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The Bhopal Gas Tragedy

On December 3, 1984, at a Union Carbide plant in Bhopal, India, approximately 40 tons of methyl isocyanide leaked from a storage tank. This accident killed over 2,000 people and injured over 500,000 others. The gas leak occurred because of faulty design, poor maintenance, and lack of safety equipment. The company had been given several opportunities to correct the problem, but refused to do so. The accident has been described as the worst industrial disaster in history.

Union Carbide is a major producer of vinyl chloride monomer, vinyl chloride polymer, and vinyl chloride copolymer. It also manufactures various organic chemicals, including methyl isocyanide. The company has operations in over 50 countries and employs over 40,000 people. The accident at the Bhopal plant was a major setback for the company, and it has since taken steps to improve its safety record.

This case was written by Sanjib Dutta, ICFAI Center for Management Research (ICMR). It is intended to be used as the basis for class discussion rather than to illustrate either effective or ineffective handling of a management situation.

The case was compiled from published sources.

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 North America, phone: +1 781 239 5884, fax: +1 781 239 5885, e-mail: ECCHBabson@aol.com.
 Rest of the World, phone: +44 (0)1234 750903, fax: +44 (0)1234 751125, e-mail: ECCH@cranfield.ac.uk.
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THE BHOPAL GAS TRAGEDY

"The numerous safety systems with which this type of plant is equipped enable us to control any of the MIC's potentially dangerous reactions."

- A Union Carbide official commenting on the safety systems in the Bhopal pesticide plant.

"It's not a deadly gas, just irritating, a sort of tear gas."

- Dr Loya, Union Carbide's official doctor in Bhopal, commenting on Methyl Isocyanate, after the tragedy.

INTRODUCTION

In the early morning hours of December 3, 1984, a poisonous grey cloud (forty tons of toxic gases) from Union Carbide India Limited (UCIL's)¹ pesticide plant at Bhopal spread throughout the city. Water carrying catalytic material had entered Methyl Isocyanate (MIC) storage tank No. 610. What followed was a nightmare. The killer gas spread through the city, sending residents scurrying through the dark streets. No alarm ever sounded a warning and no evacuation plan was prepared. When victims arrived at hospitals breathless and blind, doctors did not know how to treat them, as UCIL had not provided emergency information. It was only when the sun rose the next morning that the magnitude of the devastation was clear. Dead bodies of humans and animals blocked the streets, leaves turned black, the smell of burning chilli peppers lingered in the air. Estimates suggested that as many as 10,000 may have died immediately and 30,000 to 50,000 were too ill to ever return to their jobs.

The catastrophe raised some serious ethical issues. The pesticide factory was built in the midst of densely populated settlements. UCIL chose to store and produce MIC, one of the most deadly chemicals (permitted exposure levels in USA and Britain are 0.02 parts per million), in an area where nearly 120,000 people lived. The MIC plant was not designed to handle a runaway reaction. When the uncontrolled reaction started, MIC was flowing through the scrubber (meant to neutralize MIC emissions) at more than 200 times its designed capacity. MIC in the tank was filled to 87% of its capacity while the maximum permissible was 50%. MIC was not stored at zero degree centigrade as prescribed and the refrigeration and cooling systems had been shut down five months before the disaster, as part of UCC's global economy drive. Vital gauges and indicators in the MIC tank were defective. The flare tower meant to burn off MIC emissions was under repair at the time of the disaster and the scrubber contained no caustic soda.

As part of UCC's drive to cut costs, the work force in the Bhopal factory was brought down by half from 1980 to 1984. This had serious consequences on safety and maintenance. The size of the work crew for the MIC plant was cut in half from twelve to six workers. The maintenance supervisor position had been eliminated and there was no maintenance supervisor. The period of safety training to workers in the MIC plant was brought down from 6 months to 15 days.

