



INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X

Impact factor: 4.295

(Volume 5, Issue 3)

Available online at: www.ijariit.com

Government's preparedness for disaster management based on Bhopal Gas Tragedy 1984

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ABSTRACT

Disaster management is dealing with and avoiding risks. This involves emergency evacuation, disaster response, supporting and rebuilding society after natural or human-made disasters. During the tragedy, Union Carbide India Ltd wasn't prepared for quick disaster management. Gas concentration in the areas ranged from 85 to 0.12ppm, people who were in deep sleep got awakened by coughing, severe eye irritation, and feeling of suffocation and burning in the respiratory tract. Thousands of people had died the following morning. 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. The 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. From a Union Carbide factory killed a total of 16,000 people and injured half a million, Bhopal has become a synonymous symbol with an absence of industrial safety measures.

Keywords— Bhopal Gas Tragedy 1984, Disaster management, Union carbide India, Madhya Pradesh, Rehabilitation

1. OBJECTIVES OF THE STUDY

To study about Government's preparedness for disaster management based on the Bhopal Gas Tragedy 1984

2. RESEARCH METHOD AND MATERIAL

The research work proceeded with the help of detailed survey method with the questionnaire. Support of local NGOs and support from Satyanath Sarangi the social activist are really notable in this study. Sambavana trust clinic Bhopal, medical health care team in Bhopal and those who live in the gas-affected area also helped to get more data.

3. STUDY AREA

JP Nagar Bhopal, All the respondents in this study lived with in one km northeast of the Union Carbide Pesticide Plant at the time of the accident. This notified area was in the down wind direction of the escaping gases from the plant and recorded the highest number of a death rate.

4. INTRODUCTION

Emergency management continues the process by which all individuals, groups, and communities manage hazards in an effort to avoid or ameliorate the impact of disasters resulting from the hazards. Actions taken depend in part on the risk of those exposed. The majority of industrial disasters have caused fires, explosions, toxic emissions and their damage to the people and the environment were very heavy. Few of those occupational health hazards and their effects have been identified; their damage potential and remedial measures have not been still quantified.

5. WHAT LEAD TO THE BHOPAL GAS DISASTER

Factors leading to the gas leak include:

- 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 disaster.

6. PLANT LOCATION AND DISASTER

Location of the industry is very relevant, especially when it is included with Biochemical ingredients. But while considering the market, production facility, transportation of workers to industries, nearness to port cities and other main cities, MNCs won't even consider the environmental conditions. Those are some reasons behind the Bhopal disaster.

The industry was located near a thickly populated area; most of their workers were living near to the plant. In India, there are industries near main cities. Oil refineries in Mumbai, factories at the suburb of Delhi, Research Development Explosive Company in Jaipur, Kudankulam Nuclear Power Plant at Thirunaveli are some examples. The researcher has found there are so many schools and even hospitals located near these specified areas. If we want to reduce the casualties and to follow proper disaster management, industries have to move out from major cities and from densely populated areas. That will help to reduce the chance of public affliction and causality from future hazardous accidents and explosions.

The catastrophe raised some serious ethical issues. The pesticide factory was built in the midst of densely populated settlements. UCIL chose this place to store and produce MIC, one of the most deadly chemicals (permitted exposure levels in the USA and Britain are 0.02 parts per million), in an area where nearly 120,000 people lived. The MIC plant in India 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.

7. HOW DID AMERICAN COMPANY UCI OPEN IN INDIA?

To promote industrialisation and attract more multinational corporations to India, Union Carbide Corporation was allowed to construct a pesticide production factory in Madhya Pradesh. A runaway chemical reaction due to excessive ingress of water to the Methyl Isocyanate [MIC] tank and non-functional safety systems created an uncontrollable exothermic reaction that unleashed MIC to the air continuously almost about two hours through the vent line. This catastrophic effect has taken the lives of a lot of innocent life in sleep. One reason for the disaster is noted as negligence of safety survey warning which popped before the disaster.

7.1 How American Company UCI could become so irresponsible in their work?

They were so professional, so attentive to details, whereas we Indians often have a tendency to overlook details. If they weren't satisfied, they wouldn't let us move on to the next stage. For weeks on end, we made a concerted effort with our American colleagues to imagine every possible incident and its consequences.

