that they were not fixed in Bhopal but were fixed at the company's identical plant in the US. In June 2010, seven ex-employees, including the former chairman of UCIL, 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 law. An eighth former employee was also convicted but had died before judgment was passed.^[11]



Bhopal memorial for those killed and disabled by the 1984 toxic gas release.

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Summary of background and causes

The UCIL factory was established in 1969 near Bhopal. 50.9% was owned by Union Carbide Corporation (UCC) and 49.1% by various Indian investors, including public sector financial institutions.^{[3][4]} It produced the pesticide carbaryl (trademark Sevin). In 1979 a methyl isocyanate (MIC) production plant was added to the site. MIC, an intermediate in carbaryl manufacture, was used instead of less hazardous but more expensive materials. UCC understood the properties of MIC and its handling requirements.^{[12][13][14]}

During the night of December 2–3, 1984, large amounts of water entered tank 610, containing 42 tons of methyl isocyanate. The resulting exothermic reaction increased the temperature inside the tank to over 200 °C (392 °F), raising the pressure to a level the tank was not designed to withstand. This forced the emergency venting of pressure from the MIC holding tank, releasing a large volume of toxic gases into the atmosphere. The gases flooded the city of Bhopal, causing great panic as people woke up with a burning sensation in their lungs. Thousands died immediately from the effects of the gas and many were trampled in the panic.

Theories of how the water entered the tank differ. At the time, workers were cleaning out pipes with water, and some claim that owing to bad maintenance and leaking valves, it was possible for the water to leak into tank 610.^[15] In December 1985 *The New York Times* reported that according to UCIL plant managers the hypothesis of this route of entry of water was tested in the presence of the Central Bureau Investigators and was found to be negative.^[16] UCC also maintains that this route was not possible, and that it was an act of sabotage by a "disgruntled worker" who introduced water directly into the tank.^[17] However, the company's investigation team found no evidence of the necessary connection.^[18] The Trade Union Report failed to mention that the investigation was totally controlled by the government investigators denying UCC investigators any access to inspecting the ill-fated tank.^[citation needed]

The 1985 reports^{[18][19][20]} give a picture of what led to the disaster and how it developed, although they differ in details.

Factors leading to the gas leak include:

- The use of hazardous chemicals (MIC) instead of less dangerous ones
- Storing these chemicals in large tanks instead of over 200 steel drums.
- Possible corroding material in pipelines
- Poor maintenance after the plant ceased production in the early 1980s
- Failure of several safety systems (due to poor maintenance and regulations).
- Safety systems being switched off to save money—including the MIC tank refrigeration system which alone would have prevented the disaster.

The problem was made worse by the plant's location near a densely populated area, non-existent catastrophe plans and shortcomings in health care and socio-economic rehabilitation. Analysis shows that the parties responsible for the magnitude of the disaster are the two owners, Union Carbide Corporation and the Government of India, and to some extent, the Government of Madhya Pradesh.^{[3][4][21]}

Public information

Much speculation arose in the aftermath. The closing of the plant to outsiders (including UCC) by the Indian government, and the failure to make data public contributed to the confusion. The CSIR report^[20] was formally released 15 years after the disaster. The authors of the ICMR studies^[22] on health effects were forbidden to publish their data until after 1994. UCC has still not released their research

about the disaster or the effects of the gas on human health. Soon after the disaster UCC was not allowed to take part in the investigation by the government. The initial investigation was conducted entirely by the government agencies – Council of Scientific and Industrial Research (CSIR) under the directorship of Dr. Varadarajan and Central Bureau of Investigation (CBI). UCC and the Government of India maintained until 1994, when the International Medical Commission on Bhopal met, that MIC had no long term health effects.^[4]

Contributing factors

Several other factors were identified by the inquiry, including the fact that the operators chose a dangerous method of manufacturing pesticides, there was large-scale storage of MIC before processing, the location of the plant was close to a densely populated area, there was under-dimensioning of the safety features, and the plant depended on manual operations.^[4]

Deficiencies in the management of UCIL were also identified. There was a lack of skilled operators due to the staffing policy, there had been a reduction of safety management due to reducing the staff, there was insufficient maintenance of the plant and there were only very loose plans for the course of action in the event of an emergency.^{[4][23]}

Plant production process

Union Carbide produced the pesticide Sevin (a trademarked brand name for carbaryl) using MIC as an intermediate. Until 1979, MIC was imported from the US.^[4] Other manufacturers, such as Bayer, made carbaryl without MIC, though at greater manufacturing costs.^[24]

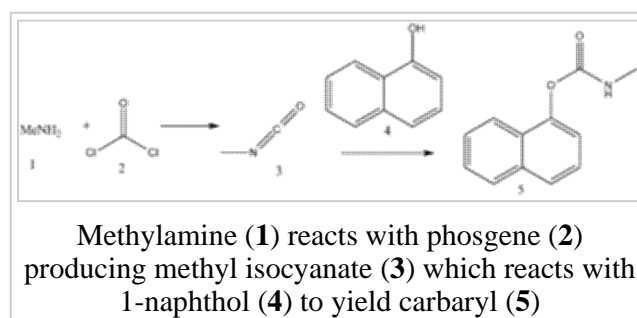
The chemical process, or "route", used in the Bhopal plant reacted methylamine with phosgene to form MIC (methyl isocyanate), which was then reacted with 1-naphthol to form the final product, carbaryl. This route differed from MIC-free routes used elsewhere, in which the same raw materials are combined in a different manufacturing order, with phosgene first reacted with the naphthol to form a chloroformate ester, which is then reacted with methyl amine. In the early 1980s, the demand for pesticides had fallen, but production continued, leading to buildup of stores of unused MIC.^{[4][24]}

See also: Carbaryl#Production

Work conditions

Attempts to reduce expenses affected the factory's employees and their conditions. Kurzman argues that "cuts ... meant less stringent quality control and thus looser safety rules. A pipe leaked? Don't replace it, employees said they were told ... MIC workers needed more training? They could do with less. Promotions were halted, seriously affecting employee morale and driving some of the most skilled ... elsewhere".^[25] Workers were forced to use English manuals, even though only a few had a grasp of the language.^{[15][26]}