In addition to causing the Bhopal disaster, UCC was also guilty of prolonging the misery and suffering of the survivors. By withholding medical information on the chemicals, it deprived victims of proper medical care. By denying interim relief, as directed by two Indian courts, it caused a lot hardship to the survivors. In February 1989, the Supreme Court of India ruled that UCC should pay US\$470 million as compensation in full and final settlement. UCC said it would accept the ruling provided Government of India (GoI) did not pursue any further legal proceedings against the company and its officials. GoI accepted the offer without consulting with the victims.

¹ Subsidiary of the US based Union Carbide Corporation (UCC).

THE JOURNEY FROM VIRGINIA TO BHOPAL

In the beginning of the 20th century, UCC was born of a merger of four US companies producing batteries and arc lamps for street lighting and headlamps for cars. By the second half of the 20th century, UCC had 130 subsidiaries in 40 countries, approximately 500 production sites and 120,000 employees. UCC manufactured industrial gases, such as nitrogen, oxygen, methane, ethylene and propane, used in petroleum industry as well as chemical substances like ammonia and urea used in the manufacture of fertilizers. It also produced sophisticated metallurgical specialities based on alloys of cobalt, chrome and tungsten, used in airplane turbines. In addition to all these, it produced a whole range of plastic goods for general use.

In the 1950s, parasites were creating havoc in the United States, as well as Mexico, Central America and several South American countries, destroying fodder crop, and plantations. These parasites also found in Malaysia, Japan, and southern Europe attacked potato crops as well as fruit trees and vegetables. The red vine spider was another threat to food crops. The chemical industry had to come up with something to eradicate this. A number of companies went into action. One of them was UCC.

In 1954, UCC embarked on a mission of devising a product to exterminate a wide range of parasites, while at the same time respecting the prevailing standards for the protection and safety of human beings and their environment. Thus was born the 'Experimental Insecticide Seven Seven,' which soon came to be known as 'Sevin.' To manufacture Sevin phosgene² gas was made to react with another gas called monomethylamine. The reaction of these two gases produced a new molecule, MIC. MIC was one of the most dangerous compounds ever invented in the chemical history. UCC's toxicologists had tested it on rats and the results had been so terrifying that the company banned publication of their work. Other experiments had shown that animals exposed to MIC vapours would face instantaneous death. MIC was so volatile that as soon as it came into contact with a few drops of water or a few ounces of metal dust, it got off an uncontrollably violent reaction. No safety system, no matter how sophisticated, would then be able to stop it emitting a fatal cloud into the atmosphere. To prevent explosion, MIC had to be kept permanently at a temperature near zero. Therefore, provision had to be made for the refrigeration of any drums or tanks that were to hold it.

UCC's operations in India started in the beginning of the twentieth century. In 1924, an assembly plant for batteries was opened in Kolkata. By 1983 UCC had 14 plants in India manufacturing chemicals pesticides, batteries and other products. UCC held a 50.9 % stake in the Indian subsidiary. The balance of 49.1% was owned by various Indian investors. Normally foreign investors were limited to 40% ownership of equity in Indian companies, but GoI waived this requirement in the case of UCC because of the sophistication of its technology and the company's potential for export.

In 1966, an agreement was signed between GoI and UCIL. Under the agreement, UCIL would import 1,200 tons of Sevin from the parent company in the United States. UCC would build a factory in India to produce Sevin within five years. The location of the factory would be Kali Grounds in Bhopal (Madhya Pradesh) (Refer Exhibit I). In 1969, UCC set up its pesticide unit in Bhopal.

