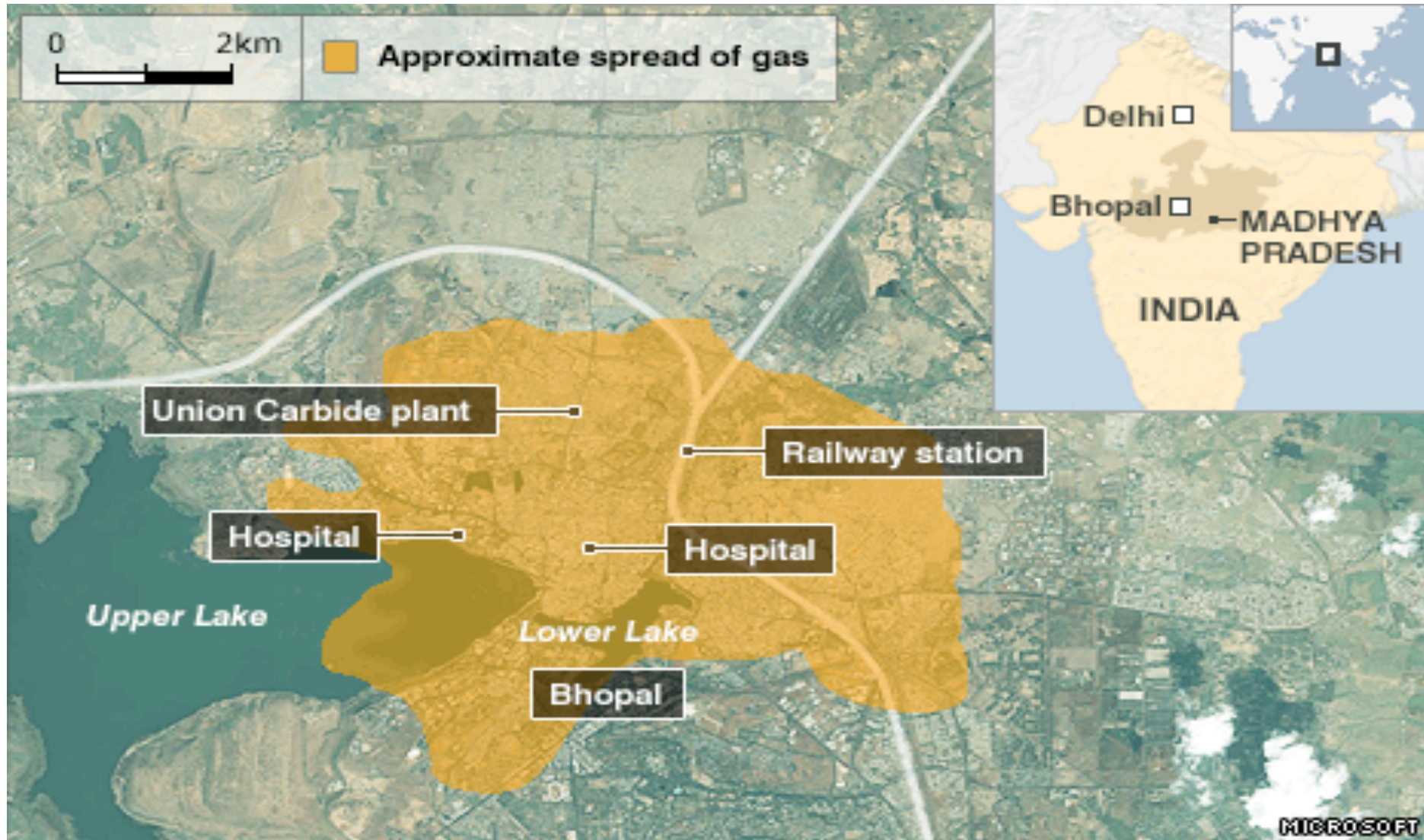


BHOPAL DISASTER

Environmental Toxins

University of Colorado Jun 2013

Location



What happened

- On December 3th, 1984 , gas leak in pesticides plant at the union carbide Limited (UCIL) caused the world's worst industrial disaster
- Chemical reaction took place in Methyl isocyanate (MIC) gas tank due to water entered the tank
- 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.
- that forced the emergency venting of pressure from the MIC holding tank, releasing a large volume of toxic gases into the atmosphere.
- 40 tons of MIC emitted out and created dense cloud of chemicals as result of explosion blown over Bhopal caused thousands of people death
- It is estimated that around 8,000 people died during the first week and in total death around 20,000 people
- More than a half million people effected by that industrial disaster