By 1984, only six of the original twelve operators were still working with MIC and the number of supervisory personnel was also cut in half. No maintenance supervisor was placed on the night shift and instrument readings were taken every two hours, rather than the previous and required one-hour readings.^{[15][25]} Workers made complaints about the cuts through their union but were ignored. One employee was fired after going on a 15-day hunger strike. 70% of the plant's employees were fined



before the disaster for refusing to deviate from the proper safety regulations under pressure from management.^{[15][25]}

In addition, some observers, such as those writing in the Trade Environmental Database (TED) Case Studies as part of the Mandala Project from American University, have pointed to "serious communication problems and management gaps between Union Carbide and its Indian operation", characterised by "the parent companies [*sic*] hands-off approach to its overseas operation" and "cross-cultural barriers".^[27] The personnel management policy led to an exodus of skilled personnel to better and safer jobs.^{[15][23]}

Equipment and safety regulations

- It emerged in 1998, during civil action suits in India, that, unlike Union Carbide plants in the US, its Indian subsidiary plants were not prepared for problems. No action plans had been established to cope with incidents of this magnitude. This included not informing local authorities of the quantities or dangers of chemicals used and manufactured at Bhopal.^{[3][4][15][24]}
- The MIC tank alarms had not worked for four years.^{[3][4][15][28]}
- There was only one manual back-up system, compared to a four-stage system used in the US.^{[3][4][15][28]}
- The flare tower and the vent gas scrubber had been out of service for five months before the disaster. The gas scrubber therefore did not treat escaping gases with sodium hydroxide (caustic soda), which might have brought the concentration down to a safe level.^[28] Even if the scrubber had been working, according to Weir, investigations in the aftermath of the disaster discovered that the maximum pressure it could handle was only one-quarter of that which was present in the accident. Furthermore, the flare tower itself was improperly designed and could only hold one-quarter of the volume of gas that was leaked in 1984.^{[3][4][15][29]}
- To reduce energy costs, the refrigeration system, designed to inhibit the volatilization of MIC, had been left idle—the MIC was kept at 20 degrees Celsius (room temperature), not the 4.5 degrees advised by the manual, and some of the coolant was being used elsewhere.^{[3][4][15][28]}
- The steam boiler, intended to clean the pipes, was out of action for unknown reasons.^{[3][4][15][28]}
- Slip-blind plates that would have prevented water from pipes being cleaned from leaking into the MIC tanks through faulty valves were not installed. Their installation had been omitted from the cleaning checklist.^{[3][4][15]}
- Water sprays designed to "knock down" gas leaks were poorly designed—set to 13 meters and below, they could not spray high enough to reduce the concentration of escaping gas.^{[3][4][15][28]}
- The MIC tank had been malfunctioning for roughly a week. Other tanks had been used for that week, rather than repairing the broken one, which was left to "stew". The build-up in temperature and pressure is believed to have affected the magnitude of the gas release.^{[3][4][15][28]}
- Carbon steel valves were used at the factory, even though they corrode when exposed to acid.^[24] On the night of the disaster, a leaking carbon steel valve was found, allowing water to enter the MIC tanks. The pipe was not repaired because it was believed it would take too much time and be too expensive.^{[3][4][15][28]}



Union Carbide MIC plant

- UCC admitted in their own investigation report that most of the safety systems were not functioning on the night of December 3, 1984.^[19]
- Themistocles D'Silva asserts in the latest book—*The Black Box of Bhopal*—that the design of the MIC plant, following government guidelines, was "Indianized" by UCIL engineers to maximize the use of indigenous materials and products. It also dispensed with the use of sophisticated instrumentation as not appropriate for the Indian plant. Because of the unavailability of electronic parts in India, the Indian engineers preferred pneumatic instrumentation. This is supported with original government documents, which are appended. The book also discredits the unproven allegations in the CSIR Report.^[30]

See also: Carbaryl#Production and Carbaryl production

History/Previous warnings and accidents

A series of prior warnings and MIC-related accidents had occurred:

- In 1976, the two trade unions reacted because of pollution within the plant.^{[4][23]}
- In 1981, a worker was splashed with phosgene. In panic he ripped off his mask, thus inhaling a large amount of phosgene gas; he died 72 hours later.^{[4][23]}
- In January 1982, there was a phosgene leak, when 24 workers were exposed and had to be admitted to hospital. None of the workers had been ordered to wear protective masks.
- In February 1982, an MIC leak affected 18 workers.^{[4][23]}
- In August 1982, a chemical engineer came into contact with liquid MIC, resulting in burns over 30 percent of his body.^{[4][23]}
- In September 1982, a Bhopal journalist, Raajkumar Keswani, started writing his prophetic warnings of a disaster in local weekly 'Rapat'. Headlines, one after another 'Save, please save this city', 'Bhopal sitting at the top of a volcano' and 'if you don't understand, you will all be wiped out' were not paid any heed.^[31]
- In October 1982, there was a leak of MIC, methylcarbaryl chloride, chloroform and hydrochloric acid. In attempting to stop the leak, the MIC supervisor suffered intensive chemical burns and two other workers were severely exposed to the gases.^{[4][23]}
- During 1983 and 1984, leaks of the following substances regularly took place in the MIC plant: MIC, chlorine, monomethylamine, phosgene, and carbon tetrachloride, sometimes in combination.^{[4][23]}
- Reports issued months before the incident by scientists within the Union Carbide corporation warned of the possibility of an accident almost identical to that which occurred in Bhopal. The reports were ignored and never reached senior staff.^{[4][24]}
- Union Carbide was warned by American experts who visited the plant after 1981 of the potential of a "runaway reaction" in the MIC storage tank; local Indian authorities warned the company of problems on several occasions from 1979 onwards. Again, these warnings were not heeded.^{[4][24]}

The leakage

In November 1984, most of the safety systems were not functioning. Many valves and lines were in poor condition. Tank 610 contained 42 tons of MIC, much more than safety rules allowed.^[4] During the nights of 2–3 December, a large amount of water entered tank 610. A runaway reaction started, which was accelerated by contaminants, high temperatures and other factors. The reaction generated a major increase in the temperature inside the tank to over 200 °C (400 °F). This forced the emergency venting of pressure from the MIC holding tank, releasing a large volume of toxic gases. The reaction was sped up by the presence of iron from corroding non-stainless steel pipelines.^[4] It is known that workers cleaned pipelines with water. They were not told by the supervisor to add a slip-blind water

isolation plate. Because of this, and the bad maintenance, the workers consider it possible for water to have accidentally entered the MIC tank.^{[4][15]} UCC maintains that a "disgruntled worker" deliberately connected a hose to a pressure gauge.^{[4][17]}

Timeline, summary

At the plant^[4]

- 21:00 Water cleaning of pipes starts.
- 22:00 Water enters tank 610, reaction starts.
- 22:30 Gases are emitted from the vent gas scrubber tower.
- 00:30 The large siren sounds and is turned off.
- 00:50 The siren is heard within the plant area. The workers escape.