7.2 Five past midnight in Bhopal by *Dominique Lapierre and Javier Moro*

Every question is upon the Union Carbide Company, so what is the role of the Indian Government in giving permission for opening a toxic chemical pesticide plant in city premises? How did the Indian Government escape from this disaster picture? It was another question.

UCI's first business with India is in 1934. They imported batteries to India; slowly apart from poor corporate decisions at different stages they build a manufacturing plant of "Everyday Battery". It is a series of Government policies that lead to the Bhopal plant being set up here, causing losses and ultimately the disaster which ended up killing 2500 people in a densely populated area.

Congress Government was inspired by the Swadeshi philosophy of Gandhi and curtailed foreign investment in India and insisted on technology transfer without considering the capabilities of local talent in handle such advanced technologies. But when time went on for a quick massive development Government had to do some sort of adjustments in policies. In 1956 UCI had to sell off 40% of holding, most was bought by Indian Government through Public Sectors Banks and companies. During the time of the accident, the Government of India was holding at least 25% of it.

UCC invented SEVIN to make a harmless pesticide to humans. It is in the form of a granule. MIC is one of the main ingredients of SEVIN. It was a huge success in rescuing Egypt's cotton crop in 1961, which averted an economic disaster for the country, catapulted it to worldwide popularity.

During 1960 India faced food shortage and Lal Bahadur Shastri had to call upon all Indian fast once in a week under public law - 480. Taking this an opportunity UCIL expanded its operations into the agricultural sector through pesticide. After taking relevant permissions from the Indian Government, UCIL initially imported technical grade, Sevin. They diluted it with local pesticides and sold it over India.

Based on the Planning Commission's demand and with faulty statistical models of the National Sample Survey Organisation, UCIL applied for Government's permission to set up a plant to produce 5,000 MT of Sevin every year in Bhopal, India.

The government gave permission to UCC set up the plant. Sevin was the product name for the insecticide. Carbaryl is produced by reacting Naphtol with MIC, in a process called Carbamoylation. Sevin was in the Indian market for 12 years. Politicians and bureaucrats came up with an argument to develop local technology to manufacture Naphtali. UCIL was permitted to import the design of the plant from UCC but all the aspects of the construction of the plant were mandated to be indigenous.

The 1970s, the Indian Government gave incentives to small manufacturers to produce second-grade, less effective fertilisers, which they sold at half the price of Sevin. Parallel the Government also gave farmers subsidies to buy these fertilisers. This has resulted in the selling of less than 1,000 metric tonnes of SEVIN, while the Bhopal plant was designed to produce 5 times that amount based on the Planning Commission's projections.

Initially, when land granted to the factory, the nearby place wasn't a slum or shantytown. When city progressed it has grown to suburbs, later this became a populated area and workers who worked started settling in this colony. Government has given ownership rights to the people for the sake of votes. When the company raised a question about the safety of those people, Government said that's companies responsibly. Even though 25 % part of the company was owned by the Government, the Government didn't do any kind of compensation to the victims. Though the company paid 750 cores to the victims in an out-of-court settlement, the Government escaped with all moral and financial responsibility. So if we take in this point we can identify this ongoing phase of tragedy is living proof of wrong central planning.

8. LESSONS LEARNT FROM BHOPAL DISASTER

Most important step that needs to be taken to prevent a disaster of such a magnitude in the future is that during signing MoU (Memorandum of Understanding) between any company, the Government should be made clear to the company concerned that in case any mishap occurs then the responsibility will be bared by the company, concern if there is any security lapse on their part and it should also be made clear that incase an incident does occur then the company should pay at least half of the compensation to the aggrieved people and to the Government. With which they signed the Memorandum of Understanding.

This was clearly violated in the case of UCI Ltd; they paid only a little amount of compensation. Comparing to the magnitude that happened the compensation what they paid was just a little in a purse. Due to improper money handling of Indian Government and its poor bureaucratic management people did not get even that small amount of money, later they had to protest against the company and the Government.