Released Gases

Some other gases released with MIC that produced in the tank or in the atmosphere as reaction with the oxygen atoms or other chemicals emitted from other sources

- Phosgene
- hydrogen
- cyanide
- carbon monoxide
- hydrogen chloride
- oxides of nitrogen
- monomethyl amine(MMA)
- carbon dioxide

Some precede leaks and potential of reaction

- * 1976, two trade union complained of pollution within plant .
- * 1981, worker was splashed with phosgene and inhaling a large amount of phosgene and died after 72 hours later.
- * 1979, local Indian authorities had warned the company of the problem but was not undertaken action by UCIC at that time.
- * 1981, American experts warned UCC of potential of a runaway reaction in the MIC storage tank.
- * 1982, phosgene leaks exposed 24 workers.
- * 1983 and 1984, there were leaks of MIC, chlorine, monomethylamin, phosgene, and carbon tetrachloride .

Some factors leading to the disaster

- * Large tank to storage MIC beyond the recommended level
- * The refrigeration unit for keeping MIC at low temperatures had been shut off
- * The flare tower, designed to burn off MIC escaping from the scrubber, was also turned off
- * Poor maintenance
- * Switch off of safety system to save money
- * Use more dangerous pesticides production method
- * The dependence on manual operation
- * Lack of skilled operators
- * Lack of inadequate emergency action plans

Effects of the Spill

- * Overnight death estimates of 2,000 to 3,000
- * Estimate that 8,000 more died within two weeks and that eventually led to about 20,000 deaths
- * About 558,125 injuries were caused from the accident with 3,900 permanently disabling
- * About 2,000 buffalo, goats and other animals were killed
- * Infrastructures were missing from the town for a decade

Health Effects

- * Immediate effects:
 - * Coughing, vomiting, severe eye irritation, loss of breath, skin damage
- * Respiratory problems
 - * Lung irritation, shortness of breath, Asthma, pulmonary oedema
- * Cancer increase
 - * Uterine, cervical and breast cancer
- * Reproductive problems
 - * Miscarriages, Deformed and handicapped babies born, in breast milk of mothers and passed to children
- * Tuberculosis increase
- * Bronchial Pneumonia

Long-Term problems

- * Stillbirth rate increase by 300%
- * Neonatal mortality rate increased by 200%
- * Women who survived have hard time marrying due to medical problems and chance of reproductive problems
- * Greenpeace reported that chemicals in water today that cause cancer, damage to liver and kidneys, effect the nervous system, and human fetuses
 - * Sevin, tarry residue, mercury, organochlorides, VOCs, chromium, copper, nickel, lead, hexachloroethane, hexachlorobutadiene and pesticide HCH
 - * This water is still being contaminated and is drank by over 20,000 people

Long-Term Problems

- * Legal Problems

- * UCC paid US \$470 million for damages
 - * Government of India claimed \$350 million from UCC
 - * Seven ex-employees were convicted and sentenced to two years in prison and fined
 - * Victims of tragedy only got about \$300-500 to cover medical expenses
 - * For 28 years the victims have demanded justice and have not received anything near what they deserve
- * 10-15 people still dying a month due to gas exposure
- * Abnormal menstrual cycles in women
- * Health problems appear three generations later

Cleanup

- * Site turned over to state government
- * Cleanup ended in 1998
- * Groundwater still contaminated

Prevention

- * Safer method of pesticide manufacturing
- * Employees
- * Follow regulations
 - * Storage
 - * Cleaning
- * Infrastructure

Social Media Can Help

- * Get informed and SHARE:

- * Twitter:

- * @BhopalMedAppeal

- * Facebook

- * <https://www.facebook.com/pages/The-Bhopal-Medical-Appeal/176365402876>

- * YouTube

- * <http://www.youtube.com/user/BhopalMedicalAppeal>

- * Flickr

- * <http://www.flickr.com/photos/bhopalmedicalappeal/>



References

- * http://en.wikipedia.org/wiki/Bhopal_disaster
- * <http://old.studentsforbhopal.org/WhatHappened.htm>
- * <http://www.eolss.net/Sample-Chapters/C09/E4-12-02-04.pdf>
- * [http://en.wikipedia.org/wiki/Bhopal_disaster - cite_note-first3-6](http://en.wikipedia.org/wiki/Bhopal_disaster_-_cite_note-first3-6)
- * <http://www.slideshare.net/pjoon007/bhopal-gas-tragedy-case-study>
- * <http://www.youtube.com/watch?v=5ehFcv4ywwA&feature=c4-overview&playnext=1&list=TLnJlfuSE-oto>
- * <http://www.bhopal.org/>



Questions