Outside^[4]

- 22:30 First sensations due to the gases are felt—suffocation, cough, burning eyes and vomiting.
- 1:00 Police are alerted. Residents of the area evacuate. Union Carbide director denies any leak.
- 2:00 The first people reached Hamidia Hospital. Symptoms include visual impairment and blindness, respiratory difficulties, frothing at the mouth, and vomiting.
- 2:10 The alarm is heard outside the plant.
- 4:00 The gases are brought under control.
- 7:00 A police loudspeaker broadcasts: "Everything is normal".

Health effects

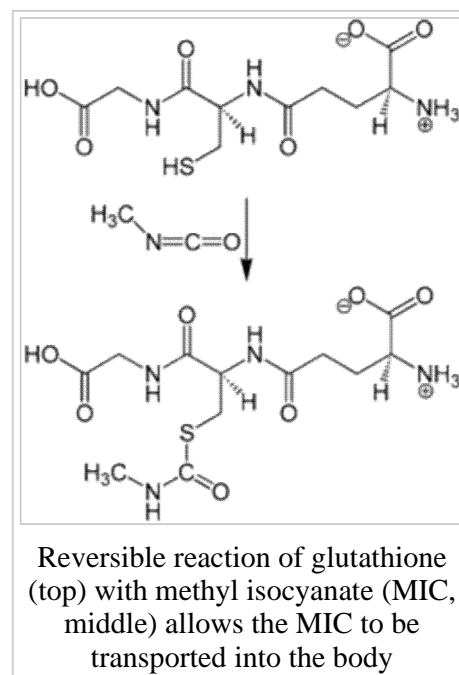
Short term health effects

The leakage caused many short term health effects in the surrounding areas. Apart from MIC, the gas cloud may have contained phosgene, hydrogen cyanide, carbon monoxide, hydrogen chloride, oxides of nitrogen, monomethyl amine (MMA) and carbon dioxide, either produced in the storage tank or in the atmosphere.^[4]

The gas cloud was composed mainly of materials denser than the surrounding air, stayed close to the ground and spread outwards through the surrounding community. The initial effects of exposure were coughing, vomiting, severe eye irritation and a feeling of suffocation. People awakened by these symptoms fled away from the plant. Those who ran inhaled more than those who had a vehicle to ride. Owing to their height, children and other people of shorter stature inhaled higher concentrations. Many people were trampled trying to escape.^[4]

Thousands of people had succumbed by the morning hours.

There were mass funerals and mass cremations as well as disposal of bodies in the Narmada river. 170,000 people were treated at hospitals and temporary dispensaries. 2,000 buffalo, goats, and other animals were collected and buried. Within a few days, leaves on trees yellowed and fell off. Supplies, including food, became scarce owing to suppliers' safety fears. Fishing was prohibited as well, which caused further supply shortages.^[4]



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. In 1991, 3,928 deaths had been certified. Independent organizations recorded 8,000 dead in the first days. Other estimations vary between 10,000 and 30,000. Another 100,000 to 200,000 people are estimated to have permanent injuries of different degrees.^[4]

The acute symptoms were burning in the respiratory tract and eyes, blepharospasm, breathlessness, stomach pains and vomiting. The causes of deaths were choking, reflexogenic circulatory collapse and pulmonary oedema. Findings during autopsies revealed changes not only in the lungs but also cerebral oedema, tubular necrosis of the kidneys, fatty degeneration of the liver and necrotising enteritis.^[32] The stillbirth rate increased by up to 300% and neonatal mortality rate by 200%.^[4]

Hydrogen cyanide debate

Whether hydrogen cyanide was present in the gas mixture is still a controversy.^{[32][33]}

According to some books written about the disaster, Union Carbide never made public the names of the toxic gases that leaked from the plant on December 2nd 1984. As a result, medical officers operating on the affected human beings could not administer the right antidote.

Exposed at higher temperatures, MIC breaks down to hydrogen cyanide (HCN). According to Kulling and Lorin, at +200 °C, 3% of the gas is HCN.^[34] However, according to another scientific publication,^[35] MIC when heated in the gas-phase starts breaks down to hydrogen cyanide (HCN) and other products above 400 °C. Concentrations of 300 ppm can lead to immediate collapse.

Laboratory replication studies by CSIR and UCC scientists failed to detect any HCN or HCN-derived side products. Chemically, HCN is known to be very reactive with MIC.^[36] HCN is also known to react with hydrochloric acid, ammonia, and methylamine (also produced in tank 610 during the vigorous reaction with water and chloroform) and also with itself under acidic conditions to form trimers of HCN called triazenes. None of the HCN-derived side products were detected in the tank residue.^[37]

The non-toxic antidote sodium thiosulfate ($\text{Na}_2\text{S}_2\text{O}_3$) in intravenous injections increases the rate of conversion from cyanide to non-toxic thiocyanate. Treatment was suggested early, but because of confusion within the medical establishments, it was not used on larger scale until June 1985.^[4]

Long term health effects

It is estimated that 20,000 have died since the accident from gas-related diseases. Another 100,000 to 200,000 people are estimated to have permanent injuries.^[4]

The quality of the epidemiological and clinical research varies. Reported and studied symptoms are eye problems, respiratory difficulties, immune and neurological disorders, cardiac failure secondary to lung injury, female reproductive difficulties and birth defects among children born to affected women. Other symptoms and diseases are often ascribed to the gas exposure, but there is no good research supporting this.^[4]

There is a clinic established by a group of survivors and activists known as Sambhavna. Sambhavna is the only clinic that will treat anybody affected by the gas, or the subsequent water poisoning, and treats the condition with a combination of Western and traditional Indian medicines, and has

performed extensive research.^[38]

Union Carbide as well as the Indian Government long denied permanent injuries by MIC and the other gases. In January 1994, the International Medical Commission on Bhopal (IMCB) visited Bhopal to investigate the health status among the survivors as well as the health care system and the socio-economic rehabilitation.