The second step that needs to be taken is that the victim should not be asked to provide evidence to get their compensation. This means that the tort law should be used where the victim has to provide evidence for getting compensation. Clearly, this is a problem we people in India are facing. It's a high time that we have to change this law so that aggrieved people can get compensation easily and they don't have to face hassle, in fact, this point has been raised when 1986 in the Sriram Industries case where there was an oleum leak in Delhi which led to the death on one person, the supreme court pronounced a judgment where this point was one of the landmark points in the case.

The third lesson we learned from this incident is, always ensure such a drastic mishap doesn't take place again. If the local people notice and report something untoward happening near the factory site then Government should take this seriously and take necessary action accordingly. This again was violated during the Bhopal gas tragedy as before this mega disaster took place the locals had reported that they witnessed gas leaks two-three times earlier as well but on a much smaller scale. So there was a problem before itself.

There are so many local incidents from this factory. Respondents said that to the researcher. They mentioned this factory before 1984 also faced so many minor or major accidents. Government or company didn't take care of any proper action for that said a respondent who lived near the plant during the tragedy.

One another important point is that there should be some kind of witness protection act, so that even if there is political or any other kind of pressure from the company then they are forced to change their point of view, leading to the escape of the culprits as has happened with many cases including this one.

Chemical disasters may be traumatic in their impacts on human beings and have resulted in the casualties and also damages nature and property. The elements which are at highest risks due to chemical disaster primarily include the industrial plant, its employees & workers, hazardous chemicals vehicles, the residents of nearby settlements, adjacent buildings, occupants and surrounding community. There are many crucial lessons to be learned from this incident and if necessary steps are taken such a massive catastrophe could be avoided in the future.

9. SUPPORT FROM UNION CARBIDE FACTORY AFTER THE TRAGEDY

According to the report from Union Carbide they have provided immediate relief to victims and attempted to set up a process to resolve their needs:

- (a) They have provided approximately \$2 million in aid to the Prime Ministers Relief Fund.
- (b) They kept on providing medical equipment for the needy.
- (c) They sent a team of medical experts with emergency medicines and other assistance.
- (d) They have shared maximum information about Methyl Isocyanate with the Government of India, including all published and unpublished details about the toxicity.
- (e) Team of MIC experts has appointed by the company to study and research about the toxicity.
- (f) Arizona State University with the support of the company established a vocational-technical center at Bhopal.
- (g) Companies offered fund to open a hospital at Bhopal later that offer was declined.
- (h) Company provided funds to Indian Red Cross.

10. CONCLUSION

There is a number of legal regulations to control the chemical factories in India. They have proclaimed regulations covering safety in transportation. Liability, insurance and compensations have been enacted. Given below, the relevant provisions on Chemical Disaster Management in India.

- Explosives Act 1884 Act of 1943.
- Factories Act of 1948.

- Insecticides Act 1968.
- Environment Protection Act of 1986.
- Vehicles Act of 1988.
- Public Liability Insurance Act 1991.
- Management Act of 2005.

National Disaster Management Authority had come out with very specific guidelines on chemical disaster management. Indian Government came up with legal protection to stop chemical accidents. Such as MSIHC Rules, EPPR Rules, SMPV Rules, Gas cylinder rules, Hazardous waste rules and Dock workers rules etc. Guidelines by NDMA is prepared by the directions to ministries departments and state authorities for the preparation of their detailed disaster management plans. These guidelines call for a participatory, proactive multidisciplinary framework.

NDMA has provided specific inputs to the GOMP for the avoidance of future chemical disasters in the country, along with suggested amendments on the existing framework. NDMA is also working on revamping of CIFs (Chief Inspectorate of Factories) to strengthen chemical safety in India. In addition, the National Action Plan on Chemical Industrial Disaster Management (NAP-CIDM), has been finalized which will act as the roadmap for chemical disaster management in India.

Union Carbide continued to provide interim relief funds and work with victims providing them economic support, legal action, medical support and other benefits. Indian Parliament passed a law enabling the Government of India to bring all claims on behalf of its citizens. In February 1989 after 24 days of hearings, the Supreme Court of India directed a final settlement of all Bhopal litigation in the amount of \$470 million.