The GoI granted a license to UCIL to manufacture 5,000 tons of Sevin a year. UCIL would produce Sevin and all the chemical ingredients required in India itself. Eduardo Munoz, the Argentinean agronomic engineer, who was with UCC, was entrusted the responsibility of making the project a success. Eduardo Munoz felt that manufacturing 5,000 tons of Sevin would require considerable quantities of MIC to be manufactured and stored. He was not in favour of storing huge quantity of MIC and suggested an alternative like batch production of MIC to meet production line requirements as they rose. This would eliminate the need to store large quantity of MIC on site. However, this production philosophy was against the American industrial culture and UCC officials turned down the

² The gas used to strangle thousands of First World War soldiers in the guise of Mustard gas.

suggestion saying, "You have absolutely no need to worry, dear Eduardo Munoz. Your Bhopal plant will be as inoffensive as a chocolate factory."³

Eduardo Munoz was also against the proposed site of the factory as it was too close to areas where people lived, such as the slums in Oriya Bustee, Jayprakash Nagar and Chola (Refer Exhibit I). However, UCC officials thought Kali Grounds was the right place to build the plant. These officials submitted their request for a sixty hectare plot of land on Kali Grounds. According to municipal planning regulations, no industry likely to give off toxic emissions could be set up on a site where the prevailing wind might carry effluents into densely populated areas. At the Kali Grounds the wind usually blew from north to south, toward the slums, the railway station and finally toward the overpopulated parts of the old town. Under such circumstances, the application should have been rejected. But the UCC officials did not mention that their proposed factory would be making pesticides out of the most toxic gases available in the chemical industry.

At the beginning of the summer of 1972, UCC dispatched to UCIL all the plans for the factory's construction and development. In 1979, the Bhopal plant was inaugurated and work started. Initially, when the factory was not ready to make the MIC needed to produce Sevin, the UCIL management decided to import several hundred barrels from the parent company's factory in the United States. In May 1980, the chemical reactors of the Bhopal plant produced their first gallons of MIC and dispatched them into three huge tanks. The new CEO of UCC, Warren Anderson, came over especially from the United States for the event.

ALL'S NOT WELL WITH THE BHOPAL PLANT

Since 1980, the Bhopal plant had caused death and injury to many. In December 1981, plant operator Mohammed Ashraf was killed by a phosgene gas leak. Two other workers were injured. In May 1982, three American engineers from the chemical products and household plastics division of UCC came to Bhopal. Their task was to appraise the running of the plant and confirm that everything was functioning according to the standards laid down by UCC. The report presented to the UCC officials revealed that all was not well with the Bhopal plant. The report described the surroundings of the site as being 'strewn with oily old drums, used piping, pools of used oil and chemical waste likely to cause fire.' It condemned the shoddy workmanship on certain connections, the warping of equipment, the corrosion of several circuits, the absence of automatic sprinklers in the MIC and phosgene production zones, and the risk of explosion in the gas evacuation flares. It also reported leaks of phosgene, MIC and chloroform, ruptures in pipework and sealed joints, absence of any earth wire on one of the three MIC tanks and poor adjustment of certain devices where excessive pressure could lead to water entering the circuits. At the same time, the report expressed concern at the inadequately trained staff, unsatisfactory instruction methods and sloppy maintenance reports.

Local newspapers in Bhopal published articles criticizing the poor management of the Bhopal plant. One newspaper said, "The day is not far off when Bhopal will be a dead city, when only scattered stones and debris will bear witness to its tragic end."⁴ In October 1982, MIC escaped from a broken valve, seriously affecting four workers and causing eye irritation and breathlessness among people in the nearby communities. This incident was a clear indication of the potential risk to public life.

In the early 1980s, UCC appointed Warren Woomer as the managing director of its pesticide plant in Bhopal. Analysts felt that this signaled the degree of control UCC wanted to exercise over UCIL. In 1982, Woomer retired and Jagannathan Mukund (Mukund) became the managing director. In 1983, under pressure from the parent company, Mukund devoted all his energies to cost cutting. Two hundred skilled workers and technicians were asked to resign. In the MIC unit alone, the manpower in

³ It was five past midnight in Bhopal, Dominique Lapierre & Javier Moro, Full Circle Publishing, 2001.

⁴ Rapat Weekly, September 30, 1982.

each shift was cut by half. In the control room, only one man was left to oversee some seventy dials, counters and gauges, which relayed, among other things, the temperature and pressure of the three tanks containing the MIC.