The reports from Indian Council of Medical Research^[22] were not completely released until around 2003.

Aftermath of the leakage

- Medical staff were unprepared for the thousands of casualties.^[4]
- Doctors and hospitals were not informed of proper treatment methods for MIC gas inhalation. They were told to simply give cough medicine and eye drops to their patients.^[4]
- The gases immediately caused visible damage to the trees. Within a few days, all the leaves fell off.^[4]
- 2,000 bloated animal carcasses had to be disposed of.^[4]
- "Operation Faith": On December 16, the tanks 611 and 619 were emptied of the remaining MIC. This led to a second mass evacuation from Bhopal.^[4]
- Complaints of a lack of information or misinformation were widespread. The Bhopal plant medical doctor did not have proper information about the properties of the gases. An Indian Government spokesman said that "Carbide is more interested in getting information from us than in helping our relief work."^[4]
- As of 2008, UCC had not released information about the possible composition of the cloud.^[4]
- Formal statements were issued that air, water, vegetation and foodstuffs were safe within the city. At the same time, people were informed that poultry was unaffected, but were warned not to consume fish.^[4]



Victims of Bhopal disaster asking for Warren Anderson's extradition from USA

Compensation from Union Carbide

- The Government of India passed the Bhopal Gas Leak Disaster Act that gave the government rights to represent all victims in or outside India.^[4]
- UCC offered US\$ 350 million, the insurance sum.^[4] The Government of India claimed US\$ 3.3 billion from UCC.^[4] In 1999, a settlement was reached under which UCC agreed to pay US\$470 million (the insurance sum, plus interest) in a full and final settlement of its civil and criminal liability.^[4]
- 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. Bhopal Memorial Hospital and Research Centre (BMHRC) was inaugurated in 1998. It was obliged to give free care for survivors for eight years.^[4]

Economic rehabilitation

- After the accident, no one under the age of 18 was registered. The number of children exposed to the gases was at least 200,000.^[4]

- Immediate relief was decided two days after the tragedy.^[4]
- Relief measures commenced in 1985 when food was distributed for a short period and ration cards were distributed.^[4]
- Widow pension of the rate of Rs 200/per month (later Rs 750) was provided.^[4]
- One-time ex-gratia payment of Rs 1,500 to families with monthly income Rs 500 or less was decided.^[4]
- Each claimant was 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.^[4]
- From 1990 interim relief of Rs 200 was paid to everyone in the family who was born before the disaster.^[4]
- The final compensation (including interim relief) for personal injury was for the majority Rs 25,000 (US\$ 830). For death claim, the average sum paid out was Rs 62,000.^[4]
- Effects of interim relief were more children sent to school, more money spent on treatment, more money spent on food, improvement of housing conditions.^[4]
- The management of registration and distribution of relief showed many shortcomings.^[39]
- 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 Rs.1,546.47 crores.^[40]
- Because of the smallness of the sums paid and the denial of interest to the claimants, a sum as large as Rs 10 billion is expected to be left over after all claims have been settled.^[4]

Occupational rehabilitation

- 33 of the 50 planned work-sheds for gas victims started. All except one was closed down by 1992.^[4]
- 1986, the MP government invested in the Special Industrial Area Bhopal. 152 of the planned 200 work-sheds were built. In 2000, 16 were partially functioning.^[4]
- It is estimated that 50,000 persons need alternative jobs, and that less than 100 gas victims have found regular employment under the government's scheme.^[4]

Habitation rehabilitation

- 2,486 flats in two- and four-story buildings were constructed in the "Widows colony" outside Bhopal. The water did not reach the upper floors. It was not possible to keep cattle. Infrastructure like buses, schools, etc. were missing for at least a decade.^[4]

Health care

- In the immediate aftermath of the disaster, the health care system became tremendously overloaded. Within weeks, the State Government established a number of hospitals, clinics and mobile units in the gas-affected area.^[4]
- Radical health groups set up JSK (the People's Health Centre) that was working a few years from 1985.^[4]
- Since the leak, a very large number of private practitioners have opened in Bhopal. In the severely affected areas, nearly 70 percent do not appear to be professionally qualified.^[4]
- The Government of India has focused primarily on increasing the hospital-based services for gas victims. Several hospitals have been built after the disaster. In 1994, there were approximately 1.25 beds per 1,000, compared to the recommendation from the World bank of 1.0 beds per 1,000 in developing countries.^[4]
- The Bhopal Memorial Hospital and Research Centre (BMHRC) is a 350-bedded super speciality hospital. Heart surgery and hemodialysis are done. Major specialities missing are

gynecology, obstetrics and pediatrics. Eight mini-units (outreach health centers) were started. Free health care for gas victims should be offered until 2006.^[4] The management has faced problems with strikes, and the quality of the health care is disputed.^{[41][42][43]}

- Sambhavna Trust is a charitable trust that registered in 1995. The clinic gives modern and Ayurvedic treatments to gas victims, free of charge.^{[4][44]}

Environmental rehabilitation

- When the factory was closed in 1985–1986, pipes, drums and tanks were cleaned and sold. The MIC and the Sevin plants are still there, as are storages of different residues. Isolation material is falling down and spreading.^[4]
- The area around the plant was used as a dumping area for hazardous chemicals. In 1982 tubewells in the vicinity of the UCC factory had to be abandoned.^[4] UCC's laboratory tests in 1989 revealed that soil and water samples collected from near the factory and inside the plant were toxic to fish.^[45] Several other studies has shown polluted soil and groundwater in the area.^[4]
- Reported polluting compounds are, among others, naphthol, naphthalene, Sevin, tarry residue, mercury, toxic organochlorines, volatile organochlorine compounds, chromium, copper, nickel, lead, hexachloroethane, hexachlorobutadiene, pesticide HCH and halo-organics. It is plausible that these chemicals have some negative health effects on those exposed, but there is no scientific evidence.^[4]
- In order to provide safe drinking water to the population around the UCC factory, there is a scheme for improvement of water supply.^[40]
- In December 2008, the Madhya Pradesh High Court decided that the toxic waste should be incinerated at Ankleshwar in Gujarat.^[46]