10.1 Statistical Analysis on Government’s preparedness for disaster management based on the Bhopal Gas Tragedy 1984
Variable – I

- a. Is any health care insurance available under Government plan?
 I) Yes II) No III) Not Aware
- b. Does the Government financially support the patients who need multi-speciality treatment?
 I) Yes II) No

Warnings

The requested number of dimensions is greater than the maximum number of dimensions. It is adjusted to 1.
 PLOT = RPOINTS, CPOINTS, or BIPLLOT will not be drawn, because there is only one valid dimension. PLOT = TRROWS or TRCOLUMNS can be still drawn.
 PLOT = RPOINTS, CPOINTS, or BIPLLOT will not be drawn, because there is only one plot dimension. PLOT = TRROWS or TRCOLUMNS can be still drawn.

Table 1: Frequency for each category

Health care insurance available under government plan	Government financially support the patients who need multi speciality treatment		
	Yes	No	Active Margin
Yes	27	267	294
No	8	102	110
Not Aware	14	82	96
Active Margin	49	451	500

The Correspondence Table displays the frequency for each category of each variable; it is essentially a cross-tabulation frequency table.

The nominal variable is health care insurance available under Government plan and another variable is Government financially support the patients who need multispecialty treatment. The values given are called scores, frequencies. The relationship between the two variables cannot explain in the graph. The graph cannot be drawn because there is only one valid dimension. The requested number of dimension is greater than the maximum number of dimension. It’s adjusted to 1. Correspondence analysis studies the relationship with non-parametric variables.

Table 2: Chi-square test

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.406 ^a	2	.182
Likelihood Ratio	3.188	2	.203
Linear-by-Linear Association	1.486	1	.223
N of Valid Cases	500		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.41.

Chi-square test is used to find if there is any kind of relationship between the categorical variables. The two variables which have given here consist of more than two categorical variables. The value of the test statistic is 3.406.

The variables such as Health care insurance available under Government plan and Government financially support the patients who need multispecialty treatment are dependent, they are related to each other. Sig. value is less < 0.05 . Since the p-value is less than our chosen significance level < 0.05 we can reject this hypothesis and finalize that there is a relation between Health care insurance available under Government plan and Government financially support the patients who need multispecialty treatment. Both have a significant association.

Table 3: Row profile

Health care insurance available under government plan	Government financially support the patients who need multi speciality treatment		
	Yes	No	Active Margin
Yes	.092	.908	1.000
No	.073	.927	1.000
Not Aware	.146	.854	1.000
Mass	.098	.902	

The row profile shows the proportions of each column value along each row.

Table 4: column profile

Health care insurance available under government plan	Government financially support the patients who need multi speciality treatment		
	Yes	No	Mass
Yes	.551	.592	.588
No	.163	.226	.220
Not Aware	.286	.182	.192
Active Margin	1.000	1.000	

The column profile shows the proportions of each row value along to each column.

Table 5: Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation
1	.083	.007			1.000	1.000	.049	.083
Total		.007	3.406	.182 ^a	1.000	1.000		

a. 2 degrees of freedom

The summary shows the proportion of inertia. There is only one dimension. For the first dimension proportion of inertia is 1.000. The total inertia explained is 1.000. The requested number of dimension is greater than the maximum number of dimension.

Table 6: Over view row points

Health care insurance available under government plan	Mass	Score in Dimension	Inertia	Contribution		
		1		Of Point to Inertia of Dimension	Of Dimension to Inertia of Point	
				1	1	Total
Yes	.588	-.072	.000	.037	1.000	1.000
No	.220	-.296	.002	.233	1.000	1.000
Not Aware	.192	.560	.005	.730	1.000	1.000
Active Total	1.000		.007	1.000		

a. Symmetrical normalization

The table gives summary information about the roles of the row categories in the solution. The table explains the relationship between the row values. Values here given are called scores, frequencies. The relationship between the two variables cannot explain in the graph. The graph cannot be drawn because there is only one valid dimension.

Table 7: Over view column points

Government financially support the patients who need multi speciality treatment	Mass	Score in Dimension	Inertia	Contribution		
		1		Of Point to Inertia of Dimension	Of Dimension to Inertia of Point	
				1	1	Total
Yes	.098	.872	.006	.902	1.000	1.000
No	.902	-.095	.001	.098	1.000	1.000
Active Total	1.000		.007	1.000		

a. Symmetrical normalization

The table gives summary information about the roles of the column categories in the solution.