The issue of the danger posed by the pesticide plant to Bhopal was raised in the Madhya Pradesh Assembly in December 1982. However, T S Viyogi, labour minister in the Arjun Singh⁵ government allayed all fears saying, "A sum of Rs. 250 million has been invested in this unit. The factory is not a small stone, which can be shifted elsewhere. There is no danger to Bhopal, nor will there ever be." Equally confident was Mukund: "The gas leak just can't be from my plant. The plant is shut down.⁶ Our technology just can't go wrong, we just can't have such leaks," he said.

In the autumn of 1983, Mukund ordered the shutting down of the principal safety systems in the plant. He felt that because the factory was no longer active, these systems were no longer needed. According to analysts Mukund did not pay heed to the fact that sixty tons of MIC were stored in the tanks. Interrupting the refrigeration of these tanks might possibly save a few hundred rupees worth of electricity a day, but it violated a fundamental rule laid down by UCC's chemists, which stipulated that MIC must in all circumstances be kept at a temperature close to zero degree celsius. In order to save coal, the flames which burnt off any toxic gases emitted into the atmosphere in the event of an accident that burned day and night at the top of the flare, was also extinguished. Other essential equipment, such as the scrubber cylinder used to decontaminate any gas leaks, were subsequently deactivated.

All this served as a signal for many well-trained and experienced engineers and operators to leave the Bhopal factory in search of more secure and satisfactory employment. Between one-half and two-thirds of the skilled engineers who had worked with the plant right from the project stage had left the plant by 1983.

Analysts felt that the top officials at UCC were neglecting the Bhopal plant because they were no longer interested in it. The Bhopal plant was licensed to manufacture 5,000 tons of MIC based pesticides per year. However, peak production was only 2704 tons in 1981, which fell to 1657 tons in 1983. Thus the quantity of pesticides manufactured in 1983 was only 33.14% of its licensed capacity. In the first ten months of 1984, UCIL's losses amounted to Rs. 50 million. UCC planned to close the plant and put it up for sale. When no buyer came forward in India, plans were made to dismantle the factory and ship it to another country. Negotiations to this end were completed by the end of November 1984. Financial losses and plans to dismantle the plant exacerbated UCIL's already negligent management practices.

THE TRAGEDY

On the night of December 2, 1984, during routine maintenance operations at the MIC plant, at about 9.30 p.m., a large quantity of water entered storage tank no. 610 containing over 40 tons of MIC. This triggered off a reaction, resulting in a tremendous increase of temperature and pressure in the tank. 40 tonnes of MIC, along with Hydrogen Cyanide and other reaction products burst past the ruptured disc into the night air of Bhopal at around 12.30 a.m. Safety systems were grossly under-designed and inoperative. Senior factory officials knew of the lethal build-up in the tank at least one hour before the leakage, yet the siren to warn neighbourhood communities was sounded more than one hour after the leak started. By then, the poisonous gases had covered an area of 40 sq.kms. killing thousands of people. Over 500 thousand experienced acute breathlessness, pain in the eyes, and vomiting as they inhaled the deadly vapours. They ran in panic to get away from the poisonous cloud that hung close to the ground for more than four hours. When people poured into hospitals by thousands, their eyes and lungs in burning, choking agony, the doctors called up the plant medical officer to find out what they

⁵ The then Chief Minister of Madhya Pradesh.

⁶ In 1982, Mukund stopped MIC production to empty the tanks where MIC was stored.

ought to do. Dr Loya, UCIL's official doctor in Bhopal replied, "It is not a deadly gas, just irritating, a sort of tear gas."⁷

Unofficial estimates put the death toll at over 16,000. A study carried out by a Non Governmental Organization in March 1985 showed that between 50% - 70% of the non-hospitalised population in exposed areas of Bhopal had one or more symptoms of MIC poisoning. According to an epidemiological study sponsored by Jawaharlal Nehru University, New Delhi, in October 1989, 70% to 80% of the people in the severely affected communities and 40% to 50% in the mildly affected communities continued to suffer from MIC exposure related illnesses five years after the disaster. A house to house symptom survey in one community, conducted as part of a doctoral dissertation in Delhi University in early 1993, showed 65.7% people suffering from respiratory symptoms, 68.4% with neurological problems and 49% with ophthalmic symptoms. Among the women in the reproductive age, 43.2% suffered from reproductive disorders.