Union Carbide's defense

Now owned by Dow Chemical Company, Union Carbide denies allegations against it on its website dedicated to the tragedy. The corporation believes that the accident was the result of sabotage, stating that safety systems were in place and operative. It also stresses that it did all it could to alleviate human suffering following the disaster.^[47]

Investigation into possible sabotage

Theories of how the water entered the tank differ. At the time, workers were cleaning out pipes with water. The workers maintain that entry of water through the plant's piping system during the washing of lines was possible because a slip-bind was not used, the downstream bleeder lines were partially clogged, many valves were leaking, and the tank was not pressurized. The water, which was not draining properly through the bleeder valves, may have built up in the pipe, rising high enough to pour back down through another series of lines in the MIC storage tank. Once water had accumulated to a height of 6 meters (20 feet), it could drain by gravity flow back into the system. Alternatively, the water may have been routed through another standby "jumper line" that had only recently been connected to the system. Indian scientists suggested that additional water might have been introduced as a "back-flow" from the defectively designed vent-gas scrubber.^{[4][15]} However, none of these postulated routes of entry could be duplicated when tested by the Central Bureau of Investigators (CBI) and UCIL engineers. See Steve Weisman NYT and The Black Box of Bhopal. The company cites an investigation conducted by the engineering consulting firm Arthur D. Little, which concluded

that a single employee secretly and deliberately introduced a large amount of water into the MIC tank by removing a meter and connecting a water hose directly to the tank through the metering port.^[17] Carbide claims such a large amount of water could not have found its way into the tank by accident, and safety systems were not designed to deal with intentional sabotage. Documents cited in the Arthur D. Little Report as well as in the recent book *The Black Box of Bhopal* state that the Central Bureau of Investigation (CBI) along with UCIL engineers tried to simulate the water-washing hypothesis as a route of the entry of water into the tank. This all-important test failed to support this as a route of water entry. UCC claims the plant staff falsified numerous records to distance themselves from the incident, and that the Indian Government impeded its investigation and declined to prosecute the employee responsible, presumably because that would weaken its allegations of negligence by Union Carbide.^[48]

Safety and equipment issues

The corporation denies the claim that the valves on the tank were malfunctioning, claiming that "documented evidence gathered after the incident showed that the valve close to the plant's water-washing operation was closed and leak-tight. Furthermore, process safety systems—in place and operational—would have prevented water from entering the tank by accident". Carbide states that the safety concerns identified in 1982 were all allayed before 1984 and "none of them had anything to do with the incident".^[49]

The company admits that "the safety systems in place could not have prevented a chemical reaction of this magnitude from causing a leak". According to Carbide, "in designing the plant's safety systems, a chemical reaction of this magnitude was not factored in" because "the tank's gas storage system was designed to automatically prevent such a large amount of water from being inadvertently introduced into the system" and "process safety systems—in place and operational—would have prevented water from entering the tank by accident". Instead, they claim that "employee sabotage—not faulty design or operation—was the cause of the tragedy".^[49]

Response

The company stresses the "immediate action" taken after the disaster and their continued commitment to helping the victims. On December 4, the day following the leak, Union Carbide sent material aid and several international medical experts to assist the medical facilities in Bhopal.^[49]

Union Carbide states on its website that it put \$2 million into the Indian Prime Minister's immediate disaster relief fund on 11 December 1984.^[49] The corporation established the Employees' Bhopal Relief Fund in February 1985, which raised more than \$5 million for immediate relief.^[50]

According to Union Carbide, in August 1987, they made an additional \$4.6 million in humanitarian interim relief available.^[50]

Union Carbide states that it also undertook several steps to provide continuing aid to the victims of the Bhopal disaster after the court ruling, including:

- The sale of its 50.9 percent interest in UCIL in April 1992 and establishment of a charitable trust to contribute to the building of a local hospital. The sale was finalized in November 1994. The hospital was begun in October 1995 and was opened in 2001. The company provided a fund with around \$90 million from sale of its UCIL stock. In 1991, the trust had amounted approximately \$100 million. The hospital caters for the treatment of heart, lung and eye problems.^[47]
- Providing "a \$2.2 million grant to Arizona State University to establish a vocational-technical center in Bhopal, which was constructed and opened, but was later closed and leveled by the

government".^[51]

- Donating \$5 million to the Indian Red Cross.^[51]
- Developing the Responsible Care system with other members of the chemical industry as a response to the Bhopal crisis, which is designed "to help prevent such an event in the future by improving community awareness, emergency preparedness and process safety standards".^[50]

Long-term fallout

Legal action against Union Carbide has dominated the aftermath of the disaster. However, other issues have also continued to develop. These include the problems of ongoing contamination, criticisms of the clean-up operation undertaken by Union Carbide, and a 2004 hoax.

Legal action against Union Carbide

Legal issues began affecting Union Carbide, the US and Indian governments, the local authorities in Bhopal and the victims of the disaster immediately after the catastrophe.

Legal proceedings leading to the settlement

On 14 December 1984, the Chairman and CEO of Union Carbide, Warren Anderson, addressed the US Congress, stressing the company's "commitment to safety" and promising to ensure that a similar accident "cannot happen again". However, the Indian Government passed the Bhopal Gas Leak Act in March 1985, allowing the Government of India to act as the legal representative for victims of the disaster,^[50] leading to the beginning of legal wrangling.

In 1985, Henry Waxman, a Californian Democrat, called for a US government inquiry into the Bhopal disaster, which resulting in US legislation regarding the accidental release of toxic chemicals in the United States.^[52]

March 1986 saw Union Carbide propose a settlement figure, endorsed by plaintiffs' US attorneys, of \$350 million that would, according to the company, "generate a fund for Bhopal victims of between \$500–600 million over 20 years". In May, litigation was transferred from the US to Indian courts by US District Court Judge. Following an appeal of this decision, the US Court of Appeals affirmed the transfer, judging, in January 1987, that UCIL was a "separate entity, owned, managed and operated exclusively by Indian citizens in India".^[50] The judge in the US granted Carbide's forum request, thus moving the case to India. This meant that, under US federal law, the company had to submit to Indian jurisdiction.