11. REFERENCES

[1] Rajkumar S, Safety security and risk management - aftermath Bhopal disaster, India, 2017, p 24.

[2] Ashok S Kalelkar, Arthur D Little, Investigation of large magnitude incidents Bhopal as a case study, Cambridge Massachusetts, USA, 1988, p 45.

[3] What Triggered the Disaster? International Campaign for Justice in Bhopal", Bhopal.net, June 2016.

[4] What Triggered the Disaster? International Campaign for Justice in Bhopal", Bhopal.net, June 2016.

[5] Ethics in Business, Organization: Union Carbide India Limited, Pub Date: 2002.

[6] Dominique Lapierre, Javier Moro, Five Past Midnight in Bhopal, The Epic Story of the World's Deadliest Industrial Disaster, France, 2001, p 54.

[7] Ingrid Ekerman, the Bhopal saga, India: Universities Press, 2004, p 34.

[8] Rajkumar S, Safety security and risk management - aftermath Bhopal disaster, India, 2017, p 45.

[9] Ashok S Kalelkar, Arthur D Little, Investigation of large magnitude incidents Bhopal as a case study, Cambridge Massachusetts, USA, 1988, p 47.

[10] Taemistocles D Silva, The Black Box of Bhopal, A Close look at the world's deadliest industrial disaster, Canada, 2006, p 64.

[11] Ibid, p 34.

[12] Ravi Kiran and Shamanth Jilla, Citizens' Issues, Public Interest, 7 ways the Government played a role in the Bhopal disaster, 03 December 2014.

[13] Jamie Cassel, The Uncertain promise of law: lessons from Bhopal, University of Toronto Press, 1993, p 43.

[14] Ravi Kiran and Shamanth Jilla, Citizens' Issues, Public Interest, 7 ways the Government played a role in the Bhopal disaster, 03 December 2014.

[15] Taemistocles D Silva, The Black Box of Bhopal, A Close look at the world's deadliest industrial disaster, Canada, 2006, p 65.

[16] Special Correspondent, Gas victims allege bungling of funds, Pioneer, New Delhi, and April 13, 2006.

[17] Vibha Sharma, Govt agrees to major demands of Bhopal victims, Tribune, New Delhi, and April 18, 2006.

[18] Sango Bidani, Bhopal Gas Tragedy: Lessons to Be Learnt From It, Youth Ki Awaaz, 2005.

[19] National Disaster Management Authority (NDMA) SITE, Government of India.

[20] National disaster management authority Government of India website, media and public awareness.

[21] <http://www.Bhopal.com/UCC-Response-Efforts-to-Tragedy>.

[22] Explosives Act 1884, India Code, Digital repository of all central and state acts.

[23] Smirithi Tiwari, Legal Service India.

[24] National Disaster Management Authority Government of India website, media and public awareness.

[25] Vikaspedia.in, social-welfare and disaster-management, man-made-disasters, chemical-disaster .

[26] National Disaster Management Authority Government of India website, chemical disaster.

[27] Sunita Narain, Chandra Bhushan, 30 years of Bhopal gas tragedy: a continuing disaster - Down To Earth, 08 July 2015.

[28] Bhopal Gas Tragedy, The worst industrial disaster in human history, A book for young people, Suroopa Mukherjee, Raghu Rai, Tulika Publishers, New Delhi, 2002.

[29] Bhopal Gas Tragedy: accident or experiment, Brokendra Nath Banerjee, Paribus Publishers and distributors, New Delhi, 1986.

[30] Surviving Disasters: Salim's journey through Hell (the never ending saga of the Bhopal gas tragedy) Suroopa Mukherjee, Delhi University, The Energy and Resource Institute, 2015.

[31] The Bhopal Syndrome: pesticides, environment and health, David Weir, Sierra Club Books, United States, 1986.

[32] The Black Box of Bhopal, Taemistocles D Silva, Trafford publishers, Canada, 2006.

[33] The Uncertain promise of law: lessons from Bhopal, Jamie Cassel, University of Toronto Press, 1993.

[34] Five past midnight in Bhopal: the epic story of the world's deadliest industrial disaster, Dominique Lapierre and Javier Moro, Grand Central Publishing, United States, 1997.