UNION CARBIDE TAKES THE OFFENSIVE

Following the accident, the GoI filed a compensation lawsuit against the UCC for an estimated US\$3 billion. However, UCC felt that the GoI was to blame for the disaster. In December 1986, UCC filed a countersuit against the GoI and the State of Madhya Pradesh. The company charged the governments with "contributory" responsibility for the leak of poisonous gases, saying both governments knew of the toxicity of MIC but failed to take adequate precautions to prevent a disaster.

Under the two sections "First Steps At Control" and "Contingency Planning and Experience Help," UCC listed all the things that it did immediately following the first call it got about the tragedy. The document said that vital decisions were made—the UCC facility making MIC in the US was shut down; a task force led by Warren Anderson was set up; and medical and technical teams were dispatched to the site of the tragedy "within 24 hours." The document also said, "Union Carbide had a contingency plan for emergencies." However analysts felt that contrary to what was said in UCC's document, UCC did not have any kind of emergency plans in place at its Indian subsidiary. So much so, that when the accident occurred and people started pouring into the hospitals in Bhopal complaining about the various ailments, the hospital staff had no idea of what had happened or what to do.

UCC tried to defend its position by saying that it had only a 50.9% stake in UCIL. The company also said that all the employees in the company were Indians and that "...the last American employee at the site had left two years before." UCC maintained that it did not have any hold over its Indian affiliate. UCC further argued that the day-to-day working of UCIL was independent of the parent company and therefore it could not be held responsible for the gas leak. However investigations revealed that this was not really true. In spite of denials, it appeared that UCC had substantial authority over its affiliate. Many of the day-to-day details, such as staffing and maintenance, were left to Indian officials, but every major decision, such as the annual budget, had to be cleared with the parent company.

THE SETTLEMENT

Within months after the disaster, the GoI issued an ordinance appointing itself as the sole representative of the victims for any legal dealings with UCC as regards compensation. The ordinance was later replaced by the Bhopal Gas Leak (Processing of Claims) Act, 1985. Armed with this power, the GoI filed its suit for compensation and damages against UCC in the United States District Court for the Southern District of New York. Besides filing the suit, one of its prime responsibilities was to register the claims of each and every gas victim in Bhopal. Analysts felt that this job was never done, or rather, not with any seriousness for the next ten years. The government set up various inquiry

⁷ It was five past midnight in Bhopal, Dominique Lapierre & Javier Moro, Full Circle Publishing, 2001.

commissions to investigate the causes of the disaster; they remained half-hearted initiatives at best. UCC, on the other hand, moved more quickly with its ‘investigations’: it announced by March 1985 that the disaster was due to ‘*an act of sabotage*’ by a Sikh terrorist. Then they shifted blame to a disgruntled worker.

In May 1986, Judge J.F. Keenan ruled that India and not the US was the appropriate forum for the Bhopal compensation litigation. In the first pre trial hearing in the consolidated Bhopal litigation in US federal courts, John F Keenan, asked UCC as ‘a matter of fundamental human decency’ to provide an interim relief payment of \$5 - 10 million. UCC agreed to provide \$5 million, provided a satisfactory plan of distribution and accounting of the funds was devised. For 8 months, the UCC and the GoI haggled over terms of reference and conditions for using the \$5 million interim relief. Finally, in November 1985, the parties agreed to channel the money through the American Red Cross to the Indian Red Cross. Even after one year of the tragedy, no one—not even the official of the MP Government in charge of relief for the victims—had any idea what the Red Cross would do with the money.