Litigation continued in India during 1988. The Government of India claimed US\$ 350 million from UCC.^[4] The Indian Supreme Court told both sides to come to an agreement and "start with a clean slate" in November 1988.^[50] Eventually, in an out-of-court settlement reached in 1989, Union Carbide agreed to pay US\$ 470 million for damages caused in the Bhopal disaster, 15% of the original \$3 billion claimed in the lawsuit.^[4] 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.^[53]

Throughout 1990, the Indian Supreme Court heard appeals against the settlement from "activist petitions". Nonetheless, in October 1991, the Supreme Court upheld the original \$470 million, dismissing any other outstanding petitions that challenged the original decision. The decision set aside a "portion of settlement that quashed criminal prosecutions that were pending at the time of settlement". The Court ordered the Indian government "to purchase, out of settlement fund, a group medical insurance policy to cover 100,000 persons who may later develop symptoms" and cover any

shortfall in the settlement fund. It also "requests" that Carbide and its subsidiary "voluntarily" fund a hospital in Bhopal, at an estimated \$17 million, to specifically treat victims of the Bhopal disaster. The company agreed to this.^[50] However, the International Campaign for Justice in Bhopal notes that the Court also reinstated criminal charges.

Charges against Warren Anderson and others

The Chairman and CEO of Union Carbide, Warren Anderson, had been arrested and released on bail by the Madhya Pradesh Police in Bhopal on December 7, 1984. The arrest, which took place at the airport, assured Anderson would meet no harm by the Bhopal community. Anderson was taken to Union Carbide's house after which he was released six hours later on \$2,100 bail and flown out on a government plane.

It is claimed by the then Deputy Chief of Mission of the US embassy in New Delhi, in an interview with a news channel, that communications between the Government of India and himself relating to the release of Warren Anderson to return to the US went through the erstwhile foreign secretary.^[54] Rasgotra has also confirmed meeting Anderson and said, "Well, he looked deeply troubled, bedraggled, very sad, sorrowful, remorseful. And he said to me, 'I am shattered by what I have seen. Mr. Rasgotra, it will be my endeavour ... we can't undo what has happened, [but] it will be my endeavour to ensure a generous compensation package for those who had suffered'."^[55] Rasgotra also claimed that the Home Ministry, under the late P V Narasimha Rao, had assured "safe passage" to Union Carbide Chief Warren Anderson before he came to India in the aftermath of the deadly accident.^[56] Narasimha Rao's son Ranga Rao asserted that his father would not have taken such a decision on his own.^[57]

In 1987, the Indian government summoned Anderson, eight other executives and two company affiliates with homicide charges to appear in Indian court.^[58] Union Carbide balked, saying the company is not under Indian jurisdiction.^[58]

Beginning in 1991, the local authorities from Bhopal charged Anderson, who had retired in 1986, with manslaughter, a crime that carries a maximum penalty of 10 years in prison. Anderson has so far avoided an international arrest warrant and a US court summons. He was declared a fugitive from justice by the Chief Judicial Magistrate of Bhopal on February 1, 1992, for failing to appear at the court hearings in a culpable homicide case in which he was named the chief defendant. Orders were passed to the Government of India to press for an extradition from the United States, with whom India had an extradition treaty in place. The Bhopal Medical Appeal believe that "neither the American nor the Indian government seem interested in disturbing him with an extradition". A seemingly apathetic attitude from the US government, which has failed to pursue the case, has also led to strong protests in the past, most notably by Greenpeace. A plea by India's Central Bureau of Investigation to dilute the charges from culpable homicide to criminal negligence has since been dismissed by the Indian courts.

The U.S. Supreme Court refused to hear an appeal of the decision of the lower federal courts in October 1993, meaning that victims of the Bhopal disaster could not seek damages in a US court.^[50] The Rajiv Gandhi government reached an out of court settlement for compensation for the victims.

Meanwhile, very little of the money from the settlement reached with Union Carbide went to the survivors.^[4] On the anniversary of the tragedy, effigies of Anderson and politicians are burnt.

In July 2004, the Indian Supreme Court ordered the Indian government to release any remaining settlement funds to victims. The deadline for this release was extended by the Indian Supreme Court In April 2005, giving the Indian government until 30 April 2006 after a request from the Welfare Commission for Bhopal Gas Victims. The fund is believed to amount to \$500 million after earning interest "from money remaining after all claims had been paid".^[50]

August 2006 saw the Second Circuit Court of Appeals in New York City uphold the dismissal of remaining claims in the case of *Bano v. Union Carbide Corporation*. This move blocked plaintiffs' motions for class certification and claims for property damages and remediation. In the view of Carbide, "the ruling reaffirms UCC's long-held positions and finally puts to rest—both procedurally and substantively—the issues raised in the class action complaint first filed against Union Carbide in 1999 by Haseena Bi and several organizations representing the residents of Bhopal". In September 2006, the Welfare Commission for Bhopal Gas Victims announced that all original compensation claims and revised petitions had been "cleared".^[50]

Criminal charges were laid against former Union Carbide India Limited employees including: Former UCIL Non- Executive Chairman Keshub Mahindra; presently Chairman-cum-managing Director Vijay Gokhale; former Vice-President Functioning In charge, Kishor Kamdar; former works manager J. Mukund; and former Production manager A.P. Division, S.P. Choudhury. On June 7, 2010, an Indian court convicted all five of the above employees plus plant superintendent K.V. Shetty and production assistant S.I Qureshi of "death by negligence", which carries a maximum prison term of two years. All seven employees were given bail the same day against a bond of **Rs. 25,000** and all are expected to appeal against the decision.^[59]

Federal class action litigation, *Sahu v. Union Carbide et al.* is presently pending on appeal before the Second Circuit Court of Appeals in New York.^[60] The litigation seeks damages for personal injury, medical monitoring^[61] and injunctive relief in the form of cleanup^[62] of the drinking water supplies^[63] for residential areas near the Bhopal plant^[64] A related complaint seeking similar relief for property damage claimants is stayed pending the outcome of the Sahu appeal before the federal district court in the Southern District of New York.

On 7 June 2010 seven former employees of the Union Carbide subsidiary, all Indian nationals and many in their 70s, were convicted of causing death by negligence and each sentenced to two years imprisonment and fined Rs.1 lakh (US\$2,124; €1,776).^[65] All were released on bail shortly after the verdict.^[66] ^[67]^[68]

The names of those convicted are:

- Keshub Mahindra, former non- executive chairman of Union Carbide India Limited
- V.P. Gokhale, managing director
- Kishore Kamdar, vice-president
- J. Mukund, works manager
- S.P. Chowdhury, production manager
- K.V. Shetty, plant superintendent
- S.I. Qureshi, production assistant^[11]

Changes in corporate identity

Sale of Union Carbide India Limited

Union Carbide sold its Indian subsidiary, which had operated the Bhopal plant, to Eveready Industries India Limited, in 1994.

Acquisition of Union Carbide by Dow Chemical Company

The Dow Chemical Company purchased Union Carbide in 2001 for \$10.3 billion in stock and debt. Dow has publicly stated several times that the Union Carbide settlement payments have already fulfilled Dow's financial responsibility for the disaster. However, Dow did not purchase UCC's Indian

subsidiary, Union Carbide India. That was sold in 1994 and renamed Eveready Industries India limited

Some Dow stockholders filed suits to stop the acquisition, noting the outstanding liabilities for the Bhopal disaster.^[69] The acquisition has gained criticism from the International Campaign for Justice in Bhopal, as it is apparently "contrary to established merger law" in that "Dow denies any responsibility for Carbide's Bhopal liabilities". According to the Bhopal Medical Appeal, Carbide "remains liable for the environmental devastation" as environmental damage was not included in the 1989 settlement, despite ongoing contamination issues.^[69]

In June 2010, commentators criticised the disparity between the handling of the Bhopal disaster and the 2010 Deepwater Horizon oil spill (BP).^{[70][71][72]}

Ongoing contamination

The contamination in the site itself and the surrounding areas did not arise directly from the Bhopal disaster, but rather from the materials processed at the plant and the conditions under which those materials were processed. The area around the plant was used as a dumping ground area for hazardous chemicals. Between 1969 and 1977, all effluents were dumped in an open pit. From then on, neutralization with hydrochloric acid was undertaken. The effluents went to two evaporation ponds. In the rainy seasons, the effluents used to overflow. It is also said that large quantities of chemicals are buried in the ground.^[4]

By 1982 tubewells in the vicinity of the UCC factory had to be abandoned. In 1991 the municipal authorities declared water from over 100 tubewells to be unfit for drinking.^[4]

Carbide's laboratory tests in 1989 revealed that soil and water samples collected from near the factory were toxic to fish. Twenty-one areas inside the plant were reported to be highly polluted. In 1994 it was reported that 21% of the factory premises were seriously contaminated with chemicals.^{[45][73][74]}

Studies made by Greenpeace and others from soil, groundwater, wellwater and vegetables from the residential areas around UCIL and from the UCIL factory area show contamination with a range of toxic heavy metals and chemical compounds.^{[73][74][75][76][77]}

Substances found, according to the reports, are naphthol, naphthalene, Sevin, tarry residues, alpha naphthol, mercury, organochlorines, chromium, copper, nickel, lead, hexachlorethane, Hexachlorobutadiene, pesticide HCH (BHC), volatile organic compounds and halo-organics. Many of these contaminants were also found in breast milk.

In 2002, an inquiry found a number of toxins, including mercury, lead, 1,3,5 trichlorobenzene, dichloromethane and chloroform, in nursing women's breast milk. Well water and groundwater tests conducted in the surrounding areas in 1999 showed mercury levels to be at "20,000 and 6 million times" higher than expected levels; heavy metals and organochlorines were present in the soil. Chemicals that have been linked to various forms of cancer were also discovered, as well as trichloroethene, known to impair fetal development, at 50 times above safety limits specified by the United States Environmental Protection Agency (EPA).^[69]

In an investigation broadcast on BBC Radio 5 on November 14, 2004,^[78] it was reported that the site is still contaminated with 'thousands' of metric tons of toxic chemicals, including benzene hexachloride and mercury, held in open containers or loose on the ground. A sample of drinking water from a well near the site had levels of contamination 500 times higher than the maximum limits recommended by the World Health Organization.^[79]

In 2009, a day before the 25th anniversary of the disaster, Centre for Science and Environment (CSE), a Delhi based pollution monitoring lab, released latest tests from a study showing that groundwater in areas even three km from the factory up to 38.6 times more pesticides than Indian standards.^[80]

The BBC took a water sample from a frequently used hand pump, located just north of the plant. The sample, tested in UK, was found to contain 1000 times the World Health Organization's recommended maximum amount of carbon tetrachloride, a carcinogenic toxin.^[81] This shows that the ground water has been contaminated due to toxins leaking from the factory site.

Criticisms of clean-up operations

Lack of political willpower has led to a stalemate on the issue of cleaning up the plant and its environs of hundreds of tonnes of toxic waste, which has been left untouched. Environmentalists have warned that the waste is a potential minefield in the heart of the city, and the resulting contamination may lead to decades of slow poisoning, and diseases affecting the nervous system, liver and kidneys in humans. According to activists, there are studies showing that the rates of cancer and other ailments are high in the region.^[82] Activists have demanded that Dow clean up this toxic waste, and have pressed the government of India to demand more money from Dow.

Carbide states that "after the incident, UCIL began clean-up work at the site under the direction of Indian central and state government authorities", which was continued after 1994 by the successor to UCIL, Eveready Industries, until 1998, when it was placed under the authority of the Madhya Pradesh Government.^[50] Critics of the clean-up undertaken by Carbide, such as the International Campaign for Justice in Bhopal, claim that "several internal studies" by the corporation, which evidenced "severe contamination", were not made public; the Indian authorities were also refused access. They believe that Union Carbide "continued directing operations" in Bhopal until "at least 1995" through Hayaran, the U.S.-trained site manager, even after the sale of its UCIL stock. The successor, Eveready Industries, abruptly relinquished the site lease to one department of the State Government while being supervised by another department on an extensive clean up program. The Madhya Pradesh authorities have announced that they will "pursue both Dow and Eveready" to conduct the clean-up as joint tortfeasors.^[citation needed]

The International Campaign view Carbide's sale of UCIL in 1994 as a strategy "to escape the Indian courts, who threatened Carbide's assets due to their non-appearance in the criminal case". The successor, Eveready Industries India, Limited (EIIL), ended its 99-year lease in 1998 and turned over control of the site to the state government of Madhya Pradesh.^[47] Currently, the Madhya Pradesh Government is trying to legally force Dow and EIIL to finance clean-up operations.