On December 17, 1987, a Bhopal District Court Judge passed an order directing UCC to pay Rs. 3.5 billion as interim relief. UCC challenged this order in the MP high court (at Jabalpur) on the grounds that the trial judge was not authorised to pass the order under any provisions of the Indian Civil Penal Code. On April 4, Justice S. K. Seth of the High Court upheld the liability of UCC for the Bhopal disaster, but reduced the interim compensation to Rs 2.5 billion. UCC appealed to the Supreme Court of India against the High Court order saying, “No court that we know of in India or elsewhere in the world has previously ordered interim compensation where there is no proof of damages or where liability is strongly contested.”⁸ On February 14, 1989, the Supreme Court directed UCC to pay up US \$ 470 million in “full and final settlement” of all claims, rights, and liabilities arising out of the disaster. The Supreme Court of India ruled that the \$470 million settlement was “just, equitable and reasonable.”

UCC described the court’s decision as fair and reasonable, and the company’s stock soared in the London market. Analysts felt that the Bhopal Gas disaster, which left thousands of people dead and injured, was settled for a mere US \$ 470 million—which worked out to around Rs. 10,000 per victim (if it was divided equally). In the same year, a leading national daily⁹ stated that approximately US \$ 40,000 was spent on the rehabilitation of every sea otter affected by the Alaska oil spill.¹⁰ Each sea otter was given rations of lobsters costing US \$ 500 per day. Thus the life of an Indian citizen in Bhopal was clearly much cheaper than that of a sea otter in America.

In 1991, the Bhopal court summoned Warren Anderson to appear on a charge of ‘homicide in a criminal case.’ However, he did not turn up.

On September 9, 1993, UCC sold its entire 50.9% stake in UCIL to the Calcutta based Mc Leod Russell India Ltd., a company of the B M Khaitan Group.

Till 2000, attempts to serve a summon on Warren Anderson by victims’ organizations in the Federal Court on Southern district of New York have been unsuccessful. Kenneth McCallion, who was the lawyer for some of the victims and their family members, said a private investigator also hired to deliver the summons at Anderson’s residences in Vero Beach, Florida, and Manhattan and Long Island in New York was unable to locate him. Asked if he believed Warren Anderson had gone into hiding to

⁸ An independent investigation carried out by Arthur D. Little, Inc, on behalf of UCC, showed that the Bhopal incident was caused by a disgruntled employee who introduced a large volume of water by connecting a water hose directly to the tank.

⁹ The Times of India.

¹⁰ Exxon was involved in a major disaster in 1989, when one of its tankers met with an accident and spilled 11 million gallons of oil in Prince William Sound in Alaska. The oil tanks of the Exxon Valdez were ruptured in a collision off the coast of Alaska.

avoid the summons, McCallion said, "We are just surprised we have been unable to find him, a former CEO of a major corporation." He observed, "And there is also a legal process which has been issued by the courts in India for him to appear in Bhopal district court to answer criminal charges and those attempts to serve him... have been unsuccessful as well."