On 7 March 2009, Indian scientists of the Indian Council of Medical Research (ICMR) have decided to investigate the long term health effects of the disaster. Studies will also be conducted to see if the toxic gases caused genetic disorders, low birth weight, growth and development disorders, congenital malformation and biological markers of MIC/toxic gas exposure.^[83]

Settlement fund hoax

On December 3, 2004, the twentieth anniversary of the disaster, a man claiming to be a Dow representative named Jude Finisterra was interviewed on BBC World News. He claimed that the company had agreed to clean up the site and compensate those harmed in the incident, by liquidating Union Carbide for \$12 billion USD.^[84]

Immediately afterward, Dow's share price fell 4.2% in 23 minutes, for a loss of \$2 billion in market

value. Dow quickly issued a statement saying that they had no employee by that name—that he was an impostor, not affiliated with Dow, and that his claims were a hoax. The BBC broadcast a correction and an apology. The statement was widely carried.^[85]

"Jude Finisterra" was actually Andy Bichlbaum, a member of the activist prankster group The Yes Men. In 2002, The Yes Men issued a fake press release explaining why Dow refused to take responsibility for the disaster and started up a website, at "DowEthics.com", designed to look like the real Dow website but with what they felt was a more accurate cast on the events. In 2004, a producer for the BBC emailed them through the website requesting an interview, which they gladly obliged.^[86]



Bichlbaum as Finisterra on BBC World News

Taking credit for the prank in an interview on *Democracy Now!*, Bichlbaum explains how his fake name was derived: "Jude is the patron saint of impossible causes and Finisterra means the end of the Earth". He explained that he settled on this approach (taking responsibility) because it would show people precisely how Dow could help the situation as well as likely garnering major media attention in the US, which had largely ignored the disaster's anniversaries, when Dow attempted to correct the statement.^[87]

After the original interview was revealed as a hoax, Bichlbaum appeared in a follow-up interview on the United Kingdom's Channel 4 News.^[88] During the interview he was repeatedly asked if he had considered the emotions and reaction of the people of Bhopal when producing the hoax. According to the interviewer, "there were many people in tears" upon having learned of the hoax. Each time, Bichlbaum said that, in comparison, what distress he had caused the people was minimal to that for which Dow was responsible. In the 2009 film *The Yes Men Fix the World*, the Yes Men travel to Bhopal to assess public opinion on their prank, and are surprised to find that the residents applaud their efforts to bring responsibility to the corporate world.

2010 Bhopal controversy

On June 7 2010 eight officials of Union Carbide had been convicted for the 1984 Bhopal gas disaster only for criminal negligence, which is punishable with a maximum of two years jail, despite the enormity of the tragedy. The eight include Keshub Mahindra, Industrialist. CII came for support of Mahindra - 'The law regarding potential liability of non-executive and independent directors needs to undergo a change,' said a statement issued by the Confederation of Indian Industry (CII), quoting its president Hari Bhartia. But Bhopal Gas Victims felt the Justice is not done yet saying Indian authorities of lacking the political will to go after Warren Anderson, who headed Union Carbide, the parent company in the US. "The message is going out that peoples' lives don't matter, what matters is foreign direct investment (FDI). You can kill people, maim them for life and get away almost scot-free," he said.

Congress admitted that it had no choice but to allow Warren Anderson, the former chairman of Union Carbide Corp responsible for the Bhopal gas tragedy, to leave the country. Pranab Mukherjee made this confession at a time when Congress is under pressure to explain Anderson's release after being arrested on Dec 7, 1984, five days after the gas tragedy. Pranab Mukherjee revealed that the decision to let Warren Anderson go, was taken by Arjun Singh and Rajiv Gandhi. He said that the release order was provided by the state government. He defended the decisions taken by Arjun Singh and Rajiv Gandhi. Mukherjee said that the law and order was deteriorating that it was very important to move Anderson out of the country. Madhya Pradesh Chief Minister Shivraj Singh Chauhan has written a letter to veteran Congress leader and former Madhya Pradesh Chief Minister Arjun Singh seeking an explanation for the escape of Union Carbide Chairman Warren Anderson, in connection with the 1984 Bhopal Gas Tragedy. In the letter, Singh asked Arjun Singh to reveal the person

responsible facilitating the safe passage for Warren Anderson days after the Bhopal gas leak. Later in political debates, Congress's spokespersons refused to comment on release of Warren Anderson.

In response to US President Barack Obama's stance against BP following the Deepwater Horizon oil spill, The Guardian ran headlines claiming that the difference in the US reaction to the two incidents was evidence of double standards.^[89]

On 24 June Group of Ministers for Bhopal Gas tragedy case announced a Rs1265cr package. This will be from the Indian taxpayer's money, as the Rajiv Gandhi government had freed UCIL of any liabilities in 1989. Till 2 July Congress party or Indian government still have not disclosed why Anderson was released and Why Indian government let go UCIL liability free for less money than needed for rehabilitation of Bhopal Gas victims.

See also

- List of industrial disasters
- Corporate social responsibility

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- It Happened in Bhopal, 27 Aug 2007
- Shrouds of Silence, August 2008
- Bhopal: Prayer for Rain, upcoming film based on the Bhopal disaster.
- The Yes Men Fix the World, documentary film released on October 23, 2009, which includes discussion of the disaster and shows
- The Bhopal Chemical Disaster. documentary film
- Chingari Trust at YouTube

Photos

- No More Bhopals, Micha Patault
- Raghu Rai, 1984
- Pablo Bartholomew, 1984
- The Ghosts of Bhopal, Common Language Project
- Child killed by the poisonous gas leak in the Union Carbide chemical plant disaster, World Press Photo of the Year, 1984
- Poison in Bhopal, ReMedAct, 2008
- Bhopal XXV, Stephane Bouillet
- Bhopal Gas Tragedy – 25 Years On | 26 Photos, Reuters India
- 25th anniversary of the Bhopal disaster, The Boston Globe

Texts

- Bhopal Gas Tragedy A railway officer describes how he received victims coming by train, 2002

Music

- "No Thunder, No Fire, No Rain" by Tim Finn, from the 1986 album Big Canoe, presents a lyrical narrative of the disaster.
- The Bhopal disaster is referenced in the song R.S.V.P. by B Dolan in which he decries Warren Anderson's involvement and gives out his home address.

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