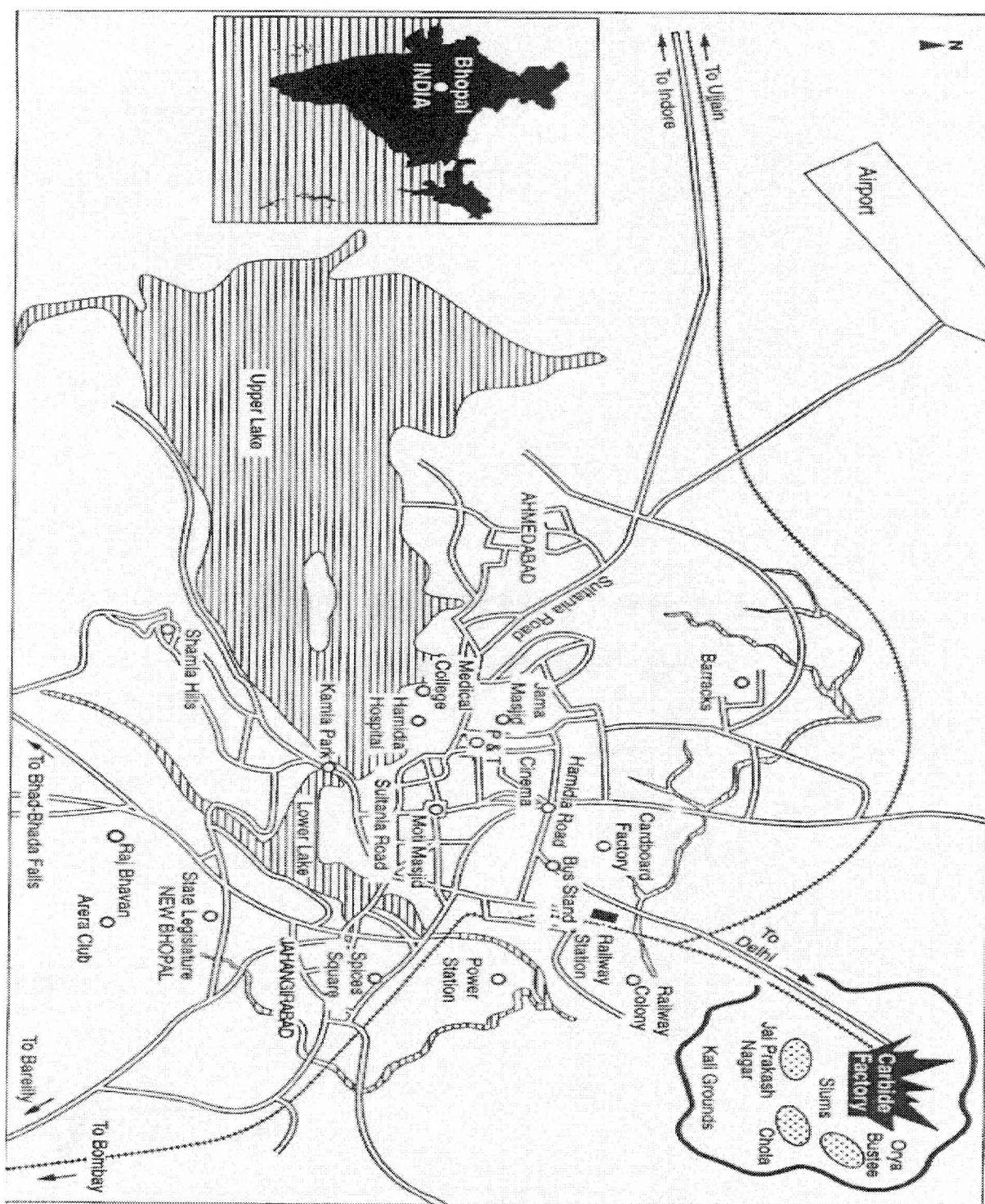
In 2001, in their book, *It was five past midnight in Bhopal*, Dominique Lapierre and Javier Moro wrote that bringing UCC to justice was unlikely because UCC had been sold out. In August 1999, Dow Chemical purchased UCC for US\$ 9.3 billion.

QUESTIONS FOR DISCUSSION:

1. The Bhopal Gas Tragedy is a catastrophe that has no parallel in industrial history. Bring out the ethical issues involved in the case. Do you think the GoI and the Madhya Pradesh Government were equally responsible for the disaster? Explain with reasons.
2. Do you think Union Carbide Corp.'s response to the Bhopal Gas Tragedy was in line with the image it held in the public? What according to you UCC should have done to restore its image after the disaster?

EXHIBIT I

THE SITE FOR THE PESTICIDE FACTORY



Source: It was five past midnight in Bhopal, Dominique Lapierre & Javier Moro, Full Circle Publishing